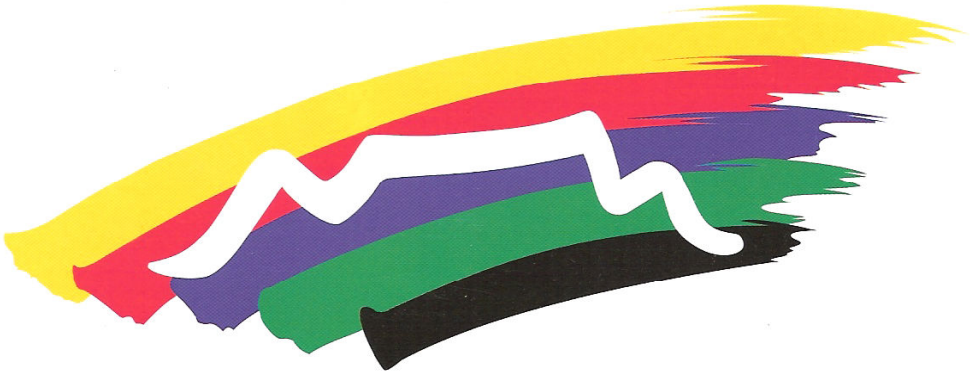

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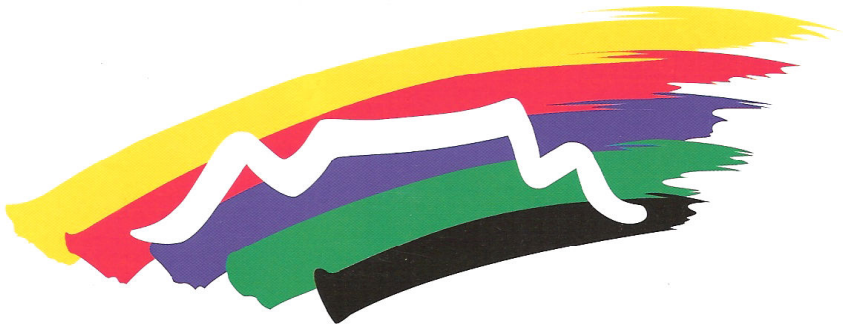
LONG-TERM WATER CONSERVATION AND WATER DEMAND MANAGEMENT STRATEGY

APRIL 2007

WATER & SANITATION

WATER DEMAND MANAGEMENT



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LONG-TERM WATER CONSERVATION AND WATER DEMAND MANAGEMENT STRATEGY

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DOCUMENT OVERVIEW AND PURPOSE

The aim of this document is to describe, motivate and illustrate the need for a revised, more comprehensive Water Conservation and Water Demand Management (WC/WDM) policy and strategy for the City of Cape Town. This strategy will be implemented over a ten-year period starting from June 2007.

A summary version of this report has also been published and can be made available on request to any interested party.

This document consists of four sections:

- **Section A**: Gives a background to the strategy and describes the current water situation in the City of Cape Town and the current status regarding WC/WDM

- **Section B**: Describes both the generic and specific concepts and theory that the strategy is based on.

- **Section C**: Evaluates the economic, social and environmental benefits of WC/WDM and establishes the motivation for the scope of the strategy. A demand analysis is also carried out and analysed in order to determine the opportunities of WDM.

- **Section D**: Describes the framework of action to be implemented. The framework of action is divided into three components;

    1) Goals
    2) Implementation objectives and action plan
    3) Enabling objectives and action plan to facilitate and ensure implementation

  The implementation objectives are sub-divided into two categories; "Water Demand reduction objectives" and "Water Resource Conservation objectives"

EXECUTIVE SUMMARY

1 Introduction

The availability of Water Resources and adequate bulk water and wastewater infrastructure to meet the growing water demand in the City of Cape Town (CCT) is a limiting constraint to the social upliftment and economic prosperity of the city. As early as 1995, City of Cape Town committed itself to a 10% saving on the historical demand growth of 4 % per annum. An Integrated Water Resource Planning (IWRP) study carried out in 2001 also indicated that various Water Demand Management and Water Conservation (WC/WDM) initiatives are the most feasible water augmentation options to meet the growing water demand for the city.

In 2001 CCT developed a WC/WDM policy and strategy based on the outcome of the IWRP study. A number of WC/WDM projects were implemented and some of the projects such as the Khayelitsha Pressure management project were very successful and received wide recognition. The implementation of the strategy was however not sustainable and due to numerous institutional challenges the initial commitment and resources to WC/WDM were significantly reduced during 2003, 2004 and again during 2006. This revised WC/WDM strategy seeks to overcome these challenges, build on experience gained and adapt to the city's approach in light of current socio-political, environmental and urban management imperatives.

The **purpose of the WC/WDM strategy** is to ensure the long-term balance between available Water Resources and water demand, to postpone the need for expensive capital infrastructure projects for as long as it is economically viable and to minimise water wastage.

The report documents and motivates the implementation of the new comprehensive and sustainable strategy and consists of the following four sections:

- **Section A**: Gives a background to the strategy and describes the current water situation in the city of Cape Town and the current status regarding WC/WDM

- **Section B**: Describes both the generic and specific concepts and theory that the strategy is based on.

- **Section C**: Evaluates the economic, social and environmental benefits of WC/WDM and establishes the motivation for the scope of the strategy. A demand analysis is also carried out and analysed in order to determine the opportunities of WDM.

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  1) Goals
  2) Implementation objectives and action plan
  3) Enabling objectives and action plan to facilitate and ensure implementation

  The implementation objectives are sub-divided into two categories; "Water demand reduction objectives" and "water resource conservation objectives"

2 Need for WC/WDM

The need of a WC/WDM at CCT is not limited to the immediate water resource shortages and includes the following:

a) Reconciling supply and future demand. The IWRP study of 2001 as well as the Reconciliation study of 2006, had clearly indicated that WC/WDM measures are the most feasible options for reconciling supply and future demand.

b) Water resource and environmental protection. Through WC/WDM, the environment can be protected by limiting the water abstracted from rivers and also reducing the pollution discharged through the wastewater system and reducing the pollution from contaminating the water supply.

c) Financial viability of the Water Services. WC/WDM can contribute significantly to ensuring the financial viability of water service delivery in CCT in the following ways:

- Reducing the direct operating costs by reducing non-revenue demand
- Reducing the operating cost of revenue demand (not significant)
- Increasing income from consumers through more equitable tariffs
- Increasing income by capacitating non-paying consumers (reducing consumption to affordable levels) to pay for water
- Postponing capital infrastructure requirements

The estimated financial benefit of implementing WC/WDM over the next 10 years is estimated at approximately R 1694 million.

d) Assist in alleviating the current problems of the wastewater system. The wastewater treatment in CCT is currently under severe stress due to lack of capacity. There are a number of treatment plants where hydraulic loading is the key constraint and WC/WDM can play a significant role in alleviating problems and reducing costs.

3 Consequences of not implementing WC/WDM

The consequences of not implementing the entire WC/WDM strategy can be significant and will depend on the extent of implementation. Some of the important consequences are as follows:

1) Premature development of the next water augmentation scheme at significant cost.

2) The aim of achieving sustainable and affordable service delivery to low-income areas could be threatened.

3) The existing loss of income to Council will continue to increase. Current levels of loss of income could be as high as R 205 million per annum (20% of total demand at an average selling price of R3.50 /kl).

4) The existing direct cost of distribution losses will continue to increase. Current financial losses due to distribution losses are estimated as R 15 million per annum. (Assuming 10% of total demand and R0.50 / kl)

4 Opportunity of reducing wastage and increasing efficiency

From the demand analysis and from the various discussions with various key role players it is estimated that the implementation of WC/WDM can achieve the following savings:

1. Reduction of water wastage from an estimated **148 Ml/day to 111 Ml/day**

2. Reduction of inefficient water usage from **210 Ml/day to 147 Ml/day**

3. Reduction in the normal natural growth rate due to new consumers by **25 %** per annum. Reduce growth rate from the high water demand of 3.09% to 2.32% (excluding reduction of existing water usage).

It can therefore be concluded that the water demand (based on 2004) can be reduced through WC/WDM from an estimated **797 Ml/day to 539 Ml/day**. A further reduction of approximately **65 Ml/day** is also feasible due to effluent treatment recycling and other alternative Water Resources. The following table illustrates where the various opportunities exist within each sector.

Table i: Opportunities in reducing demand – Ml/day

Domestic(household)				Domestic(outside use)			
Efficient Usage	Ineffici. Usage	Leaks	Total	Efficient Usage	Ineffici. Usage	Leaks	Total
55%	38%	7%	100%	73%	20%	7%	100%
189.7	132.4	24.2	346.3	84.3	23.1	8.1	115.4
Industrial				**Commercial / business**			
Efficient Usage	Ineffici. Usage	Leaks	Total (Ml/day)	Efficient Usage	Ineffici. Usage	Leaks[1]	Total
85%	10%	5%	100%	65%	25%	10%	100%
32.3	3.8	1.9	38.0	62.7	24.1	9.6	96.4
Municipal				**other consumers**			
Efficient Usage	Ineffici. Usage	Leaks[2]	Total (Ml/day)	Efficient Usage	Ineffici. Usage	Plumbi.Leaks[2]	Total (Ml/day)
65%	25%	10%	100%	65%	25%	10%	100%
22.4	8.6	3.4	34.5	47.3	18.2	7.3	72.8
UAW + bulk losses				**Summary - Total**			
Leaks bursts	Backgr. Leaks	Commercial	Total	Efficient Usage	Ineffici. Usage	Leaks	Total
30.00%	20%	50.00%	100%	**55.08%**	**26.40%**	**18.53%**	**100%**
55.8	37.2	93.0	185.9	**438.7**	**210.2**	**148**	**796.5**

The activities and the target savings that can be achieved are illustrated in the table below.

Table ii: Activities that will achieve the savings envisaged.

	Inefficiency component	Max Saving	% savings target	Target Savings (Ml/day)	Activity to achieve saving	Primary necessity
1	Reduction of NRW (leaks only)	93.0	60%	55.8	· Comprehensive reticulation management programme	• Financial sustainability of Council
2	Inefficient water consumption in low income areas	52.2	75%	39.2	Comprehensive management programme in low income areas	• Financial sustainability of Council • Affordability for consumer
3	Inefficient water consumption of business / industry	77.0	80%	61.6	· Behavior change · Retro-fitting · Leak repair	• Water resource consideration
4	Inefficient water consumption of domestic, affluent consumers	135.6	75%	101.7	· Behavior change · Retro-fitting · Leak repair / flow limiter · Effective tariff	• Water resource considerations
5	Treated effluent and alternative water resources	72.0	91%	65.5	· Effluent recycling plants · Well and bore holes · rain harvesting · Unconventional resources	• Water resource considerations
	Total	**429.8**		**323.8**		

5 The role of WC/WDM in postponing the need for new Water Resource Augmentation scheme

Analysing the potential role of WC/WDM on two possible future demand scenarios, a 3.09 % growth p.a. and a 1.43% growth p.a., illustrates that WC/WDM can postpone the need for further water resource augmentation scheme by a number of years. If a 3.09 % growth p.a. is assumed, a new water augmentation will be required by 2008. Through WC/WDM, however a new resource augmentation scheme will only be needed by 2026 or 2051 depending on the future water requirement. The table below illustrates the range of possible impact of WC/WDM on the need for a new water augmentation scheme

Table iii: Impact of WC/WDM on need for new dam

Impact of WC/WDM	Year new supply augmentation will be needed	
	Low Water Requirement	High Water Requirement
No WC/WDM	2016	2008
Sustaining efficiency from restrictions	2020	2013
10 yr WC/WDM progr.	2051	2026

The results indicate quite a significant potential for WC/WDM in postponing new water resource augmentation. The calculations however are based on a number of assumptions that need to be verified. A number of decision makers are also sceptical on the potential role of a sustained WC/WDM programme because it is a new function in water resource planning. In order to overcome these constraints and also to verify the number of assumptions made in the calculations, it is proposed that CCT adopts the following undertaking:-

> **Proposed Undertaking**: CCT will commit over the next five years to implementing and monitoring a comprehensive WC/WDM strategy. Within this time no decision should be taken regarding further water augmentation schemes in verify the full potential of WC/WDM. After five years, the full impact and potential of WC/WDM must be clearly demonstrated by CCT and re-evaluated. All assumptions made in the current analysis on the role of WC/WDM will be tested and adequately researched.

6 Framework of action

Based on the fundamental principles of WC/WDM as well as the policy adopted in the previous WC/WDM strategy by CCT, five goals have been identified and represent the overall policy.

Goals, A,B and E relate to the implementation objectives that will result in the direct reduction of water demand. Thirteen implementation objectives have been developed under the various goals. These objectives are illustrated in the table below.

> **<u>Goal A:</u> CCT must by 2010 reduce and maintain the non-revenue water to below 15% of the total average demand and within accepted international benchmarks.**

Goal B: Water wastage by consumers should be reduced and maintained to below 2% of the total demand by 2012 and most consumers should achieve acceptable water efficiency benchmarks by 2016.

Goal E: Reduce the projected potable water demand to an average growth rate of no more than 1% pa. for the next 10 years and conserve Cape Town's Water Resources.

Table iv: Implementation /Water Demand reduction objectives

Policy	Objective number	Description
Goal A	A1	Reduce and maintain low levels of water losses through the reticulation system
	A2	Reduce and maintain low levels of non-revenue demand by consumers
	A3	Adopt and implement proactive O & M measures
	A4	Reduce and maintain low levels of billing and metering losses
Goal B	B1	Promote the efficient use of water to consumers and customers
	B2	Regulate and enforce the prevention of wastage of water
	B3	Ensure the efficient use of water in new connections and developments
	B4	Introduce more equitable tariffs and informative billing
	B5	Assist and capacitate consumers to be water efficient, including the introduction of leak repair and retrofitting projects
	B6	Reduce and maintain low levels of inefficient water use by Council (internal money)
Goal E	E1	Maximise the use of treated effluent
	E2	Promote alternative Water Resources and technologies
	E3	Conservation of existing Water Resources
	E4	Ensure the quality of treated effluent is of suitable standards

The enabling action plan consists of two goals and seven objectives as illustrated in the table below. Goal C relates mainly to ensuring adequate information and Goal D relates mainly to ensuring adequate resources and capacity to implement WC/WDM.

Goal C: CCT must by 2009 ensure and maintain ongoing effective management systems and implement Integrated Water Resource Planning in all decisions regarding Water Resources augmentation, bulk infrastructure development and water efficiency projects.

Goal D: CCT must adopt WC/WDM as one of the key water service delivery strategies, and must give priority to its implementation and ensure an ongoing adequate enabling environment.

Table v: Enabling WC/WDM objectives

Policy	Objective number	Description
Goal C	C1	Establish appropriate district management areas and monitor the unaccountable for water
	C2	Ensure adequate information and policies to support decision-making
	C3	Ensure all decisions are supported in terms of Integrated Resource Planning (IRP).
	C4	Monitor the impact of WC/WDM measures and KPI
Goal D	D1	Ensure adequate financial resources
	D2	Ensure adequate human resources and processes
	D3	Ensure adequate transparency, stakeholder buy-in and commitment

7 Budget

The proposed budget allocation for WC/WDM over the next ten years, starting during the 2007/08 financial year, is as follows;

Table vi: Budget for WC/WDM

Year	Operating	Capital	Total x 1000
2007/08	R 19,581	R 27,167	R 46,748
2008/09	R 40,417	R 56,078	R 96,495
2009/10	R 57,125	R 79,260	R 136,385
2010/11	R 54,692	R 75,884	R 130,576
2011/12	R 52,616	R 73,004	R 125,620
2012/13	R 26,872	R 37,284	R 64,155
2013/14	R 18,771	R 26,045	R 44,816
2014/15	R 16,138	R 22,391	R 38,530
2015/16	R 24,685	R 34,250	R 58,935
2016/17	R 24,727	R 34,308	R 59,035
Total	R 335,624	R 465,670	R 759,195

8 Progress to date

The following is brief summary of the progress on the WC/WDM initiatives undertaken during 2005/2006 and 2006/2007.

a) Treated effluent distribution systems: R18M in Blaauwberg Area to serve industry and farms, as well as an innovative pilot dual network system in the new residential development of De Grendel. The estimated additional treated effluent supplied between 2005 and 2007 is an annual average of **14.55 Ml/day**.

b) Sustainable domestic leak repairs focusing on more than 12 000 indigent homes, including skills transfer to communities: R2,7M with estimated reduction in consumption of **3 Ml/day**.

c) Reduction of Non Revenue Demand by approximately **34 Ml/day**. It is not clear however what the reduction of real losses versus commercial losses is.

d) Pressure reduction schemes to halve nightflows and greatly reduce leakage, Umfeleni and Guguletu: R1,2M with estimated reduction in water supplied of **2.5 Ml/day** (reduction is a combination of reticulation losses and consumer demand)

e) Retro fit of water efficient shower=heads issued and installed by Eskom. The estimated reduction in water supplied is **1.3 Ml/day**.

f) Communication, awareness and educational drives: R1,8M

The overall combined impact of the WC/WDM initiatives and water restrictions is to reduce the total demand by approximately **50 Ml/day** based on the 2004 base demand.

9 Conclusions

Both the IWRP study undertaken by CCT during 2001 and the recent reconciliation study undertaken by DWAF have clearly identified WC/WDM as the most feasible solution to reconcile the future water demand. The following extract from the reconciliation study emphasises the need for WC/WDM:

> " The long lead time required to implement a supply-side intervention precludes its selection as the first intervention to be implemented prior to 2013. It is therefore imperative that additional WC/WDM interventions (beyond the CCT's long-term strategy) be studied and implemented as the first phase of the development path. If the CCT is unsuccessful in implementing its WC/WDM strategy and programme, and assuming that the HWR Curve is followed, then the supply will exceed requirement in 2011 and the City will face an increased possibility of having to impose water restrictions on its consumers."

To avoid water shortages and ensure sustainable and affordable Water Services CCT has no choice but to implement a very comprehensive WC/WDM strategy.

The current method of forecasting future demand by DWAF and CCT is considered very inaccurate and can result in a wide range of demand forecasts. Such a wide range of forecasts is having a significant impact on the need for the next augmentation and the financial consequences are enormous. The difference for a new Water Resource augmentation between a High Water Requirement and Low Water Requirement (assuming WC/WDM is implemented) is 14 years. Internationally there are more accurate models based on "end-use" demand analysis that can provide a greater level of confidence in demand forecasting.

10 Key recommendations

The following are some of the key recommendations of the WC/WDM strategy:

1) CCT must commit to implementing WC/WDM as the preferred Water Resource augmentation option. This commitment should be reviewed after an initial period of five years.

2) WC/WDM should be submitted for consideration to become a Mayoral Flagship project.

3) Attention should be given to address all of the proposed WC/WDM related programmes and projects described in the strategy.

4) An approximate budget of R 759 million should to be allocated to WC/WDM over the next ten years. Most of the budget required can be allocated from savings achieved from WC/WDM or from extra revenue generated from the water restrictions tariff or the sale of treated effluent.

5) The 2007/2008 budget and the rolling 3- year budget allocated to WC/WDM activities as part of the Water Services budget, should be revised in accordance with the budgets identified in this strategy.

6) WC/WDM activities should be intensified over the next two years in accordance with the strategy, in order to ensure that the total water demand does not suddenly increase to the levels prior to the introduction of the water restrictions.

7) All revenue from the sale of treated effluent should be ring-fenced and allocated towards the WC/WDM budget requirements.

8) The Water Restriction levy should be renamed the Water Conservation levy and all revenue collected from this should be allocated towards the costs of the WC/WDM strategy.

9) Finance and Water Services should agree on a method to estimate the financial impact of the various WC/WDM initiatives. The net savings should then be allocated towards the budget requirements of the WC/WDM strategy.

10) The strategy should be regularly reviewed to incorporate the latest available information and to re-prioritise the implementation of various programmes.

11) A new forecasting model based on “end-use” demand analysis should be developed in conjunction with an appropriate Management Information System and research.

12) Attention should be given to the human resource requirements to enable the successful implementation of the WC/WDM strategy.

13) The effluent treatment strategy should be accelerated and implemented fully over the next five years in order to assist in generating adequate income to subsidise other WC/WDM related activities.

LIST OF ACRONYMS

AADD	Annual Average Daily Demand
AU	Automatic Flushing Urinals
AMR	Automated Meter Reading
BABE	Burst and Background Estimate
BWP	Berg Water Project
CAMM	Customer and Meter Management section
CCT	Cape Town City Council
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
DMA	District Metered Areas
DWAF	Department of Water Affairs and Forestry
ERP	Enterprise Resource Planning
HWR	High Water Requirement
IRP	Integrated Resource Planning
IWRP	Integrated Water Resource Planning
IWRM	Integrated Water Resource Management
JASWIC	Joint Acceptance Scheme for Water Installation Components
KPIs	Key performance indicators
Kl/month	Kilolitres per month
LWR	Low Water Requirement
LOS	Level of Service
l/s	Litres per second
m^3/s	Cubic metres per second
Mm^3/a	Million cubic metres per annum
NRW	Non-Revenue Water
NWA	National Water Act
NWRS	National Water Resource Strategy
O & M	Operation and Maintenance
PPP	Private Public Partnerships
MIS	Management Information System
SALGA	South African Local Government Association
SWOT	Strengths Weaknesses Opportunities and Threats
ToR	Terms of Reference

UaW	Unaccounted for water
WC	Water Conservation
WDM	Water Demand Management
WSA	Water Services authorities
WSDP	Water Services Development Plans
WSI	Water Services institutions
WWTW	Waste Water Treatment Works

PLENARY - DEFINITIONS

Demand-side management: Any measure or initiative that will result in the reduction in the expected water usage or water demand.

Reticulation management: Any function relating to the management, maintenance and operation of any system of structures, pipes, valves, pumps, meters or other associated equipment, including all mains, connection pipes and water installations that are used or intended to be used in connection with the supply of water.

Inefficient use of water: Water used for a specific purpose over and above the accepted and available best practices and benchmarks, or water used for a purpose where very little benefit is derived from it.

Integrated Water Resource Planning: A way of analysing the change in demand and operation of water institutions that evaluates a variety of supply-side and demand-side management measures to determine the optimal way of providing Water Services.

Long-run marginal cost: The Average Incremental Cost of system expansion, taking into account the next large scheme or schemes to be built to meet the current and future demand

Retrofitting: The modification, adaptation, or replacement of an existing device, fitting or appliance.

Supply-side management: Any measure or initiative that will increase the capacity of a water resource or water supply system to supply water.

Unaccounted for water: The difference between the measured volume of water put into the supply and reticulation system and the total volume of water measured to authorised consumers whose fixed property address appears on the official list of Water Services Authorities.

Water Institutions: Water institutions include both Water Management Institutions and Water Services Institutions as defined in the National Water Act and the Water Services Act respectively.

Water Wastage: Water lost through leaks or water usage, which does not result in any direct benefit to a consumer or user.

Water Conservation: The minimisation of loss or waste, care and protection of Water Resources and the efficient and effective use of water

Water Demand Management: The adaptation and implementation of a strategy by a water institution or consumer to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and political acceptability.

SECTION A: BACKGROUND AND CONTEXT

1 Introduction

The City of Cape Town (CCT) is facing long-term water shortages, as well as severe capacity constraints on wastewater collection and treatment facilities with concomitant increased levels of inland and coastal water pollution. In response, the City has adopted an integrated approach to water management, which seeks a balance between Water Conservation and Water Demand Management (WC/WDM) initiatives and conventional supply augmentation.

The concept and philosophy of water demand management has increased in prominence within the City since the mid 1990's. This culminated in the adoption of a policy and implementation strategy during 2001. An Integrated Water Resource Planning (IWRP) study completed during 2002 provided a comparative evaluation of various water demand initiatives and supply augmentation schemes that could potentially assist in meeting Cape Town's future water requirements. In comparison to supply schemes, WC/WDM ranked highly in terms of affordability, implementation timeframes and was generally found to be more environmentally and socially acceptable. This outcome was repeated again as part of the results of the Western Cape Water resource reconciliation study carried out during 2006 by Department of Water Affairs and Forestry (DWAF).

Whilst the overall growth in water demand in Cape Town has dropped significantly since 2000, DWAF had expressed concern about the level of institutional commitment to WC/WDM by the City of Cape Town following the decision to go ahead with the Berg Water Project (BWP). The main cause for the temporary reduction in WC/WDM initiatives was due to various institutional challenges and the institutional transformation process that took place at CCT. This revised WC/WDM strategy seeks to overcome these challenges, build on experience gained and adapt to the city's approach in light of current socio-political, environmental and urban management imperatives.

The **purpose of the WC/WDM strategy** is to ensure the long-term balance between available Water Resources and water demand, to postpone the need for expensive capital infrastructure projects for as long as it is economically viable and to minimise water wastage. Although the primary motivation for WC/WDM is the water resource situation in the Western Cape, financial efficiency has also been adopted as a main theme throughout the strategy. The WC/WDM strategy developed aims to increase financial efficiency by reducing non–revenue demand, improving operation and maintenance and by postponing the need for large expensive infrastructure projects.

The strategy also seeks to introduce a long-term ethic and culture of water use efficiency amongst all consumers of CCT and institutionalise WC/WDM within the Water Services department. All end consumers who receive Water Services from CCT should eventually be influenced by this strategy. These include commercial, industrial and domestic consumers.

The **purpose of this report** is to document, motivate and obtain adequate buy-in to the revised WC/WDM strategy.

The document consists of four sections:

- **Section A**: Gives a background to the strategy and describes the current water situation in the city of Cape Town and the current status regarding WC/WDM

- **Section B**: Describes both the generic and specific concepts and theory that the strategy is based on.

- **Section C**: Evaluates the economic, social and environmental benefits of WC/WDM and establishes the motivation for the scope of the strategy. A demand analysis is also carried out and analysed in order to determine the opportunities of WDM.

- **Section D**: Describes the framework of action to be implemented. The framework of action is divided into two components: implementation objectives and enabling objectives.

This is the second revision of this report after it was initially completed during 2005. Council never adopted the initial draft "Dec 05", however, and the implementation of the strategy was severely affected by the reduction of available budget for WC/WDM during the 2006/2007 financial year. Year one of the ten-year strategy is therefore considered to be the implementation of activities during 2005/2006, 2006/2007 and the proposed activities to be implemented during 2007/2008 financial year. Year 2 of the ten-year proposed strategy will be the 2008/2009 financial year.

2 Background

2.1 Vision for Water Services (WC/WDM role)

The vision of the Water Services Directorate is as follows:

To become leaders in the provision of equitable, sustainable, people-centered, affordable and credible Water Services to all

The key linkages of the vision statement with regards to WC/WDM are as follows:

- **Equitable:** The block-rate tariff system ensures that consumers who use a lot more water pay a tariff related to the marginal cost of water. This promotes equity since consumers who use more than their equal share of existing Water Resources should be made liable/accountable for new bulk infrastructure and Water Resources.

- **People-centered:** The WC/WDM paradigm places an emphasis on the consumers, the environment and their needs. Traditionally the supply side management paradigm focused mainly on engineering solutions to address perceived needs.

- **Affordable:** The implementation of WC/WDM can result in the postponement of capital projects that will result in long-term financial savings and therefore restrain future increases in water prices. The reduction of non-revenue demand will also increase the efficiency of water supply and therefore make water more affordable. A number of WC/WDM initiatives will also directly reduce the water costs to most low-income consumers. Such initiatives will include leak repairs and retrofitting of plumbing fittings.

- **Sustainable:** The current limited Water Resources threaten the sustainability of Water Services in Cape Town. WC/WDM can extend the assurance of supply of the existing Water Resources and go a long way in reconciling future demand and supply.

- **Services to all:** WC/WDM can greatly increase the ability to supply Water Services to all by reallocating existing bulk capacity and Water Resources from inefficient use to new consumers, and ensuring that new water supply projects are sustainable and affordable.

2.2 Legislative requirements on WC/WDM

This WC/WDM strategy supports the key principles embodied and complies with the relevant provisions of both the National Water and Water Services Acts. The following is a list of all the relevant national legislations and policies regarding WC/WDM.

2.2.1 National Water Act

The National Water Act adopts water conservation as a key concept. Conservation appears more than twenty times throughout the Act. The following are the most significant clauses regarding WC/WDM in the National Water Act.

- **Clause 8** makes water conservation one of the requirements of a catchment management strategy.

  "(1) A catchment management agency contemplated in Chapter 7 must, by notice in the *Gazette,* establish a catchment management strategy for the protection, use, development, **conservation,** management and control of Water Resources within its water management area."

- **Clause 29** makes water conservation one of the conditions associated with authorisation of licences.

  "(1) A responsible authority may attach conditions to every general authorisation or licence -
  (a) relating to the protection of -
  (i) the water resource in question;
  (ii) the stream flow regime; and
  (iii) other existing and potential water users;
  (b) relating to water management by -
  (iv) specifying management practices and general requirements for any water use, including water **conservation** measures;"

- **Clause 56** specifies that the cost of water conservation can be included in the pricing strategy.

  "(1) The Minister may, with the concurrence of the Ministry of Finance, from time to time by notice in the *Gazette*, establish a pricing strategy for charges for any water use within the framework of existing relevant government policy.
  (2) The pricing strategy may contain a strategy for setting water use charges -
  (a) for funding water resource management, including the related costs of -
  ……..
  (iv) water resource protection, including the discharge of waste and the protection of the Reserve; and
  (v) **water conservation**;"

- **Schedule 3 Clause 6** specifies that the catchment management agency may require users to undertake water conservation measures.

  "(1) If a catchment management agency on reasonable grounds believes that a water shortage exists or is about to occur within an area it may, despite anything to the contrary in any authorisation, by notice in the *Gazette* or by written notice to each of the water users in the area who are likely to be affected -
  (i) limit or prohibit the use of water;
  (ii) require any person to release stored water under that person's control;
  (iii).prohibit the use of any waterwork; and
  (iv) require specified **water conservation measures to be taken**."

2.2.2 Water Services Act

The following clauses in the Water Service Act relate directly to WC/WDM:

- **Clause 2 (j)** states that one of the main objectives of the Act is:

  " the promotion of effective water resource management and conservation"

- **Clause 4 (2)** requires that one of the conditions set by the Water Services provider

  (c) "Must provide for-

  (vi) measures to promote water conservation and water demand management"

- **Clause 11** specifies the duty of water service authorities to provide access to Water Services.

  (1) " Every Water Services authority has a duty to all consumers or potential consumers in its area of jurisdiction to progressively ensure efficient , affordable, economical and sustainable access to Water Services."

  It specifies that this duty is subject to:

  (2) (e) "the duty to conserve Water Resources"

- **Clause 13** specifies the contents of a draft Water Services development plan. Clause (j) specifies the following:

  (j) "of existing and proposed water conservation, recycling and environmental protection measures"

2.2.3 Water Services Act regulations

The following clauses in the Regulations under the Water Service Act relate directly to WC/WDM:

- Clause 10 (1) " A Water Services authority must include a Water Services audit in its annual report on the implementation of its Water Services development plan required in terms of section 18(1) of the Act."

- Clause 11 1) Within two years of the promulgation of these regulations, a Water Services institution must every month-

  b. "Determine the quantity of unaccounted for water ……"

- Clause 12 " A Water Services institution must repair any major, visible or reported leak in its Water Services system within 48 hours of becoming aware thereof."

- Clause 13 " A Water Services institution must

  a. within two years …fit a suitable water volume measuring device or volume controlling device to all user connections provided with water supply services that are existing at the time of commencement of these regulations"

- Clause 15 "A Water Services institution must design and maintain every water reticulation system installed after promulgation of these regulations to operate below a maximum pressure of 900 kPa."

2.3 Guiding Principles

In the context of this strategy, water is considered both a **social and economic good**. As a social good, well-managed water processes play an important part in ensuring the health, well-being and dignity of vulnerable communities as well as in promoting social equity. As an economic good, broader societal benefits may be realised through the reallocation of water between urban uses.

Social development and upliftment is one of the key objectives of CCT. WC/WDM can significantly assist in pursuing the objectives of social development and upliftment in the following ways:

- Ensuring that water supply services remain affordable to the poor.
- Educating communities on how to manage their Water Services effectively and efficiently.
- Reallocating Water Resources and bulk infrastructure capacity from inefficient water use to consumers without adequate services.
- Free financial resources that can be allocated to social upliftment projects by postponing the need for expensive capital infrastructure projects.

For decades **water resource planning** has been equated with supply augmentation, often with negative economic, social and environmental implications. The opposing view, which advocates demand management and voluntary water reallocation whilst discounting supply augmentation, is equally untenable. Cape Town subscribes to a balanced approach, underpinned by an Integrated Water Resource Planning Study undertaken between 1999 and 2002. Various options for water demand management and resource augmentation to be implemented over the next two decades were identified. These were subjected to multi-criteria decision analysis and ranking based on yield, technology, socio-economic, financial, environmental and public acceptability criteria.
The strategy also seeks to identify and meet all regulatory requirements prescribed in the National Water Services Act, regulations and the bulk water supply agreement between the CCT and DWAF.

2.4 Links between WC/WDM strategy and water restrictions

The water restrictions introduced due to the drought over the last few years (2002-2005) may have both negative and positive consequences on a long term WC/WDM strategy. It is important to recognise the linkages and consequences between the water restrictions and WC/WDM in order to maximise any benefits that may be derived and minimise any negative impact.

Understanding drought and water restrictions

Water resource planning is based on a model that reconciles available Water Resources with projected water demand. The available water resource yield is related to the long-term mean rainfall and runoff. A drought occurs when the rainfall is below the long-term mean, which leads to the reduction of storage of water in dams and therefore impacts on the available yield that can be abstracted. Water restrictions are then enforced to reduce the demand until such a time as the dam levels are restored to a safe level. Water restrictions can last for a short or long period depending on the duration of the drought.

Comparison of water restrictions and long term WC/WDM

Water restrictions need to achieve savings almost immediately once they are implemented and they are therefore usually limited to targeting the behaviour change of consumers. Water restrictions can be punitive and can result in damage to gardens and negatively influence people's lifestyles. A long term WC/WDM strategy however aims to incrementally target water wastage and inefficient use in a prioritised order. The long term WC/WDM strategy is a more comprehensive and balanced approach that aims to achieve water savings from consumer behaviour change as well as technological improvements. The strategy also aims to achieve water savings from all consumer categories (including industrial), target reticulation losses and explore alternative Water Resources to minimise abstraction from the current surface Water Resources. The approach adopted in the strategy is not limited to enforcing water restrictions but includes educating, capacitating and even directly supporting consumers to achieve savings without having a negative impact on economic activity or lifestyles.

Benefits of water restrictions towards a long-term WC/WDM strategy

1. Internationally the most successful long-term WC/WDM strategies emerged after droughts and water restrictions. This is mainly due to two reasons: firstly, water institutions become aware of the opportunities and advantages of WC/WDM and secondly water institutions can capitalise on the awareness and behaviour change of consumers.

2. If the water restrictions are long enough it stimulates technological improvements and innovation from both the business sector and private individuals. Without restrictions, it is often difficult for water institutions to encourage innovation and entrepreneurship and this requires the introduction of by-laws and incentives. The following are examples of innovations and entrepreneurship identified in Cape Town during restrictions:

    - Adverts and fliers from plumbers to fix and repair leaks.
    - Most new developments are now using pebbles instead of grass between their property and the pavements.
    - There are a number of entrepreneurs offering the development of inexpensive boreholes or well points to domestic consumers.
    - The development of a number of water saving innovations (i.e. recycling of grey water system and new efficient toilet systems).
    - The import and marketing of waterless car wash products.

Possible negative impact of water restrictions towards a long term WC/WDM strategy

1. If not managed correctly, water restrictions can create a negative impression and opinions amongst the public. The type of opinions that have already been formed by some people and consumers in Cape Town are as follows:

    - "Why does the municipality and government not desalinate or increase its water resource capacity from ground Water Resources."
    - "Water restrictions are an excuse by the municipality to make money."
    - "I paid a lot of money for my garden and the water restrictions are destroying my investment and my property value."
    - "Water restrictions are not implemented fairly. I have a family of six and have the same restrictions imposed as my neighbour that has a family of 2."
    - "The municipality does not practise what they preach and they waste water in irrigating public areas and not fixing leaks."

2. Consumers may feel that there is no longer a need to use water wisely after restrictions are lifted and that water savings are only necessary during a drought.

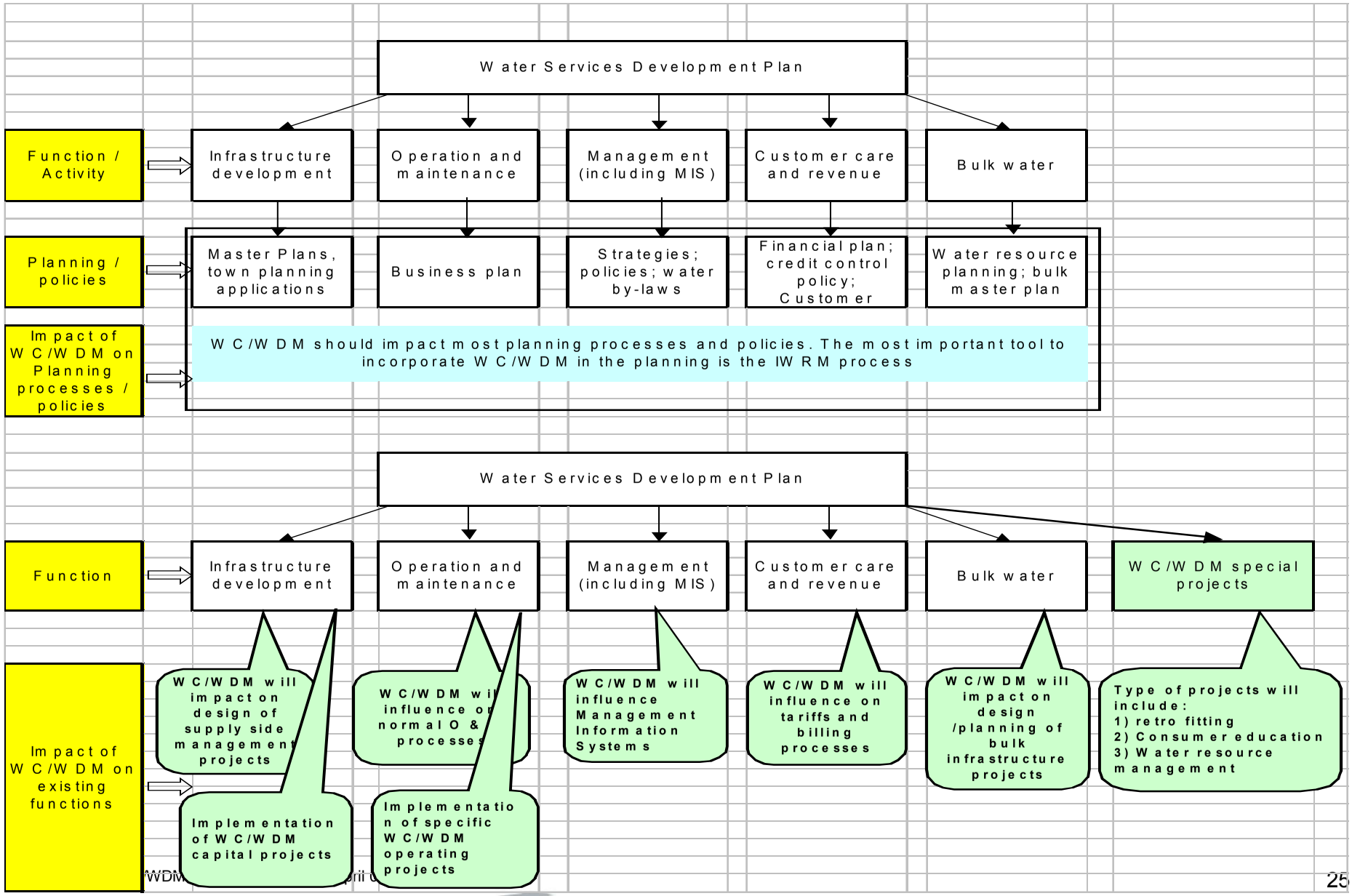
3. A drought often creates an excuse to pursue and accelerate the need for further water augmentation schemes at the possible expense of a long-term WC/WDM strategy. A long-term comprehensive WC/WDM strategy needs to be motivated as an economic alternative to expensive water- resource augmentation schemes. The opportunistic rationale sometimes used by decision makers is often linked to the public's uninformed calls for further augmentations and is not necessary based on sound water resource planning. A drought is not necessarily caused by the lack of existing Water Resources schemes but by the reduction of rainfall. The existing Water Resources are planned in accordance with a water resource model that incorporates historical rainfall data and various planning parameters including surety of supply. The occurrence of a drought does not necessarily change the planning model unless it can be proven that the planning parameters need to be modified due to climate change or because the assumptions made in the model are incorrect.

2.5 WDM in the context of other Council activities

The following diagram illustrates the link between WC/WDM and the other functions of the various sections of the water department at CCT. The top part of Figure 2-1 illustrates the existing functions and the planning processes that inform these functions. For example the Master plan studies and town planning applications inform the infrastructure development process. (It should be noted that the diagram does not distinguish between water supply and sewage reticulation).

The bottom part of the Figure 2-1 illustrates how WC/WDM will impact on the various functions and activities of the water directorate at CCT. For example WC/WDM will influence normal O & M processes and it will also require the implementation of specific O & M activities such as the implementation of a proactive leakage program. In addition to influencing the existing activities, it is anticipated that a new-dedicated WC/WDM section will need to be created. Such a unit will implement specialised WC/WDM projects such as retrofit programs and consumer education programs.

Figure 2-1: WC/WDM in context of other Water Services functions



3 Context

3.1 Geographic and Socio-Economic Overview

In common with other metropolitan areas, the city population and concomitant demand for municipal services is rapidly increasing. This is driving urban sprawl and growing competition for the limited regional Water Resources. The municipal area measures approximately 2500km^2 and experiences mild, wet winters and hot, dry and windy summers. Annual average precipitation varies between 550mm per annum on the Cape Flats to in excess of 1700mm per annum over the surrounding mountainous areas.

The population of the city is currently estimated at approximately 3.2 million with an annual growth rate of 2.6%. The highest population densities occur on the Cape Flats. Over the period 1991 to 2000 the local economy grew at an average annual rate of 2.6% (1.8% nationally) and contributed approximately 11% to national GDP. Against this encouraging backdrop, a staggering 30% of households currently live below the poverty datum line, many within the 90 informal settlements or "backyard" dwellings. The present housing backlog is 240 000 units, with a growth of 8 000 units per annum.

Current metropolitan growth predictions indicate that vacant land available for development will reduce by 70% over the next two decades, with significant ramifications for service provision. The bulk of this predicted development will take place along the northern and eastern fringes of the municipal area as indicated below.

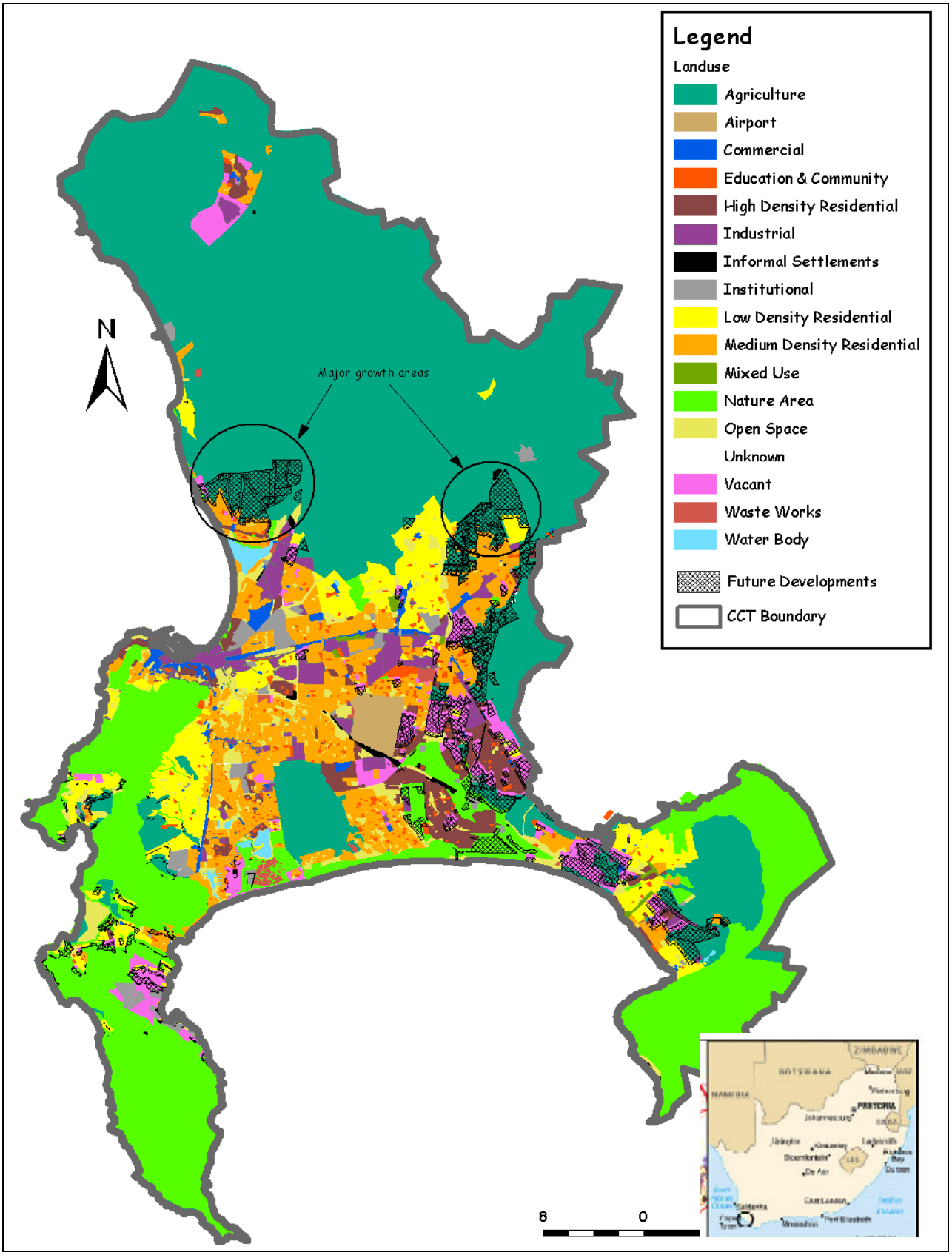


Figure 3-1: Map of CCT illustrating major growth areas

3.2 Environmental Considerations

The metropolitan area is characterised by unparalleled beauty with many diverse, unique and sensitive natural habitats that require protection and appropriate management for the benefit of residents and visitors alike. The burgeoning tourism industry, which stimulates the local economy, is notably dependant on the natural environment.

WC/WDM can play an important role in conserving and protecting the environment. Some of the environmental functions and roles of WC/WDM are: the rehabilitation of wetlands, the removal of alien vegetation, the prevention of pollution to rivers and the reduction of abstraction of water from Water Resources.

3.3 Global Climate Change

Rainfall trends in South Africa have shown increasing intensity of droughts over the past 80 years as a direct result of global climate change. If predictions are correct, we can expect many of the already arid areas in South Africa to become drier over the next decades due to global climate change.

Climate changes in South Africa are already vulnerable to variation and will require considerable adaptations. The type of adaptations that will be needed are as follows:

- Enhance our water use efficiency – to make the same amount of water go further.
- Reduce our pollution impacts – to keep the same water cleaner for further use.
- Make significant infrastructure and technical changes in order to ensure that we increase our ability to store water, and our ability to hold back floodwaters. (The above is an abbreviated extract from a speech made by the minister of Water Affairs and Forestry in 2001, obtained from the DWAF web page)

3.4 Legislative and Political Reforms

Water management in South Africa has been subjected to far-reaching legislative and political reforms over the past decade, driven primarily by the National Water Act (No. 36 of 1998) and the Water Services Act (No. 108 of 1997). An important feature thereof is the recognition of the environment as a legitimate user of water. The principles underpinning this act and other applicable legislation such as the Constitution, National Environmental Management and Municipal Systems acts have been incorporated into the latest vision and mission statements of the city.

Both the Water Services Act, and the National Water Act, promote water use efficiency and water conservation as fundamental principles. (The legislative mandate of WC/WDM is discussed in more detail in section 2.2 above)

3.5 Institutional Perspective

3.5.1 Mandate and Roles

In terms of the Constitution of the Republic of South Africa (Act 108 of 1996), municipalities have the executive authority and the right to administer water and sanitation services limited to potable water supply systems and domestic wastewater and sewage disposal systems.

In accordance with the Water Services Act, the roles and responsibility for water service delivery are divided into the role of a Water Services authority and Water Services provider. CCT is the Water Services authority and the Water Services provider responsible for the provision of services in city of Cape Town, but it is also the regional bulk water service provider to Boland, West Coast and Drakenstein Municipalities (including the towns of Paarl, Wellington, Stellenbosch and some of the surrounding farms).

The Council intends separating the roles and responsibilities of the service authority and service provider as required by the Water Services Act. This strategy has been formulated for the current integrated scenario of service delivery to the City of Cape Town. The strategy does not impact on the regional bulk water supply to the other towns, since CCT does not have any authority to influence the other towns' policies, but it strongly suggested that the other councils adopt a similar WC/WDM strategy.

3.5.2 Core Business

The service comprises activities associated with surface water impoundment, groundwater abstraction, water purification and distribution as well as the collection and treatment of sewage as well as effluent disposal and recycling.

3.5.3 Functional Areas

The primary functions necessary for the provision of water and sanitation services include:

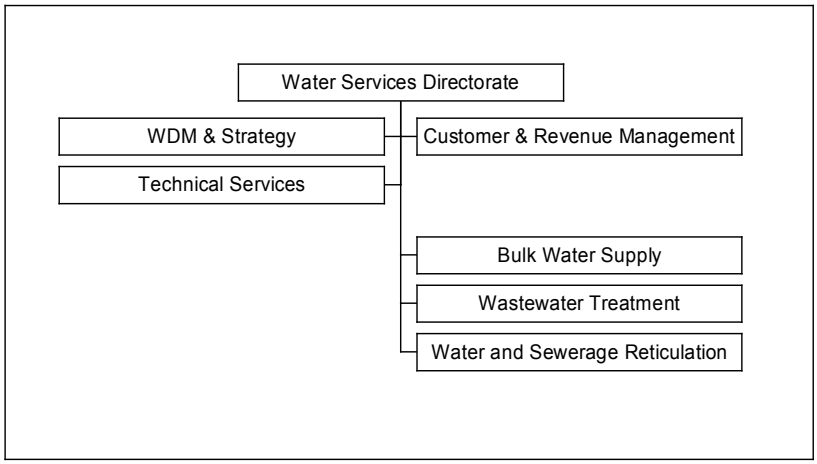
1. Strategy, policy and guideline formulation
2. Water resource planning and management
3. Design, construction, upgrading of infrastructure
4. Operation and maintenance of reticulation and collection networks and systems
5. Facilitation and management of urban development
6. Relationship management and education
7. Quality control and compliance monitoring
8. Water demand management
9. Management information systems

Associated functions such as billing and elements of customer care are undertaken corporately by Financial Services in terms of a Service Level Agreement.

3.5.4 Service Delivery Mechanisms

Water Services are provided by a 'ring-fenced' directorate within the City administration, with clear cost and income apportionment. Whilst the Water Services Directorate is directly responsible for direct service provision, responsibility for income and customer relationship management vests with the Finance Directorate and support services are provided by corporate directorates. The current organisational structure of the Water Services directorate is illustrated below.

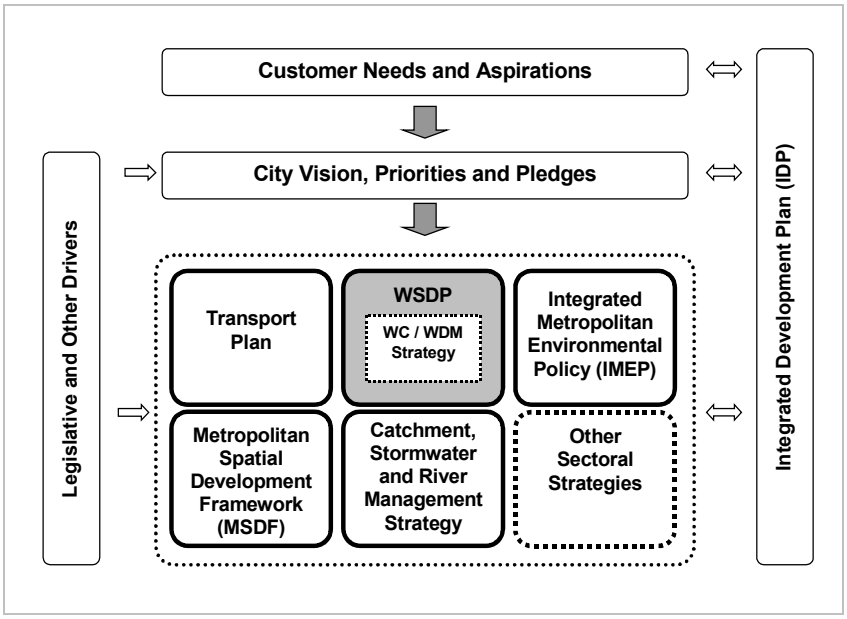
Figure 3-2: Water Services directorate organisation structure



3.6 City Vision and Priorities

The WC/WDM strategy supports the strategic objectives outlined in Council's Vision, Goals and Priorities Statement for 2003 and beyond. In addition, it forms an important component of the City's Water Services Development Plan and complies with the various principles of Integrated Metropolitan Environmental Policy (IMEP). The latter policy forms the foundation for an environmental management strategy for the City of Cape Town and integrates the built, cultural and socio-economic factors into a single environmental policy framework. The context of the WC / WDM Strategy is graphically illustrated below.

Figure 3-3: Context of WC/WDM in relation to other policies

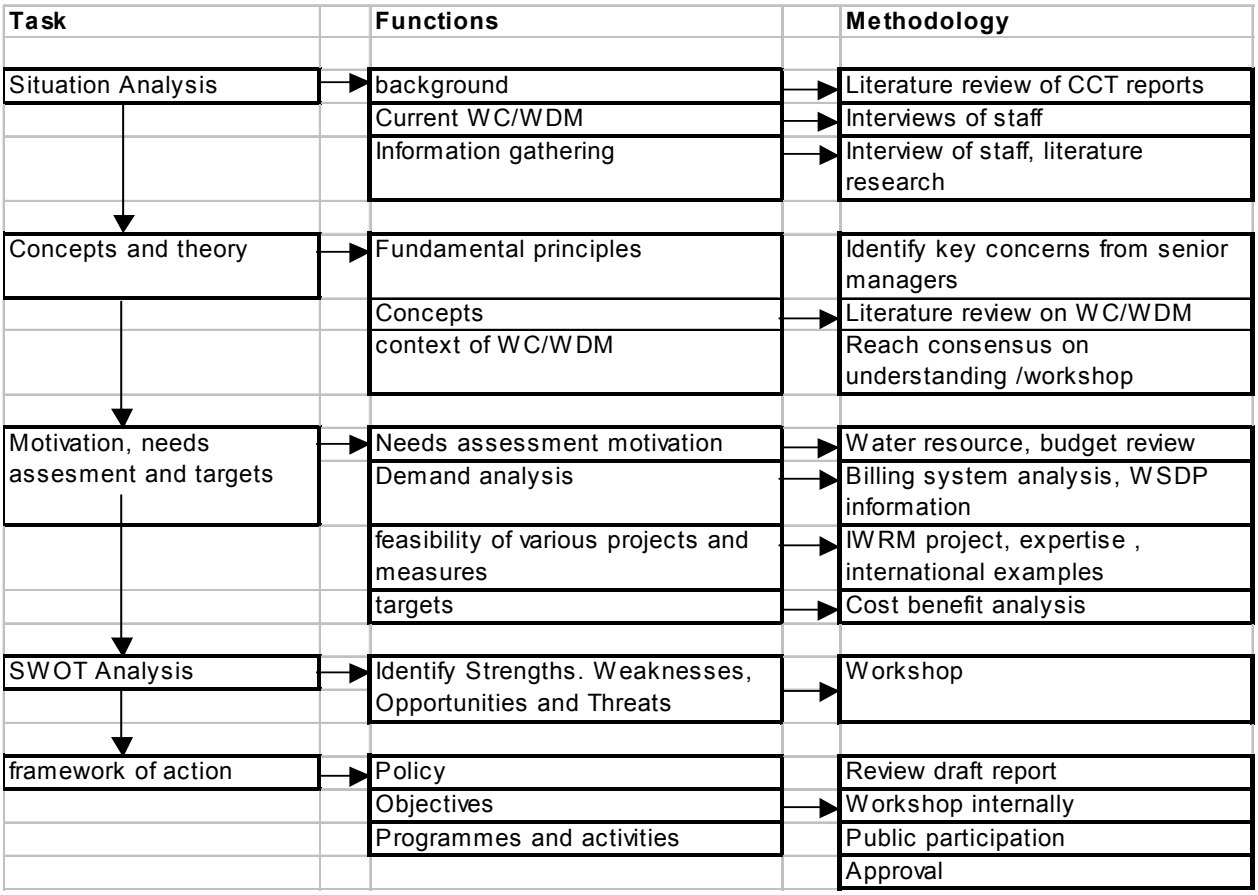


4 Development of strategy

4.1 Methodology

The methodology adopted in developing the WC/WDM strategy is illustrated below. The various chapters in this report are aligned with most of the steps indicated in the methodology.

Figure 4-1: Methodology in developing the WC/WDM strategy



4.2 Process and background

The development of this strategy began in 2004 after DWAF had approached CCT and requested that, in conjunction with the approval of the Berg Water Project, CCT should intensify its commitment to WC/WDM. DWAF had offered the services of a specialist service provider, Mr G. Constantinides, to assist in the development of the strategy and had contributed to his initial costs. Part of the strategy was completed by November 2004 but due to limited funds available, work on the strategy was suspended before it was finalised. After a lengthy delay CCT then re-appointed Mr G Constantinides to complete the strategy. Further delays were also caused due to the changes in the management of the Water Services Department.

During the 2005 drought it also became urgent to launch a water conservation campaign in conjunction with the drought. A separate process was initiated and the **10-point Water Conservation Plan was launched.** The 10- point plan however was designed more as a water conservation campaign and not as a long-term strategy. The major difference between the 10-point conservation plan and the WC/WDM is that the 10-point plan does not adequately address issues and activities that will enable the implementation of the strategy and sustain efficiency key-performance indicators. A more detailed comparison of the 10- point conservation plan with the strategy is indicated in the section below. Reference is also made for each programme and activity to the 10-point conservation plan in all the cost tables indicated in chapters 12 and 13.

During 2006/2007 the strategy was revised to incorporate the latest information and developments that had occurred over the last two years.

The following processes took place in order to ensure adequate input, ownership and involvement of Council staff and stakeholders:

1. Consultation with Water Demand Management staff

   Numerous direct consultations and review of the strategy took place between the various managers responsible for WDM. This included meetings with Mr. John Frame, Mr. D. Heineke and Mr. Julian Daniels.

2. Workshops with Water Department staff

   Four workshops were held to review and discuss various aspects of the strategy with senior staff of the Water Department. Specific emphasis was placed on reconciling the demand curves and agreeing with bulk water division on the overall future demand target. A workshop also took place during December 2005 with the Operations division in order to highlight the overlaps and alignment of the WC/WDM with their division.

3. Workshops with DWAF and CCT

   Although various meetings and small workshops were held during 2004 and during 2005 between DWAF and CCT, the most significant was the workshop held during October 2005. This was effectively the first workshop held with the current new management of WC/WDM from both DWAF and CCT. The workshop was held in a spirit of co-operation. Valuable input was obtained from DWAF during the workshop and CCT invited DWAF to submit further detailed comments on the strategy.

4.3 Comparison and integration with 10-point Conservation Plan

The 10- point Conservation Plan approved by CCT during 2005 is not very different from the proposed WC/WDM strategy. Rather than considering the two as products of different processes, the WC/WDM strategy described in this report should be regarded as a more detailed evolution of the approved 10-point Conservation Plan.

Some of the reasons why the WC/WDM strategy should be regarded as the evolution of the current approved 10-point conservation plan are as follows:

a. WC/WDM must not be seen as a drought relief campaign only. It must ensure that the objectives and principles specified relate to a long-term programme that will not be reduced once the drought has ended.

b. The strategy needs to relate to enabling objectives. In the past, there have been a number of institutional and financial constraints preventing the long-term implementation of WC/WDM. The 10-point plan does not include enabling objectives and activities.
c. The 10-point conservation plan does not include a number of important WC/WDM initiatives, such as proactive operation and maintenance, efficiency in new developments, and integration of planning.
d. The WC/WDM strategy should not only be based on water resource considerations but should also include financial efficiency, social equity and service delivery objectives.
e. The strategy must not be limited to water reduction initiatives. In order to ensure sustainability, the strategy must include monitoring, research, effective management and progressive development of various WC/WDM initiatives.
f. A number of the activities in the 10-point conservation plan are not adequately described. The strategy is more uniformly detailed and developed for all programmes and projects.
g. The 10-point conservation plan does not analyse the opportunities of WC/WDM and does not analyse the possible impact of WC/WDM on the future demand projections. Such analysis is imperative in order to ensure that WC/WDM becomes part of the overall Water Resources and Water Services functions instead of a stand-alone programme.

4.4 Literature review

A number of publications and reports were referenced in developing this strategy. A full list of these publications is given at the end of this report. The three reports that give the mandate to the WC/WDM are the Raw Water Supply Agreement between DWAF and CCT, the WSDP and the IWRP study. The key aspects in these reports with regards to WC/WDM are listed for quick reference.

a) Raw Water Supply Agreement between DWAF and CCT

Reference: Report "Raw Water Supply Agreement between the Department of Water Affairs and Forestry and the City of Cape Town" – Mallinicks attorneys; 2003

The following keys aspects of the agreement have a direct impact on the WC/WDM strategy:

- *Page 9, section 2*.
  Clause 2.4: "After reviewing, and being satisfied with, progress made by the City in water conservation and water demand management and ……., the Minister has, in terms of section 109 of the NWA, approved the implementation of the Berg Water Project (PWP)"

- Page 23, section 17,
  Clause 17.1: "The city shall use all reasonable endeavours to ensure the water demand management measures contained in the Water Services Development Plan and any other water demand policies adopted from time to time, including the Water Demand Management Policy and Strategy, are implemented."

  Clause 17.2: "DWAF shall monitor the City's compliance with its WSDP.

  Clause 17.3: "The city shall be responsible for actively promoting the efficient use of water by its consumers."

b) Water Service Development Plan (WSDP – 2004 and 2005)

The following key aspects of the WSDP have a direct impact on the WC/WDM strategy:

- Page x; executive summary

"CCT is in the process of implementing the ISO 9001 Quality Management System to improve communication with consumers, revenue collection and quality management. As part of this process the CCT has established a Customer Charter"

- Page xi, executive summary
"The CCT through its WDM strategy and programme has committed itself to the implementation of the recommendations emanating from the IWRP study.

- Page xii, executive summary
"Current resources cannot meet the 98 % assurance supply level, which implies that the CCT should aggressively pursue WDM ."

- Page xiii, executive summary
"Based on Package 1 & 2 (of the IWRP study) the CCT has formulated and accepted a water demand management policy and strategy with the main objectives as summarized below…..

- Page xxvi, Table B: Provisional list of key performance Indicators
KPI specified for: bulk water supply targets, reduction of per capita consumption, NRW, effluent recycled.

c) Integrated Water Resource Planning study

Reference: "Integrated Water Resource Planning study" – Main Report, City of Cape Town, Oct 2001
The key output from the IWRP study, is illustrated in Table 4-1 below.

Table 4-1: IWRP scores of various water resource options

Option	Yield	Financial	Socio-economic	Acceptability	Environmental	Overall Score
Pressure management	78	79	62	95	91	82
User education	77	76	68	91	91	81
Elimination of automatic flushing urinals	60	72	59	94	91	77
Treated wastewater for local urban and industrial use	71	73	37	85	96	74
Leakage repair	64	62	77	80	91	73
Lourens River diversion	86	82	66	74	39	72
Tariffs, metering and credit control	79	88	69	29	91	71
Introduction of water-efficient fittings	61	57	60	70	91	66
Eerste River diversion	77	72	54	78	40	66
Cape Flats Aquifer	77	65	58	75	55	66
Promotion of private boreholes	59	56	57	91	47	63
Promotion of grey-water use	45	59	13	91	77	61
Treated wastewater for commercial irrigation farmers	62	58	15	46	80	52
Treated wastewater reclaimed to potable standard	75	10	71	37,5	96	44

Comments on the IWRP study

1. The IWRP study signalled a significant deviation from the normal supply side management planning practices used throughout South Africa.

2. Although the outcome of the study is used as the main reference for the WC/WDM strategy, the following arguments are used to deviate from the recommendations and conclusions made.

   - The study only identifies projects that may reduce demand and does not focus on the initiatives and measures necessary to maintain, monitor and manage on a long-term basis the various key performance indicators.

   - The weighting criteria allocated and the possible water savings of various WC/WDM measures were conservative. The possible impact of the various projects was based on calculated estimates and subjective to conservative opinions due to the lack of adequate case studies and experience.

   - The financial savings of the WC/WDM measures were limited because they were calculated based on the avoided infrastructure of Water Resource augmentation schemes only. Possible financial savings from postponing other bulk water supply and wastewater system infrastructure were not considered.

   - The opportunities of WC/WDM measures were further reduced due to perceived institutional constraints. Should the strategy be successfully accepted and approved, such constraints should be reduced significantly.

3. The IWRP study should be further reviewed and developed taking into account some of the limitations identified.

5 Water supply situation

5.1 Overview of water supply

The following are some of the key aspects of water supply system in CCT for the **base year of 2004** that are relevant to the WC/WDM analysis:

a) The population of CCT during 2004 is estimated at 3,099 million with the highest population density occurring on the Cape Flats. (Population figures according to census 2001 and extrapolated at 2.7% growth)

b) There are approximately 654 000 consumers on formal erven and approximately 100 000 consumers on informal sites. According to the 1996 census approximately 67% of consumers earn less than R2500/month.

c) Current water demand (2004 level) by CCT is 795 Ml/d. The average effluent is 68% of the total water demand. The bulk water purchase is approximately 1000 Ml/d and includes water supplied to Wellington, Paarl and other rural consumers.

d) The historic growth in demand between 1973 and 1997 is approximately 4% per annum.

5.2 Key challenges of Water Services

A number of key challenges regarding water supply have been identified in the WSDP. The following list of challenges is directly referenced from the summary chapter of the WSDP report. Most of these challenges relate and can be influenced by WC/WDM.

Although WC/WDM can have a positive impact on most of these challenges, there are a number of WC/WDM measures that may also have a negative impact. The following section identifies briefly the possible influence of WC/WDM for two reasons: to further motivate the need for a comprehensive WC/WDM strategy and to identify some of the parameters and scope of the strategy.

Maintenance and operation

a) "Inadequacy of current preventative maintenance / pipe replacement programs."

   One of the key aspects of the WC/WDM paradigm is to develop a proactive approach to operation and maintenance.

b) "Stormwater / groundwater infiltration in sewers"

   Stormwater / groundwater infiltration in sewers is not considered as part of the WC/WDM strategy. It is however part of a similar theme to WC/WDM of efficient operation and maintenance.

Capital infrastructure requirements

c) "Major bulk water and wastewater infrastructure requirements."

   WC/WDM can significantly reduce and/or postpone the need for both bulk water and wastewater infrastructure requirements. Although the IWRP study did not incorporate the potential financial savings of WC/WDM postponing reticulation and effluent infrastructure requirements, the strategy identifies some of the opportunities and makes suggestions on how to modify the IWRP approach.

d) "Address the current backlog of consumers with inadequate Water Services."

   The sustainability of any service delivery project to reduce the backlog to consumers with inadequate Water Services will also depend on the WDM measures introduced. The WC/WDM strategy defines certain functions and measures that must be introduced as part on any such projects.

e) "Wastewater Treatment Works would require upgrading with a total estimated cost of R1.5 billion in order to comply with the new treated effluent standards as imposed by DWAF and to accommodate future growth."

   WC/WDM may have an impact in postponing the capital infrastructure requirements of Wastewater Treatment Works. There are a number of wastewater treatment plants that have reached or exceeded the hydraulic loading capacity. The implementation of retrofit projects and leak repair projects could therefore reduce wastewater and release some of the pressure on existing wastewater plants.

f) "A survey on the status of existing master plans indicated that not all of the former administrations have a comprehensive water and sewer master plan."

   The development of new master plans should be in accordance with the new IWRP principles defined in the strategy. The new master plans must take into account the possible impact of WC/WDM.

Water resource requirements

g) "Current resources cannot meet the 98% assurance supply level."

WC/WDM will play the most important role in ensuring adequate Water Resources.

h) "Over the past few decades rivers have been viewed as convenient drains to convey urban waste and storm runoff. They were canalised on a large scale and many wetland areas filled-in and drained to allow for urban development, dramatically altering the natural hydrological cycle. In retrospect, this approach has inadvertently also precipitated a decline in water quality and the ecological integrity of the city's rivers and vleis. "

Although the majority of the environmental issues are incorporated into the catchment management strategy developed by CCT, there are a number of initiatives that must be included in the WC/WDM strategy.

Institutional / financial issues

i) "The City of Cape Town faces significant challenges to transform Water Services into a world class Water Services provider which is customer friendly, efficient and sustainable. "

The implementation of WC/WDM will meet a lot of the requirements to make CCT into an efficient and effective Water Services provider. Conversely, however, if some of the key institutional challenges are not addressed such as human resources constraints, it will negatively impact on the implementation of the WC/WDM strategy.

j) "Current water customer debt is about R460 million, representing 8 months of sales. Revenue collection needs to be improved and non-payment reduced."

Credit control measures alone will not help alleviate the issue of non-payment particularly in low-income areas. WC/WDM must become an integral part of any approach to reduce non-revenue demand by consumers. The approach advocated in the WC/WDM strategy is to capacitate the consumer to take responsibility for their services. This will include assisting the consumer to reduce their demand to an affordable level.

WC/WDM measures that reduce the demand from paying consumers may also reduce the present income stream to the Council. The WC/WDM strategy therefore needs to be carefully balanced between the financial savings and any reduction in income.

5.3 Water resource situation

The CCT makes use of 5 large storage dams (Theewaterskloof, Voëlvlei, Wemmershoek, Steenbras Upper and Steenbras Lower), which have a total capacity of approximately 780Mm ^{3} as well as a number of smaller dams. These surface Water Resources are augmented from the Atlantis Aquifer borehole scheme and the Albion Spring. The rivers in the CCT are relatively small. Some rivers worth mentioning are the Salt-, the Diep-, the Black-, the Eerste-, Kuils-, Moddergat- and Lourens rivers. The rivers, which are utilised as water sources, lie mostly outside of the CCT. These are the Berg- (including its Wolwekloof and Banhoek tributaries), Sonderend-, Eerste-, Palmiet-, Klein Berg- and Leeu rivers. Of these, the Berg River that flows in a northerly and later westerly direction is by far the largest. Table 5-1 indicates all the existing Water Resources available to CCT. The Berg River project is not included and

will provide an additional 56 Mm^3 to CCT once completed, bringing the total available Water Resources to **369 Mm^3 or 1010 Ml/day**.

Cape Town has a mean annual rainfall of 515mm/annum and an average temperature of 16.7 °C. The CMA is a winter rainfall area. The meteorological depressions that typically bring rain to this area during winter move past to the south of the area (and the land mass) during summer; resulting in long dry spells. It is during the dry summer that the water demands are at their highest, due to the higher temperatures and the fact that watering of gardens is the norm in almost all residential areas. This contrast complicates the management of a bulk water supply system, as sufficient run-off needs to be stored during winter in order to meet the increased water demand in the hot and dry summer months.

The limited nature of the available Water Resources and the shortage of raw water storage capacity have markedly increased the risk of water shortages occurring in the Cape Metropolitan Area from the year 2001 onwards. The lack of storage capacity coupled with 3 years of below average rainfall between 1998 and 2000 led to DWAF imposing low level (10% reduction in water demand required) water restrictions upon the users of water from the Western Cape Water Supply System.

Table 5-1: Surface Water Resources

DAMS/RIVERS	OWNED & OPERATED BY	APPROXIMATE % OF TOTAL SUPPLY REQUIREMENTS	FIRM YIELD* (1:50 YEAR) M m^3	CCT Registered Usage
Major Sources		**%**		**M m^3**
Theewaterskloof Dam/ Kleinplaas Dam	DWAF DWAF	48.3%	219	120
Voëlvlei Dam	DWAF	23.2%	105	70.5
Palmiet River	DWAF	5%	22,5	22.5
Wemmershoek Dam	CMC	11.9%	54	54
Steenbras Upper and Steenbras Lower Dam	CMC	8.8%	40	40
Total		**97.1%**	**440.5**	**307**
Minor Sources			Approx. yields	
Simon's Town: Lewis Gay Dam Kleinplaas	CMC	0,4%	1,85	1.85
Land en Zeezicht Dam (From Lourens River)	CMC	0,1%	0,5	0.5
Table Mountain: Woodhead Hely-Hutchinson De Villiers Dam Victoria Dam Alexandra Dam	CMC	0.88%	4	4
Grand Total		**98.5***	**446.86**	**313.35***

* *Excludes the Atlantis Aquifer and Albion Springs*
*** Approximate % of total supply requirement and firm yield includes Agriculture and other Water Service Authorities.*

SECTION B: CONCEPTS AND THEORY

6 Key concepts

6.1 What is strategy

The following definitions of strategy are referenced from various publications.

> "A strategy is a plan, or something equivalent-a direction, a guide or course of action into the future, a path to get from here to there. A strategy is also a pattern that is consistency in behaviour over time. Both definitions seem to be valid, organizations develop plans for the future and they also evolve patterns out of their past." – Reference "The Rise and Fall of Strategic planning" ; Henry Mintzberg
>
> "The Art of distributing and applying means to fulfil the ends of policy" – Liddell Hart
>
> "Strategy is a plan, a how, a means of getting from here to here" –Henry Mintzberg
>
> "Corporate strategy is the pattern of decisions in a company that determines and reveals its objectives, purposes, or goals, produces the principal policies and plans for achieving those goals, and defines the range of business the company is to pursue, the kind of economic and human organisation it is or intends to be, and the nature of the economic and non-economic contribution it intends to make to its shareholders, employees, customers and communities" – Kenneth Andrews, *The Concept of Corporate Strategy*

The following extract from a paper written by Fred Nickols, 2000, is perhaps the most relevant explanation to the WC/WDM strategy.

> "What, then, is strategy? Is it a plan? Does it refer to how we will obtain the ends we seek? Is it a position taken? Just as military forces might take the high ground prior to engaging the enemy, might a business take the position of low-cost provider? Or does strategy refer to perspective, to the view one takes of matters, and to the purposes, directions, decisions and actions stemming from this view? Lastly, does strategy refer to a pattern in our decisions and actions? Strategy is all these—it is perspective, position, plan, and pattern. Strategy is the bridge between policy or high-order goals on the one hand and tactics or concrete actions on the other. Strategy and tactics together straddle the gap between ends and means. In short, strategy is a term that refers to a complex web of thoughts, ideas, insights, experiences, goals, expertise, memories, perceptions, and expectations that provides general guidance for specific actions in pursuit of particular ends. Strategy is at once the course we chart, the journey we imagine and, at the same time, it is the course we steer, the trip we actually make. Even when we are embarking on a voyage of discovery, with no particular destination in mind, the voyage has a purpose, an outcome, an end to be kept in view. **Strategy, then, has no existence apart from the ends sought**. **It is a general framework that provides guidance for actions to be taken and, at the same time, is shaped by the actions taken.** This means that the necessary precondition for formulating strategy is a clear and widespread understanding of the ends to be obtained. Without these ends in view, action is purely tactical and can quickly degenerate into nothing more than a flailing about."

The most important aspect on the understanding of strategy that needs to be appreciated is highlighted in the paragraph above. The significance of the above sentence is that the budgets included in the WC/WDM strategy and the scope of a lot of the projects and programmes should not be considered as

absolute. As projects get implemented each year and as CCT gains further understanding of how water is used and the opportunities of WC/WDM, the action plan and budgets should be continuously revised.

6.2 Definition of WDM and WC

a) Definition of Water Demand Management:

"The adaptation and implementation of a strategy or a programme by a water institution or consumer to influence the water demand and usage of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services, and political acceptability."

WDM should not be regarded as the objective but rather as a strategy to meet a number of objectives. One reason why the full potential of WDM is often not recognised is because it is often perceived or understood in a limited context. It is common to equate WDM only with activities such as communication campaigns or tariff increases. WDM should be considered as a broader strategy that requires the development and implementation of systems and measures associated with managing the overall use of water.

b) Definition of Water Conservation:

"The minimisation of loss or waste, care and protection of Water Resources and the efficient and effective use of water."

WC is the overall concept that requires the effective management and protection of Water Resources. WC should be considered both an objective in water resource management as well as a strategy for Water Services institutions (WSI). This implies that irrespective of the WDM objectives, it is necessary to also have long-term WC objectives, which recognise that South Africa is a water-scarce and water-stressed country. Cognisance should also be taken of the adverse effects of global climate changes.

c) Integrated Water Resource Planning

The proposed definition for "Integrated Water Resource Planning" is:

"A holistic way of analysing the change in demand and operation of water institutions that evaluates a variety of supply-side and demand-side management measures to determine the optimal way of providing Water Services."

Integrated Water Resource Planning (IWRP), or integrated least-cost planning, is a process for determining the appropriate mix of demand-side and supply-side resources expected to provide long-term, reliable service to users at the lowest reasonable total cost. It maximises benefits to society and minimises the negative impact to the environment. IP for water institutions is an evolving concept with certain parameters such as avoided costs and cost-benefit tests that need to be appreciated.

All demand-management activities that decrease demand tend to affect supply management because existing system capacity is released for other customers and users. The redirected capacity can be compared to that provided by the development of new capacity. Taking this concept further leads to the introduction of "**negalitres**", water "produced" through conservation and efficient use of existing resources.

The opportunities for WC/WDM exist owing to high levels of loss and inefficient use. It is also important to note that water is most often used for the service derived from it and not for the water itself. Some examples to illustrate this in the Water Services sector are:

a) Flushing a toilet. The objective is to clean the pan and contribute to the transport of sewage to the wastewater treatment plants. If through new technologies the water required to flush a toilet is reduced to 4,5 litres rather than 11 litres, the consumer's lifestyle is not altered, but water consumption is reduced significantly.

b) Watering a garden. The objective is to have a flourishing garden. This can be achieved with indigenous plants, by watering the correct way and even by recycling bathroom water. Such measures can reduce the total consumption of the consumer without necessarily affecting the desired objective.

6.3 WDM as a management paradigm

The understanding of WDM varies considerably between individuals or organisations. The most common interpretation is that WDM implies the reduction of unaccounted for water or the reduction of consumer demand or the combination of both. In the interests of sustainability and in order to incorporate the principles of Integrated Resource Planning, it has been decided to expand the understanding of WDM and consider it as a wider management paradigm.

WDM is considered the converse of supply side management where water service providers focused on engineering infrastructure development solutions to meet some projected future demand without too much emphasis on understanding the consumer, their needs or how water was used. WDM is considered as a strategy that manages the demand in the same way as profit-oriented organisations adopt a marketing approach to manage their sales. As with a marketing strategy, the WDM strategy should influence most aspects of the company activities in order to set and achieve certain sales / demand objectives.

Expanding the role of WDM as a management paradigm is important for the following reasons:

- It needs to impact on the planning of Water Services.
- It needs to change the attitude and approach to most operators and managers involved in the supply of services.
- WDM needs to become a sustainable function and not just a programme or project with a limited duration.
- WDM needs to include functions and measures that will not directly result in the reduction of water demand, but will monitor and ensure that key performance indicators are sustained.

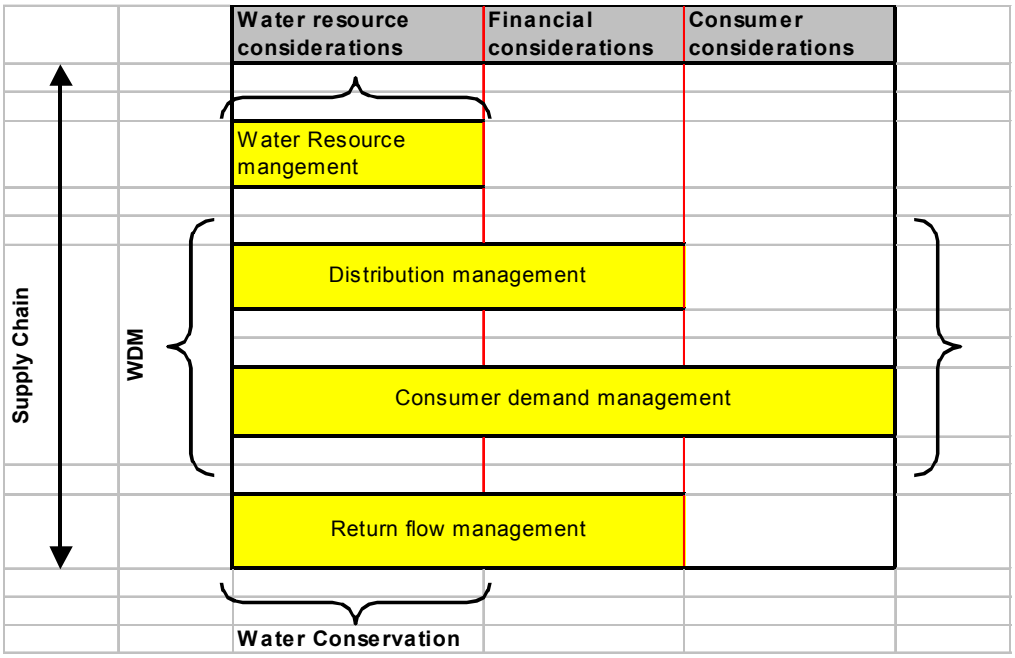
6.4 Difference between WC and WDM

In general, WDM can be considered a component of WC. A potential difference between the concepts of WC and WDM is that WC focuses on the efficiency of Water Resources where WDM may focus on achieving the most beneficial solution to Water Services from various perspectives including social and financial. Figure 6-1 illustrates the difference between WC and WDM and how they are linked to each other. The diagram illustrates that in terms of water resource considerations WDM is part of WC. It also highlights that WDM can be implemented for other considerations including social and financial.

A typical example where WC and WDM may not be entirely aligned is when a water service provider does not target the reduction of water demand from paying affluent domestic consumers. A Water Services provider may prioritise measures to reduce non-revenue consumption but will be reluctant to target WC/WDM to paying consumers in order to avoid reducing income. The WC perspective however recognises the long-term scarcity of available Water Resources and requires that all consumers adopt a conservation culture and ethic. Such an objective cannot be achieved overnight, and activities to achieve this must be continuous and ongoing.

Although the above example highlights potential differences in WC and WDM objectives, it is not practical to separate them, and the objectives developed in the proposed framework of action combine both the concepts of WC and WDM.

Figure 6-1: Comparison between WC and WDM



6.5 Social and economic concepts

One of the biggest constraints in the implementation of WC/WDM is the perception that WC/WDM will have a negative impact on financial and economic considerations. It is perceived that WC/WDM will reduce income to the municipality and can also lead to an increase in the cost of water. The purpose of a well-planned WC/WDM strategy however is to have the exact opposite effect and it is to promote financial viability to the Water Services authority and to optimise the cost of water to the consumers. The following concepts demonstrate the financial considerations that are adopted in the strategy.

a) The role of government is to ensure efficient and effective service delivery

The basic difference between a private and a public or government institution is that the main objective of a private institution is to make a profit for its shareholders. Government and public institutions however do not have shareholders and their main aim is to provide the most cost effective services to society. Both public and private institutions need to pursue efficiency but for different goals. Any reduction of income to the Council due to WC/WDM can be justified if it will result in a greater financial saving to society. For example, reducing the income to the Council received by high water consumers in Constantia may result in a direct cost benefit by postponing large capital infrastructure such as a new dam or a new wastewater treatment plant.

b) WC/WDM can provide water for provision of new services

The role of WC/WDM is to free up water which is currently inefficiently used in order to provide water to consumers who are un-serviced or for new developments.

The overall aim of WC/WDM is not to have a negative water demand growth but to offset the normal growth in demand. An idealistic target is to try and maintain a zero percent growth by incrementally implementing WC/WDM.

WC/WDM can also have a direct impact on specific localized water supply areas. Currently development in certain areas is been held up due to limitations of the bulk water supply and/or wastewater system. In many such instances, WC/WDM can provide a much faster and much cheaper solution to the construction of large infrastructure and therefore facilitate the development needs of that area.

c) The economic benefits of WC/WDM should be considered over a 5 and 10 year planning horizon

The economic benefit of various WC/WDM measures may appear to be limited if considered only over one financial year but may be significant if considered over a longer planning period. Economic savings from the postponement of capital infrastructure should be considered over a 5 and 10 year planning horizon. The financial savings from WC/WDM may not be direct savings but could avoid future costs. Such avoided future savings will reduce any future increases in the cost of water and assist in making water affordable particularly to the poor.

d) Optimal social benefits and social equity for the poor.

WC/WDM can reduce the cost of water particularly to the poor in two ways. Firstly, by capacitating consumers to use less water and secondly by reducing any increases in the cost of water.

6.6 Fundamental principles of WC/WDM

The national WC/WDM strategy as developed by DWAF is based on the three fundamental principles described below. These principles are founded on the understanding and need of the three concepts of Water Conservation, Water Demand management and Integrated Water Resource Planning.

a) Water Institutions should endeavour to supply water in an efficient and effective manner minimising water losses and promoting WC/WDM to their consumers.

Water service institutions should ensure that they reduce the level of leakage in any water Works or Water Services Works to an optimal level and implement measures that promote on an ongoing basis WC/WDM to their consumers.

b) Consumers should not waste water and should endeavour to use water efficiently.

Water wastage can be defined as the use of water without deriving any direct benefit. The non-efficient use of water can be described as water used over and above the accepted benchmark for a specific purpose or water used where very little benefit is derived.

c) WC/WDM must be considered as part of the Water Resources and Water Services planning process

The implementation of WC/WDM measures could provide a more cost effective or appropriate solution to reconciling growing water demand with existing Water Resources or infrastructure. Where water is used inefficiently, WC/WDM could postpone the need for premature capital infrastructure such as dams and Bulk Treatment Works. The resources, scope of work and prioritisation of WC/WDM activities should be determined through an Integrated Planning process.

7 General benefits of WC/ WDM

7.1 Benefits to Water Service providers

Water providers can enjoy many benefits from reduced water demand. The following is a list of some of the generic benefits that can result from WC/WDM.

a. **Postponement of capital infrastructure for water supply.** Efficiency programs are generally faster, easier, and cheaper to implement than traditional supply-side programs. Most efficiency measures do not require large investments that are necessary for large water resource schemes.

b. WDM can reduce the **financial risk of miscalculating demand far into the future**. Prediction of future demands is proving to be very uncertain due to the impact of Aids, impact of more frequent droughts, impact of the economy, and population movements. The building of a new water resource scheme depends on planning scenarios of 10 to 20 years in the future. A miscalculation on the demand projections could result in the premature development of such infrastructure. Because efficiency programs can be implemented incrementally as needed, the lower costs of the program can be spread over a period of years. This reduces payback periods, and reduces the need for large up-front loans. Although water tariffs may need to be increased, overall costs to the utility should decrease due to lower costs of providing Water Services.

c. WC/WDM can **reduce the uncertainty of demand forecasts**. In order to implement WC/WDM it is necessary to understand and manage the water needs of end users: i.e. the number of toilets times the average water used by each toilet, the area of lawns times their average water use per square meter, and so on. Without WC/WDM, the water intensity of each end-use is unknown over a wide range, which makes future total demand calculations highly uncertain. WC/WDM programs directly reduce the variation of the type of water use by reducing the population of the most water-intensive kinds of toilets, lawn-watering equipment, etc. Through appropriate by-laws, the demand for new consumers can also become more predictable as there can be more certainty as to the water usage per consumer. Theoretically, once the WC/WDM paradigm is more entrenched and highly advanced within a water supply area, the service provider can almost directly control the water demand.

   Having direct control on the demand will enable the water service provider to operate and design the water supply system more effectively and efficiently and that can result in better service delivery and significant financial savings.

d. WC/WDM can reduce the **effluent that must be treated**. The retro fitting of plumbing and repair of plumbing leaks as well as other WC/WDM measures can significantly reduce the volume of effluent that must be treated. This can result in the postponing of new wastewater treatment plants and reduce operating costs of treating effluent. Some of the operating cost savings are due to reductions in pumping, in chemical use and in the wear and tear of equipment. Efficient water use can reduce both overall base demands and peak demands.

7.2 Benefits to communities and individuals

The net social benefit of the overall WC/WDM is difficult to measure although it is expected that WC/WDM will have significant benefits over the various options of supply side augmentation options. Some of the potential social benefits of WC/WDM may include:

a. WC/WDM can be the catalyst to **ensure sustainable, efficient and effective service delivery** particularly in low-income areas. Throughout South Africa Water Services Providers are faced with the significant challenge of reducing non-revenue demand in low-income areas and at the same time providing adequate services. A comprehensive WC/WDM programme in such areas can reduce non-revenue demand, reduce leakages, reduce individual water accounts to affordable levels and ensure more equitable distribution of the available water supply.

b. WC/WDM can benefit communities by **creating jobs** in plumbing and other semi-skilled jobs.

c. Money saved from WC/WDM by the service authorities or generated can be **redirected towards other community needs**.

d. Efficiency can **reduce water, sewer, and energy bills,** making water **affordable** particularly to the poor.

e. Through WC/WDM it may be possible to **reallocate existing infrastructure and resources** to people without services, enabling the enhancement of service delivery

f. Social equity through **fair water tariffs**. Large consumers of water often do not pay for the marginal cost of water and are often subsidised by consumers who use less water.

7.3 Financial savings resulting from the postponement of capital infrastructure

One of the primary goals of WC/WDM is to be financially efficient. The larger the financial savings and the smaller the costs to implement, the more favourable the programme or project. The type of financial savings can vary according to the type of program and according to the situation with regards to water supply. Most water service providers appreciate the direct financial value of WC/WDM measures that result in the reduction of non-revenue demand. This is usually the case when municipalities pay a "water board" a tariff for bulk water purchases and it is to their direct financial benefit to reduce wastage. Few service providers however make the association that a reduction of the overall demand may result in savings in postponing bulk capital infrastructure. Such indirect savings can be significant and are calculated by using the real interest rate, which is the difference between inflation rate and the current lending rate from a bank or financial institution.

There are six standard methods of economic analysis that can be used to evaluate the relative costs and benefits of WC/WDM. These are as follows:

- Net present value method
- Benefit-cost ratio
- Internal rate of return
- Discounted payback
- Life-cycle revue impact
- Levelized costs

The following is a short description of the first two methods that are considered the most common.

a. **Net present value method**. The net present value (NPV) method provides a comparison of costs and benefits throughout the life of the WC/WDM project.

$$NPV = \sum_{t=1}^{n} (B_t - C_t) / (1+i)^t$$

b. **Benefit-Cost Ratio method**. This method determines the ratio of the net present value of benefits to the net present value of costs.

$$\text{Benefit cost ratio} = \sum_{t=1}^{n} \frac{B_t}{(1+i)^t} / \frac{C_t}{(1+i)^t}$$

where:

B_t = all applicable benefits in year t
Ct = all applicable costs in year t
i = selected interest (discount) rate
n = number of years in the time period selected for analysis

SECTION C: MOTIVATION AND ANALYSIS

8 SWOT Analysis with regards to WDM

Various aspects that informed the WC/WDM strategy were identified through a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis described below.

8.1 Strengths

1. High levels of technical capability and competence.

CCT currently still has a number of well-qualified officials that have adequate expertise in the various fields of WC/WDM. The challenge is to make sure that the existing capacity and competence is adequately utilised.

There is also a perception that there are a number of qualified people who are currently under-utilised, therefore creating an opportunity to transfer such individuals to WC/WDM related functions.

2. Integrated metering and billing system

CCT has an integrated metering and billing system of most water consumers. It is estimated that more than 90% of consumers have a meter and are on the CCT's integrated billing system. With the appropriate management information systems, the monthly meters readings can be an instrumental tool for WC/WDM.

3. Adopting IRP

According to DWAF, CCT is probably the only city council in South Africa that has adopted the principles of Integrated Resource Planning (IRP) and carried out a comprehensive study. The study illustrates and motivates clearly the advantages of various WC/WDM measures over traditional supply augmentation options.

4. Previous WC/WDM programmes and activities

The strategy should utilise the success and impact of the previous WC/WDM activities and build on them. Some of the key initiatives that should be continued are the communication campaign, school education, and pressure-reducing programme.

5. Alignment of WC/WDM programmes to electricity efficiency campaign.

CCT has developed an electricity efficiency program. Aligning the two campaigns can reduce implementation costs and result in greater awareness by consumers.

8.2 Weaknesses

1. Current organisational structure arguably hinders holistic water management, by entrenching fragmented policy, planning and budgeting approaches. Some of the institutional constraints are as follows:

a. Vision and strategy are not clearly communicated throughout all levels of the organisation.
b. Knowledge is not actively managed within the institution.
c. Current constraints with regards to new appointments and the organisation structure of the water department.
d. Lack of adequate coordination between the various departments of CCT.
e. Lack of uniformity in the water department resulting from the merging of various local authorities into one metro.

2. Short-term financial planning.

The opportunities of WC/WDM are apparent if a 5 or 10-year financial assessment is carried out. The current financial planning is limited to 1 or 2 years' horizon, which makes it difficult to motivate WC/WDM based on financial considerations.

3. Suspension on credit control measures

CCT has currently suspended credit control measures for payment defaulters. Although an isolated credit control policy is not ideal for the objectives of a WC/WDM strategy, the suspension can prevent the implementation of adequate social re-engineering measures, which limits the ability to reduce water wastage by users.

4. Combined authority and provider

The lack of separation of the authority and provider functions within CCT can be a constraint to the implementation of WC/WDM for the following reasons:

a. Alternative city objectives may influence the allocation of budget on WC/WDM
b. Alternative city objectives may influence the approval of various WC/WDM projects.
c. Performance criteria and benchmarks for water service delivery may not be adequately pursued
d. Responsibility and accountability for performance may not be clearly identified

5. Lack of knowledge and understanding of consumers' needs and water usage patterns.

There is a lack of knowledge on the consumers' needs and water use patterns, which may limit the ability to reduce consumer demand. This is due to the lack of adequate management information systems, adequate consumer interaction, and lack of research.

8.3 Opportunities

1. Possibility of securing external funding from a range of institutions and donors.

There are a number of examples in S.A. where large industries have sponsored various WC/WDM initiatives by Councils in order to ensure a more secure supply of water. This idea can be expanded considerably and can be utilised to fund a number of the proposed WC/WDM initiatives. There are also a number of foreign programmes that offer funding opportunities. Some examples are the UN habitat programme and the African Cities Water Conservation programme.

2. Establishment of PPP's geared around elimination of water wastage

There are a number of private companies that are willing to enter into concessions or joint management contracts to manage Water Services delivery or specific key performance indicators such as the reduction of non-revenue demand.

3. Delayed infrastructure investment and energy savings leading to reduced water costs.

CCT's infrastructure requirements for water supply are significant. WC/WDM can result in significant financial benefits by postponing the need for many of the infrastructure requirements, as well as reduce some of the operating costs including energy savings.

4. Increased efficiency in the use and allocation of water whilst promoting social equity

Increased efficiency will make way for a more equitable distribution of Water Resources to people without services.

8.4 Threats

1. Capital and operating budget reductions linked to Council's financial recovery strategy.

The reductions in budget during the 2003/2004 financial year have threatened the current activities in the supply of Water Services. There is a concern that the approval of a WC/WDM strategy will result in further reduction in budget for the normal activities.

2. Perceived general low profile of demand management activities. WC/WDM measures are commonly perceived only as drought relief mechanisms

In general, water supply in South Africa has been managed in the supply side management paradigm. Although there is an increased awareness and commitment to WC/WDM at CCT, it still has a general low profile with a number of individuals involved in the supply of water.

3. Finalisation of organisational transformation.

The process of organisational transformation at CCT can be both a threat and an opportunity to the WC/WDM strategy. It is a threat because of the current inability to create and appoint new positions that are required for WC/WDM. It can also be an opportunity if the process is utilised to create or redefine existing positions in the water department with WC/WDM functions and responsibilities.

4. Aging infrastructure

As the infrastructure becomes older with each passing year, the more leakages and pipe bursts occur, increasing the level of water wastage.

5. Low level of knowledge and awareness of the need and benefits of Water Conservation amongst the public.

There is a general public perception that WC/WDM is a punitive concept and is only acceptable during a time of drought.

9 Motivation for WC/WDM

9.1 Overcoming concerns and prejudice against WC/WDM

There are a number of concerns and prejudices that are often raised with regards to the implementation of WC/WDM. Officials of CCT's water department and/or DWAF officials have also expressed some of these concerns.

Most of the concerns have an element of truth in them but it is important not to generalise, and/or to use such concerns as an excuse to deter from the objectives of implementing a sustainable WC/WDM strategy. The important thing to remember is that just like with "supply side management", WC/WDM should be guided through a planning process. One does not build all dams simultaneously, but progressively, as required and in the priority determined according to various planning parameters. Similarly, one does not implement all WC/WDM measures at once and one should also determine their extent and priority according to planning parameters.

The generic approach to dealing with most concerns and prejudices against WC/WDM is as follows:

- WC/WDM should not be generalised. It should be recognised that there are different aspects to WC/WDM.
- Concerns regarding the impact of WC/WDM should be quantified and substantiated. Often a great number of the concerns are not founded on any scientific research, sound economic and engineering principles or on any specific circumstances related to WC/WDM measures.
- The negative impacts of WC/WDM should be weighed against the positive impact of WC/WDM. Because a certain WC/WDM initiative may have some negative impacts it does not mean that it is not valuable or necessary.

This section of the report identifies some of these concerns and gives a theoretical overview of how to overcome them. A proposed action plan is also identified and was considered when the WC/WDM strategy objectives and action plan was developed.

a) WC/WDM will reduce the income to the municipality and is therefore a financial burden to the Council

Table 9-1 describes the motivation against this concern and proposes the type of action plan that should be incorporated into the strategy.

Table 9-1: Motivation regarding concern that WC/WDM will reduce revenue

Motivation against concern	Proposed Action Plan
1. A number of WC/WDM activities will target non-revenue and therefore not impact on revenue	1. Give preference to non revenue demand initiatives
2. WC/WDM projects can have a financial benefit even if they reduce revenue. A WC/WDM project could result in the postponement of expensive bulk infrastructure at significant financial savings. (Refer to section on the theory of financial savings due to WC/WDM).	2. Test the financial benefits of all proposed WC/WDM projects
3. WC/WDM maybe have a negative impact on short-term financial indicators but can have significant financial benefits in the long -term	3. Carry out long-term (5 yrs, and 10 yrs) review of the financial impact of WC/WDM

4. The overall WC/WDM strategy does not have to reduce the demand curve into a negative growth but should ideally reduce and offset the growth in demand due to new developments and new consumers.	4. Develop a staggered and prioritised WC/WDM programme to ensure that the total demand is not negative (target a 0% to 1% growth if possible)
5. Offset short-term revenue reduction due to WC/WDM with a revised tariff structure.	5. Implement the progressive implementation of the true marginal cost block-rate tariff structure. This will off-set the reduction of revenue from WC/WDM

b) WC/WDM is a constraint to economic development, growth and prosperity

Such a statement is often made due to the following reasons: WC/WDM may be directly linked to water restrictions, WC/WDM strategy is biased to environmental motives, or the individuals making the statement are ignorant of the various aspects of WC/WDM. Table 9-2 describes the motivation against this concern and proposes the type of action plan that should be incorporated into the strategy.

Table 9-2: Motivation regarding the potential constraint to economic development

Motivation against concern	Proposed Action Plan
1. The purpose of WC/WDM should not be to reduce demand at all costs, but to reduce water inefficiencies.	1. WC/WDM programme should be focused on inefficient use 2. Identify WC/WDM measures that would also benefit consumers.
2. WC/WDM strategy should not only target new consumers but all inefficient consumers	3. Block rate tariff with marginal cost should be implemented to all consumers 4. Introduce incentives and programmes to new consumers to be water efficient from the start.
3. A long term WC/WDM strategy should not be confused with water restrictions due to a drought	5. The motivation of WC/WDM strategy should be separated from that of water restrictions
4. WC/WDM can reduce the long-term cost of water by avoiding expensive infrastructure. This will assist economic growth and not reduce it.	6. Make financial criteria one of the most important objectives in the IRP process
5. WC/WDM can enhance economic growth and development by making available Water Resources and infrastructure capacity from inefficient use to new consumers	7. WC/WDM should be prioritised in areas that it will alleviate capacity problems of existing infrastructure

c) A sustained WC/WDM programme will reduce the opportunity to manage a drought.

This statement is often made by water resource managers whose interests are usually limited to water resource considerations.

Table 9-3 below describes the motivation against this concern and proposes the type of action plan that should be incorporated into the strategy.

Table 9-3: Motivation regarding the impact of WC/WDM on managing droughts

Motivation against concern	Proposed Action Plan
1. Water Resources consideration is not the only objective of WC/WDM campaign. You shouldn't allow millions of Rands to be wasted every year so that you have flexibility when in drought	1. N/A
2. The implementation of a long term WC/WDM will minimise the risk of drought, as less water will be used.	2. N/A
3. The implementation of a comprehensive WC/WDM campaign will provide access to important information that will enable the more effective management of a drought. (i.e. CCT will know who to target and can be more fair in the implementation of restrictions)	3. Implementation of MIS 4. Implementation of ongoing water audits of large consumers 5. Research into water use efficiency
4. Water restrictions often bring about short-term savings associated to behaviour changes with gardening. WDM can bring about technology changes (i.e. retro-fitting) With a long term WDM strategy a lot of the savings potential from gardening will remain	6. Research impact of restrictions
5. WC/WDM and water resource planning should be integrated through the principles of IWRP. Assurance of supply for the planning of Water Resources and other key planning parameters should be reviewed to incorporate the impact of WC/WDM if necessary.	7. Review of IWRP planning principles 8. Development of a planning protocol 9. Co-operation with DWAF regarding Water Resources planning

d) WC/WDM will negatively impact on the sewage system and the wastewater treatment plants

Table 9-4 describes the motivation against this concern and proposes the type of action plan that should be incorporated into the strategy.

Table 9-4: Motivation regarding the impact of WC/WDM on wastewater

Motivation against concern	Proposed Action Plan
1. Studies (i.e. CSIR) have indicated that in most cases the reduction of water consumption will not cause more blockages to sewers. (There is no evidence to the contrary)	1. Sewage blockages should be monitored where WC/WDM projects are implemented
2. A number of wastewater treatment plants have hydraulic capacity constraints and not organic. WC/WDM can therefore improve the capacity problem in such plants	2. Prioritise reduction of non-consumptive water use in areas where hydraulic loading is a constraint.
3. The reduction of water demand will not change the organic loading but change the concentration. This will not have an adverse affect on most treatment plants.	3. Evaluate the impact of a higher concentration on most treatment plants
4. It is often a convenient excuse to blame WC/WDM for the deterioration of the quality of treated effluent discharged from wastewater plants	4. Any association of deteriorating water quality to WC/WDM should not be accepted without evidence

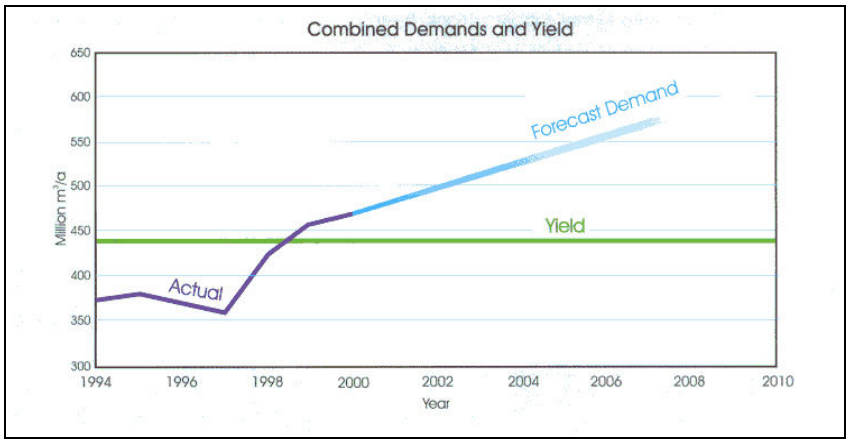
9.2 Need for WC/WDM in the Western Cape

The purpose and need of a WC/WDM is not limited to the apparent water resource shortages in the Western Cape as highlighted in the following sections.

a) Reconciling supply and demand

Short-term considerations relate to drought situations and long-term considerations relate to the overall limited Water Resources in the Western Cape. Figure 9-1 below illustrates the overall water situation in the Western Cape. (Discussed in more detail in section 10.7). It clearly illustrates that the current demand exceeds the average yield of the existing Water Resources. To reconcile demand and supply it is necessary to reduce the demand and augment the current Water Resources. The IWRM study clearly showed that a number of WC/WDM initiatives are more feasible than Water Resource augmentation options.

Figure 9-1: Demand vs. Yield of current resources



b) Water resource and environmental protection

Through WC/WDM, the environment can be protected by limiting the water abstracted from rivers and also by reducing the pollution discharged through the wastewater system and by reducing the pollution from contaminating the water supply.

Tastes and odours in drinking water produced by algae, out of the Voelvlei Dam and Theewaterskloof Dam cause regular consumer responses. These odours are caused by algae that are caused by pollution inputs from nutrients into the dams. In order to reduce the influx of nutrients, urgent catchment management activities are required.

As from 2010, DWAF is imposing new more stringent effluent standards, requiring that CCT increase the quality of the wastewater discharged. This will require upgrades to the current wastewater treatment plants.

c) **Financial viability of the Water Services**

Contrary to what some individuals believe, WC/WDM can contribute significantly to ensuring the financial viability of water service delivery in CCT. Although the current financial situation at CCT for Water Services is viable, the financial situation will change and become a lot more vulnerable for the following reasons:

- The capital expenditure needed over the next five years will exceed R 2 billion
- A high portion of consumers will not be able to afford significant tariff increases that may be required.

The current customer debt for Water Services is R 460 million. WC/WDM needs to contribute to the financial viability of CCT's water service delivery in the following ways:

- Reducing the direct operating costs by reducing non-revenue demand (not significant)
- Reducing the operating cost of revenue demand (not significant)
- Increasing income from consumers through more equitable tariffs
- Increasing income by capacitating non-paying consumers to pay for water (by reducing consumption to affordable levels)
- Postponing capital infrastructure requirements

d) **Assist in alleviating the current problems in wastewater treatment**

The wastewater treatment of effluent in CCT is currently under severe stress due to the following reasons:

- A number of the plants are operating beyond their designed capacity
- More stringent wastewater quality standards are being imposed by DWAF
- Inadequate operation and management resources

WC/WDM can assist in alleviating capacity problems where hydraulic loading is the key constraint. WC/WDM can also reduce the need for bulk effluent pipes and reduce operating costs at some of the treatment plants.

Table 9-5: Wastewater treatment plants at critical hydraulic capacity

Works	Rated Hydraulic capacity	Mean daily flow Aug 2003 – Ml	% utilised
Athlone	105	99.7	95
Bellville	55	63.6	115.5
Borcherds Quarry	30	30	100
Gordons Bay	4	4	100
Kraaifontein	7	9.5	135.3
Macassar	41	45.3	110.4
Parow	1.2	2.7	225.5
Potsdam	32	34.4	107.6
Scottsdene	7.5	7.5	100.3
Wesfleur	14	11.9	85

WC/WDM can have significant financial savings in postponing new Wastewater Treatment Works and reducing operating costs in all of the areas indicated in Table 9-5. Priority should be given to implementing WC/WDM in the areas that are under the most severe pressure in terms of wastewater treatment capacity.

9.3 Consequences of not implementing WC/WDM

The consequences, if CCT does not implement a long-term WC/WDM strategy, should be identified considering the financial cost of WC/WDM and the fact that a number of the proposed initiatives are not normal functions of local authorities. The consequences, however, will depend on how much of the strategy the Council implements and at what rate.

The consequences of not implementing WC/WDM are converse to the arguments presented in section 9.2 and are therefore described in similar sections.

a) Reconciling supply and demand

Should CCT not implement WC/WDM, the overall water demand will remain above the existing available Water Resources and Cape Town will be faced with permanent water shortages and have to maintain intensive water restrictions. Increasing efficiency and reducing water wastages may avoid punitive water restrictions until such a time as the next water augmentation scheme is developed.

Failure to implement WC/WDM would also require the premature development of the next water augmentation scheme at significant cost. The IWRP study clearly indicated that WC/WDM is a much cheaper option than any of the other possible water augmentation schemes after the completion of the Berg Water Project.

b) Water resource and environmental protection

Should CCT not adequately address water resource and environmental protection it will have the following consequences:

i. Occurrence of odours in the drinking water will increase
ii. CCT will not be able to meet new legislative requirements
iii. Treatment costs will increase (difficult to estimate financial value)
iv. Availability of Water Resources will decrease due to pollution

c) **Financial losses and loss of income**

The exact value of the current rate of Non-Revenue Water is not known but it is estimated at approximately 30% of the total demand (including non-payment). If the activities described to reduce and sustain the Non-Revenue Water are not implemented, it will have the following consequences:

i. It will create a negative image about the Council and can also negatively affect consumer relations.
ii. The aim of achieving sustainable and affordable service delivery to low-income areas could be threatened.
iii. The existing loss of income to the Council will continue to increase. Current levels of loss of income could be as high as R 205 million per annum (20% of total demand at an average selling price of R3.5 /kl).
iv. The existing direct cost of distribution losses will continue to increase. Current financial losses due to distribution losses are estimated at R 15 million per annum. (Assuming 10% of total demand and R0.5 / kl)

d) **Assist in alleviating the current problems in wastewater treatment**

Should CCT not implement consumer WC/WDM measures in areas that can alleviate problems with wastewater treatment it will have the following consequences:

i. Unnecessary premature expenditure. WC/WDM could be a significantly cheaper option to the development of new infrastructure (cost value not yet estimated)
ii. Prolong constraints on new developments due to limited capacity to collect and treat effluent. WC/WDM could alleviate effluent capacity related problems in certain areas a lot faster.

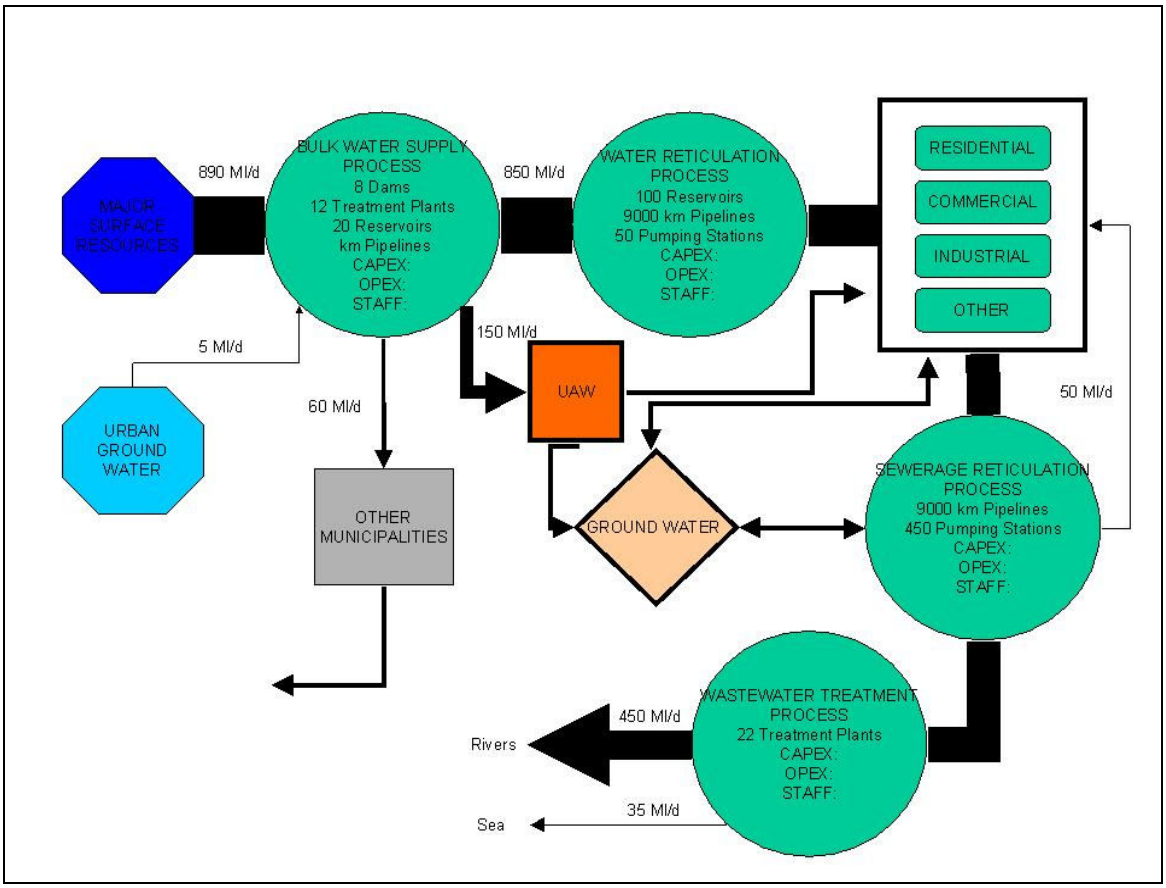
10 Analysis on WC/WDM

This section analyses the current water demand and determines the opportunity for water reductions due to WC/WDM. The potential economic benefits of WC/WDM are also calculated. Most of the calculations are based on assumptions and these will need to be verified with more accurate data obtained from an appropriate Management Information System and field research.

10.1 Current Demand

The total water demand for the metropolitan area amounts to approximately 828 Ml/day (2006). For analysis of the WC/WDM potential, the 2003/4 demand is used in order to **exclude the impact of the water restrictions that were introduced due to the drought**. In addition, approximately 60 Ml/d is supplied to Paarl and Wellington situated in the Drakenstein Municipality. The total wastewater flow generated within the metropolitan area amounts to 530Ml/d, including storm water infiltration, or 70% of the total water demand. Unaccounted for water including bulk losses amounted to approximately 186 Ml/d, or 23.3% of the total water demand during 2004. It should noted that the current level is estimated at 19%. Presently only 10% of wastewater effluent is recycled, primarily for irrigation and industrial purposes. The urban water cycle and associated processes are illustrated in Figure 10-1 below.

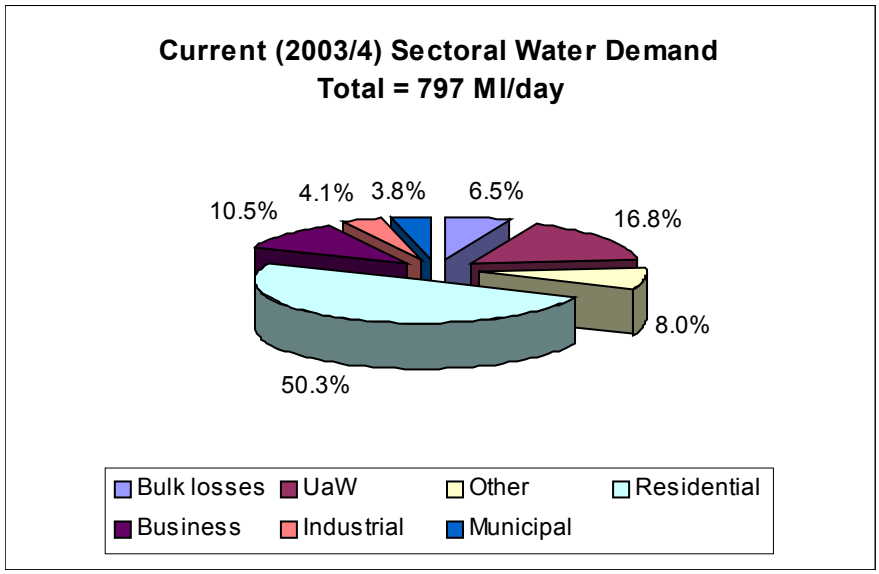
Figure 10-1: Urban Water Cycle in CCT



10.2 Water use analysis

The following demand analysis is based on the **2004 consumption figures**. Figure 10-2 depicts the water demands for the various sectors. Residential demand accounts for 50.3% of the overall demand. Between 25% and 30% of the 420 Ml/d demand is utilised for gardening purposes.

Figure 10-2: Sectoral demand analysis



Unaccounted for Water (UaW) includes reticulation losses through leaks and apparent losses (inaccurate meters) as well as some of the water used by non-paying consumers.

10.3 Water wastage

The total unaccounted for water is estimated at **23.3% or 186 Ml/day**. This includes bulk losses, reticulation losses and apparent losses. This has been reduced to 19% or **152 Ml/day** during 2006.

Statistics on UaW do not necessarily reflect the quantum of water wasted. A good indicator is minimum night flow (MNF). This is illustrated in Figure 10-4 which clearly shows that MNF is made up of reticulation losses and consumer wastage. In a residential area where there is no industrial water usage it can be assumed that most of the Minimum Night Flow recorded from data logging is water wastage made up of the following:

- Leaks in the reticulation systems
- Leaks within the consumers' properties (i.e. plumbing leaks)
- Indiscriminate wastage of water (i.e. people leaving taps open)
- Automatic flushing urinals (i.e. urinals in schools and public buildings)

The overall MNF in CCT cannot be accurately calculated because there are several areas that do not have adequate district management areas. Based on a number of MNF meter readings the overall minimum night flow in CCT is estimated at 20 % to 35% of the total average demand. This amounts to between **159 Ml/day** and **279Ml/day**.

10.4 Inefficient use of water

In addition to water wastage, it is estimated that a significant proportion of water is used inefficiently. Inefficient water use is the amount of water that can be saved by implementing water efficient technology and practices and by altering the consumption behaviour towards industry benchmarks and best available practices. The opportunity of reducing inefficient water usage is related to the fact that most of the water is used for the service that is derived from it and not for the water itself. For example, when a toilet is used the objective is to clean the pan and contribute to the transport of sewage to the wastewater plants. If through new technologies, the water required to flush a toilet is reduced to 3 litres (i.e.6/3 l dual flush toilet) the objective is not altered but water consumption is reduced significantly.

The following sections outline the estimated water use inefficiencies per sector.

10.4.1 Residential

The per capita consumption per day for domestic water use in CCT is calculated for the different level of services and is illustrated in Table 10-1 below.

Table 10-1: Per capita consumption for domestic water use

Level of service	consumers	popu. per Stand	Popula.	l.p.c.d	Total demand Ml/day
Informal - Inadequate	18043	6	108258	5	0.54
Informal - basic	71264	6	427584	25	10.69
Informal - Intermediate	1200	6	7200	25	0.18
Informal - Full	1713	6	10278	40	0.41
Formal - Full	654,050	3.89	2545361	176.77	449.95
total	**746,270**		**3,098,681**		**461.77**

92220

Data from WSDP, adjusted to 2.7 % p.a.

estimates adjusted so that total population = 3, 098 million

l.p.c.d adjusted so that total demand is equal to domestic demand

The average domestic water consumption is estimated at 176.77 l/day/person for consumers with full water supply services. This is not considered excessive but there are still opportunities for further efficiency gains. Assuming that 23% of all domestic water consumption is water used outside for gardening, pools and washing of cars, this implies that the average domestic household usage per consumer is approximately 123.74 l/d/p. (Refer to Table 10-2 below). Estimating how water is used within the household we can identify where the opportunities to increase efficiency exist. Figure 10-3 illustrates comparison between a typical non-efficient household, an efficient household and the average household estimated in CCT.

The efficiency of household water use can be improved significantly through the following key measures:

- Retro-fitting of plumbing fittings

- Consumer behaviour change
- Pressure management
- Usage of water efficient appliances

It is estimated that up to 38.23% of the existing household demand in CCT can be reduced through various WC/WDM measures. The biggest potential saving can be achieved from the retrofitting of toilets. The total potential water savings from **retrofitting toilets in all consumer sectors is approximately 80 Ml/day or 10% of the total demand**. (Toilet use is also a component of commercial / industrial usage)

Table 10-2: Split between domestic indoor and outdoor usage

Sub sector	%	l/p/d
Indoor use	70%	123.74
Outdoor use	23%	40.66
Leaks	7%	12.37
Total	**100%**	**176.771**
Indoor leak	5.27%	
Outdoor leak	1.73%	

Split between indoor and outdoor based on analysis of seasonable variation

Various experts suggest that in general inefficient use of water for gardening could be as high as 40%. A conservative figure of 20% is used however because water usage for gardening continuously varies according to rainfall and weather conditions. The efficiency of water used for gardening / outside water use can be improved significantly by:

- Irrigation scheduling (no watering between 10H00 and 16H00)
- Mulching
- Planting local indigenous plants
- Use of grey water
- Replacing grassed areas with alternative ground covers
- Pool covers

There is little inefficient water usage by low-income households were the level of service often consists of a communal standpipe or a yard tap. The total inefficient water usage for domestic water is calculated at **34% or 155 M/day**.

Figure 10-3: Breakdown of Domestic household usage

Component of water use (l/c/day)	Typical non-efficient	CCT average	Efficient	Details of use , estimated CCT average	Details of use max. efficiency
Clothes washing	20	16.2	***12.4***	Inefficient washing machine used 4 times per week @110 l/load / 4.45 p/family	Efficient washing machine used 3 times per week @ 87 l/load per 4 p/family
WC flushing	40	36	***15***	WC flush @ 9.5 x 4 times /day	retro fit 6/3 l dual flush; WC flush @ (6 x10 +(3 x 3)
Personal cleansing	80	62	***40***	(0.25 x bath at 70l) + (0.75 x shower at 50l) + wash basin 7l	(0.25 x bath at 50l) + (0.75 x shower at 30l) + wash basin 5l
Cooking, dishwashing drinking	20	9.6	***9***		Aerators on washbasin, behaviour change
Totals	**160**	**123.7**	**76.4**		
% possible reduction	**52.23%**	**38.23%**			

10.4.2 Commercial

It is estimated that approximately 65 % of the water used by commercial consumers is used for human needs, 25% for commercial processes and 10% for gardening. Water used for human needs is mostly used at toilets, urinals, hand basins, showers and kitchens. The opportunities for reducing the water consumption in office buildings and schools are significant and case studies throughout South Africa have illustrated a potential drop in consumption of up to 80%. Such savings have been achieved particularly in premises that have "tip tray" urinals that waste up to 60 kl/month for each unit. Due to the varying nature of commercial water consumers and usage the combined potential drop in consumption from water leaks and inefficient water usage is estimated at 35%.

The total water wastage is estimated at 10% and the inefficient water usage is estimated at 25% of the total commercial water usage. (Water used by "tip tray" urinals is considered as water wasted according to the Minimum Night Flow criteria.)

10.4.3 Industry

"Wet industries" are becoming more and more sensitive to price increases and a 15% decrease in water demand by existing consumers could arise over the next five years as a response to normal price increases.

As with commercial consumers, a portion of the water used by industrial consumers is used for domestic purposes (i.e. toilets, gardens) and can therefore be reduced without affecting industrial production. The opportunities of reducing industrial water consumption can also be enhanced by giving individual attention to the few large consumers who represent a significant portion of the total demand.

Potable water for industrial water usage can be further reduced by up to 50% through the use of treated effluent. **Excluding** the opportunity of using treated effluent, the total water wastage is estimated at 5% and the inefficient water usage is estimated at 10% of the total industrial water usage.

10.4.4 Municipal

Municipal water is water used by various departments and includes watering parks, dust suppression of roads, hydrant testing, and cleaning of pavements. Many of the current practices are considered inefficient and wasteful and it is estimated that at-least 35% of the total demand is inefficient usage.

10.4.5 Large Consumers

An analysis of the large consumers is an important requirement for identifying WC/WDM potential. A saving of between 10% and 20% of the demand of large consumers can have a significant effect on achieving overall demand targets with limited effort from the Council. The top hundred consumers have a total average consumption of 130 Ml/d or 15 % of the overall water demand. The same assumptions regarding inefficient water use for commercial consumers is made for large consumers.

10.4.6 Reduction in the demand by new consumers – reduction of natural growth rate

On average, it is estimated that by increasing the efficiency of all new consumers the growth in water demand can be reduced by an estimated average of 25%. Opportunities in reducing water demand of new consumers include selecting appropriate levels of service for different communities, efficient plumbing fittings, efficient reticulation design practices and pre-payment meters.

Reduction of new demand by new consumers can be achieved by the following related activities:

1. Installation of pre-payment systems (if economically, technically and socially viable)

2. Installation of flow limiters (water demand devices)
3. Effective billing systems
4. Communication and education campaigns
5. Regulations and by-laws
6. Negotiations and incentives to developers
7. Improved reticulation design and plumbing standards
8. A high level of operation and maintenance, with rapid response to bursts and leaks

10.5 Total opportunity of WC/WDM

Combining the assumptions regarding water wasted and inefficient water usage described in the section on demand analysis, the opportunities in reducing the current water demand are illustrated in the tables below. The results are within the parameters quoted in a number of international researches.

Table 10-3: Opportunities in reducing demand – (Ml/day)

Domestic(household)				Domestic(outside use)			
Efficient Usage	Ineffici. Usage	Leaks	Total	Efficient Usage	Ineffici. Usage	Leaks	Total
55%	38%	7%	100%	73%	20%	7%	100%
189.7	132.4	24.2	346.3	84.3	23.1	8.1	115.4
Industrial				**Commercial / business**			
Efficient Usage	Ineffici. Usage	Leaks	Total (Ml/day)	Efficient Usage	Ineffici. Usage	Leaks[1]	Total
85%	10%	5%	100%	65%	25%	10%	100%
32.3	3.8	1.9	38.0	62.7	24.1	9.6	96.4
Municipal				**other consumers**			
Efficient Usage	Ineffici. Usage	Leaks[2]	Total (Ml/day)	Efficient Usage	Ineffici. Usage	Plumbi.Leaks[2]	Total (Ml/day)
65%	25%	10%	100%	65%	25%	10%	100%
22.4	8.6	3.4	34.5	47.3	18.2	7.3	72.8
UAW + bulk losses				**Summary - Total**			
Leaks bursts	Backgr. Leaks	Commercial	Total	Efficient Usage	Ineffici. Usage	Leaks	Total
30.00%	20%	50.00%	100%	**55.08%**	**26.40%**	**18.53%**	**100%**
55.8	37.2	93.0	185.9	**438.7**	**210.2**	**148**	**796.5**

(It should be noted that the total domestic demand illustrated in Table 10-3 has been increased by the same amount as the apparent losses, half of 54 Ml/day for household and half for gardening. The reason is that it is assumed that the bulk of financial loss is consumption used by the domestic sector that is not adequately metered.)

From Table 10-3 above the total water wastage and the total inefficient water use is as follows:

1. Wasted water (leaks) = **148 Ml / day**

2. Inefficient usage = **210.2 Ml/day**

From the demand analysis and from the various discussions with various key role players it is estimated that the implementation of WC/WDM can achieve the following savings:

1. Reduction of water wastage from an estimated **148 Ml/day to 111 Ml/day**

2. Reduction of inefficient water usage from **210 Ml/day to 147 Ml/day**

3. Reduction in the normal natural growth rate due to new consumers by **25 %** per annum.

It can therefore be concluded that the existing water demand can be reduced through WC/WDM from an estimated 797 Ml/day to 539 **Ml/day**. A further reduction of approximately **65 Ml/day** is also feasible due to effluent treatment recycling and other alternative Water Resources.

Table 10-4 illustrates the type of activities that will achieve the savings envisaged.

Table 10-4:Summary of potential savings and activities

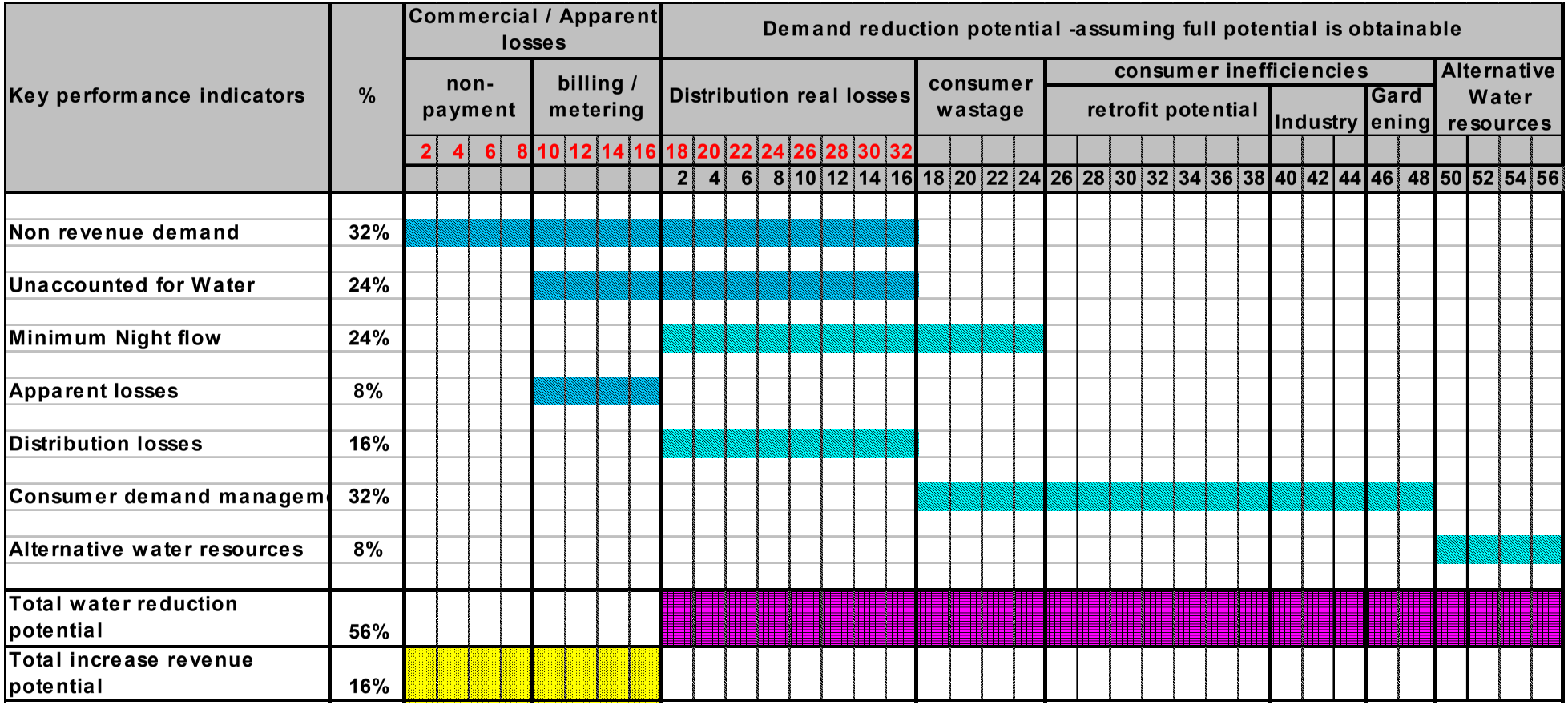
	Inefficiency component	Max Saving	% savings target	Target Savings (Ml/day)	Activity to achieve saving	Primary necessity
1	Reduction of NRW (leaks only)	93.0	60%	55.8	· Comprehensive reticulation management programme	• Financial sustainability of Council
2	Inefficient water consumption in low income areas	52.2	75%	39.2	Comprehensive management programme in low income areas	• Financial sustainability of Council • Affordability for consumer
3	Inefficient water consumption of business / industry	77.0	80%	61.6	. Behavior change · Retro-fitting · Leak repair	• Water resource consideration
4	Inefficient water consumption of domestic, affluent consumers	135.6	75%	101.7	. Behavior change · Retro-fitting · Leak repair / flow limiter · Effective tariff	• Water resource considerations
5	Treated effluent and alternative water resources	72.0	91%	65.5	. Effluent recycling plants . Well and bore holes · rain harvesting · Unconventional resources	• Water resource considerations
	Total	**429.8**		**323.8**		

10.6 Water demand indicators and WDM potential

An alternative method of illustrating the potential for WC/WDM is indicated in Figure 10-4. The diagram also helps to illustrate the differences between the various terms currently used in the Water Services Industry.

One of the observations from Figure 10-4 is the fact that the reduction of Apparent / Commercial Losses does not directly result in the reduction of the water demand but can influence the revenue collection. The total water reduction potential is the sum of the distribution losses, consumer demand management and alternative water resource potential.

Figure 10-4: Illustration of components of Water Demand reduction and Key Performance Indicators



10.7 Demand projections

There are a number of demand projections that have been developed over the last few years. A study commissioned by DWAF that was completed in 2000 entitled "Review of the long-term urban demand for water in the Cape Town-Saldanha supply area" concluded that the future growth rate in demand (until 2013) for CCT would range from 1.6 % to 2.8% per annum.

Figure 10-5: Bulk Water Supply by CCT

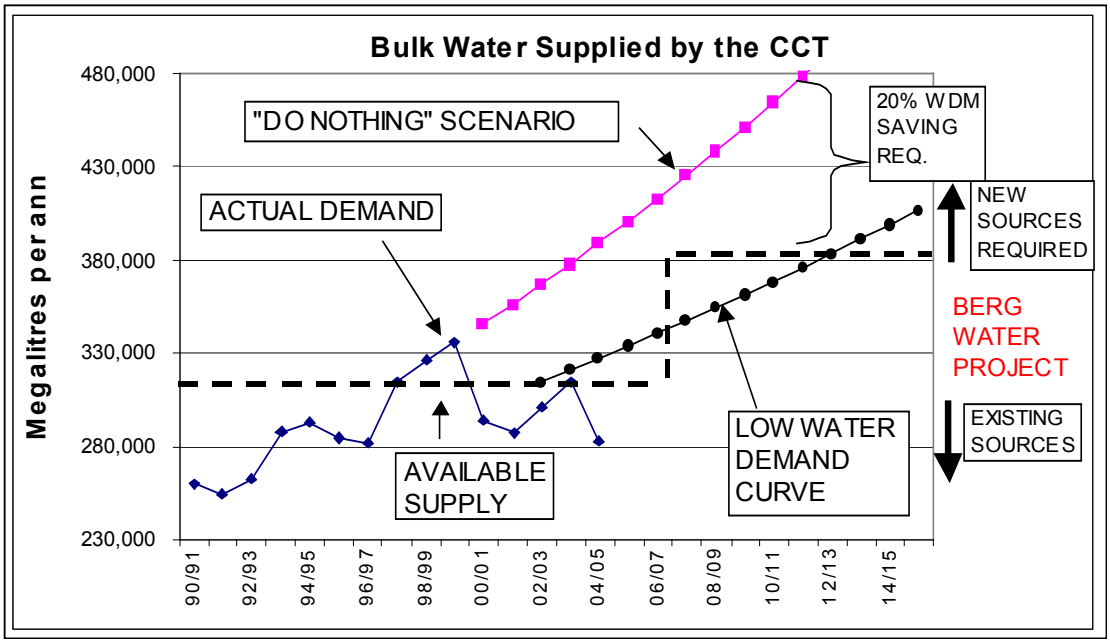
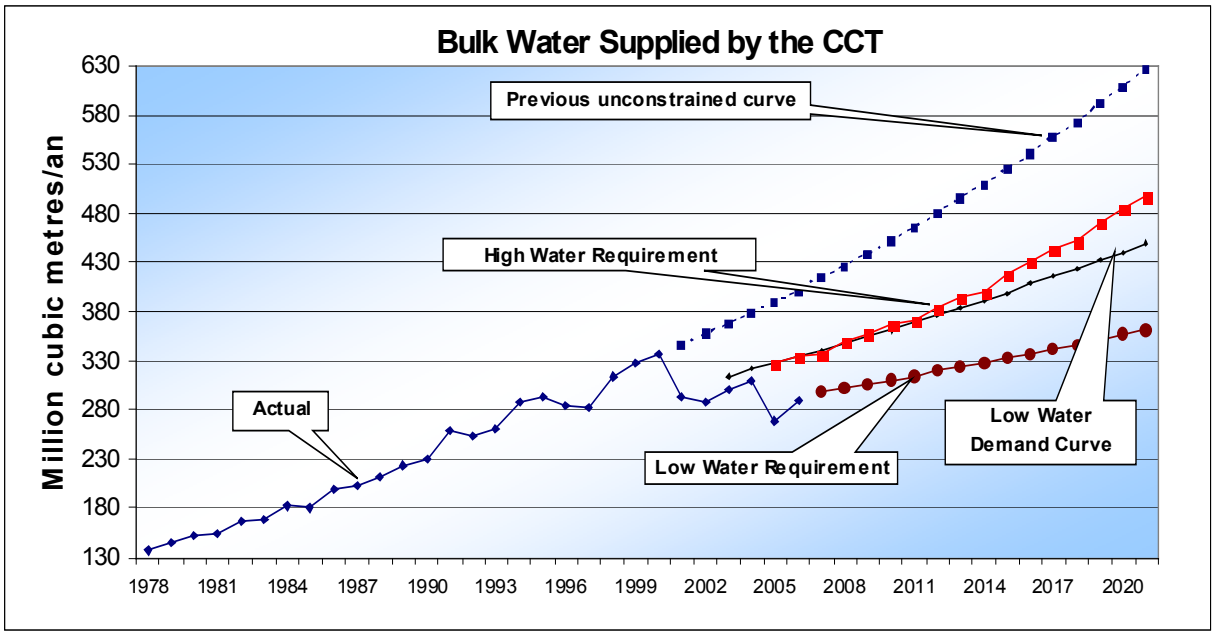


Figure 10-5 indicate the demand curves previously developed as well as the actual demand and the existing resources.

Figure 10-6: Water demand projections from the Reconciliation study



Projected unrestricted

The projected unrestricted demand is the original demand projection developed during 2000 and has a growth rate of 3% p.a. The unrestricted demand is based on the historical trend for overall water demand between 1991 to 2000.

Projected low

The projected low demand has a growth rate of 2% p.a. and assumes that some of the savings achieved due to the restrictions between 1999 and 2001 will be maintained. The low water requirement curve is CCT's commitment to DWAF in accordance with the 2001 WDM strategy (the curve therefore includes WC/WDM interventions). The Low Water Demand Curve is the CCT's commitment to DWAF with regard to WC/WDM when the "Raw Water Supply Agreement" between the DWAF and CCT was signed.

Unrestricted –20% by 2010

This curve represents the curve that CCT committed to achieve as part of the Berg River project. The key target is that by 2010 the demand must not exceed 372 million m^3 per annum (0.8 of 465)

Actual demand

The actual demand reduced from 1999 until 2001 due to the drought and water restrictions. The demand started increasing again from 2001 until 2003 but never recovered to the original level achieved in 1999. From 2003 until now the demand started declining again due to further restrictions. The current level of 302 million m^3 per annum during 2006 is 10% less than the demand of 1999.

Restrictions

Due to the drought in 2004, DWAF required a 20% reduction on the low projected curve (263 million m^3 / annum).

High and Low Water Requirements

The recently completed reconciliation study facilitated by DWAF has adopted two future water requirement curves for the CCT, namely a HWR Curve with a growth of 3.09 % per annum and a LWR Curve and a high water demand future demand requirement with a growth of 1,43 % per annum as indicated in Figure 10-6

The assumptions for the two curves are listed in Table 10-5 below. Additional information on the requirement curves is provided in the Reconciliation Strategy.

Table 10-5*: Water Requirement Curves*

Water Requirement Curve	Population Growth	Economic Growth
High Water Requirement	HIGH	HIGH
Low Water Requirement	LOW	LOW

The Low Water Demand Curve includes the impact of implementing WC/WDM measures, whilst the HWR Curve and LWR Curve exclude the impact of WC/WDM interventions. This assumption is ignored and WC/WDM is also applied to the LWR in the calculations that follow.

10.7.1 Comments on the future demand projections

From the above figures, the following observations and discussions are raised with regards to which of the future demand curves are most appropriate.

Over optimistic High Water Requirement

The following motivation is given regarding why the high water demand projections are perhaps over-optimistic:

1. Due to HIV/AIDS and other factors, the WSDP has adopted that the population growth rate will decrease from the current 3% to 1.2 % p.a. by 2010.
2. The current economic growth rate is estimated at 2.6 %.
3. Normally the water demand growth is a combination of the current population and economic growth rate which would imply that the water demand growth rate should be about 2,7 % p.a. for the first 5 years and thereafter reduce to approximately 1.5% from 2010 onwards.
4. Considering that domestic water demand (50%) is significantly more than the industrial and commercial water demand (25%), we can conclude that the demand growth will be more closely related to the population growth rate rather than the economic growth rate.
5. Besides the impact of reducing the current inefficient water demand, it is also feasible to reduce the demand of new consumers (as described in the previous chapter). This implies that the growth in water demand can be less than the level of the population growth.

Starting points of High Water Requirements

The starting point of the HWR adopted in the Reconciliation study is at the existing demand during 2004. The assumption is that the existing demand will recover to the level prior to the 2005/2006 restrictions. The WDM section of CCT disagrees with this assumption for the following reasons:

- Some water restrictions are still in place
- The demand has never fully recovered after the lifting of the previous restrictions
- The long-term WC/WDM strategy can capitalise on the current awareness and promote the sustainability of current efficiency targets of existing consumers.

More detailed discussion on his issue is described in Appendix C: Implementation progress.

10.8 Role of WC/WDM to reconcile demand and supply

The possible impact of WC/WDM on reconciling the projected future demand with existing Water Resources will depend on the following four key elements:

- Total potential savings that can be achieved on the existing demand
- The rate of implementation of WC/WDM
- The accepted future demand without any direct WC/WDM measures
- The role of WC/WDM in reducing water demand of new consumers

The **total potential savings** on existing demand are based on the calculation described in section 10.5 and are estimated at 323 Ml/day or 118 million m ^{3} per annum. It is estimated however, that savings already achieved based on the 2004 base figure due to the restrictions and WD/WDM measures implemented to date is 55Ml/day.

The **rate of implementation** will depend on the capacity and resources of CCT as well as on determining the most appropriate demand curve for the future. In theory it can be argued that if there was no drought, the most appropriate implementation of WC/WDM would be to maintain an overall zero percent growth rate until such a time as the total potential savings have been achieved. This implies that the rate of implementing WC/WDM in one year should yield savings that are equivalent to the natural growth in demand for that year.

For the purposes of determining the possible impact of WC/WDM, the HWR and the LWR developed in the reconciliation study are adopted, but with the assumption that both demand curves will start on the existing 2006 demand point and that the LWR does not incorporate WC/WDM

The role of **reducing the demand of new consumers** is often ignored. It is often easier to ensure new consumers are efficient rather then changing the technology and behaviour patterns of existing consumers. This implies that besides WC/WDM achieving savings on existing consumption, it can also reduce the natural growth in demand. It is estimated that the normal growth in consumption can be changed from 3.09 % per annum to 2.32 % per annum.

Figure 10-8and Figure 10-7 both illustrate the impact of WC/WDM on the HWR and LWR. As illustrated in both figures the demand curves can be maintained at a 0% growth rate for a considerable length of time by implementing WC/WDM measures, before the full potential of WC/WDM is fully achieved. An alternative will be to slow down the rate of implementation of WC/WDM and adopt a 1% growth rate per annum. Many officials at CCT consider a 1% p.a. growth rate a more favourable demand curve to adopt for the following reasons:

- It provides some safety margin for possibly under estimating the unrestricted or natural growth rate in demand.
- It is considered more appropriate for the planning of bulk water supply

Table 10-6 illustrates the possible impact of WC/WDM on the need for a new water augmentation scheme. WC/WDM can postpone the need for a new water augmentation scheme from the year 2008 until 2026 or 2051 depending on the Water Requirement adopted.

Table 10-6: Impact of WC/WDM on need for new dam

Impact of WC/WDM	Year new supply augmentation will be needed	
	Low Water Requirement	High Water Requirement
No WC/WDM	2016	2008
Sustaining efficiency from restrictions	2020	2013
10 yr WC/WDM progr.	2051	2026

Recommendations

The results indicate quite a significant potential for WC/WDM in postponing new water resource augmentation. The above calculations however are based on a number of assumptions that need to be verified. Furthermore, many people are sceptical about the potential role of a sustained WC/WDM programme because it is a new function in water resource planning. In order to overcome these constraints and also to verify the number of assumptions made in the calculations, it is proposed that CCT makes the following undertaking.

> **Undertaking**: CCT will commit over the next five years to implementing and monitoring a comprehensive WC/WDM strategy. In such a time no decision should be taken regarding any further water augmentation scheme in order to verify the full potential of WC/WDM. After five years the full impact and potential of WC/WDM must be clearly demonstrated by CCT and re-evaluated. All assumptions made in the current analysis on the role of WC/WDM will be tested and adequately researched.

The analysis also highlights the need to adopt and implement an "end-use" forecasting model to project future requirements more accurately and enable adequate analysis and understanding of different categories of consumers and categories of consumption.

Figure 10-7: Impact of WC/WDM on HWR

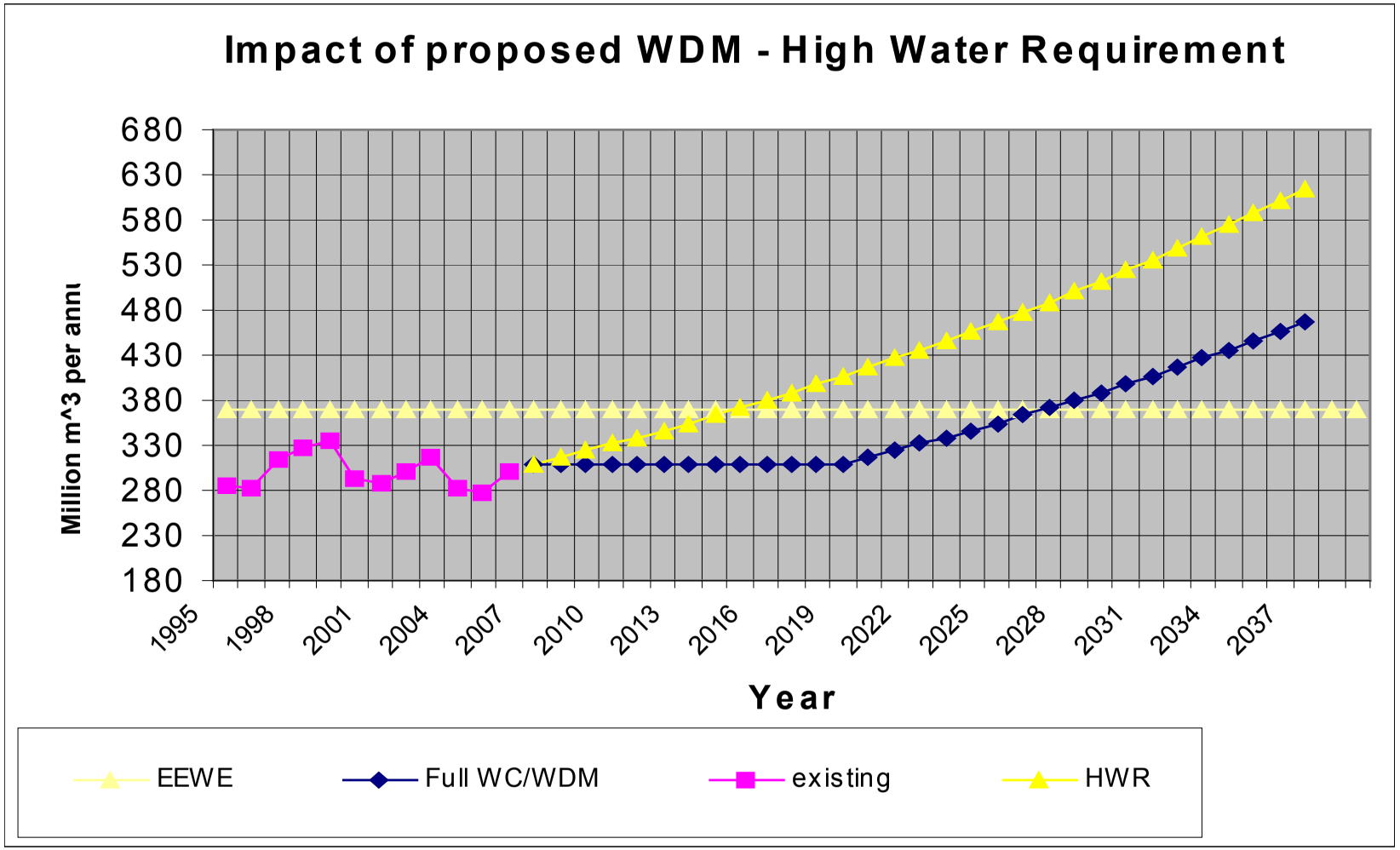
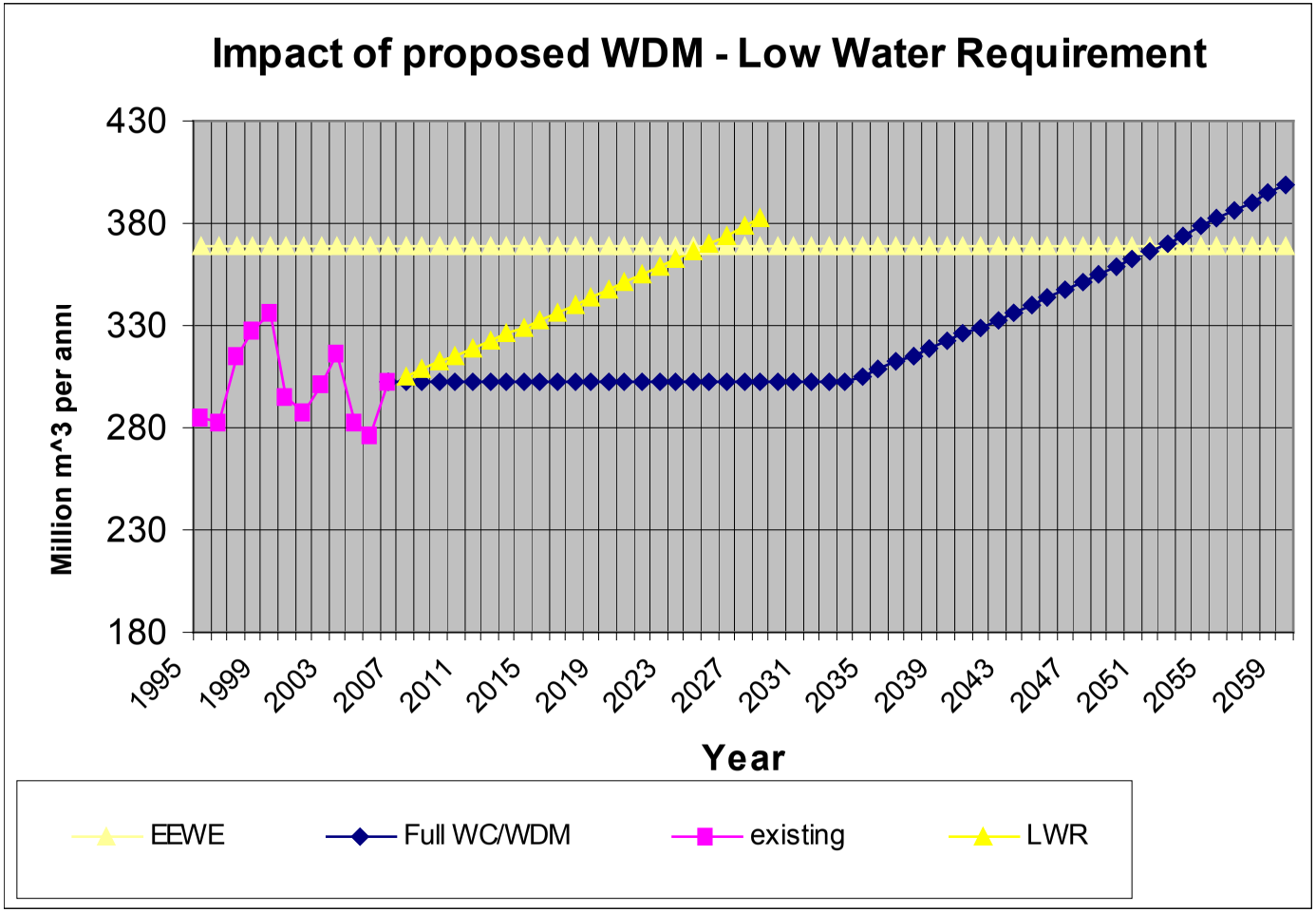


Figure 10-8: Impact of WC/WDM on LWR



10.9 Economic Benefits

An accurate economic benefit analysis is beyond the scope of this study and the following calculations only give some indications as to the type of economic benefits that can be expected through WC/WDM. A more detailed assessment needs to be done as part of implementing the strategy.

The net economic benefit of WC/WDM is calculated as the difference between the economic benefit of WC/WDM and the economic costs of implementing WC/WDM.

The economic benefit of WC/WDM consists of the following components:
1. Operating costs of reducing water demand
2. Increased revenue from decreasing apparent loses and increasing payment by consumers
3. Savings from deferring bulk infrastructure costs

The economic costs of WC/WDM consists of the following components:
4. Cost of implementing WC/WDM projects
5. Reduction in income from reduced sales (**can be offset by increasing price however**)

General assumptions:
- Unconstrained growth in demand without WC/WDM is 2.7 % p.a.
- Impact of WC/WDM is to reduce demand growth to 1% per annum for the next 14 years.
- Real discount rate is 7%

1. Operating costs

Assuming that the average operating cost of water is only R 0.5 / kl, the potential net present value of savings on operating cost is estimated at **R 131 million** over the next 10 years and **343 million** over the next 20 years. Operating cost savings include electricity cost for pumping, chemical costs for treatment of raw water and the treatment of effluent.

2. Increased revenue from decreasing apparent losses and increasing payment

Assuming that the average selling price is R 3.5 /kl and that the total increase in payment is 7% of the total demand, then the net present value of increased revenue is approximately **R 600 million** over the next 10 years and **R 937 million** over the next 20 years.

3. Savings from deferring bulk infrastructure costs

This is calculated by estimating the present value of avoided capital costs of infrastructure. The capital costs savings includes the postponement of infrastructure throughout water and wastewater systems and including Water Resource augmentation schemes. This exercise however cannot be done accurately without direct knowledge of which bulk capital projects can be postponed through WC/WDM and requires detail investigation.

Table 10-7 illustrates some assumptions made to determine a rough estimate of the economic benefit of postponing bulk infrastructure. We assume that WC/WDM will postpone the water augmentation by 10 years, 50% of the bulk water infrastructure by 10 years and 30% of the effluent bulk by ten years. Based on these estimates we calculate that the potential benefit of WC/WDM to defer bulk capital costs can be as high as **R 1 721 million** over the next 10 years.

Table 10-7: Assumption on postponement of Capex

Capex for next 10 years	cost x R millions	% postponment
Bulk Water supply	2068	50%
Assume Water Resources	3000	100%
Bulk effluent	1551	30%

4. Overall economic costs of implementing WC/WDM

The overall economic costs of implementing WC/WDM to achieve the above targets need to be assessed for each WC/WDM measure and then added to provide a total cost. From the strategy that follows the total cost of WC/WDM over the next 10 years is estimated at **R 759 195 million**. In addition to identifying any potential cost benefits of the WC/WDM options, there are also potential environmental benefits that should be taken into account. Such benefits may however be difficult to quantify in monetary terms.

5. Reduction of income from the reduction of sales

The reduction of income from the possible reduction of sales is ignored because it is assumed that such a reduction can be offset by appropriate adjustments to the tariffs. (Refer to discussion in section 12.8 programme B4.1.). The motivation for changing the tariff system is as follows:

- The current tariffs for water is considered to be cheap in comparison to other Metros.
- The current tariff structure needs to be adjusted to be in line with the marginal cost principles.
- A distinction must be made between the cost of water and the selling price of water. Although one of the objectives of WC/WDM is to reduce the overall cost of water, high tariffs are needed to create an incentive for consumers to use water efficiently. There is a fine balance between the two objectives and this issue needs to be carefully looked at.

Despite the above reasons the issue of price elasticity and the impact of WC/WDM on tariffs must be carefully analysed and a proposed project is included in the strategy under section 12.8

6. Increase in revenue from the sale of treated effluent

From the sale of treated effluent it is estimated that if the average tariff of 2 /kl is maintained the annual income after all projects are completed is estimated at approximately R 66 million per year.

Table 10-8: envisaged revenue from the sale of treated effluent

Effluent reuse	Ml/day	Revenue R millions per annum	
		total	Cumulative total
Current sales	18.47	R 13.485	R 13.485
Immediate action plan, to be implemented during 1st year	7.07	R 5.164	R 18.649
Additional full implementation capacity	64.90	R 47.374	R 66.022
* assuming a current average selling price of 2 R /kl			

The above table also illustrates that the potential income after the immediate action plan is completed together with the existing consumers is estimated at R 18,65 million per annum. Adding a water scarcity

levy on the tariff could further increase the potential revenue. (see programme E1.3 for motivation)

7. Overall economic benefit of WC/WDM

The overall economic benefit of implementing the WC/WDM strategy could be as high as R 1694.4 million over the next ten years**.**

Table 10-9 illustrates the different components of the economic analysis.

Table 10-9: Economic benefit of WC/WDM

Describtion	NPV Savings over the next 10 years x R million
Operating cost savings	131.26
Increased revenue, reduce commercial losses, debt management strategy	600.64
Savings from deferring capital projects	1721.73
Revenue from the sale of treated effluent	278.17
Sub-total	2453.62
Less cost of implementing WC/WDM	759.20
Total net economic benefit	1694.43

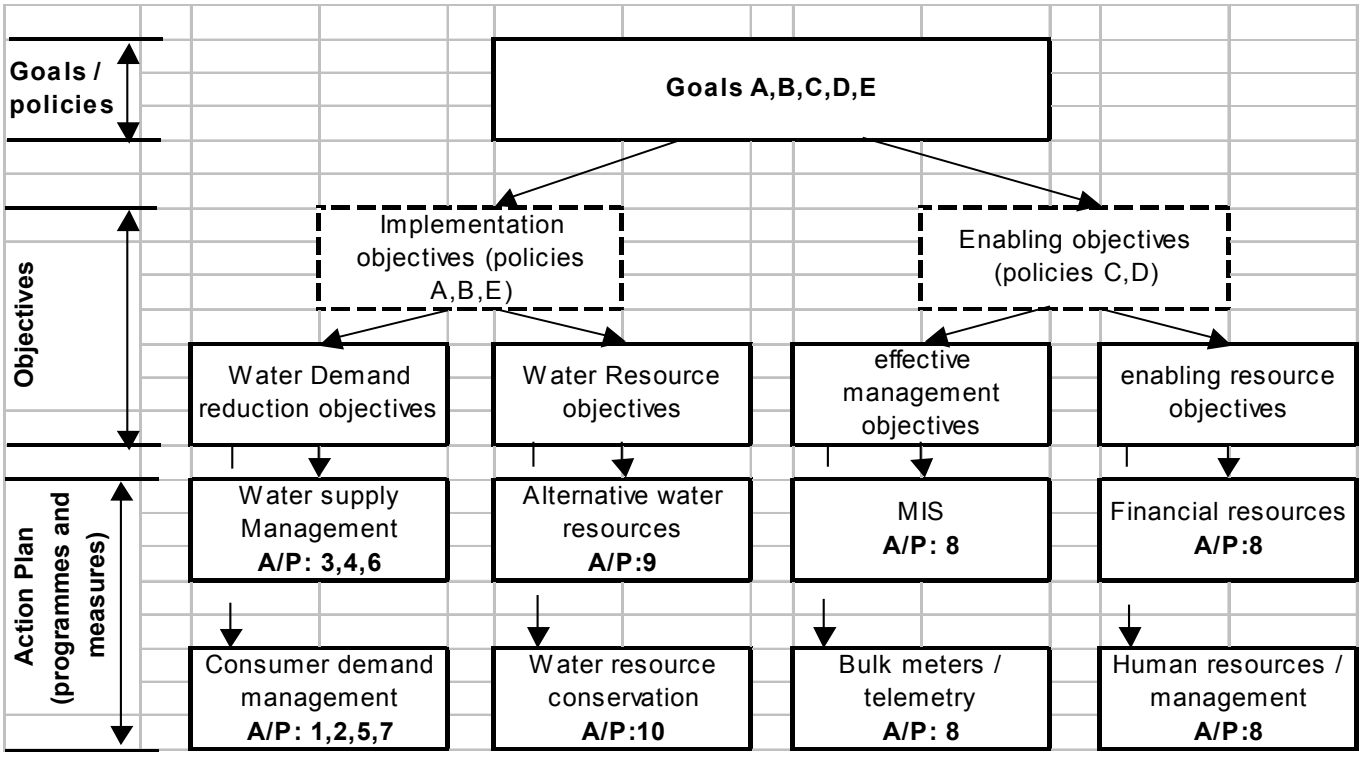
SECTION D: FRAMEWORK OF ACTION

11 Overview

11.1 Structure

The framework of action, for WC/WDM is illustrated in Figure 11-1 below.

Figure 11-1: Structure of WC/WDM framework of action



(1) Policy / Goals

The policy consists of five key goals that that the strategy is based on.

(2) Objectives

(2.1) Implementation objectives.

These are the objectives that refer to reducing and sustaining the water demand to specific targets. These objectives are divided into two components: water demand reduction and water resource objectives. Water Demand reduction objectives relate to activities that will directly result in the reduction of losses or water usage by consumers. Water resource objectives relate to activities that will protect the current Water Resources and explore alternative resources that will alleviate the impact on the current resources.

(2.2) Enabling objectives

These objectives will seek to overcome the existing constraints of WC/WDM and will seek to ensure that WC/WDM is implemented on an ongoing basis and is institutionalised with the existing functions of CCT. These objectives are divided into two components: effective management and enabling resource objectives. The effective management objectives relate to activities that will manage and monitor the demand targets and key performance indicators. Although these measures will not directly result in the reduction in demand, they are essential in order to ensure sustainability and the access to necessary information. The enabling resource objectives refer to activities that will ensure adequate financial resources, human resources and management protocols to ensure that the WC/WDM policies and goals are achieved.

(3) Action Plan

This relates to proposals that should either be adopted or implemented as departmental policy or as specific programmes. Individual projects, when possible, are identified for each programme and priced for budget purposes. The current version of the strategy does not identify the exact scope of all programmes and is limited according to the information available. Subsequent reviews of the strategy should continuously update the scope and parameters of the various programmes as more information becomes available through the implementation of research and further analysis.

11.2 Policy / Goals

The policy describes the overall desired targets and goals of the strategy. The objectives describe specific components that will contribute to the achievement of the policy.

Based on the **fundamental principles described** in section 6.6 as well as the policy adopted in the previous WC/WDM strategy by CCT, the following five goals have been identified and represent the overall policy.

Goal A: CCT must by 2010 reduce and maintain the non-revenue demand of water to below 15% of the total average demand and within accepted international benchmarks.

This requires that CCT must ensure the reduction of the level of leakage in any Water Services Works, reduce the level on non-revenue demand by consumers to an optimal level and sustain such targets on an ongoing basis.

The reason that the reduction of non-revenue demand by consumers is part of this goal is to highlight the direct relationship between water resource efficiency and financial efficiency.

Goal B: Water wastage by consumers should be reduced and maintained to below 2% of the total demand by 2012 and most consumers should achieve acceptable water efficiency benchmarks by 2016.

All consumers of CCT must not waste water and should endeavour to use water efficiently. CCT must implement and enforce adequate regulatory measures that prohibit consumers from wasting water. (Water wastage can be defined as the use of water without deriving any direct benefit. The non-efficient use of water can be described as water used over and above the accepted benchmark for a specific purpose or water used where very little benefit is derived.)

This policy statement refers directly to the consumers of CCT. It emphasises that the responsibility for WC/WDM is not limited to CCT. Consumers' representatives must be key stakeholders to this strategy and should also be made accountable.

Goal C: CCT must by 2009 ensure and maintain ongoing effective management systems and implement Integrated Water Resource Planning in all decisions regarding Water Resources augmentation, bulk infrastructure development and water efficiency projects.

WC/WDM must be determined in the context of IWRP and must be considered as part of the Water Resources and Water Services planning process. The implementation of WC/WDM measures could provide a more cost effective or appropriate solution to reconciling growing water demand with existing Water Resources or infrastructure. Where water is used inefficiently WC/WDM could postpone the need for premature capital infrastructure such as dams and Bulk Treatment Works. The resources, scope of work and prioritisation of WC/WDM activities should be determined through an integrated planning process.

Goal D: CCT must adopt WC/WDM as one of the key Water Service delivery strategies, and must give priority to its implementation and ensure an ongoing adequate enabling environment.

WC/WDM should not be an added campaign within CCT and needs to be incorporated into the normal functions of the water department and given priority. Management needs to take responsibility for ensuring that WC/WDM is implemented, allocate adequate resources and develop appropriate processes.

Goal E: Reduce the projected potable water demand to an average growth rate of no more than 1 5 p.a. for the next 10 years and conserve Cape Town's Water Supply to acceptable environmental standards.

Considering the limited water resource of CCT, this is perhaps the most important goal. Although there is considerable overlapping between this goal and Goal A and B, they need to be highlighted separately. This goal relates directly to the Water Resources constraints where as goal A for example also relates to financial efficiency. Goal A is necessary irrespective of whether there was no shortage of Water Resources.

This goal also allows for the introduction of water- resource conservation measures such as the reduction of water pollution. Although such measures are the primary objective of DWAF and the relevant catchment management authorities, CCT also has a responsibility to contribute to the conservation of the Water Resources.

11.3 Implementation priorities & process

The primary objective of WC/WDM is to facilitate increased efficiency and equity in the provision of water and sanitation services, through various techniques and practices. Efficiency gains or reduced wastage can then be utilised to offset or postpone costly water augmentation schemes required to cater for urban growth.

11.3.1 Priorities

The WC/WDM implementation strategy will have the following priorities (in descending order):

1. Reduce the level of non- revenue demand
2. Reduce pressures in the reticulation system
3. Recycle water
4. Reduce the projected demand by new consumers and new developments
5. Reduce the water wastage of existing paying consumers
6. Increase the efficiency of water by paying consumers.
7. Sustain demand targets achieved (refer to 1 - 4)
8. Explore alternative Water Resources

11.3.2 Reduction of non revenue demand and apparent losses

Non-revenue demand can be divided into the following categories: -

- Unaccounted for water: Real losses; Apparent losses
- Unbilled authorised consumption: water consumption by non – paying consumers; Free basic water.

Obviously, free basic water is a social benefit and cannot be targeted for reduction. Unaccounted for water can be divided into two categories: water losses in the reticulation systems and apparent losses.
The reduction of apparent losses may not have a direct impact on the Water Resources situation, but it is still considered part of the WC/WDM strategy for the following reasons:

- Consumers who do not pay for Water Services often use a lot more water than they need. Plumbing leaks are not repaired, taps are left running open and excessive watering of gardens is common in such households.
- An increase in revenue efficiency associated with reducing apparent losses can offset the reduction of revenue that may result from reducing the water consumption of paying consumers.
- When targeting the reduction of non-revenue demand, which is the most common key performance indicator of WC/WDM, it is difficult to separate apparent losses and real losses.

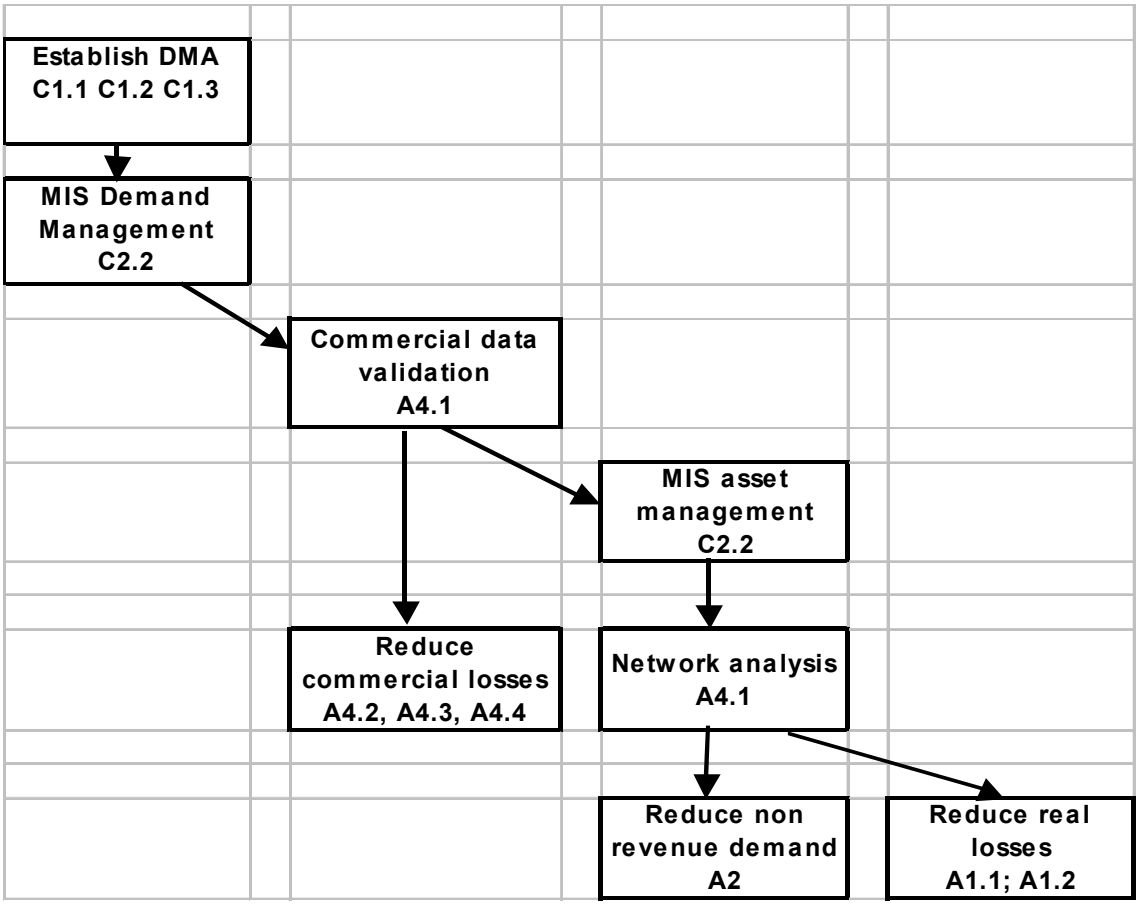
11.3.3 Implementation process for reducing non revenue demand

It is important to recognise that although the strategy is defined according to specific objectives, programmes and activities, a number of them are interlinked and should be implemented in a specific order. Of particular importance is the need to implement management information systems and to carry out a number of activities that will assist in determining or verifying the extent of losses for each category. Failure to do so can lead to unnecessary activities, projects and wasted funds.

The following diagram illustrates the order of priority or the activities that need to be undertaken in order to reduce non-revenue demand (Objective A). The numbers indicated correspond to the programme /

initiative as described in sections 12 and 13 of the report.

Figure 11-2 Process to reduce non revenue demand



The above diagram illustrates the following important aspects:

- Before intensive work on reducing non-revenue demand commences, it is important to establish the extent of non-revenue and various other key performance indicators. Integral to this task is the need to establish district management areas and to implement an adequate **Demand Management Information System**.
- Once the Demand Management Information System is implemented, the next important task is to carry out a commercial data validation. Such a commercial data validation exercise can identify and resolve a number of the apparent losses prior to any physical activities on the reticulation system. This can result in significant financial savings by preventing unnecessary exercises. One example that has occurred in various municipalities is implementation of leak detection projects in areas where the physical losses were minimal resulting in very low benefit / cost ratio.
- Following the commercial data validation it is important to implement an asset management MIS system and carry out a network analysis. Such a network analysis should identify problematic pipelines according to records of bursts, type of material, pressures and other criteria. This can again greatly reduce the amount of field investigations to identifying physical leaks.
- The emphasis of the above approach is to "work smartly". The field activities to identify physical leaks must be guided through an informed and well-documented process and it is therefore important not to commission leak detection exercises without adequate preparation.

11.4 Costing and budgets

Most of the costing and budgets indicated for the various programmes and projects in the tables in chapters 12 and 13 are based on educated assumptions and certain principles. The budgets should be used as a guideline and should be reviewed on an annual basis and updated as more information becomes available. The following costing principles and assumptions were made in developing the budgets:

1. No escalation for inflation has been included
2. Costs of staff resources that are currently employed have not been included
3. Costs of service providers that would need to be sub-contracted have been included.
4. A number of capital infrastructure projects have been excluded in order to avoid duplication by other sections.
5. Some "top up" budget for capital infrastructure project has been included (for example meter installations)
6. Most operation and maintenance costs for reticulation and effluent management have been excluded.

A summary of the costs for the various objectives and programmes is illustrated in the Table 11-1 below.

A summary of the key projects representing approximately 90% of the total costs and the envisaged savings are illustrated in Table 11-2. The row at the bottom "Total required" illustrates the required implementation of WC/WDM to offset the natural growth in water demand. The last two rows of the table indicate that the proposed implementation of WC/WDM is greater than the rate of implementation required. For example in "year 2" the additional water savings required is 23 Ml/day but the proposed savings are estimated at 34 Ml/day. Similarly the required budget is R 51,99 million but the proposed budget is R 84,99. By year 10 of the strategy it can be seen that the cumulative difference between proposed and required is only 2 Ml/day, implying that the strategy was designed to achieve the full efficiency potential in the full ten years. The reasons for accelerating the implementation of the WC/WDM strategy in the first few years are as follows;

1) To complete the treated effluent projects as quickly as possible in order to generate additional income o subsidise other WC/WDM activities.

2) To ensure that the total demand does not recover to the level before the water restrictions were implemented

Table 11.1: Summary and budgets of WC/WDM strategy
Version final draft : April 2007

Policy		Objective		Programme	Budget x R 1000 from cost tables										
					2007/08	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Policy A: CCT must by 2010 reduce and maintain the non-revenue demand of water to below 15% of the total average demand.	A1	Reduce and maintain low levels of water losses	A1.1	Pressure reduction	4200	3000	2900	2900	50	50	50	50	50	50	13300
			A1.2	Establishment of leak detection teams	1400	1400	1000	1000	1000	1000	1000	1000	1000	1000	10800
	A2	Reduce and maintain low levels of non-revenue demand by consumers	A2.1	Comprehensive management projects in low income areas	2000	15700	30620	30676	30879	21142	7485	1485	1485	1485	142958
			A2.2	Fix-it leak in low income areas	1293	2300	2630	3010	3446	3948	3446	3010	2630	2300	28012
			A2.3	Implementation of debt management policy	1920	2220	3640	3640	3640	3640	3640	3640	3640	3640	33260
	A3	Adopt and implement proactive O & M	A3.1	Rehabilitation of network system	420	0	0	0	0	0	0	0	0	0	420
			A3.2	Preventative maintenance	300	700	1150	1150	1150	1150	1150	1150	1150	1150	10200
			A3.3	passive leakage control	50	170	50	50	100	50	50	50	50	50	670
			A3.4	uniform O & M policy	25	20	0	0	0	0	0	0	0	0	45
	A4	Reduce and maintain low level of apparent (commercial) losses	A4.1	Data validation of billing system	0	0	0	0	0	0	0	0	0	0	0
			A4.2	Meter management /replacement	1000	4200	4050	4000	4000	4050	4000	4000	4000	4000	37300
			A4.3	Resolving billing exception reports	50	150	150	150	150	150	150	150	150	150	1400
			A4.4	Management of large consumer meters	0	1550	1250	100	150	150	100	200	200	200	3900
			A4.5	Reduce illegal connections	250	800	720	700	400	200	200	200	200	200	3870
			A4.6	Manage meter readings	125	325	125	125	125	225	125	125	125	125	1550
Policy B: Consumers must not waste water and should endeavour to use water efficiently	B1	Promote the efficient use of water to consumers and customers	B1.1	Consumer awareness campaign	1410	2010	2410	7350	2710	2710	2710	2710	2710	2710	29440
			B1.2	Consumer education campaign	0	2040	2040	1790	1790	1590	1590	1590	1590	1590	15610
			B1.3	School education	1150	2300	2300	2300	2300	2300	2300	2300	2300	2300	21850
			B1.4	Special events (water week etc)	745	845	895	945	995	1045	1095	1145	1145	1145	10000
			B1.5	Establish consumer forums	0	520	590	600	530	460	530	530	530	530	4820
			B1.6	Develop a dedicated web pages	300	190	40	40	40	40	40	40	40	40	810
			B1.7	2010 Soccer World cup	0	500	2600	1500	0	0	0	0	0	0	4600
	B2	Regulate and enforce the prevention of wastage of water	B2.1	Revise the current by-laws	20	20	20	60	20	20	20	20	20	20	240
			B2.2	Enforcement of water by-laws	80	305	5	150	5	5	5	5	5	5	570
			B2.3	Registration of plumbers	0	0	270	170	170	170	170	170	170	170	1460
	B3	Ensure the efficient use of water in new developments and new consumers	B3.1	Develop incentive schemes for developers	0	40	50	50	50	50	50	50	50	50	440
			B3.2	Revise engineering standards	0	200	100	0	0	0	0	0	0	0	300
			B3.3	Develop incentives for new consumers	0	50	600	600	600	200	200	200	200	200	2850
			B3.4	Sustainable service programme for new consumers in low income areas	0	800	720	720	720	720	720	720	720	720	6560
	B4	Introduce more equitable tariffs	B4.1	Review water tariffs	350	200	150	150	200	150	150	150	150	150	1800
			B4.2	Informative billing	500	0	0	0	0	0	0	0	0	0	500
			B4.3	Monitoring demand and notifying consumers	0	130	130	130	130	130	130	130	130	130	1170
	B5	Assist and capacitate consumers to be water efficient, and initiate a retro fit programme	B5.1	Implement plumbing retro –fit	0	500	2300	5000	5000	5050	5000	5000	5000	5000	37850
			B5.2	Implement a water-wise gardening scheme	200	400	220	220	220	220	220	220	220	220	2360
			B5.3	Introduce water audit for domestic consumers	100	20	190	190	190	190	190	190	190	190	1640
			B5.4	Implement an on-going support programme for large consumers	0	520	1070	1070	870	870	870	870	870	870	7880
	B6	Reduce and maintain low levels of inefficient water use by Council	B6.1	Increase water efficiency by the parks department	70	350	350	350	350	110	110	110	110	110	2020
			B6.2	Increase efficiency in Council owned buildings	150	300	300	100	100	100	100	100	100	100	1450

Policy		Objective		Programme	Budget x R 1000 from cost tables										
					2007/08	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Policy E **Reduce the projected potable water demand to an average growth rate of no more than 1% p.a. for the next ten years and conserve Cape Town's Water Resources**	E1	Maximise use of treated effluent	E1.1	Infrastructure projects for recycling treated effluent	23490	34000	50200	47000	51000	0	0	0	0	0	205690
			E1.2	Operations , maintenance and effective management of treatment effluent	430	750	2650	350	350	350	200	200	200	200	5680
			E1.3	Consumer and financial management of treated effluent	150	600	300	400	100	100	0	100	0	100	1850
	E2	Promote alternative water resources and technologies	E2.1	Implement rain harvesting pilot projects	0	0	280	70	20	20	70	20	20	20	520
			E2.2	Development of Local boreholes, install in schools etc & promote	300	800	250	250	250	250	250	250	250	250	3100
			E2.3	Grey water reuse, pilot projects, booklets	0	220	50	50	70	50	50	50	50	50	640
			E2.4	investigations into unconventional water resources	0	100	500	500	500	500	0	0	0	0	2100
	E3	Conserve water resources	E3.1	Support working for water programme	0	950	950	950	950	950	950	950	950	950	8550
			E3.2	Support catchment management initiatives, (I.e. monitoring pollution)	0	50	450	450	450	450	450	450	450	450	3650
			E3.3	Implement clean up campaigns	150	300	500	500	600	500	500	500	500	500	4550
			E3.4	Management of ground water resources (register)	300	50	200	100	0	0	300	0	0	0	950
	E4	ensure the quality of treated effluent is of suitable standards	E4.1	Ensure adequate effluent treatm. works	0	0	0	0	0	0	0	0	0	0	0
			E4.2	Ensure adequate maintenance of treatment plants	0	0	0	0	0	0	0	0	0	0	0
			E4.3	Ensure adequate and efficient operation of treatment plants	0	0	0	0	0	0	0	0	0	0	0
			E4.4	set standards of effluent discharge for each plant	0	0	0	0	0	0	0	0	0	0	0
			E4.5	Monitor the effluent discharge on an ongoing basis	0	0	0	0	0	0	0	0	0	0	0
			E4.6	Minimise the infiltration of rain water into the effluent system	0	0	0	0	0	0	0	0	0	0	0
			E4.7	Monitor effluent disc. of big consumers	0	0	0	0	0	0	0	0	0	0	0
Policy C **Ensure effective management and implement IWRP in all decisions regarding water resources augmentation, bulk infrastructure development and water efficiency projects**	C1	Establish appropriate district management areas, & NRW	C1.1	Establish district management areas	1600	1500	1500	0	0	0	0	0	0	0	4600
			C1.2	Determine UaW	400	200	0	0	0	50	0	0	0	0	650
	C2	Ensure adequate information / policies to support decision-making	C2.1	Management Information System	500	10000	10000	1000	1000	1000	1000	1000	1000	1000	27500
			C2.2	Upgrading the telemetry system, remote communications (cell)	0	0	200	6400	6530	6730	2030	2030	2030	2030	27980
			C2.3	End use / Consumer behaviour research	0	0	800	650	400	350	350	750	750	750	4800
	C3	Adopt Integrated Water Resource Planning (IWRP).	C3.1	IRP water resources	300	830	500	0	300	0	0	0	0	0	1930
			C3.2	IRP for bulk water and sanitation	50	300	300	0	0	0	0	0	0	0	650
	C4	Monitor the impact of WC/WDM measures and KPI	C4.1	Monitoring WC/WDM	100	300	600	600	600	600	600	600	600	600	5200
			C4.2	Monitoring KPI	100	150	100	100	100	100	100	100	100	100	1050
Policy D **Adopt WC/WDM as one of key water service delivery strategies, give priority to its implementation and ensure an adequate enabling environment.**	D1	Ensure adequate financial resources for the strategy	D1.1	Develop a WC/WDM fund	0	0	0	0	0	0	0	0	0	0	0
			D1.2	Seek private partnerships	0	0	0	0	0	0	0	0	0	0	0
	D2	Ensure adequate human resources and processes	D2.1	Develop a WDM section	400	200	100	100	100	100	100	100	100	100	1400
			D2.2	working procedures , capacity in reticulation section	100	100	0	0	0	0	0	0	0	0	200
	D3	Ensure adequate transparency, stakeholder buy in and commitment	D3.1	Ensure political and management buy-in	120	170	220	120	120	120	120	120	120	120	1350
			D3.2	co-operation and partnerships	0	0	0	0	0	0	0	0	0	0	0
			D3.3	Transparency and public participation	150	150	100	0	100	50	150	0	0	0	700
Total					**46748**	**96495**	**136385**	**130576**	**125620**	**64155**	**44816**	**38530**	**38050**	**37820**	**759195**

Table 11-2: Summary cost of main projects indicating water savings

Objective number		Programme	Budget x R 1000 & expected savings																			
			Year 1	Ml/day	Year 2	Ml/day	Year 3	Ml/day	Year 4	Ml/da	Year 5	Ml/day	Year 6	Ml/day	Year 7	Ml/da	year 8	Ml/da	Year 9	Ml/da	year 10	Ml/day
Objective A1	A1.1	Pressure reduction	4200	7.98	3000	5.70	2900	5.51	2900	5.51	50	0.10	50	0.10	50	0.10	50	0.10	50	0.10	50	0.10
	A1.2	Establishment of leak detection task teams	1400	0.43	1400	0.43	1000	0.31	1000	0.31	1000	0.31	1000	0.31	1000	0.31	1000	0.31	1000	0.31	1000	0.31
Objective A2	A2.1	Comprehensive water supply management projects in previously disadvantaged areas	2000	0.47	15700	3.65	30620	7.13	30676	7.14	30879	7.19	21142	4.92	7485	1.74	1485	0.35	1485	0.35	1485	0.35
	A2.2	Fix-it leak in low income areas	1293	0.39	2300	0.69	2630	0.79	3010	0.90	3446	1.03	3948	1.18	3446	1.03	3010	0.90	2630	0.79	2300	0.69
	A2.3	Implementation of debt management policy	1920	0.47	2220	0.54	3640	0.89	3640	0.89	3640	0.89	3640	0.89	3640	0.89	3640	0.89	3640	0.89	3640	0.89
Objective A3	A3.2	Preventative maintenance	300	0.25	700	0.57	1150	0.94	1150	0.94	1150	0.94	1150	0.94	1150	0.94	1150	0.94	1150	0.94	1150	0.94
Objective A4	A4.2	Meter management /replacement programme	1000	0.14	4200	0.57	4050	0.55	4000	0.55	4000	0.55	4050	0.55	4000	0.55	4000	0.55	4000	0.55	4000	0.55
Objective B1	B1.1	Consumer awareness campaign	1410	0.44	2010	0.62	2410	0.75	7350	2.29	2710	0.84	2710	0.84	2710	0.84	2710	0.84	2710	0.84	2710	0.84
	B1.2	Consumer education campaign	0	0.00	2040	1.20	2040	1.20	1790	1.05	1790	1.05	1590	0.93	1590	0.93	1590	0.93	1590	0.93	1590	0.93
	B1.3	School education	1150	0.48	2300	0.96	2300	0.96	2300	0.96	2300	0.96	2300	0.96	2300	0.96	2300	0.96	2300	0.96	2300	0.96
	B1.4	Special events	745	0.00	845	0.00	895	0.00	945	0.00	995	0.00	1045	0.00	1095	0.00	1145	0.00	1145	0.00	1145	0.00
	B1.7	2010 Soccer World cup	0	0.00	500	0.00	2600	0.01	1500	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Objective B2	B2.2	enforcement of by-laws	80	0.00	305	0.01	5	0.00	150	0.00	5	0.00	5	0.00	5	0.00	5	0.00	5	0.00	5	0.00
Objective B5	B5.1	Implement a plumbing retro –fit programme	0	0.00	500	0.52	2300	2.38	5000	5.17	5000	5.17	5050	5.22	5000	5.17	5000	5.17	5000	5.17	5000	5.17
	B5.4	Implement an on-going support programme for large consumers	0	0.00	520	2.96	1070	6.09	1070	6.09	870	4.95	870	4.95	870	4.95	870	4.95	870	4.95	870	4.95
Objective E1	E1.1	Recycling of treated effluent - infrastructure	23490	7.42	34000	10.74	50200	15.86	47000	####	51000	16.12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Objective E2	E2.1	Support working for water programme	0	0.00	950	0.00	950	0.00	950	0.00	950	0.00	950	0.00	950	0.00	950	0.00	950	0.00	950	0.00
Objective C1	C1.1	Establish District management areas	1600	0.00	1500	0.00	1500	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Objective C2	C2.1	Management Information System	500	0.25	10000	5.07	10000	5.07	1000	0.51	1000	0.51	1000	0.51	1000	0.51	1000	0.51	1000	0.51	1000	0.51
	C2.2	Upgrading the telemetry system, remote communications (cell)	0	0.00	0	0.00	200	0.08	6400	2.55	6530	2.60	6730	2.68	2030	0.81	2030	0.81	2030	0.81	2030	0.81
Total			41088	19	84990	34	122460	49	121831	50	117315	43	57230	25	38321	20	31935	18	31555	18	31225	18
Total required			48473	21	51992	23	55765	24	59813	26	64154	28	68810	30	73804	32	79161	34	84907	37	91069	39
Difference between required and proposed			7385	2	-32998	-12	-66695	-24	-62018	-24	-53161	-15	11580	5	35483	12	47226	16	53351	19	59844	21
Cumulative difference between required and prop			7385	2	-25613	-9	-92308	-34	-154326	-58	-207487	-73	-195907	-68	-160424	-56	-113197	-40	-59846	-21	-2	0
Note that A5.1 and A5.2 will not result in a significant reduction of demand, but can result in a significant increase in financial reve																						
Assume total demand, in 2004			797																			

11.5 Roles and responsibilities

The framework of action refers to WC/WDM activities and programmes that need to be implemented by various departments within the City Council and various sections within the Water Services department. The following gives a brief overview of the envisaged roles and linkages between the various departments and sections.

a) Role of the Water Demand Management Section

Responsible for the implementation of most programmes and activities as well as responsible for the oversight function on programmes that other sections and departments are accountable for. The WDM section's responsibility on certain reticulation related projects will be to implement and commission and then hand over to the reticulation section (i.e. pressure reducing valves).

b) Role of the Reticulation Section

Responsible for the rehabilitation programme of pipelines and meters, meter reading management, repairing of distribution leaks and passive leakage control. The Reticulation section will also be responsible for monitoring and maintaining various key performance indicators.

c) Role of the Wastewater Section

Responsible for ensuring the quality of treated effluent is of suitable standards and reducing infiltration and leakage. This is part of the normal functions of the wastewater section but WDM will have an oversight function to ensure that the WC/WDM objectives are achieved.

d) Role of the finance department

Responsible for commercial data validation, reducing billing errors and implementing an informative billing system.

12 Implementation objectives

Goals, A, B and E relate to the implementation objectives that will result in the direct reduction of water demand. Thirteen implementation objectives have been developed under the various goals. These objectives are illustrated in Table 12-1 below.

Goal A: CCT must by 2010 reduce and maintain the non-revenue water to below 15% of the total average demand and within accepted international benchmarks

Goal B: Water wastage by consumers should be reduced and maintained to below 2% of the total demand by 2012 and most consumers should achieve acceptable water efficiency benchmarks by 2016.

Policy E: Reduce the projected potable water demand to an average growth rate of no more than 1% p.a. for the next ten years and conserve Cape Town's Water Resources.

Table 12-1: Water demand reduction objectives

Policy	Objective number	Description
Goal A	A1	Reduce and maintain low levels of water losses through the reticulation system
	A2	Reduce and maintain low levels of non-revenue demand by consumers
	A3	Adopt and implement proactive O & M measures
	A4	Reduce and maintain low levels of billing and metering losses
Goal B	B1	Promote the efficient use of water to consumers and customers
	B2	Regulate and enforce the prevention of wastage of water
	B3	Ensure the efficient use of water in new connections and developments
	B4	Introduce more equitable tariffs and informative billing
	B5	Assist and capacitate consumers to be water efficient, including the introduction of leak repair and retrofitting projects
	B6	Reduce and maintain low levels of inefficient water use by Council (internal money)
Goal E	E1	Maximise the use of treated effluent
	E2	Promote alternative Water Resources and technologies
	E3	Conservation of existing Water Resources
	E3	Ensure the quality of treated effluent is of suitable standards

(It should be noted that objective A1 to B6 also contribute to Goal E)

12.1 Objective A1: Reduce and maintain low levels of water losses through the reticulation system

The reduction of losses from leaks can be divided into two categories: proactive and passive leakage control. (Passive leakage control is described in objective A3). Two main **proactive** programmes have been identified to ensure the reduction of reticulation leaks and losses:

1. Pressure reduction (Installation of smart pressure reducing valves)
2. The establishment of dedicated reticulation leak detection teams.

Programme A1.1: Pressure reduction

Most water reticulation systems are designed to provide a minimum acceptable pressure during periods of high demand, and this generally occurs during the daytime. Conversely significantly higher pressures are experienced during periods of low demand that occur during night-time particularly in residential areas. This accounts for the fact that in many areas the majority of pipe bursts tend to occur during the night.

The volume of losses experienced as well as the volume of water used by consumers is related to the pressure in the system. The concept of pressure management is to reduce the excess system pressure in order to reduce leakage, the occurrence of pipe bursts and also reduce excessive consumption by consumers.

The first step in the pressure management programme is to develop knowledge of the relevant characteristic of the reticulation system. This requires dividing the parts of the network into appropriate districts or pressure zones. These are called District Metered Areas (DMAs). A suitable bulk meter should be installed to measure the flow into the DMAs.

Most of CCT has already been divided into suitable DMAs but there are still a number of areas that are not adequately divided and do not have bulk meters.

The activities of this programme that need to be budgeted for are as follows:

A1.1.1 Divide areas into suitable DMAs

A1.1.2 Identify all further potential areas to be logged

A1.1.3 Install pressure reducing valves in areas identified (prioritise)

A1.1.4 Ongoing maintenance of PRVs

Table 12-2: Budget; Pressure reduction

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A1.1.1	To be budgeted under C1.1.1										0
A1.1.2	200	150	0	0	0	0	0	0	0	0	350
A1.1.3	4000	2850	2850	2850	0	0	0	0	0	0	12550
A1.1.4	0	0	50	50	50	50	50	50	50	50	400
Total	**4200**	**3000**	**2900**	**2900**	**50**	**50**	**50**	**50**	**50**	**50**	**13300**

Programme A1.2: Establishment of reticulation leak detection teams

Dedicated leak detection teams must be established within CCT whose function will be to react in any district or zone that has been identified with a high level of unaccounted for water. The types of activities they should be trained to carry out are as follows:

- Analysis of minimum night flows
- Leak detection using correlation equipment
- Step testing
- Data logging of pressures and flows
- Estimating the extent of leaks

Another specialised approach that the leak detection teams can consider is the use of aerial photography. By analysing the pipeline routes on such photographs any unusually green batch can be investigated for leaks.

The team should not be responsible for the repair of any leaks identified. The operational and maintenance staff for that district will carry out any necessary repairs. The leak detection teams will be responsible however for ensuring that the repairs are carried out and will be responsible for documenting each leak and capturing the information on a database.

Each leak detection team should consist of five people with the following profiles:

- 1 x technician
- 2 x plumbers
- 2 x plumbing assistants

The work schedule for these teams should be determined in two ways. Firstly, on a monthly basis by the Water Demand Manager, and secondly, according to emergency situations. The Water Demand Manager should identify on a monthly basis which areas should be investigated after assessing all relevant key performance criteria. Emergency situations should be identified and reported by each district to the specialist teams. An example of an emergency situation will be the sudden increase in the minimum night flow of more than 200 kl/hour in a specific zone or district.

The activities of this programme that need to be budgeted for are as follows:

A1.2.1 Establishment of specialized teams / or sub-contracted service providers.

This requires the hiring or re-allocation of staff, the purchase or re -allocation of equipment and the training of the staff. An alternative to using Council staff will be to employ community contractors, EPW (Expanded Public Workers) and train them. It may also be necessary to appoint an external firm in the first year in order to train and support the teams. Part of the training required will be the

understanding of and familiarization with the reticulation system throughout CCT.

A1.2.2 Ongoing costs of the specialized teams

The ongoing expenses of the leak detection teams should be budgeted. These will include salaries, travelling costs, maintenance and purchase of additional equipment and all other administration costs relating to the employment of the team members.

A1.2.3 Repair of leaks once identified

The cost of repairing the leaks should also be highlighted in the WC/WDM, budget. The costs include the material, travelling and labour costs. Although most of these costs are normally part of the O & M budget they should be highlighted as part of the WC/WDM strategy and priced separately.

Table 12-3: Budget; Leak repairs

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A1.2.1	400	400	0	0	0	0	0	0	0	0	800
A1.2.2	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	10000
A1.2.3	To be budgeted in reticulation budget										0
Total	**1400**	**1400**	**1000**	**1000**	**1000**	**1000**	**1000**	**1000**	**1000**	**1000**	**10800**

12.2 Objective A2: Reduce and maintain low levels of non-revenue demand by consumers

Three main programmes have been identified to reduce non-revenue demand by consumers and are as follows.

1. Implementation of comprehensive water management programmes in low-income areas (also referred to as Integrated Water Leaks Projects)
2. Fix -it domestic leaks
3. General implementation of a debt management policy.

Programmes 2 and 3 will be ad-hock based on the identification of individual consumers with large leaks or large debts. Programme 1 will implement comprehensive measures in a specified area.

Programme A2.1: Comprehensive water demand management in low-income areas.

The challenges of effective management of water supply in low-income areas are significantly different from water supply in middle and higher income residential areas. Some of the common problems often linked to low-income areas that have existing individual house connections are as follows:

a) Plumbing leaks (past the consumer meter) in excess of 20 kl / month in more than 50% of all households.
b) Poverty
c) Inferior or inadequate reticulation system (i.e. mid-block system)
d) Consumer metering and billing is almost non-existent
e) A flat rate is charged for Water Services irrespective of the volume of water consumed
f) Very low levels of payment

g) High levels of reticulation losses
h) Very high level of inefficient water usage. Minimum night flows (recorded on bulk zone / district meters) of 70% of the average demand have been recorded in a number of such areas.
i) Houses did not belong to the community and were rented from the municipality
j) Consumer apathy
k) Inferior plumbing installations

The combination of the above problems makes water supply in such areas unsustainable. The introduction of specific activities or initiatives targeting consumers, such as credit control or leak repair in the past had limited success because they did not address the problems holistically.

The following examples highlight the need to implement a holistic approach:

- Implementation of debt management policy only. Many consumers with plumbing leaks will receive excessive accounts and any credit control action by the Council will create resentment and an impression that the Council is financially exploiting the community.

- Repair of plumbing leaks (without the introduction of financial and regulatory interventions). In this instance the leaks would eventually re-occur and many consumers will not regard it necessary to carry out further repairs.

- Communication campaign (without the rehabilitation and repair of leaks from the reticulation system). Consumers will find it difficult to conserve water if water leaks in the street are left unattended by the Council.

The aim of a comprehensive water management programme in low-income areas is to introduce a holistic approach that will **capacitate consumers to take responsibility for their Water Services**. The programme will introduce a combination of social, technical and regulatory interventions that will meet the requirements of the consumer and at the same time reduce non-revenue demand to sustainable levels. This approach recognizes the social, technical and historical background of the many water supply problems and instead of focusing on getting the consumer to pay for excessive water demand, it assists the consumer in reducing and controlling the demand to affordable levels. It recognizes that rather than increase income to meet the cost of water supply in low-income areas, it is preferable to reduce the water supply and the costs to affordable levels for both the community and the Council.

The approach of capacitating the consumer to take responsibility for their Water Services goes beyond the principle described in CCT's previous debt management policy, which states "to instil a sense of responsibility towards the payment of municipal accounts".

The proposed comprehensive water management programme for low-income areas will vary to the specific conditions of each area but will generally consist of the following elements:

Social interventions:
- Awareness
- Communication
- Education
- Public participation
- Introduction of an indigent plan.

Technical interventions /household:
- The installation or repair of meters
- The installation of flow limiters
- The repair of plumbing leaks

- Retro fitting of toilets, taps and showers

Technical interventions reticulation:
- Rehabilitation of reticulation system
- Installation of pressure reducing valves
- Leak detection and repair
- Installation of zones valves and meters

Regulatory /financial interventions:
- Credit control
- Enforcement of by-laws
- Signing of service agreements
- Validation and correction of billing information

Maintenance programme:
- Water forum
- Ongoing awareness
- Establishment and support of a community water task team.

In addition to all the implementation activities, it is also suggested that new service agreements should be drafted and signed by the consumers. Although some of the consumers have service agreements in place from the previous local authorities structures, most copies of these agreements are no longer valid or cannot be found. By developing a new service agreement it will be possible to obtain valuable information, incorporate new conditions as specified in the debt management policy and also provide an opportunity to collect accurate information on all consumers. This information can subsequently be used for validation of the billing database.

The activities of this programme that need to be budgeted for are as follows:

A2.1.1 Pre-feasibility research and prioritisation of all areas

A2.1.2 Initial project: Water management project in area 1

A2.1.3 Initial project: Water management project in area 2

A2.1.4 Initial project: Water management project in area3

A2.1.5 Initial project: Water management project in area 4

A2.1.6 Initial project: Water management project in area 5

A2.1.7 Sustainability, maintenance measures in various areas

Table 12-4: Budget; Comprehensive demand management in low-income areas

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A2.1.1	0	300	100	0	0	0	0	0	0	0	400
A2.1.2	2000	0	0	0	0	0	0	0	0	0	2000
A2.1.3	0	10000	0	0	0	0	0	0	0	0	10000
A2.1.4	0	5000	20000								25000
A2.1.5	0	0	10000	20000							30000
A2.1.6	0	0	0	10000	20000						30000
A2.1.7	0	0	0	0	10000	20000	6000				36000
A2.1.8	0	400	520	676	878.8	1142.44	1485.172	1485.172	1485.172	1485.172	9557.928
Total	**2000**	**15700**	**30620**	**30676**	**30878.8**	**21142.4**	**7485.17**	**1485.17**	**1485.17**	**1485.17**	**142958**

Programme A2.2: Fix – it leak domestic leaks in low-income areas.

The concept behind the "Fix-it leaks" is to be able to carry out plumbing leak repairs (and other demand management activities) in low-income areas on a sustainable and ad-hoc basis by empowering community plumbers. The "Fix –it leaks" programme can take place either prior or after a comprehensive demand management project as described in programme A2.1. If it takes place prior to a comprehensive project in a specific area, the Fix-it leak will introduce the various aspects of demand management to the community, which will then be intensified to reach all of the houses through the comprehensive project. The purpose of the "Fix-it leaks" programme after a comprehensive demand management project has been completed will be to maintain and sustain the objectives achieved in that specific area. The activities of the "Fix-it leaks" programme will in fact be overtaken by the activities as described and budgeted in A2.1.7 above. It should be noted that this programme is specific to low-income areas and focuses on consumers who high consumptions and who generally do not pay, or only pay a fixed tariff or their Water Services. A similar project for paying (higher income) consumers is described in programme B5.3.

The activities of this programme that need to be budgeted for are as follows:

A2.2.1 Identifying, **hiring and training** up Community Liaison Officers and community plumbers

Community liaison will be selected from the community, who will identify leaks and educate residents on how to identify, stop and repair water leaks and how to use less water.

Community plumbers or "Restricted Plumbers", selected from the Community, who will set up small businesses.

A2.2.2 Facilitating a process to establish small "informal" **plumbing businesses** that can do plumbing repairs at affordable rates.

A2.2.3 Developing an on-going **monitoring process** that identifies consumers with a very high consumption or whose consumption had increased significantly.

A2.2.4 Implement ongoing **awareness and education** campaign with the community Liaison officers.

A2.2.5 **Subsidise and manage** the functions of the community plumbers to carry out plumbing leaks.

Table 12-5: Budget; "Fix-It Leaks" low-income areas

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A2.2.1	0	0	0	0	0	0	0	0	0	0	0
A2.2.2	50	100	100	100	100	100	100	100	100	100	950
A2.2.3	0	0	0	0	0	0	0	0	0	0	0
A2.2.4	443	700	805	925.75	1064.613	1224.304	1064.613	925.75	805	700	8658.029
A2.2.5	800	1500	1725	1983.75	2281.313	2623.509	2281.313	1983.75	1725	1500	18403.63
Total	**1293**	**2300**	**2630**	**3009.5**	**3445.93**	**3947.81**	**3445.93**	**3009.5**	**2630**	**2300**	**28011.7**

Programme A2.3: Implementation of debt management policy.

CCT has suspended its previous debt management policy for a number of years and has only recently re introduced debt management. As a result of the suspension of the policy, no credit control action has been taken against payment defaulters over the last few years and there a number of consumers with considerable arrears for services.

The water department has recently developed (2006) a new debt management policy for Water Services that needs to be fully integrated within the overall debt management policy of the Council.

Similar to the recommendations made in the water supply management programme for low-income areas, the debt management policy should be adopted in a combined manner offering assistance before adopting a more stringent approach. Such assistance should not be limited to easy payment schemes or write off arrears and should focus on getting the consumer to reduce their water demand to affordable levels and to take responsibility. It can be said that demand management and debt management are two sides to the same coin, the difference is from which side you focus from. A debt management approach would focus on collecting money. In low-income areas where consumers are generally very poor, the more correct approach is to focus on reducing the demand to below the 6 kl/month free basic water or according to affordability levels. In effect, it is proposed that debt management is a secondary policy in low-income areas and the main focus should be demand management. Debt management however is still an essential tool and needs to be enforced concurrently with demand management.

Programme 2.1 referred to a comprehensive demand management for low-income areas, which also includes debt management measures. Programme 2.2 referred to ad-hoc leak repair projects, which are prioritised and target specific consumers. This programme is similar to programme 2.2 where debt management measures are targeted on an ad-hock and prioritised manner and should complement the activities of programme 2.1 and programme 2.2.

In addition to the functions of this programme in low-income areas it also needs to be implemented to all non-paying consumers throughout the city.

Assistance to consumers regarding their water demand should consist of the following:

a) **Information brochures** on how to reduce their water consumption.
b) The option of having a **water audit carried** out to determine how consumers could reduce their consumption (to be paid by the consumer). The municipality should train community workers who can carry out such audits at a subsidised reduced rate.
c) The option of consumers volunteering to have a **flow limiter installed**.

Flow limiters (demand management devices)

One of the key elements in the proposed programme above is the installation of flow limiters. Over the last few years many devices such as water restrictors and pre-paid meters have been introduced in South Africa to try and limit water supply to poor consumers.

The flow limiter is an electronic flow valve with a programmable control unit that is connected to a normal meter. The flow limiter is capable of controlling the volume of water used by a consumer on a daily basis. Unlike a flow restrictor, which tries to limit water, flow rates (i.e. 4 l / minute) the flow limiter can be programmed to close and reset daily based on the volume of water or the time of day. For example the flow limiter can be programmed to shut off at 11 p.m. every night and re-open water supply at 5 am in the morning. By doing so it will prevent water been lost through leaks during the night. Alternatively the flow limiter will be shut –off once the consumer uses 200 l during the day and reopen at 5 a.m. the next day. In this way poor consumers will receive water every day, but at the same time will not exceed the 6 kl /month free basic water. Each flow limiter can also be set to the individual consumer's needs. For example if a consumer would like more water and can afford to pay say R 10 per month, his flow limiter will be adjusted to 300 litres per day. This will allow a total of 9 kl /month. The municipality does not necessarily have to read the meter and can invoice the consumer a flat rate of R 10 every month

The activities of this programme that need to be budgeted for are as follows:

A2.3.1 Development of **management information system** to manage flow limiters and link to the SAP financial system.

A2.3.2 Ongoing **assessment of billing data** by Customer and Meter Management section (CAMM):

- Identify all consumers with a municipal value of less than R100,000 (qualify for R20 Indigent Grant) and with average monthly consumption greater than 30 KL/month on a monthly basis.
- Identify all non-paying consumers in higher income areas and non-domestic.
- Make billing changes and corrections (i.e. where flow limiters are connected).
- Capture data of various activities on data-base (fixed leaks, etc).
- Monitoring reports on a monthly basis (i.e. payment and consumption of properties where leaks were repaired).
- Exception reports on a monthly basis (i.e. meter reading discrepancies on connections with flow limiters).

A2.3.3 **Correspondence and legal demands** to non-paying consumers in properties of municipal value greater than R 100 000.

A2.3.4 Initials customer visits by WDM staff on a prioritised basis (highest first). In the case of an area based project (Integrated demand management Project) such as Mfuleni all properties are visited by the appointed contractor.

- The aim of the first visit is to establish contact with the consumer to assess the nature of the problem and set up appointments for a plumber and liaison officer.
- WDM staff or the contractor **audits and repairs all water leaks.**
- WDM staff or liaison officer offers advice and issues literature to consumers on how to manage their water demand and explains their options and consequences.

A2.3.5 **Install flow limiters** on all the identified properties that do not comply.

- Education of consumers on flow limiters
- **S**igning of service agreements

- Installation of flow limiters
- Ongoing management and repairs

A2.3.6 **Council write-offs of arrears** to all consumers who comply to specified criteria
- Approval of write-off
- Adjustments to billing
- Notice to consumers
- Install "Hlonipha Amanzi" Boards (where arrears have been written off).

A2.3.7 Water Services **disconnection / re-connection**
- Issue of notice
- Disconnection of meter
- Reconnection if consumer complies

Table 12-6: Budget for implementation of debt management policy

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A2.3.1	0	300	0	0	0	0	0	0	0	0	300
A2.3.2	0	0	0	0	0	0	0	0	0	0	0
A2.3.3	100	100	100	100	100	100	100	100	100	100	1000
A2.3.4	800	800	1500	1500	1500	1500	1500	1500	1500	1500	13600
A2.3.5	1000	1000	2000	2000	2000	2000	2000	2000	2000	2000	18000
A2.3.6	20	20	40	40	40	40	40	40	40	40	360
A2.3.7	Part of operating budget of reticulation section										0
Total	**1920**	**2220**	**3640**	**3640**	**3640**	**3640**	**3640**	**3640**	**3640**	**3640**	**33260**

12.3 Objective A3: Adopt and implement proactive O & M measures

Although the entire budget of O & M functions will not be included under the WC/WDM strategy various proactive changes that are recommended should be part of the strategy. The following programmes should be included in the WC/WDM strategy and budgeted:

a) Rehabilitation of network system
b) Preventative maintenance
c) Passive leakage control
d) Develop a uniform O & M policy

Programme A3.1: Rehabilitation of network system

It has been said that one of the biggest challenges facing the civil engineering profession internationally is the rehabilitation of an ageing reticulation system in many cities around the world. The problem is that rehabilitation has not been implemented progressively and now many cities are faced with the almost impossible task of having to replace or rehabilitate most of the reticulation system over a short period of time. This problem is also true in Cape Town where many parts of the reticulation system are older than 40 years. Although the reticulation system at CCT is not at a critical point at this stage, the Council needs to initiate a proactive ongoing programme. Failure to do so will result in the progressive increase in reticulation losses and more frequent pipe bursts.

As part of the rehabilitation programme, a pipeline management information system needs to be

implemented, and a policy developed. The policy should specify the criteria of when and how pipes should be rehabilitated. The policy should be developed based on results and analyses of research projects. For example pipes "a" of material "x" and class "y" in soil conditions "z" and pressure "p" may last more than 40 years where pipe "b" can only last for 10 years. Furthermore there are new techniques where pipes do not have to be replaced and they are relined inside existing pipes, therefore causing minimal disruption and reducing costs. The disadvantage of such techniques is the possible disruption of water supply to consumers.

The accepted norm is that all pipes should be replaced every 50 years. If this policy had to be adopted, the current rehabilitation budget on the reticulation system by CCT is approximately 35 % of the budget required.

The projects and measures that should be implemented under this programme are as follows:

A3.1.1 Carry out a research project that will determine a rehabilitation policy for the reticulation system of CCT.

A3.1.2 Develop a pipeline management information system, and record all pipe bursts.

A3.1.3 Develop a pipeline management policy.

A3.1.4 Intensify the current rehabilitation programme and ensure all pipes that have frequent bursts are rehabilitated by 2008.

A3.1.5 Develop and start implementing a comprehensive rehabilitation programme by 2008.

Table 12-7: Budget; Rehabilitation of network system

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A3.1.1	400	0	0	0	0	0	0	0	0	0	400
A3.1.2	Part MIS costs see C2.1										0
A3.1.3	20	0	0	0	0	0	0	0	0	0	20
A3.1.4	Budgeted by reticulation department										0
A3.1.5	Budgeted by reticulation department										0
Total	**420**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**420**

The budget for the rehabilitation costs is **not included** in the WC/WDM strategy as they are considered to be normal reticulation section's budget items.

Programme A3.2: Preventative maintenance

There are various items of reticulation equipment which, if not adequately maintained, will eventually break down and cause water wastage. Preventative maintenance is therefore not only important to effective service delivery but to WC/WDM objectives. Not all preventative maintenance initiatives, however, will have an impact on WC/WDM and only those that would result in the reduction of leakage are included.

The projects and measures that should be implemented under this programme are as follows:

A3.2.1 Leak detection patrols.
A dedicated team, whose role will be to walk the pipeline routes in order to identify any leaks, (also link to A1.2). This may not be necessary in areas that have sand soil conditions.

A3.2.2 Isolation valve inspection and gland packing.
Once every two years all isolation valves should be checked and if necessary carry out repairs.

A3.2.3 Control valves inspection and maintenance.
Control valves, particularly those associated with reservoirs, can result in significant water wastage. Overflowing reservoirs are very common due to faulty control valves. Similarly faulty pressure reducing valves can cause significant water wastage if they are not functioning the way they are supposed to. It is recommended that a dedicated team be developed, which will be responsible for the repair and maintenance of all control valves.

A3.2.4 Cathodic protection of steel pipes investigation and programme.
In South Africa there are reports of steel pipes that are more than 100 years old and are still in good condition. Conversely however there are steel pipes that after a few years of installation become very corroded. The recommendation is to carry out an investigation and implement proactive steps to protect steel pipes from corroding.

Table 12-8: Budget; preventative maintenance

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A3.2.1	100	200	200	200	200	200	200	200	200	200	1900
A3.2.2	To be budgeted in reticulation budget										0
A3.2.3	200	200	200	200	200	200	200	200	200	200	2000
A3.2.4	0	300	750	750	750	750	750	750	750	750	6300
Total	**300**	**700**	**1150**	**1150**	**1150**	**1150**	**1150**	**1150**	**1150**	**1150**	**10200**

Programme A3.3: Passive leakage control

CCT currently has an existing passive leakage control system where all telephone calls are logged and responded to. The following issues are of concern with regards to the current system:

1. There is no system to prioritise complaints
2. There is no uniform telephone number throughout CCT to report leaks
3. There are a number of backlogs in certain areas
4. There is no report back/feedback to the complainant to inform them of the Council's response
5. There is no policy with regards to maximum response time

Consumer perception is very important with regard to WC/WDM. If consumers perceive the Council to be inefficient they will in turn not be prone to use water efficiently. Durban Metro found that by contacting consumers once a reported leak had been dealt with enhanced the image of the Council significantly.

The projects and measures that should be implemented under this programme are as follows:

A3.3.1 Develop one help-line throughout CCT and install an automated answering system

A3.3.2 Advertise the help line

A3.3.3 Investigate current problems in responding to leaks and allocate adequate resources to avoid lengthy delays

A3.3.4 Review and develop a policy regarding responses to leaks with the aim of reducing response time, prioritising and keeping consumers informed

A3.3.5 Develop a monitoring system and quality assurance measures to ensure problems are resolved adequately

Table 12-9: Budget; Passive leakage control

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A3.3.1	Budgeted by reticulation department										0
A3.3.2	50	50	50	50	50	50	50	50	50	50	500
A3.3.3	0	100	0	0	50	0	0	0	0	0	150
A3.3.4	0	20	0	0	0	0	0	0	0	0	20
A3.3.5	Budgeted by reticulation department										0
Total	**50**	**170**	**50**	**50**	**100**	**50**	**50**	**50**	**50**	**50**	**670**

Programme A3.4: Develop a uniform O & M policy

One of the biggest problems in the operation and maintenance of Water Services in CCT is the lack of uniformity, which is the result of the merging of the various local authorities. There is currently no uniform operation and maintenance policy and each district appears to have a different approach towards O & M. There is also a perception that some districts are overstaffed while others are understaffed.

Although the development of a uniform O & M policy may not be considered under the mandate of the WC/WDM strategy, the following issues will have a direct impact on WC/WDM:

- Accountability and responsibility of reticulation managers to key performance indicators
- Procedures in repairing leaks or bursts
- Meter management policy (relate to A4.2)
- Pipeline management policy (relate to A 3.1)
- Response time to leaks
- Training and education of operations staff regarding water efficiency
- Training of reticulation staff with regards to consumer interaction and etiquette

One of the most important aspects under this programme is the accountability and responsibility of reticulation staff. Under the current approach reticulation staff are responsible for carrying out repairs to reported problems. Most of their functions are reactive rather than proactive and their responsibility is to solve problems. The proposed new approach will be that reticulation staff will be allocated responsibilities with regards to performance indicators of the reticulation system and their functions will be to ensure that certain benchmarks are reached and maintained. Reticulation staff will have to become a lot more proactive and will have to continuously monitor against the various benchmarks.

The projects and measures that should be implemented under this programme are as follows:

A3.4.1 Investigation and development of a uniform O & M policy

A3.4.2 Recommendations on staff re-deployment and changes to employment functions

A3.4.3 Training of staff on new functions

A3.4.4 Monitoring of implementation of O & M policies

Table 12-10: Budget; development of a uniform O& M policy

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A3.4.1	Budgeted by reticulation department										0
A3.4.2	25	20	0	0	0	0	0	0	0	0	45
A3.4.3	Budgeted by reticulation department										0
A3.4.4	Budgeted by reticulation department										0
Total	**25**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**45**

12.4 Objective A4: Reduce and maintain low levels of billing and metering losses

It is estimated nationally that at least 50% of the Unaccountable for Water of most municipalities is attributed to apparent losses. Apparent losses are usually divided into two sections: non-payment by consumers and billing and metering errors. Non-payment by consumers was addressed in objective A2. Billing and metering losses can be sub divided into the following components:

Meters and metering losses /errors
- Inaccurate meters
- Inefficient / inaccurate meter readings
- Un-metered connections
- Illegal unknown connections

Billing and revenue collection losses /errors
- Errors in the billing and invoicing
- Inaccurate billing system
- Errors in the revenue collection
- Errors in the tariffs system applied
- Errors in the classification of consumers (i.e. domestic instead of commercial)

The water department at CCT is not responsible for the billing of water consumers, but is however responsible for the meters and is currently taking over the responsibility of the meter readings throughout CCT. The responsibility for reducing billing and metering losses is therefore a joint responsibility between the finance department and water department at CCT and will therefore require co-operation and co-ordination between the two units.

Currently there is a lack of adequate integration, common objectives, adequate information systems, and clarity on accountability and responsibility between the two departments, which makes it difficult to

adequately address the problem of apparent losses. The current activities that aim to reduce apparent losses can be described as inadequate and ad-hoc. The following activities are taking place in this regard:

- Comparison between finance's billing system and water department's meter database
- Limited meter management / replacement programme
- Response to queries by consumers

It is currently not clear what the level of apparent losses are in CCT but considering that the level of UaW is reported to be approximately 186 Ml/day or 23 % of the total demand (WSDP), then we can assume that the apparent losses due to billing and metering errors (excluding non-payment) is 93 Ml/day or 11.5 %. A more appropriate way of representing apparent losses is to convert them into lost revenue. Assuming an average selling price of R 5 / kl (average between commercial rate and various domestic block tariffs) then the **value of commercial loss is calculated as approximately R 169 million per annum.** (Non-payment excluded)

In order to significantly reduce the current apparent losses various dedicated and proactive programmes need to be implemented. The following is a list of such programmes. It should be noted that the responsibility for the various programmes will vary between the finance department and the reticulation and WDM units of the Water Services Department.

		Overall responsibility
a)	Commercial Data validation	Finance Department
b)	Meter replacement / management programme	Reticulation Section
c)	Resolving billing exception reports	Reticulation / Finance
d)	Management of large consumers	WDM section
e)	Reduction of illegal connections	Reticulation section
f)	Meter readings management	reticulation / WDM

Programme A4.1: Commercial Data validation

Commercial Data Validation must include all reasonable activities to reconcile and validate the various sources of **customer data** and **connection /meter data** with the main purpose to confirm or correct CCT's billing system specifically relating to Water Services. The activities that should be included are as follows:

- **Evaluation**. Running specific routines that interrogate existing databases for a number of predetermined anomalies (duplicate meter numbers, missing fields, duplicate fields)
- Data integration and comparison (comparing existing billing database with others, such as town planning, Telkom etc)
- **Verification** through telephonic and ad-hoc field exercises.
- **Modification** of validated corrections.

The proposed validation programme can be very challenging and needs to be carried out by experienced service providers. A number of local authorities have tried to validate their billing systems with limited success due to the lack of appropriate Management Information Systems, inappropriate methodologies and inexperienced service providers. The costing of such a programme for CCT is estimated at approximately R 10 million for an initial project and an annual ongoing budget of approximately R 300 000. These estimates are based on examples from other local authorities.

Although data validation is not the responsibility of the Water Services Division, it needs to ensure the implementation of such a validation programme and it needs to be directly involved in the project management.

The proposed activities of this programme that need to be budgeted for are as follows:

A4.1.1 Acquisition and implementation of a commercial data evaluation information system

A4.1.2 Customer data evaluation and verification exercise

A4.1.3 Connection / meter data evaluation and verification exercise

A4.1.4 Modification and ongoing customer and connection data validation

Table 12-11: Budget; implementation of commercial data validation programme

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A4.1.1	Budgeted by finance department										0
A4.1.2											0
A4.1.3											0
A4.1.4											0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Programme A4.2: Meter management / replacement programme

There are various aspects to an effective and efficient meter management programme. Replacing all meters after a certain age is not economically feasible and a more sophisticated approach needs to be developed and implemented which recognises that certain meters under certain conditions may be accurate for several more years than others. An effective meter management programme needs to achieve the following objectives:

- Determine an ongoing meter replacement programme
- Determine exception reports on meters which are suspected to be faulty
- Test and replace faulty meters
- Size meters correctly

To achieve the above objectives, it is necessary to have an effective meter management information system. Currently CCT has a meter management information system in certain areas but this is not throughout the CCT and it is therefore necessary to develop one comprehensive and uniform system. There is also some confusion between the existing functions of the meter management system and the ability of SAP. The current meter replacement programme is also considered to be insufficient and needs to be increased considerably. A rough estimate of the number of meters that need to be replaced every year, assuming that the life of meters is not more than 12 years, is 50 000 meters.

Although it is assumed that the average lifespan of a meter is 12 years for budgeting purposes, it is necessary to carry out research to determine the most optimal replacement age for each type of meter in various circumstances. The research should identify the different types of meters, in different pressure zones and carry out accuracy tests for a number of samples at different ages. In this way a policy can be developed of when each type of meter under various circumstances should be replaced.

It is also recommended that, where deemed necessary new meters should be specified with AMR capacity to allow for remote meter reading. Such meters will assist in reducing meter-reading errors significantly.

The activities of this programme that need to be budgeted for are as follows:

A4.2.1 Research and development of a meter replacement policy and rehabilitation programme

A4.2.2 Implementation of a uniform meter management information system throughout CCT

A4.2.3 Testing and replacing faulty meters reported by consumers (part of reticulation function)

A4.2.4 Replacement of domestic meters with AMR enabled format (where appropriate) in accordance with rehabilitation programme. (Budget allocated is a top up to the budget of the reticulation section)

Table 12-12: Budget; meter management / replacement programme

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A4.2.1	0	200	50	0	0	50	0	0	0	0	300
A4.2.2	Budgeted by reticulation department										0
A4.2.3	Budgeted by reticulation department										0
A4.2.4	1000	4000	4000	4000	4000	4000	4000	4000	4000	4000	37000
Total	**1000**	**4200**	**4050**	**4000**	**4000**	**4050**	**4000**	**4000**	**4000**	**4000**	**37300**

Programme A4.3: Resolving billing exception reports

A significant component of the current O & M functions in the reticulation section of the water department is to deal with queries that emerge from the billing cycle. Such queries are generated from three possible sources: by meter readers, from the finance department after downloading the meter readings into the billing system and from the customer care centre who receive complaints from consumers. The types of exception reports that are generated are significant and range into the following categories:

1. Faulty meters
2. Meters that may be faulty (to be investigated)
3. Suspicious meter readings (to be investigated)
4. Visible leaks within properties
5. Visible leaks in street
6. Visible wastage by consumer (reported by meter readers)

Usually priority is given to investigating meters were consumers complain about them but not enough attention is given to ensuring that the meter readings are correct. In order to ensure that meter readings are done correctly, particularly when external contractors carry out the meter readings, certain activities should be implemented.

The activities of this programme that need to be budgeted for are as follows:

A4.3.1 Identify all meters that are not read regularly, and resolve problems (i.e. reallocate, clean)

A4.3.2 Identify all meter and erf discrepancies and resolve problems

A4.3.3 Identify all consumer detail discrepancies and resolve problems

Table 12-13: Budget; resolving billing exception reports

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A4.3.1	Budgeted by reticulation department										0
A4.3.2	0	100	100	100	100	100	100	100	100	100	900
A4.3.3	50	50	50	50	50	50	50	50	50	50	500
Total	**50**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**1400**

Programme A4.4: Management of large consumer meters

As in any business, the effective management of the largest consumers can significantly improve the financial situation of the water department. A 20% meter error on the account of a consumer who uses 4 Ml /month could amount to a loss of revenue to the Council of approximately R 40 000 per year. For this reason it is proposed that a dedicated meter management programme be developed for all large consumers in CCT.

The activities of this programme that need to be budgeted for are as follows:

A4.4.1 Carry out a desktop study /analysis of all large consumers and evaluate if meters are sized correctly and other key parameters.

A4.4.2 Carry out on site calibration of all large consumer meters

A4.4.3 Replace all faulty or incorrect sized meters

A4.4.4 Implement an ongoing oversight function of all large consumer meters and accounts

Table 12-14: Budget; management of large consumers meters

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A4.4.1	0	300	0	0	50	0	0	50	50	50	500
A4.4.2	0	200	200	50	50	50	50	50	50	50	750
A4.4.3	0	1000	1000	0	0	50	0	50	50	50	2200
A4.4.4	0	50	50	50	50	50	50	50	50	50	450
Total	**0**	**1550**	**1250**	**100**	**150**	**150**	**100**	**200**	**200**	**200**	**3900**

Programme A4.5: Reduction of illegal connections

Illegal connections are not perceived to be a large problem in CCT, and there are only a few known areas where they exist.

The types of illegal connections /use that should be identified are as follows:

- Illegal use from fire hydrants
- Illegal connections by consumers not currently serviced
- Illegal individual household connections by consumers who are authorised for yard or standpipe service delivery

- Illegal connections by developers and construction companies

The disconnection of illegal connections can be sensitive if it involves consumers who are not currently serviced by CCT. It is therefore necessary to develop appropriate policies and procedures on how to deal with such situations.

The activities of this programme that need to be budgeted for are as follows:

A4.5.1 Review / develop policies, procedures and by-laws regarding illegal connections

A4.5.2 Carry out an investigation to identify illegal connections throughout the CCT

A4.5.3 Disconnect or legalise existing illegal connections

A4.5.4 Check fire hydrant seals every three years

A4.5.5 Police and enforce by-laws with regards to water connections for developers

Table 12-15: Budget; reduction of illegal connections

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A4.5.1	50	0	20	0	0	0	0	0	0	0	70
A4.5.2	0	400	0	0	0	0	0	0	0	0	400
A4.5.3	0	200	500	500	200	0	0	0	0	0	1400
A4.5.4	Budgeted by reticulation department										0
A4.5.5	200	200	200	200	200	200	200	200	200	200	2000
Total	**250**	**800**	**720**	**700**	**400**	**200**	**200**	**200**	**200**	**200**	**3870**

Programme A4.6: Management of meter readings

High priority must be given to ensuring the accuracy and efficiency of meter readings. Meter readings are extremely important for the following reasons:

- They are essential for the Council's revenue
- They represent a regular interface from all of the Council's consumers
- All demand analysis and most planning functions depend on meter readings.
- A number of operation and maintenance functions are based on meter readings (i.e, NRW)

The effective management of meter readings will aim to achieve the following objectives:

- Ensure accuracy
- Ensure minimal opportunities for errors
- Ensure that information regarding leaks and any observations from the meter readers are adequately captured and dealt with
- Increase efficiency of meter readings and optimise costs

External contractors carry out most of the meter readings. Although it is not necessary for CCT to micro manage external sub-contractors, it is important to monitor and manage the meter readers' activities in order to achieve the above objectives.

The activities of this programme that need to be budgeted for are as follows:

A4.6.1 Monitor meter readings and carry out regular checks

A4.6.2 Hold regular meetings with meter reading contractors and train

A4.6.3 Review meter cycles, costs and procedures by meter readers and revise if necessary

A4.6.4 Respond to any exception reports (reported leaks, damaged meters, water wastage etc)

A 4.6.5 Pilot remote reading project

Table 12-16: Budget; managing meter readings

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
A4.6.1	75	75	75	75	75	75	75	75	75	75	750
A4.6.2	50	50	50	50	50	50	50	50	50	50	500
A4.6.3	0	100	0	0	0	100	0	0	0	0	200
A4.6.4	Budgeted by reticulation department										0
A4.6.5	0	100	0	0	0	0	0	0	0	0	100
Total	**125**	**325**	**125**	**125**	**125**	**225**	**125**	**125**	**125**	**125**	**1550**

12.5 Objective B1: Promote the efficient use of water to consumers and customers

The approach to promoting WC/WDM to consumers and society will be divided into a general consumer awareness education campaign for all consumers, an awareness campaign for industries associated to Water Services (horticultural, plumbing etc) and a specific awareness campaign associated with focused projects such as retrofitting projects. Care should be taken that the various awareness campaigns are adequately aligned.

One of the biggest challenges in an awareness campaign is to ensure sustainability and ensure effectiveness. The outcome of an awareness campaign may be difficult to measure and it is for this reason that it is difficult to determine the amount of resources and intensity of such campaigns. It is also important to keep such campaigns fresh and interesting in order to ensure a progressive impact on behaviour change. CCT has over the last few years initiated numerous awareness programmes that need to be continued or further developed.

The following programmes will be carried out under this objective:

a) Generic consumer awareness campaign
b) Domestic consumer education campaign
c) School education (focus on schools)
d) Special events
e) Establishment of horticultural and plumbing forums
f) Develop a WC/WDM web page
g) Awareness during the 2010 world cup.

Programme B1.1: Generic consumer awareness campaign

The objectives of a generic WC/WDM awareness campaign are as follows:

- Inform consumers on the need to save water
- Inform consumers on how to save water
- Inform consumers of various projects or initiatives that may have an impact on them
- Create brands associated with WC/WDM
- Capitalise on the awareness already created by the drought
- Address any negative opinions that may have formed due to the restrictions

The activities of this programme that need to be budgeted for are as follows:

B1.1.1 Advertising in media

B1.1.2 Press releases

B1.1.3 Development and distribution of leaflets, fliers and posters

B1.1.4 Distribution of small gadgets and stickers

B1.1.5 Billboards, shopping centres and washrooms

B1.1.6 Competitions

B1.1.7 WC/WDM awards

Table 12-17: Budget; consumer awareness campaign

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B1.1.1	500	500	500	3000	500	500	500	500	500	500	7500
B1.1.2	10	10	10	50	10	10	10	10	10	10	140
B1.1.3	500	700	700	1500	700	700	700	700	700	700	7600
B1.1.4	100	200	300	400	400	400	400	400	400	400	3400
B1.1.5	300	400	500	2000	700	700	700	700	700	700	7400
B1.1.6	0	200	300	300	300	300	300	300	300	300	2600
B1.1.7	0	0	100	100	100	100	100	100	100	100	800
Total	**1410**	**2010**	**2410**	**7350**	**2710**	**2710**	**2710**	**2710**	**2710**	**2710**	**29440**

Programme B1.2: Domestic consumer education campaign

This is a generic domestic consumer education campaign whose purpose is to enhance on the awareness created through objective B1. The objectives of the domestic consumer education campaign are as follows:

- Change behaviour of domestic consumers on how to use water efficiently
- Change the attitude of domestic consumers to respect water
- Teach domestic consumers techniques and methods that will result in the efficient use of water

It should be noted that additional consumer education programmes will also be included as part of other

specific projects such as the leak repair projects. It is important to adequately integrate any specific consumer education measures with this programme.

The activities of this programme that need to be budgeted for are as follows:

B1.2.1 Develop exhibitions of water –wise gardens

B1.2.2 Develop and distribute pamphlets, booklets

B1.2.3 Hold public workshops and seminars

B1.2.4 Develop a WC/WDM information help-line (can be a recording)

Table 12-18: Budget; consumer education campaign

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B1.2.1	0	500	500	250	250	50	50	50	50	50	1750
B1.2.2	0	1000	1000	1000	1000	1000	1000	1000	1000	1000	9000
B1.2.3	0	300	300	300	300	300	300	300	300	300	2700
B1.2.4	0	240	240	240	240	240	240	240	240	240	2160
Total	**0**	**2040**	**2040**	**1790**	**1790**	**1590**	**1590**	**1590**	**1590**	**1590**	**15610**

Programme B1.3: School education

DWAF has a school environmental programme that includes water conservation as one of its main themes. In the past CCT has supported this programme to varying degrees. Consideration should be given for CCT to assist in the implementation of this programme in order to utilise some of the resources and avoid duplication with DWAF. It may however be necessary to hold additional activities that will enhance the message from the DWAF programme.

The activities of this programme that need to be budgeted for are as follows:

B1.3.1 Assist in the implementation of the DWAF environmental education project

B1.3.2 Develop and distribute additional literature to schools

B1.3.3 Hold school competitions (link to Water Week)

B1.3.4 Assist / promote water audits, retrofitting of plumbing and use of boreholes

Table 12-19: Budget; school education campaign

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B1.3.1	250	500	500	500	500	500	500	500	500	500	4750
B1.3.2	500	1000	1000	1000	1000	1000	1000	1000	1000	1000	9500
B1.3.3	150	300	300	300	300	300	300	300	300	300	2850
B1.3.4	250	500	500	500	500	500	500	500	500	500	4750
Total	**1150**	**2300**	**2300**	**2300**	**2300**	**2300**	**2300**	**2300**	**2300**	**2300**	**21850**

Programme B1.4: Special events

There are a number of water supply related events and conferences that take place annually in Cape Town. WC/WDM needs to be included in such events and promoted as much as possible. The type of activities that should be considered at such events are as follows:

- Presentation of technical papers
- Key note addresses
- Exhibitions
- Distribution of pamphlets

CCT should not only use such events to promote its own WC/WDM activities but also encourage other stakeholders to present papers and discuss WC/WDM.

The following are a number of events where CCT can promote WC/WDM:

B1.4.1 National Water Week

B1.4.2 Cape Town Flower Show

B1.4.3 Annual Conference on Water Supply

B1.4.4 Others exhibitions and conferences (still to be determined)

B1.4.5 Service delivery programmes within informal settlements

Some of the special events such as conferences by water institutions do not happen regularly but should also be identified and included.

The activities of this programme that need to be budgeted for are as follows:

Table 12-20:Budget; special events

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B1.4.1	500	550	600	650	700	750	800	850	850	850	7100
B1.4.2	0	50	50	50	50	50	50	50	50	50	450
B1.4.3	70	70	70	70	70	70	70	70	70	70	700
B1.4.4	75	75	75	75	75	75	75	75	75	75	750
B1.4.5	100	100	100	100	100	100	100	100	100	100	1000
Total	**745**	**845**	**895**	**945**	**995**	**1045**	**1095**	**1145**	**1145**	**1145**	**10000**

Programme B1.5: Establishment of horticultural and plumbing forums

The support and co-operation of the horticultural and plumbing industries could be of significant benefit to the WC/WDM strategy. The development of forums and implementation of joint venture projects with these industries has proven to be very successful in Gauteng. It is therefore proposed that a similar programme is initiated in the Western Cape and if possible it should be aligned and linked with the Gauteng initiatives.

The activities of this programme that need to be budgeted for are as follows:

B1.5.1 Establishment of a horticultural forum (meetings every 3 months)

B1.5.2 Organisation of horticultural industry seminar /workshop every 4 years

B1.5.3 Implementation of joint projects in the horticultural industry

B1.5.4 Establishment of a plumbing forum (meetings every 3 months)

B1.5.5 Organisation of a plumbing industry seminar /workshop every 4 years

B1.5.6 Implementation of joint projects in the plumbing industry

Table 12-21:Budget; horticultural, plumbing industry forums

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B1.5.1	0	60	60	60	60	60	60	60	60	60	540
B1.5.2	0	0	70	0	0	0	70	0	0	0	140
B1.5.3	0	200	200	200	200	200	200	200	200	200	1800
B1.5.4	0	60	60	70	70	0	0	0	0	0	260
B1.5.5	0	0	0	70	0	0	0	70	70	70	280
B1.5.6	0	200	200	200	200	200	200	200	200	200	1800
Total	**0**	**520**	**590**	**600**	**530**	**460**	**530**	**530**	**530**	**530**	**4820**

Programme B1.6: Develop a WC/WDM web-page

The proposal is to have a dedicated section of CCT's web site on WC/WDM. Some water saving tips have already been included on the web site during 2007 but this needs to be developed to include a lot more information and functions. The WC/WDM page should include most aspects of the communication and awareness campaign, must address all consumer categories and also be interactive. It is proposed that the web site consists of the following sections:

a) Description of the WC/WDM strategy
b) Progress on the implementation of the strategy
c) Consumer tips on how to save water
d) Consumer water audit guidelines
e) Consumer forum (Suggestion / write to CCT page)
f) Announcement of events

The activities of this programme that need to be budgeted for are as follows:

B1.6.1 Develop WC/WDM web page

B1.6.2 Monthly updates of web page

B1.6.3 Response to consumer forum (link to watercomms)

Table 12-22: Budget; WC/WDM web page

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B1.6.1	300	150	0	0	0	0	0	0	0	0	450
B1.6.2	0	40	40	40	40	40	40	40	40	40	360
B1.6.3	0	0	0	0	0	0	0	0	0	0	0
Total	**300**	**190**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**810**

Programme B1.7: Awareness during the 2010 Soccer World Cup

Cape Town is own of the host cities for the 2010 Soccer World Cup. It is expected that hundreds of thousands of spectators and tourists would visit Cape Town during that period. The occasion presents an ideal situation to introduce WC/WDM to the hospitality industry as well as to the new stadium and other buildings that will be constructed.

In Germany during 2006, the government adopted a Green Goal. The following is an extract from the 2006 Germany world cub web site.

> "Green Goal is an initiative whose purpose is to plan and support projects aimed at ensuring that the World Cup will have little or no impact on the environment. In the framework of this initiative the German Soccer Federation (DFB) and the 2006 FIFA World Cup Organizing Committee agreed on a voluntary basis to organize the tournament in a way that will be as environmentally friendly as possible.
>
> Klaus Töpfer: "For the first time in the history of the World Cup environmental considerations are playing an important role in preparing for and organizing a tournament." Green Goal aims to put into effect narrowly defined environmental regulations in four areas, i.e. water, waste, energy, and transportation…… Rainwater storage systems have been set up at most locations for use in watering down playing surfaces, cleaning paved surfaces outside the stadiums, and in some cases for flushing toilets. The latest in water-free urinals are also being installed. It may be possible to save as much as 10,000 cubic meters of drinking water in the course of the season as a result of these measures. In addition to the environmental benefits this will bring, it will result in considerable cost savings."

A similar commitment could not be found on South Africa's 2010 Soccer World Cup web page, although there is no doubt that there is or there will be a similar commitment from the South African organising committee. CCT's role in the construction of the stadium can also ensure that the stadium incorporates water- use efficiency measures.

The motivation to introduce WC/WDM during the World Cup is as follows:

1. Contribute to a Green Goal to ensure that the World Cup has very little impact on the environment.
2. Utilise the opportunity to introduce WC/WDM measures in the hospitality industry.
3. Utilise the publicity opportunities of the world cup to highlight the need for water use efficiency in Cape Town and create a high level of awareness.

The activities of this programme that need to be budgeted for are as follows:

B1.7.1 Enter into discussions with the World Cup organising committees and other key stakeholders.

B1.7.2 Develop an awareness and retro fitting strategy for the following categories:

- All hotels and accommodation establishments that will be accredited for the World Cup.
- All restaurants and other tourist establishments throughout Cape Town.

- All public transport terminals with particular attention to the airport.

B1.7.3 Allocate resources to assist the hospitality industry to implement the strategies described above.
- Creating awareness for the management of the establishments.
- Technical advice.
- Subsidising certain activities.

B1.7.4 Carry out audits to ensure the implementation of the strategy in all establishments.

B1.7.5 Ensure the implementation of water efficiency measures in the stadium.

B1.7.6 Increase the general awareness campaign of WC/WDM during the World Cup.

Table 12-23: Budget; 2010 Soccer World Cup

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B1.7.1	0	0	0	0	0	0	0	0	0	0	0
B1.7.2	0	200	0	0	0	0	0	0	0	0	200
B1.7.3	0	300	2500	1200	0	0	0	0	0	0	4000
B1.7.4	0	0	100	300	0	0	0	0	0	0	400
B1.7.5	0	0	0	0	0	0	0	0	0	0	0
B1.7.6	Budgeted under B1.1										0
Total	**0**	**500**	**2600**	**1500**	**0**	**0**	**0**	**0**	**0**	**0**	**4600**

12.6 Objective B2: Regulate and enforce the prevention of wastage of water

The key to a successful WC/WDM strategy is to have a balanced approach between support, incentives and regulations. WC/WDM regulations are essential in order to ensure that savings achieved from the various projects can be sustained. The following are some examples that emphasize the need for regulations:

- There is no point in repairing internal plumbing leaks in low-income areas if consumers are allowed to leave their taps running continuously.
- The retro –fitting of efficient plumbing fittings will be irrelevant if the quality of workmanship and materials used cause frequent leakages.
- There is no point in retro fitting dual flush toilets and other water efficient plumbing to existing households if new developments are being installed with inefficient fittings.

The following programmes will be carried out under this objective:

a) Revise the current by-laws
b) Enforcement of water by-laws
c) Establish a registration of plumbers
d) Establishment of municipal court

Programme B2.1: Revise the current by-laws

During the 2005/2006 financial year a new section on WC/WDM was introduced as part of the water by-laws. These by –laws should be constantly reviewed and improved on. DWAF is also currently (2007) looking at revising the national Water Services regulations and standards. When completed, CCT will need to assess them and introduce further WC/WDM related by-laws that will be inline with the national regulations.

There are a number of key WC/WDM related issues that need to be re-addressed in any further revisions of the current by-laws. These are as follows:

- Introduction of compulsory standards on water efficient fittings
- Policies on the legalisation or removal of illegal connections
- Water restrictions
- Policy regarding metering
- Policies prohibiting the wastage of water
- Policy regarding the retrofitting of flushing urinals
- Policy regarding insurance for internal water leaks
- Conservation of Water Resources
- Compulsory audits of large consumers
- Policies regarding engineering standards for reticulation systems
- Policy requiring large consumers to develop water management plans
- Policy requiring all consumers to provide information regarding how they use water and other information that may lead to the development of benchmarks
- Policies regarding access and collection of information from SAP

The activities of this programme that need to be budgeted for are as follows:

B2.1.1 Drafting revised by-laws, adoption and gazette

B2.1.2 Research into feasibility of various clauses

B2.1.3 Public participation workshops

B2.1.4 Staff training

B2.1.5 Negotiations with SALGA on making certain by-laws as national standards

Table 12-24:Budget; revise the current by-laws

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B2.1.1	0	0	0	40	0	0	0	0	0	0	40
B2.1.2	0	0	0	0	0	0	0	0	0	0	0
B2.1.3	20	20	20	20	20	20	20	20	20	20	200
B2.1.4	0	0	0	0	0	0	0	0	0	0	0
B2.1.5	0	0	0	0	0	0	0	0	0	0	0
Total	**20**	**20**	**20**	**60**	**20**	**20**	**20**	**20**	**20**	**20**	**240**

Programme B2.2: Enforcement of water by-laws and restrictions

The introduction of new WDM by-laws as well as other existing water related by-laws and restrictions are insignificant if adequate attention is not given to their enforcement. Currently CCT has very little effective capacity in terms of "building and water inspectors" that can ensure enforcement. There are indications for example that many developers are not complying with by-laws and there is also evidence of a number of consumers continuing to waste water despite all the WDM awareness campaigns. In order to address this issue it suggested that a **special task force** of approximately five people is established, who will be responsible for enforcement of the water by-laws and restrictions. Such a task force does not necessarily require the hiring of new Council officials and one option would be to revise the scope and functions of the existing water inspectors. The water inspectors are currently reporting to the water reticulation section of the water department and it is strongly recommended that they should be transferred under the WDM section.

In addition to the proposed task force, it may also be possible to utilise the local traffic officers to enforce some of the more apparent contradictions to the by-laws and restrictions.

The main functions of the enforcement task force will be as follows:

1. Ensure that all **new** installations and developments comply to SABS standards and the water by-laws. Special emphasis should be placed on cluster developments and other large-scale domestic and commercial developments.

2. Ensure that developers are using authorised water connections and are not using illegal connections during construction.

3. Carry out spot checks on commercial buildings with high consumptions with particular emphasis on continuously flushing urinals.

4. Inspect premises of consumers who are reported not to be complying to water by-laws and restrictions.

The scope of this task force should not include domestic consumers in low-income areas as these functions are adequately addressed in programmes A2.1 and A 2.2.

The impact and effect of the enforcement task force needs to be more effectively managed. Currently very little feedback is obtained from the water inspectors on their progress and achievements. A more proactive management of their functions should be implemented and supported by various reports from the billing database and from the building approval department of CCT. The activities of the task force should also be aligned and co-ordinated with other WDM officials carrying out similar tasks as specified in this strategy. In particular the functions of this programme should be co-ordinated with the following other WDM programmes:

- A2.3: Implementation of debt management policy (in areas other than low-income areas)
- B3.1 Implement incentive scheme for developers
- B4.3: Monitoring demand and notifying consumers of increase in consumption
- B5.3: Introduction of water audits for domestic consumers
- B5.4 Implement an on-going support programme for large consumers

The activities of this programme that need to be budgeted for are as follows:

B2.2.1 Establishment of task force and revise functions

B2.2.2 Discussions with local enforcement agencies

B2.2.3 Awareness campaign of new by-laws

B2.2.4 Develop and implement an effective and proactive management and reporting system.

Table 12-25:Budget; enforcement of by-laws

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B2.2.1	0	200	0	0	0	0	0	0	0	0	200
B2.2.2	0	0	0	0	0	0	0	0	0	0	0
B2.2.3	80	5	5	80	5	5	5	5	5	5	200
B2.2.4	0	100	0	70	0	0	0	0	0	0	170
Total	**80**	**305**	**5**	**150**	**5**	**5**	**5**	**5**	**5**	**5**	**570**

Programme B2.3: Establishment of registration of plumbers

For a number of years there has been a call for the national/nationwide registration of plumbers. The purpose is to promote quality assurance in the plumbing industry. The link of such an initiative with WC/WDM is based on the fact that most leaks occur due to bad workmanship or the use of inferior material. By enforcing registration of plumbers, CCT will be promoting a certain level of self-regulation. Plumbers will hesitate to deviate from the SABS standards and other requirements specified by CCT for fear of been removed from/taken off the register. Although a national/nationwide registration has yet not been initiated, Durban has developed and implemented such a system in their area of supply and it is proposed that CCT does the same. Cape Town administration had a similar programme in the past but this was limited to the CBD area only.

The activities of this programme that need to be budgeted for are as follows:

B2.3.1 Development of policy

B2.3.2 Initiate training programme for plumbers

B2.3.3 Advertise and process applications for registration

B2.3.4 Ongoing management of the registration

B2.3.5 De-registration assessments

Table 12-26: Budget; Registration of plumbers

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B2.3.1	0	0	50	0	0	0	0	0	0	0	50
B2.3.2	0	0	100	100	100	100	100	100	100	100	800
B2.3.3	0	0	50	0	0	0	0	0	0	0	50
B2.3.4	0	0	50	50	50	50	50	50	50	50	400
B2.3.5	0	0	20	20	20	20	20	20	20	20	160
Total	**0**	**0**	**270**	**170**	**170**	**170**	**170**	**170**	**170**	**170**	**1460**

(Suggestion) B2.4: Establishment of a municipal court

Although the establishment of a municipal court is not within the mandate of this strategy, it is recommended for consideration based on the following:

- Normal courts give little significance to violations of municipal by-laws.
- A lot of consumers take advantage of the lack of prosecution and cause significant wastage of water by not adhering to certain by-laws. This is particularly true for developers.

It is interesting to note that Johannesburg Metro has recently (2004) announced the establishment of such a municipal court.

(This suggestion should be noted and addressed at the necessary forum).

12.7 Objective B3: Ensure the efficient use of water in new developments

WC/WDM strategies often focus exclusively on increasing the water efficiency of existing consumers forgetting that due to the current high development growth and backlog of services there are many new consumers who are getting water service connections every year. It is obviously cheaper and easier to install water efficient fittings rather than retrofit existing fittings. This objective is perhaps one of the most important in the strategy and a lot of attention should be placed in ensuring that all new consumers and connections are water efficient.

The following programmes will be carried out under this objective:

a) Develop incentive schemes for new developers
b) Revise engineering standards for new Water Services
c) Develop incentives for new consumers
d) Develop sustainable service delivery programme for new consumers in low income areas
e) Carry out audits and inspections of all new developments (see section B2)

Programme B3.1: Incentive schemes for developers

Although ideally most of the water efficient practices should be made compulsory under the by-laws, it is recognised that unless such standards are made applicable nationally they may be hard to enforce. An alternative or supplementary approach is to develop incentives for new developers to carry out certain practices. Such practices will be as follows:

- Installing water efficient fittings at all water points
- Installing pressure reducing valves at each consumer connection
- Ensuring minimal grassed areas
- Installing a bulk meter and individual meters for cluster developments
- Ensuring that products and materials used are SABS approved
- Ensuring that the water supply and drainage design is in accordance with SABS 0252
- Minimising water wastage while carrying out construction
- Designing a water wise garden
- Providing roof tanks for the collection of rain water
- Installing a water recycling system to utilise bath water into gardens

- Develop bore-holes in areas where ground Water Resources are not sensitive
- Utilising recycled effluent from CCT's treatment plants where possible.

The type of incentives that CCT's water department, in conjunction with the town-planning department, could consider for developers are as follows:

- Give developers who adopt water efficient practises preference to speed up building approval
- Give developers discount on their contribution to bulk infrastructure
- Award developers with an environmental recognition scheme

The activities of this programme that need to be budgeted for are as follows:

B3.1.1 In conjunction with CCT's town planning department, hold workshops and discussions with developers.

B3.1.2 Develop incentive schemes.

B3.1.3 Develop environmental recognition scheme for developers.

B3.1.4 Manage implementation of incentive and recognition scheme.

Table 12-27: budget; incentive schemes for developers

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B3.1.1	0	0	0	0	0	0	0	0	0	0	0
B3.1.2	0	20	0	0	0	0	0	0	0	0	20
B3.1.3	0	20	0	0	0	0	0	0	0	0	20
B3.1.4	0	0	50	50	50	50	50	50	50	50	400
Total	**0**	**40**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**50**	**440**

Programme B3.2: Revise engineering standards and township development policies

Like most other municipalities, CCT uses CSIR's "Human Settlement planning and design" guidelines for engineering standards for Water Services. In addition to these guidelines it is recommended that the following additional guidelines be considered for inclusion in the design of any new township and development:

- Maximum pressure of any consumer connection should not exceed 400 kPa
- All new township developments in excess of 200 houses must have a zone /district meter and must be isolated from other zones.
- All zone valves must be clearly marked and installed in a manhole
- All key reticulation components (pumps, reservoirs, zone meters) must be connected to a telemetry system.
- Minimum slope of effluent collection systems should be revised (to enable higher concentration of effluent)
- The installation of any steel pipes must be protected against corrosion.
- Where appropriate, new consumer connections must be installed with AMR enabled meters
- Where possible, recycling opportunities of wastewater and storm water must be explored.

It is interesting to note that currently only the wastewater section and not the water reticulation section is required to approve any building applications submitted by developers. In order to ensure that developers enforce the new engineering standards and WC/WDM requirements, it is proposed that the water department also becomes responsible for/involved in the approval process of building applications.

The activities of this programme that need to be budgeted for are as follows:

B3.2.1 Draft revision of engineering and township development standards.

B3.2.2 Formalise new standards.

B3.2.3 Monitor implementation of standards.

Table 12-28: Budget; Revise engineering standards

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B3.2.1	0	200	0	0	0	0	0	0	0	0	200
B3.2.2	0	0	100	0	0	0	0	0	0	0	100
B3.2.3	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**200**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**300**

Programme B3.3: Develop incentives for new consumers

The consumers and not the developers often make decisions regarding many of the specifications in developments. As with the proposals made for developers, consideration should be given to creating incentives for new consumers to implement certain water efficient practices. Such incentives could be as follows:

- Small reduction in assessment rates
- Subsidies for the purchasing and implementation of water efficient fittings and appliances
- Recognition and rating scheme for **water efficient houses and businesses**

The development of such a recognition scheme can be promoted by various NGOs. The recognition and rating of a water efficient household can become a socially acceptable and desirable requirement appealing to society's increased environmental consciousness. A proposed way of managing this scheme is to appoint an NGO at a nominal rate.

The activities of this programme that need to be budgeted for are as follows:

B3.3.1 Develop policies of incentives for new consumers

B3.3.2 Implement subsidies programme for water efficient fittings

B3.3.3 Develop WC/WDM rating scheme for new homes

B3.3.4 Implement and manage the WC/WDM rating scheme

Table 12-29: Budget; incentive scheme for new consumers

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B3.3.1	0	50	0	0	0	0	0	0	0	0	50
B3.3.2	0	0	400	400	400	0	0	0	0	0	1200
B3.3.3	0	0	50	0	0	0	0	0	0	0	50
B3.3.4	0	0	150	200	200	200	200	200	200	200	1550
Total	**0**	**50**	**600**	**600**	**600**	**200**	**200**	**200**	**200**	**200**	**2850**

Programme B3.4: Develop sustainable service delivery programme for new consumers in low income areas

The issue of effective management of service delivery in low-income areas is not only related to water efficiency requirements but to affordability and sustainability. The approach proposed for targeting new consumers of government-funded houses is more direct and should be combined with other objectives including affordability of electricity and other social programmes such as food production. The idea is that new homeowners should receive training and resource material illustrating how to budget and manage their services and even how to carry out maintenance of their plumbing.

The activities of this programme that need to be budgeted for are as follows:

B3.4.1 Policy development and plumbing standards negotiations with provincial housing department and CCT's housing department (Human settlement department)

B3.4.2 Subsidies for the installation of water efficient toilets and taps

B3.4.3 Initial awareness, education and training of new consumers (workshops)

B3.4.4 Ongoing effective monitoring, management and awareness measures

Table 12-30: Budget; incentive scheme for new consumers in low-income areas

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B3.4.1	0	100	20	20	20	20	20	20	20	20	260
B3.4.2	0	400	400	400	400	400	400	400	400	400	3600
B3.4.3	0	200	200	200	200	200	200	200	200	200	1800
B3.4.4	0	100	100	100	100	100	100	100	100	100	900
Total	**0**	**800**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**6560**

12.8 Objective B4: Introduce more equitable tariffs and informative billing

Traditionally throughout South Africa water tariffs are used as one of the most important WC/WDM tools. Block rate tariffs for domestic water use is a legislative requirement that all service providers must implement. Additional penalties are also imposed during droughts on consumers who exceed certain demand targets.

The relationship between tariffs and WC/WDM can be very controversial and it therefore requires proper/careful investigation and assessment. The following are some of the issues that should be considered:

- Price elasticity. Determining the relationship between price and demand.
- Balancing financial efficiency and price incentives. One of the main objectives of WC/WDM is financial efficiency. If tariffs are increased in order to motivate consumers to be efficient it may be contradictory to the overall financial efficiency objectives.
- Revenue requirements. A reduction of demand by paying consumers may affect the overall income stream and revenue requirements.
- Payment and demand relationship. Consumers that do not pay for the water they use, tend to use a lot more than they need.

The following programmes will be carried out under this objective:

a) Revise the Water Services tariffs and structure
b) Introduce informative billing
c) Monitor demand and send letters to consumers with unexpected large increases in consumption.
d) The creation of a **voluntary insurance for unknown water leaks**.

Programme B4.1: Revise Water Services tariffs and structure

The following are some issues that should be considered in reviewing the current water tariffs.

Low tariffs in comparison to other Metros

The current water tariff charged by CCT metro for Water Services is amongst the cheapest of all other metros. Table 12-31 below illustrates a comparison between CCT's current tariffs and other metros throughout South Africa.

Table 12-31: Tariff comparison between different metros (2006)

Block	Johannesburg			Ekurhuleni			Durban			Tswane			CPT		
	From	To	Tariff	From	To	Tariff	From	To	Tariff	From	To	Tariff	From	To	Tariff
1	0	6	R 0.00	0	6	R 0.00	0	6	R 0.00	0	6	R 5.13	0	6	R 0.00
2	7	10	R 3.36	7	15	R 5.00	6	30	R 5.83	6	12	R 5.30	6	12	R 2.28
3	11	15	R 3.99	15	30	R 6.00	30	GT	R 11.66	13	18	R 5.70	12	20	R 4.56
4	16	20	R 6.20	30	45	R 6.85				18	42	R 6.10	20	40	R 5.81
5	21	40	R 8.55	45	60	R 7.10				42	72	R 6.80	40	50	R 7.07
6	40	50	R 10.43	60	GT	R 8.20				72	GT	R 8.00	50	GT	R 9.12
7	50	GT	R 12.37												
Commerc/ Industri			R 11.03			R 7.00			R 5.83			R 6.10			R 4.51

To highlight the differences in the tariffs, Table 12-32 illustrates the potential revenue according to

CCT's water demand for the various tariffs. As illustrated if CCT had to adopt any of the other tariff structures of the other metros, its potential revenue would be between 26 to 70% higher.

Table 12-32: Comparison of potential income using tariffs of other metros

From	To	% of total	CPT tariff	JW	Durban	Tswane	Ekur
0	6	15.50%	R 0	R 0	R 0	R 15,182,886	R 0
7	12	12.40%	R 5,398,359	R 7,955,477	R 13,803,700	R 12,548,818	R 11,838,507
13	20	10.80%	R 9,403,594	R 11,483,461	R 12,022,577	R 11,754,492	R 12,373,150
21	40	11.20%	R 12,425,086	R 18,284,766	R 18,701,786	R 13,045,271	R 14,649,198
41	60	3.80%	R 5,129,893	R 7,567,861	R 8,460,332	R 4,933,984	R 5,151,660
60	GT	5.00%	R 8,707,031	R 9,957,712	R 11,132,016	R 7,637,747	R 7,828,690
Tot. Dome		43.20%	R 41,063,963	R 55,249,277	R 64,120,411	R 49,920,312	R 51,841,206
Tot. Comm.		17.00%	R 19,262,699	R 47,101,783	R 24,900,562	R 26,053,761	R 29,897,758
Total yr			**R 723,919,940**	**R 1,228,212,718**	**R 1,068,251,669**	**R 911,688,877**	**R 980,867,566**
% difference in potential income				70%	48%	26%	35%

From the above tables it can be seen that CCT's tariff is considerably cheaper than that of other metros in South Africa although it has probably the biggest water resource constraints.

Marginal costs estimate

The introduction of block rate tariffs is supposed to discourage excessive use of water and at the same time ensure equity. The consumers using a lot of water are supposed to pay for the marginal cost. Although the highest block of R 9.12 /kl in CCT's present tariff is considered to be the marginal cost, there is a strong argument that this tariff should be applied for consumption above 23 kl/month and not from 50 kl/month. The 23 Kl/month demand block is calculated as follows:

- The total available yield from existing Water Resources for CCT is 1010 Ml/day
- The total percentage of domestic use is 50.29% of the total demand
- The estimated number of domestic consumers are 663 109
- Taking the total available water for domestic use and dividing the number of domestic connections gives an amount of 23 kl /month / connection

The above calculation is based on the principle that all consumers should have equal opportunity for access to a public asset. It can therefore be argued that any domestic consumer that uses more than 23 kl/month is using more than their equal share off existing Water Resources and should therefore pay the marginal price.

Domestic cluster developments

CCT currently charges domestic cluster developments according to the bulk meter reading at a rate of R 4.22 / kl and will make allowance for the free 6 kl/month per unit. This is in contrast with the practice in most other municipalities who apply the normal block rate tariff by dividing the total demand with the number of housing units. It is strongly suggested that CCT applies a similar approach to cluster developments. This current practice is also considered to be against existing legislation. Clause 13 1) of the regulations promulgated 8 June 2001 under the Water Services Act, 1997 states as follows:

> "2) If constructed or installed after promulgation of these Regulations, a suitable water volume device or volume controlling device must be fitted to separately measure or control the water supply to every-
>
> a) Individual dwelling within a sectional title development, group housing development or apartment building"

Industrial and commercial consumers

The industrial and commercial tariff by CCT is far too low and should be increased to approximately 80% of the marginal cost. (I.e. 80% of 9.12 = R 7.30)

The tariff structure needs to also introduce an incentive for water savings by commercial and industrial users as well. One approach is to have three-block tariff system in accordance with each consumers previous year's average or alternative in accordance with a predetermined benchmark. Whichever system is developed, it could be significantly difficult to administer and careful consideration must be given before any such decision to have a multiple tariff system for non–domestic consumers is taken.

10% water reduction tariff (imposed during drought)

Consideration should be given to sustaining the 10% reduction tariff after restrictions are lifted in order to fund the WC/WDM strategy. Should this consideration be approved the reduction/reduced tariff should be rephrased as a Water Conservation Fund tariff and advertised as part of the WC/WDM campaign.

The measures that should be implemented under this programme are as follows:

B4.1.1 Carry out a study to develop the most appropriate tariff structure for the next ten years, taking into account **price elasticity**, revenue requirements and various demand scenarios. The study should illustrate the potential future tariff savings due to the financial savings that WC/WDM can achieve. (This study must be linked to Integrated Resource Planning as discussed in section 13.3)

B4.1.2 Revise annually tariff rates according to financial planning and marginal cost rates

B4.1.3 Publicize new tariffs

Table 12-33: Budget; Revise Water Services tariffs

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B4.1.1	200	50	0	0	50	0	0	0	0	0	300
B4.1.2	100	100	100	100	100	100	100	100	100	100	1000
B4.1.3	50	50	50	50	50	50	50	50	50	50	500
Total	**350**	**200**	**150**	**150**	**200**	**150**	**150**	**150**	**150**	**150**	**1800**

Programme B4.2: Introduce informative billing

The objectives of informative billing are as follows:

- Create an awareness on how consumers are using water in comparison to their neighbours and municipal average
- Create an awareness on the consumers' monthly consumption trends and patterns
- Highlight the cost advantages of reducing water consumption
- Make it easier for consumers to understand their Water Services charges

The implementation of informative billing is dependant on the ability of the current billing system or the ability of the current system to be linked to an external software programme. For this reason it is very difficult to estimate the cost of this programme accurately. The responsibility for this programme will be

mainly that of the Treasury Department (ERP division, Enterprise Resource Planning).

The measures that should be implemented under this programme are as follows:

B4.2.1 Develop a format of informative billing and make the necessary changes to the billing system

B4.2.2 Implement a pilot phase of informative billing

B4.2.3 Roll out informative billing to all clients

Table 12-34: Budget; Informative billing

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B4.2.1	500	0	0	0	0	0	0	0	0	0	500
B4.2.2	Budgeted by finance department										0
B4.2.3											0
Total	**500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**500**

Programme B4.3: Monitor demand and inform consumers of large deviations

Through an appropriate Demand Management analysis system, CCT should be able to determine on a monthly basis any consumers who had an unexpected increase in demand. (This function could also be carried out relatively easily with the existing SAP system.) CCT should then communicate with the consumers in order to assess if there is any problem and offer them advice or assistance in reducing the demand.

The measures that should be implemented under this programme are as follows:

B4.3.1 Create a reporting system (see MIS, objective C2.1).

B4.3.2 Generate letters and post on a monthly basis.

B4.3.3 Monitor trends and follow up telephonically.

Table 12-35: Budget; monitor demand of consumers

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B4.3.1	Budget under C2.1										0
B4.3.2	0	30	30	30	30	30	30	30	30	30	270
B4.3.3	0	100	100	100	100	100	100	100	100	100	900
Total	**0**	**130**	**130**	**130**	**130**	**130**	**130**	**130**	**130**	**130**	**1170**

Programme B4.4: Introduce an insurance scheme to consumers for unknown water leaks.

A number of municipalities offer low premium insurance schemes to consumers for unknown water leaks. Often a consumer may not be aware of a leak that may have occurred until they receive a very high bill. Such insurance will protect consumers from having to pay high water bills and would also indirectly assist in reducing water wastage. Often when a high water bill is first sent to a consumer, consumers do not suspect a leak and they assume it is a billing mistake. This often leads to a lengthy process before a leak is identified and repaired. If an insurance scheme is in place the customer can immediately take action by calling the insurance scheme to assess and repair any such leaks without any concern of having to pay high bills for a plumber.

CCT would not provide the insurance but can facilitate the process of identifying a suitable insurance company / companies and charging a levy through the tariff. The insurance will be restricted to the water bill and to the costs of repairing the leak.

The measures that should be implemented under this programme are as follows:

B4.4.1 Cary out initial research and develop a ToR for a tender process and appoint suitable company / companies.

B4.4.2 Market the scheme to all consumers (sent letters).

B4.4.3 Develop a tariff levy and adapt changes to the Water Services bill to reflect the extra charge.

B4.4.4 Appoint and monitor the performance of the insurance company

Table 12-36: Budget; Insurance scheme for consumers

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B4.4.1	0	0	100	0	0	0	0	0	0	0	100
B4.4.2	0	0	0	100	50	50	0	0	0	0	200
B4.4.3	0	0	200	0	0	0	0	0	0	0	200
B4.4.4	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**300**	**100**	**50**	**50**	**0**	**0**	**0**	**0**	**500**

12.9 Objective B5: Assist and capacitate consumers to be water efficient

Water tariffs, awareness campaigns and water restrictions can all have a considerable effect on consumer behaviour but may not result in adequate implementation of new water efficient technologies and may not achieve the full efficiency potential. The objective of assisting consumers goes beyond the scope of appealing for water savings and aims to facilitate the implementation of all economically viable WC/WDM solutions. With the exception of various initiatives in low-income areas, it is unknown if any municipality in South Africa has implemented projects to assist paying consumers to reduce their demand. There are however a number of very successful projects where other agencies have implemented support projects. Some examples are as follows:

1. Fisheries cleaner production project. Partially sponsored by Danita. Savings achieved in freshwater of 75% by canneries and 33% savings in "white fish" process. I & J based in Cape Town was one of the participating companies.
2. Metal Finishing cleaner production project, partially sponsored by Danita. Water savings in the 13 demonstration projects varied between 33% to 40%.
3. Eskom has distributed and installed thousands of water efficient showerheads in the Western Cape during 2006 at no cost to the consumer.

Cape Town needs to eventually move to this approach as the water demand analysis illustrates a significant potential in savings from technology changes such as retro-fitting of toilets and shower heads. The motivation for CCT offering such assistance to consumers is as follows:

- Illustrate to the public that CCT cares and is willing to help consumers become efficient
- Introduce technologies and practices that would otherwise not be adopted
- Exercise more control on the implementation of WC/WDM
- Ensure overall economic cost savings by investing in alternative WDM technologies instead of large capital infrastructure

The following programmes will be carried out under this objective

a) Implement a plumbing retro –fit programme
b) Implement a water-wise gardening scheme
c) Introduce water audit for domestic consumers
d) Implement an on-going support programme for large consumers

Programme B5.1: Plumbing retro fit programme

In terms of the WC/WDM strategy, domestic consumers can be divided into the following three categories:

- Full service low income areas
- Basic service low income areas
- Full service medium and high income areas

Most activities and programmes relating to WC/WDM in the low-income areas are considered under objective A2 described in section 12.2. Objective B deals mainly with the higher income areas where the projects do not have to be as comprehensive as the projects implemented in the low-income areas.

From the water analysis it is obvious that there are significant water saving opportunities in the retro fitting of plumbing fittings. The added benefit of such measures is that it may also significantly reduce the hydraulic loading in the wastewater system.

There are two approaches that can be taken regarding the retrofitting of plumbing and sanitary systems. The first is a consumer voluntary basis and the second is a comprehensive suburb-by-suburb Council-sponsored project. The advantage of the second approach is that it will ensure a higher level of implementation, it will be administratively easier to implement and it can target priority areas.

The nature of the retrofit projects can be as follows:

- Change existing toilets to dual flush cisterns
- Install high efficiency shower heads
- Install flow controllers on taps and mixers
- Balance plumbing systems (to be paid fully by consumer)
- Education campaign

Other considerations to take into account in considering the retrofit programme are as follows:

- Limited experience of such projects in South Africa
- Constraints on available products
- Constraints on existing plumbing installations in households (i.e. should not install water efficient showers in a non-balanced system)
- Possible resistance by consumers
- Overcoming the logistics of investing Council money in private properties

Due to a number of uncertainties and variables it is proposed that research and a pilot project are initially carried out to determine the right approach and test various products before implementing retro fitting on a large scale.

The activities of this programme that need to be budgeted for are as follows:

B5.1.1 Research and evaluation of case studies and products throughout the world.

B5.1.2 Pilot project in a selected suburb.

B5.1.3 Feasibility study for implementing and prioritising the implementation of retrofit throughout CCT (including the development of water audit database).

B5.1.4 Role out of retrofit projects throughout CCT.

Table 12-37: Budget; retrofit programme

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B5.1.1	0	300	0	0	0	0	0	0	0	0	300
B5.1.2	0	200	200	0	0	0	0	0	0	0	400
B5.1.3	0	0	100	0	0	50	0	0	0	0	150
B5.1.4	0	0	2000	5000	5000	5000	5000	5000	5000	5000	37000
Total	**0**	**500**	**2300**	**5000**	**5000**	**5050**	**5000**	**5000**	**5000**	**5000**	**37850**

Programme B5.2: Water-wise gardening scheme

The significant increase in water demand during the dry season highlights the amount of water used for watering gardens. Considering factors such as wind and high evaporation rates, it is estimated that more than 40% of water used for irrigation is wasted. Furthermore, the types of gardens often grown by consumers are not indigenous and are usually water-intensive gardens. The proposed water wise incentive scheme will try and encourage existing consumers to do the following:

- Replace grassed areas on their pavement areas with pebbles
- Change or modify their irrigation systems to drip irrigation
- Change their gardens to water wise gardens

The proposed activities of this programme that need to be budgeted for are as follows:

B5.2.1 Develop at least 10 demonstration water wise gardens throughout CCT. (Link to B6.1).

B5.2.2 Develop an incentive scheme (i.e. discount on water account) to any consumer who replaces grassed areas with pebbles. (Link to B3.3.1).

B5.2.3 Organise an ongoing water-wise garden campaign with the nursery industry.

Table 12-38: Budget; water-wise gardening programme

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B5.2.1	200	200	20	20	20	20	20	20	20	20	560
B5.2.2	part of B3.3.1										0
B5.2.3	0	200	200	200	200	200	200	200	200	200	1800
Total	**200**	**400**	**220**	**220**	**220**	**220**	**220**	**220**	**220**	**220**	**2360**

Programme B5.3: Water audits for domestic consumers

The objective of this programme is to promote and assist domestic consumers in carrying out their own water audit within their household. The proposal is that CCT trains and makes available a number of water-efficiency auditors who at a subsidised price will visit, audit and propose to consumers how to reduce their water demand. This programme will also help enhance the image and customer relations of CCT significantly.

Information obtained from this programme can also assist in planning the retro fit programme. Once a comprehensive rollout of a retro fit programme begins, this programme may not be necessary.

The proposed activities of this programme that need to be budgeted for are as follows:

B5.3.1 Develop water audit procedure, print and distribute to any consumer on request.

B5.3.2 Hire and train a water audit task team.

B5.3.3 Manage the ongoing implementation.

Table 12-39: Budget for domestic water audit programme

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B5.3.1	100	20	20	20	20	20	20	20	20	20	280
B5.3.2	0	0	100	100	100	100	100	100	100	100	800
B5.3.3	0	0	70	70	70	70	70	70	70	70	560
Total	**100**	**20**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**190**	**1640**

Programme B5.4: Support programme for large consumers

Large consumers such as wet-industry consumers may have significant opportunities to reduce their water consumption. Past experience has revealed that often such consumers are ignorant of the opportunities to reduce their water consumption because water is often a small percentage of their total costs.

One of the proposals is to allocate and train consumer water liaison officers who will manage the relationship between the 150 largest water consumers and the Council.

The objective of this programme will not be limited to assisting consumers in reducing their water demand, but will also look at wastewater, monitor compliance with by-laws and service conditions, and offer general customer support.

The proposed activities of this programme that need to be budgeted for are as follows:

B5.4.1 Hire and train a "large consumer" task team

B5.4.2 Develop water audit guidelines for various industries

B5.4.3 Identify and visit large consumers

B5.4.4 Develop a forum for large consumers (meet twice / year)

B5.4.5 Develop and implement joint water-efficient projects with large consumers

B5.4.6 Provide assistance and technical know-how where possible

B5.4.7 Introduce a compulsory water management plan for large consumers

B5.4.8 Develop / assist in the functioning of waste minimisation clubs

B5.4.9 Test the accuracy of all top 100 large consumer meters

B5.4.10 Install data-loggers on all top 100 large consumer meters

Table 12-40: Budget; Support programme for large consumers

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B5.4.1	0	500	500	500	500	500	500	500	500	500	4500
B5.4.2	0	0	200	200	0	0	0	0	0	0	400
B5.4.3	part of 5.4.1										0
B5.4.4	0	20	20	20	20	20	20	20	20	20	180
B5.4.5	0	0	200	200	200	200	200	200	200	200	1600
B5.4.6	part of 5.4.1										0
B5.4.7	0	0	100	100	100	100	100	100	100	100	800
B5.4.8	0	0	50	50	50	50	50	50	50	50	400
B5.4.9	0	0	0	0	0	0	0	0	0	0	0
B5.4.10	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**520**	**1070**	**1070**	**870**	**870**	**870**	**870**	**870**	**870**	**7880**

12.10 Objective B6: Reduce and maintain low levels of inefficient water use by Council

The WDM section needs to ensure that the water used by the various departments is used efficiently in order to reduce the cost of water and secondly to set an example to the general public. CCT has in the past received a lot of criticism from the public and various stakeholders regarding irrigation of public areas while water restrictions were imposed. This situation should not be allowed to be repeated and policies, strategies and programmes should be introduced to ensure the efficient utilisation of water by Council.

There are two main programmes proposed to reduce the inefficient water use by Council.

a) The reduction of water consumption by the parks department
b) The reduction of water in Council owned buildings.

Programme B6.1: Reduction of water by the parks department

The parks department is one of the largest water users by CCT. Although a cost is allocated to the parks department for the water used, there is no actual revenue collected and the water used could therefore be considered as part of non-revenue demand.

The projects and measures that should be implemented under this programme are as follows:

B6.1.1 Development of efficiency demand targets for water use by each park area.

Each park should be required to develop and submit an annual water management plan. The water management plan should describe a water audit, describe benchmarks of optimal water use, a water efficiency programme and progress in the implementation of the programme.

B6.1.2 Development of policies regulating the use of water by parks department

Various policies should be developed to govern the use of water by parks. Such policies should include the following:

i. No irrigation between 10:00 a.m. and 17:00 p.m. during the summer months.
ii. Where possible, alternative Water Resources should be utilised.
iii. All sprinkler systems should be changed to drip irrigation by 2009.
iv. More than 50% of all public gardens should be modified to water wise gardens by 2010.
v. More than 50% of grassed areas should be replaced with a water efficient alternative by 2010.

B6.1.3 Provide support and expertise to park officials

B6.1.4 Modification to water wise gardens projects

A6.1.5 Modification to efficient irrigation projects

Table 12-41: Budget; increase efficiency by parks department

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B6.1.1	0	0	0	0	0	0	0	0	0	0	0
B6.1.2	20	0	0	0	0	0	0	0	0	0	20
B6.1.3	50	50	50	50	50	50	50	50	50	50	500
B6.1.4	0	100	100	100	100	50	50	50	50	50	650
B6.1.5	0	200	200	200	200	10	10	10	10	10	850
Total	**70**	**350**	**350**	**350**	**350**	**110**	**110**	**110**	**110**	**110**	**2020**

Programme B6.2: Reduction of water in Council owned buildings

CCT has in the past implemented very successful WDM projects in various buildings it owns and manages. Savings in water demand of more than 50% of the water consumed were recorded in many of the buildings. The sustainability and expansion of this programme needs to be continued to all buildings that the City owns and manages. (Consideration should also be given to extending this programme to all provincial and national government buildings)

The projects and measures that should be implemented under this programme are as follows:

B 6.2.1 Retrofit efficient plumbing fittings in all Council owned buildings.

B 6.2.2 Introduce an ongoing programme that will maintain the targets achieved.

B 6.2.3 Introduce and maintain an awareness campaign at all Council buildings.

B 6.2.4 Train maintenance and operations staff.

Table 12-42: Budget; reduction of consumption in Council owned buildings

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
B6.2.1	100	200	200	0	0	0	0	0	0	0	500
B6.2.2	0	50	50	50	50	50	50	50	50	50	450
B6.2.3	30	30	30	30	30	30	30	30	30	30	300
B6.2.4	20	20	20	20	20	20	20	20	20	20	200
Total	**150**	**300**	**300**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**1450**

12.11 Objective E1: Maximise the use of treated Effluent

CCT has identified recycling of treated effluent as the most feasible option of alternative resources to conventional surface Water Resources. CCT had numerous existing treated effluent re-use schemes at various Waste Water Treatment Works (WWTW). The extent of existing re-use, potential for expansion and level of service was unknown due to the age of some of the networks and a lack of measurement equipment and control functions. Various studies were subsequently carried out by CCT during 2004/2005 to determine the feasibility of expanding the use of treated effluent and to determine the infrastructure requirements. The objectives of the studies were to investigate the current re-use schemes

and the possibility of further extensions to the re-use of treated effluent that are economically viable. The studies looked at the following:

- Status of existing pump and pipeline schemes
- Quality of treated effluent being distributed
- Reporting on any supply problems currently experienced by end users
- Assessment of potential consumers for recycled water
- Investigation into the possible expansion of treated effluent distribution.

The feasibility study was reviewed during 2006/2007 and the information contained in this revised strategy report reflects the most recent costs and potential savings.

Three main programmes have been identified in order to achieve the objective of maximising treated effluent and are as follows:

a) Installations and modifications to infrastructure

b) Operations, maintenance and effective management of the treated effluent systems

c) Consumer and financial management

Programme E1.1: Installations and modifications to infrastructure of treated effluent supply systems

The proposed extensions to the infrastructure will require approximately R 202 million of capital costs as indicated in Table 12-43 below.

Table 12-43: capital costs for effluent treatment programme

Waste Water Treatment Works (WWTW)	Capital Cost Estimates (Rm) 2007 costs	Development and Operating Cost (R/kl) @ 10% over 20 years (2007 Costs)
Athlone	R 41	R 2.42
Bellville	R 40	R 2.29
Borcherds Quarry	-	-
Cape Flats	R 32	R 2.55
Gordonsbay	R 4	R 3.12
Kraaifontein	R 2	R 1.83
Macassar	R 13	R 1.48
Mitchells Plain	R 14	R 2.52
Parow	R 1	R 1.46
Potsdam	R 13	R 2.42
Scottsdene	R 9	R 3.11
Wesfleur (Atlantis)	R 9	R 2.76
Wildevoelvlei	R 11	R 2.47
Zandvliet	R 13	R 2.92
Marine Outfalls	-	-
Total	**R 202**	

An immediate action plan was formulated to implement "quick-win" initiatives. The immediate action plan is illustrated in Table 12-44. Potential effluent reuse figures are estimated annual averages. The income that can be generated from the immediate action plan is estimated at R 5.2 million per annum.

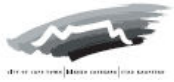
Table 12-44: Immediate action plan of Effluent Treatment Works

PLANT	EFFLUENT REUSE					Site Total Demand
	Present Ml/d	Immediate Ml/d	Cost NPV(R/m)	Long term Ml/d	Cost NPV(R/m)	
Athlone	2.911	0	0	14.787	41	17.698
Bellville	4.133	0.000	0	7.103	40	11.236
Cape flats	2.620	0.204	0	5.356	32	8.180
Gordons Bay	0.000	0.291	0	0.763	4	1.054
Kraaifontein	0.833	3.202	0.54	0.623	2	4.657
Macassar	2.038	0.000	0	4.949	13	6.986
Mitchells Plain	0.000	0.000	0	3.528	14	3.528
Parow	0.699	0.175	0.45	0.437	1	1.310
Potsdam	4.657	0.000	0	19.212	13	23.869
Scotsdene	0.116	3.202	2.5	1.182	9	4.500
Wesfleur	0.175	0.000	0	1.863	9	2.038
Wildevoelvlei	0.000	0.000	0	2.765	11	2.765
Zandvleit	0.291	0.000	0	2.329	13	2.620
Total	18.473	7.073	3.49	64.895	202	90.441

The priority of implementation from the various treatment plants was determined by allocating weighting factors to various key parameters. Table 12-45 indicates the various weights allocated to the different Waste Water Treatment Works (WWTW).

Table 12-45: Prioritisation of Effluent Treatment Plant Works

Waste Water Treatment Works (WWTW)	Quality of Treated Effluent	Financial Feasibility	Priority of Users	Balanced Development	Feasibility Status
Weighting	2	1	3	1	
Athlone	2	2	3	3	18
Bellville	1	2	3	3	16
Cape Flats	3	2	2	2	16
Gordonsbay	3	1	1	1	11
Kraaifontein	3	3	1	1	13
Macassar	3	3	3	1	19
Mitchells Plain	3	2	1	3	14
Parow	2	3	1	1	11
Potsdam	2	2	2	2	14
Scottsdene	2	1	1	1	9
Wesfleur (Atlantis)	2	1	1	1	9
Wildevoelvlei	3	2	2	1	15
Zandvliet	3	1	1	3	13



The proposed activities of this programme that need to be budgeted are indicated in ascending order of priority based on the allocations of the various modifications to the WWTW and reticulation infrastructure.

E1.1.1 Implement immediate measures to upgrade existing Works
E1.1.2 Implementation of Macassar w/t proposals
E1.1.3 Implementation of Athlone w/t proposals
E1.1.4 Implementation of Bellville w/t proposals
E1.1.5 Implementation of Cape Flats w/t proposals
E1.1.6 Implementation of Wildevoelvlei w/t proposals
E1.1.7 Implementation of Mitchells Plain w/t proposals
E1.1.8 Implementation of Potsdam w/t proposals
E1.1.9 Implementation of Kraaifontein w/t proposals
E1.1.10 Implementation of Zandvliet w/t proposals
E1.1.11 Implementation of Gordonbay w/t proposals
E1.1.12 Implementation of Parow w/t proposals
E1.1.13 Implementation of Scottsdene w/t proposals
E1.1.14 Implementation of Wesfleur (Atlantis) w/t proposals
E1.1.15 Review and update feasibility study

Table 12-46 Budget; for capital Works for recycling treated effluent

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E1.1.1	3490	0	0	0	0	0	0	0	0	0	3490
E1.1.2	0	13000	0	0	0	0	0	0	0	0	13000
E1.1.3	20000	21000	0	0	0	0	0	0	0	0	41000
E1.1.4	0	0	40000	0	0	0	0	0	0	0	40000
E1.1.5	0	0	10000	22000	0	0	0	0	0	0	32000
E1.1.6	0	0	0	11000	0	0	0	0	0	0	11000
E1.1.7	0	0	0	14000	0	0	0	0	0	0	14000
E1.1.8	0	0	0	0	13000	0	0	0	0	0	13000
E1.1.9	0	0	0	0	2000	0	0	0	0	0	2000
E1.1.10	0	0	0	0	13000	0	0	0	0	0	13000
E1.1.11	0	0	0	0	4000	0	0	0	0	0	4000
E1.1.12	0	0	0	0	1000	0	0	0	0	0	1000
E1.1.13	0	0	0	0	9000	0	0	0	0	0	9000
E1.1.14	0	0	0	0	9000	0	0	0	0	0	9000
E1.1.15	0	0	200	0	0	0	0	0	0	0	200
Total	**23490**	**34000**	**50200**	**47000**	**51000**	**0**	**0**	**0**	**0**	**0**	**205690**

The above budgets and costs were extracted from the various investigation carried out by CCT during 2004 and revised investigations during 2006/2007.

Programme E1.2: Operations, maintenance and effective management of the treated effluent systems

The recycling effluent treatment infrastructure requires a dedicated management approach to ensure it is adequately maintained and managed. Some of the operational functions will be done by the WWTW and the reticulation staff, but a specialised team is required to carry out certain maintenance, enhancements and monitoring functions. It is also necessary to install bulk meters and carry out water balances in the same way that a water balance is carried out with the water supply distribution system and implement quality control measures to assure consistency in the quality of effluent water supplied.

The activities of this programme that need to be budgeted for are as follows:

E1.2.1 Establish min. Level of Service (LOS) policy

E1.2.2 Quality testing and monitoring of treated effluent. Some of the required monitoring functions that are required are as follows:

i. Weekly checks on quality and level of disinfections of treated effluent in the networks
ii. Monthly inspections for contamination at all end users utilising both treated effluent and Potable supply

E1.2.3 Inspections of the treated effluent distribution systems. Some of the required inspection functions are as follows:

i. Daily checks of pressure and flow in networks
ii. Periodic inspections of the reticulation system

E1.2.4 Installation of bulk meters for treated effluent balance.
Bulk meter should be installed where necessary to facilitate a water balance.

E1.2.5 Testing and installing consumer meters
A lot of the old connections of treated effluent are not metered or the meters are not functioning. All existing connections should be reviewed and where necessary meters should be installed or replaced.

E1.2.6 Reading of bulk meters and carrying out a monthly treated effluent water balance.
A water balance calculating the non revenue effluent treatment water should be developed and updated on a monthly basis.

E1.2.7 Installing a Management Information system and updating new pipeline network on GIS system.
A dedicated management information system should be developed to manage the entire system of effluent treatment system and customers. The treated effluent reticulation system should also be captured on CCT's GIS system.

E1.2.8 Hire and train dedicated maintenance, monitoring and management staff.
A small sub section within the WDM section dedicated to the effective management of treatment effluent supply should be established.

Table 12-47: Budget for O & M and management of treatment effluent supply

No.	Year 1 x R	Year 2 x R	Year 3 x R	Year 4 x R	Year 5 x R	Year 6 x R	Year 7 x R	Year 8 x R	Year 9 x R	Year 10 x R	Total
E1.2.1	0	0	0	0	0	0	0	0	0	0	0
E1.2.2	30	50	100	100	100	100	100	100	100	100	880
E1.2.3	0	0	0	0	0	0	0	0	0	0	0
E1.2.4	200	500	500	0	0	0	0	0	0	0	1200
E1.2.5	200	200	50	50	50	50	50	50	50	50	800
E1.2.6	0	0	0	0	0	0	0	0	0	0	0
E1.2.7	0	0	2000	200	200	200	50	50	50	50	2800
E1.2.8	0	0	0	0	0	0	0	0	0	0	0
Total	**430**	**750**	**2650**	**350**	**350**	**350**	**200**	**200**	**200**	**200**	**5680**

Programme E1.3: Consumer and financial management of treated effluent

The success of maximising the use of treated effluent largely depends on marketing it effectively to potential consumers and managing the revenue from sales effectively. The proposed tariff calculated for the sale of treated effluent is indicated in the table below.

Table 12-48: Proposed tariff for treated effluent

Code	Category	Description	Tariff (2006/07) (R/kl)
1	Industrial / Commercial		R 2,35
2	Municipal, Schools, Sports fields		R 2,07
3	Departmental		R 2,07
4	Public Golf Courses	These are courses with historically links to council and provides a service to the public	R 0,37
5	Bulk users	These are users in excess of 5.0 ML/day	R 0,53
6	Informal & Private	Admin fee for metering, chlorination, etc	R 0.05
7	Special Users	Agreement by Director : Water Services	-

The proposed activities of this programme that need to be budgeted for are as follows:

E1.3.1 Marketing to new potential consumers and formalising agreements.
A dedicated team should identify and negotiate agreements with potential clients. The potential revenue of the sale of treated effluent is approximately R 51 million per year.

Part of the negotiations with large consumers will be to help finance the development of the effluent treatment system as part of a "Public Private Partnership agreements".

E1.3.2 Formalising agreements with existing private, informal and Council use of treated effluent
There are a number of private, informal and Council abstractions of treated effluent that are not adequately accounted for or billed. All such abstractions should be investigated and formal agreements and connection meters should be put in place.

E1.3.3 Consumer management and water audits.
All large consumers of treated effluent should be visited regularly, to assess if they are satisfied with the service and whether they are not contravening any health regulations or by-laws. All large consumers should also submit water audits illustrating how the treated water and potable water is used. The audits should illustrate the quantity of potable water that the use of treated effluent water is replacing.

E1.3.4 Revenue collection.
Necessary adjustments should be made to the SAP financial system to adequately cater for all revenue collection functions of treated effluent. An overview of the

current revenue collection process for treated effluent has revealed that there are a number of problems that need to be addressed.

All consumers abstracting treated effluent should be required to pay and a credit control policy should be implemented. An attempt should also be made to recover revenue lost from treated water previously used and not invoiced.

E1.3.5 Consumer and public awareness and information

Consumers and the public should be made aware of the effluent treatment supply system for two main reasons. Firstly, to make people aware of the health risks, regulations and by-laws regarding the use of treated effluent and secondly to encourage communities or large consumers to discuss the possibility of connecting to the system. Some of the awareness initiatives should be: leaflets published and distributed, dedicated web page on the CCT website, and ward committees should be informed.

E1.3.6 Tariff review

The tariff review of treated effluent should be reviewed annually and discussed with large consumers of treated effluent. Consideration should be given to adding a water conservation levy on the tariff of treated effluent. The motivation of such a levy is to emphasise that although treated effluent is not as valuable as normal Water Resources it should still be used wisely and should not be wasted. The extra revenue generated, from such a levy should be used to subsidise other WC/WDM related initiatives.

E1.3.7 Financial auditing and ring-fencing

It is important to record and audit the costs and revenue generated from treated effluent. It is suggested that the financial management of the sale of treated effluent is ring-fenced from other Council activities. Necessary adjustments should be made to the SAP system in order to enable ring-fencing.

Table 12-49: Budget for consumer and financial management of treated effluent supply

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E1.3.1	50	100	100	100	100	0	0	0	0	0	450
E1.3.2	0	0	0	0	0	0	0	0	0	0	0
E1.3.3	0	200	0	0	0	0	0	0	0	0	200
E1.3.4	0	0	0	0	0	0	0	0	0	0	0
E1.3.5	100	200	200	200	0	0	0	0	0	0	700
E1.3.6	0	100	0	100	0	100	0	100	0	100	500
E1.3.7	0	0	0	0	0	0	0	0	0	0	0
Total	**150**	**600**	**300**	**400**	**100**	**100**	**0**	**100**	**0**	**100**	**1850**

12.12 Objective E2: Promote alternative Water Resources and technologies

The following programmes are proposed with regards to this objective:

a) Promote rain harvesting
b) Promote local borehole extraction for small consumers
c) Promote grey water reuse
d) Investigate unconventional Water Resources

Programme E2.1: Rain harvesting

There are various methods of rain harvesting. The most common is the use of tanks to collect water from roofs. This method however may not be too useful in Cape Town due to fact that rainfall occurs during winter and the generally high cost of such tanks. There is an opportunity however that rain harvesting could be useful in low-income areas and can be associated with the promotion of food gardens.

The activities of this programme that need to be budgeted for are as follows:

E2.1.1 Implement a pilot project

E2.1.2 Develop / print booklet / posters

E2.1.3 Assist in the development of a cheap water tank

E2.1.4 Promote roof tanks to other areas

Table 12-50: Budget; rain harvesting

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E2.1.1	0	0	100	0	0	0	0	0	0	0	100
E2.1.2	0	0	50	50	0	0	50	0	0	0	150
E2.1.3	0	0	100	0	0	0	0	0	0	0	100
E2.1.4	0	0	30	20	20	20	20	20	20	20	170
Total	**0**	**0**	**280**	**70**	**20**	**20**	**70**	**20**	**20**	**20**	**520**

Programme E2.2: Borehole extraction

The development and use of small boreholes and wells for domestic gardening in non-sensitive ground water areas should be promoted. This will reduce the demand on the potable water and on the surface runoff resources. The ground water table is relatively high in a number of areas throughout Cape Town and the installation of such boreholes and wells can be relatively inexpensive. There is evidence to suggest that due to the drought a number of consumers have already installed such wells and boreholes. This should be further promoted and managed. The following considerations must be taken into account

when implementing this programme:

- Priority must be given to areas where recycled effluent will not be supplied (see programme E1.3 below)
- Guidelines should be developed informing consumers on various aspects such as water quality, applications, and areas where this is feasible.
- Adequate by-laws must be developed to prevent consumers from connecting ground water to the municipal potable supply plumbing.

The proposed activities of this programme that need to be budgeted for are as follows:

E2.2.1 Carry out a groundwater resource study, identify which areas in CCT do not have sensitive ground water deposits and develop a plan to optimise.

E2.2.2 Promote, support and manage borehole and well development by private individuals in appropriate areas. (Develop pamphlets and identify products and suppliers).

E2.2.3 Install local boreholes for sports grounds, parks, etc.

E2.2.4 Develop a monitoring system for ground Water Resources.

Table 12-51: Budget; local borehole use

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E2.2.1	0	500	0	0	0	0	0	0	0	0	500
E2.2.2	0	0	50	50	50	50	50	50	50	50	400
E2.2.3	200	200	100	100	100	100	100	100	100	100	1200
E2.2.4	100	100	100	100	100	100	100	100	100	100	1000
Total	**300**	**800**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**3100**

Programme E2.3: Grey water reuse

Grey water reuse refers mainly to domestic and commercial consumers using their bath and laundry water for their landscape irrigation. A big concern that is often raised when discussing grey water is the issue of health and pollution. For this reason adequate guidelines and regulations need to be developed regarding the use of grey water.

The proposed activities of this programme that need to be budgeted for are as follows:

E2.3.1 Development of guidelines and regulations regarding the use of grey water

E2.3.2 Research into products that can assist into grey water reuse

E2.3.3 Pilot project into grey water reuse

E2.3.4 Promoting the use of grey water

Table 12-52: Budget; grey water reuse

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E2.3.1	0	150	0	0	0	0	0	0	0	0	150
E2.3.2	0	20	0	0	20	0	0	0	0	0	40
E2.3.3	0	50	0	0	0	0	0	0	0	0	50
E2.3.4	0	0	50	50	50	50	50	50	50	50	400
Total	**0**	**220**	**50**	**50**	**70**	**50**	**50**	**50**	**50**	**50**	**640**

Programme E2.4: Investigate unconventional Water Resources

The water situation in CCT requires that all possibilities of potential Water Resources be looked at. Although considerations for the conventional development of Water Resources are not part of this strategy, investigations into unconventional resources should be considered as part of the strategy.

Such unconventional Water Resources include (but are not limited to) the following:

a. Ice berg harvesting
b. Sea water desalination
c. Weather modification (Cloud seeding)
d. Capturing storm water discharge into the sea
e. Importation of water - Shipping of fresh water
f. Suppression of evaporation
g. Recharging of ground water aquifers
h. Water trading

Due to its circumstances and geographic location, Cape Town is perhaps unique and a number of the above unconventional Water Resources could be a lot more feasible than for other cities throughout South Africa. Traditionally, consideration for such unconventional Water Resources has been the domain of DWAF and research institutions such as Water Research Commission and CSIR. The current "reconciliation study" headed by DWAF had glanced at some of the above options but it is strongly proposed that CCT becomes more actively involved in investigations of such alternative Water Resources.

Of particular importance are the opportunities of water trading with other water users in the Western Cape. It could be feasible for CCT to purchase water rights from other users such as agriculture on a temporary or permanent basis.

The proposed activities of this programme that need to be budgeted for are as follows:

E2.4.1 Literature research into previous and current studies and practises

E2.4.2 Pre feasibility investigation of various unconventional options as well as water trading

E2.4.3 Feasibility of possible alternatives

Table 12-53: Budget for investigations into unconventional Water Resources

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E2.4.1	0	100	0	0	0	0	0	0	0	0	100
E2.4.2	0	0	500	200	0	0	0	0	0	0	700
E2.4.3	0	0	0	300	500	500	0	0	0	0	1300
Total	**0**	**100**	**500**	**500**	**500**	**500**	**0**	**0**	**0**	**0**	**2100**

12.13 Objective E3: Conservation of Water Resources

The conservation of the existing Water Resources refers to the protection of the water resource from pollution and over utilisation as well as to the optimisation of operations to reduce losses. Most of these functions for CCT's existing Water Resources are the responsibility of DWAF. CCT has a responsibility however to assist and take joint responsibility in a number of functions and activities.

The following programmes are proposed with regards to this objective:

a) Support the "Working for Water" programme
b) Support Catchment management initiatives
c) Implement clean-up river campaigns
d) Develop a drought management plan

Programme E3.1: Support working for water programme

The national "Working for Water" programme seeks partners in its implementation in removing alien invading plants. CCT has been giving financial assistance for the "working for water" programme for a number of years but they have not been very involved with the management of the programme. It is suggested that CCT should continue its support and financial aid to the programme but should become more directly involved therein by participating in the management committee.

The proposed activities of this programme that need to be budgeted for are as follows:

E 3.1.1 Monitor the progress of existing projects and participate in the management of the programme in the Western Cape.

E 3.1.2 Sponsor the implementation of specific projects.

E 3.1.3 Initiate a maintenance programme to prevent the re-introduction of alien plants.

Table 12-54: Budget working for water programme

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E3.1.1	0	50	50	50	50	50	50	50	50	50	450
E3.1.2	0	500	500	500	500	500	500	500	500	500	4500
E3.1.3	0	400	400	400	400	400	400	400	400	400	3600
Total	**0**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**950**	**8550**

Programme E3.2: Catchment management initiatives

Although the responsibility for catchment management is that of DWAF and the soon to be established catchment management agencies (CMA), it would be to CCT's benefit to assist in the implementation of various catchment management measures. The obvious reason is that should anything jeopardise the quantity or quality of the Water Resources it will have a direct impact on CCT's ability to provide Water Services to its consumers.

The proposed activities of this programme that need to be budgeted for are as follows:

E.3.2.1 Monitoring the quality of various Water Resources at various key points.

E3.2.2 Monitoring the discharge of effluent of large consumers including farmers

E3.2.3 Participating the effective management of the Water Resources

Table 12-55: Budget catchment management activities

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E3.2.1	0	0	200	200	200	200	200	200	200	200	1600
E3.2.2	0	0	200	200	200	200	200	200	200	200	1600
E3.2.3	0	50	50	50	50	50	50	50	50	50	450
Total	**0**	**50**	**450**	**450**	**450**	**450**	**450**	**450**	**450**	**450**	**3650**

Programme E3.3: Clean up river campaigns

One of the biggest threats to CCT's Water Resources is pollution by upstream users. CCT should get directly involved in various clean up campaigns and pollution prevention initiatives. These campaigns need to be separated into **catchment and urban river** campaigns. For the purpose of the budget they are consolidated into one programme.

The proposed activities of this programme that need to be budgeted for are as follows:

E3.3.1 Initiate a research project to identify problem areas where pollution enters the rivers

E3.3.2 Initiate ongoing clean up projects in association with communities living adjacent to rivers

E3.3.3 Initiate rehabilitation of wetlands projects

Table 12-56: Budget; clean up river campaign

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E3.3.1	150	0	0	0	100	0	0	0	0	0	250
E3.3.2	0	300	300	300	300	300	300	300	300	300	2700
E3.3.3	0	0	200	200	200	200	200	200	200	200	1600
Total	**150**	**300**	**500**	**500**	**600**	**500**	**500**	**500**	**500**	**500**	**4550**

Programme E3.4: Develop a drought management policy / plan

The occurrence of droughts in the Western Cape Town is something that will always occur. The water restrictions imposed during the recent drought have proven to be mostly effective and a considerable reduction in demand was achieved. There are, however, a number of lessons that can be learned from the drought and the water restrictions that Cape Town experienced over the last few years. A number of the lessons will affect the long term WC/WDM strategy (discussed in section 2.5) and will also assist in improving the management of the next drought. In order to learn and document these lessons it is proposed that a research study is commissioned. DWAF should be approached to initiate the study as a joint venture. The study should have the following objectives:

- Assess the overall effect of the various water restrictions in terms of reducing demand
- Determine the effect of the restrictions on the various types of consumers
- Investigate how the savings were achieved by the different types of consumers and in terms of different types of activities
- Assess the economic, social and environmental impact of the drought
- Determine the views and opinions of consumers regarding the drought and water restrictions.
- Determine the consumers' knowledge regarding water use efficiency and various other water supply issues.
- Evaluate the functions of CCT and DWAF during the drought

The implementations of water restrictions imposed by CCT were uniform within each category of consumers and did not adequately cater for consumers' different circumstances. When a drought occurs there is no adequate time for detailed investigations and there is no available information to develop databases that are more accurate. In order to have more appropriate restrictions imposed when the next drought occurs, it is proposed that a detailed investigation is carried out, combined with the development of an appropriate Demand Management Information model. (Refer to MIS systems in section 13.2)

The proposed activities of this programme that need to be budgeted for are as follows:

E3.4.1 Carry out an investigation into recent drought and water restrictions

E3.4.2 Carry out a detailed investigation into water-use efficiency by different consumers and develop a database (refer to programme C2.3)

E3.4.3 Develop a model for water restrictions guidelines and a drought management plan

Table 12-57 Drought management plan

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
E3.4.1	300	50	0	0	0	0	300	0	0	0	650
E3.4.2	Refer to C2.3										0
E3.4.3	0	0	200	100	0	0	0	0	0	0	300
Total	**300**	**50**	**200**	**100**	**0**	**0**	**300**	**0**	**0**	**0**	**950**

12.14 Objective E4: Ensure the quality of treated effluent is of suitable standards and operated efficiently

The quality of treated effluent discharged and the efficiency of the effluent collection and treatment can have a significant impact on the objectives and role of WC/WDM for the following reasons:

- The quality of wastewater discharge can contaminate and have a negative effect on down-stream Water Resources (not applicable if discharged into the sea).
- Inadequate management of the treatment plants may impact on the opportunities for recycling of treated wastewater.
- Inadequate operation and maintenance of the effluent collection system may impact on the opportunities to retrofit plumbing fittings that will increase the effluent concentration.
- Investigations of water infiltration into sewer systems can also assist in identifying leaks in the water supply system.

Other significant links between the effluent system and WC/WDM are as follows:

- WC/WDM can alleviate and assist in resolving capacity problems of the effluent system
- WC/WDM can significantly reduce the size and cost of new envisaged bulk effluent related infrastructure
- WC/WDM may reduce or even increase operational costs of treatment plants depending on the circumstances.
- Dedicated officials managing the water supply services of large consumers can combine to also manage the effluent services. (Refer to 12.9 programme B5.4)

Although the effective management of the effluent system is not the direct role of WC/WDM, it is important that various objectives and functions are specified through the strategy and monitored to ensure implementation. It is also important to illustrate that wastewater treatment can play an important role in meeting the WC/WDM objectives.

The following programmes are proposed, but not budgeted with regards to this objective:

E4.1 Ensure adequate effluent treatment plants
E4.2 Ensure adequate maintenance of treatment plants
E4.3 Ensure adequate and efficient operation of treatment plants
E4.4 Set standards of effluent discharge for each plant
E4.5 Monitor the effluent discharge on an ongoing basis
E4.6 Minimise the infiltration of rain water into the effluent system
E4.7 Monitor the effluent discharge of large consumers

13 Enabling objectives

The following proposed action plan is to ensure the on–going implementation of WC/WDM. It is designed to overcome the many constraints and obstacles limiting the implementation of a comprehensive and sustainable WC/WDM strategy. The enabling action plan consists of two goals and seven objectives as illustrated in Table 13-1 below. Goal C relates mainly to ensuring adequate information and Goal D relates mainly to ensuring adequate resources and capacity to implement WC/WDM.

Goal C: CCT must by 2009 ensure and maintain ongoing effective management systems and implement Integrated Water Resource Planning in all decisions regarding Water Resources augmentation, bulk infrastructure development and water efficiency projects.

Goal D: CCT must adopt WC/WDM as one of key Water Service delivery strategies, and must give priority to its implementation and ensure an ongoing adequate enabling environment.

Table 13-1: Enabling WC/WDM objectives

Policy	Objective number	Description
Goal C	C1	Establish appropriate district management areas and monitor the unaccounted for water
	C2	Ensure adequate information and policies to support decision-making
	C3	Ensure all decisions are supported in terms of Integrated Resource Planning (IRP).
	C4	Monitor the impact of WC/WDM measures and KPI
Goal D	D1	Ensure adequate financial resources
	D2	Ensure adequate human resources and processes
	D3	Ensure adequate transparency, stakeholder buy in and commitment

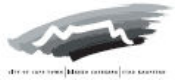
13.1 Objective C1: Establish appropriate district management areas, and monitor the unaccounted for water

The establishment of District Management Areas (DMA) is essential to WC/WDM and will enable the following important functions:

1. Water balance between bulk meters and consumer meters
2. Monitoring minimum night flows for water leakages
3. Pressure management

The following programmes are proposed with regards to this objective:

a) Establish district management areas and maintain integrity
b) Determine the various components of NRW



Programme C1.1: Establish district management areas

In the past there was a programme to establish district management areas and install bulk meters but this programme was suspended before it was completed.

The assessment of where to install District Management Areas (DMA) will depend on a number of criteria. Some of the criteria are as follows: distribution layout, total demand, pressures, number of connections, connections to bulk supply system and location of reservoirs and pumps. In certain instances selecting DMAs can be a simple exercise and can be done manually by reviewing the reticulation maps. There are however a number of instances when it is necessary to have hydraulic information regarding the behaviour of the distribution system. For this reason it is proposed that the review and assessment of all DMAs should be done in conjunction with the Master Plan analysis. Such an analysis should also be combined with pressure management design and the installation of pressure reducing valves. (Link this programme with A1.1)

Once the DMAs are determined, it is necessary to carry out the bulk meter design and other reticulation changes that may be required. Such changes include installation of zone valves, disconnection and installation of by-passes. Consideration must be given to installing AMR (Automated Meter Reading) meters on all district meters.

After the construction of suitable zone meters and other reticulation changes, it would be necessary to test the integrity of the zones to ensure that there are no unknown links with adjacent DMAs. Some of the unknown links between DMAs could be due to the following:

- Pipe connection not illustrated on plans
- Zone valves do not close properly
- Illegal pipe connections

The integrity of all water management areas will need to be tested periodically or whenever there is any sudden change in minimum night flows, pressures or measured flow on the bulk meters.

The proposed activities of this programme that need to be budgeted for are as follows:

C1.1.1 Review all existing DMAs, revise and determine new ones where required.

C1.1.2 Design all new meter zones and reticulation changes

C1.1.3 Install new zone meters, zone valves and other reticulation changes

C1.1.4 Test the integrity of all new DMA and carry out any necessary repairs or changes

C1.1.5 Test the integrity of all the DMA every two years

Table 13-2: Budget development of DMA

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C1.1.1	300	0	0	0	0	0	0	0	0	0	300
C1.1.2	300	0	0	0	0	0	0	0	0	0	300
C1.1.3	1000	1500	1500	0	0	0	0	0	0	0	4000
C1.1.4	Budgeted by reticulation department										0
C1.1.5	Budgeted by reticulation department										0
Total	**1600**	**1500**	**1500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4600**

Programme C1.2: Determine the various components of Non Revenue Water (NRW) for each district on a monthly basis

The various components of NRW can be determined and analysed using two fundamental approaches. The first approach is a top down approach that is based on a water balance and the second is the bottom up approach that is based on the minimum night flow analysis. It is proposed that both methods are used and combined in order to get the most accurate figures possible. Furthermore it is also proposed that the top down approach is combined with the process to determine apparent losses and unbilled authorised consumption (commercial losses) as described in objective A4.

The water balance is determined by comparing the total amount of measured demand from the consumer meters with the measured amount from the bulk district meters. Although this function may sound relatively easy it is complicated by the fact that the consumer meters are not read at the same time as the district water meters. A further complication is the fact that the integrity of a district is often compromised by various activities such as opening of zone valves. In order to have an accurate water balance it is required to implement a specialised management information system that converts consumer meter readings to daily flow rates and calculates the estimate total demand for the same period as the district water meter.

In addition to determining the overall water balance it is necessary to identify the various water losses and develop a more detailed water balance by identifying the various components. The most acceptable format of a water balance is in accordance with IWA guidelines as indicated in the diagram below.

Figure 13-1: IWA water balance format

<table>
<tr><td rowspan="8">System Input Volume</td><td rowspan="4">Authorised consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed metered consumption</td><td rowspan="2">Potential revenue Water</td><td>Free Basic Water</td></tr>
<tr><td>Billed unmetered consumption</td><td>Recovered revenue</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled Metered Consumption</td><td>Non payment</td><td colspan="2" rowspan="6">Non Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="4">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorised Consumption</td></tr>
<tr><td>Customer Meter Inaccuracies</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and Distribution Mains</td></tr>
<tr><td>Leakage on Overflows at Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to point of customer meter</td></tr>
</table>

The following processes are necessary to carry out a monthly water balance for each district and the entire Council:

- Establishment of district Management areas and the installation of district meters (addressed in programme C1.1)
- Implementation of a suitable demand analysis management information system (addressed in programme C2.1)
- Read bulk meters and enter readings into MIS
- Run MIS routines and print reports

The minimum night flow analysis (MNF) can only be used effectively in residential areas where there is not supposed to be any demand by consumers during the night. MNF can be used in two ways to control NRW. The first is to analyse the MNF to calculate the different components of real losses using the BABE (Burst and Background Estimate) approach and the second is to monitor the MNF for any sudden changes that may indicate a sudden burst pipe.

The following processes are necessary to carry out MNF analysis for each domestic district:

- Obtain a suitable spreadsheet or model to analyse real losses from the MNF.
- Collect information on various parameters, burst leakage, flow rates, number of connections, length of pipes etc.
- Install data loggers and obtain MNF readings.
- Run analysis and compare with figures from top down approach.
- Develop a telemetry system to monitor MNF and activate alarm if sudden changes occur.

A number of the processes described above are already budgeted elsewhere in the strategy. In order to ensure implementation of these activities it is recommended that a dedicated senior technician or engineer is employed who will be responsible for carrying out the necessary analysis on a continuous basis. A number of the field functions such as installation of data loggers and reading of bulk meters will be done either by the normal reticulation staff or the dedicated leak detection team described in programme A1.2. In order to avoid a lot of detail, only the activities that need to be budgeted and not the processes are described and are as follows:

C1.2.1 Acquire and implement an appropriate Demand analysis MIS (see programme C2.1) and determine the various NRW components in accordance with IWA water balance model

C1.2.2 Employ and train a dedicated engineer or senior technician to manage NRW analysis

C1.2.3 Acquire additional data loggers

C1.2.4 Acquire a suitable software model for a bottom up analysis of real losses

C1.2.5 Telemetry for bulk meters (see programme C2.2)

Table 13-3: Budget; Determine NRW

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C1.2.1	part of C2.1										0
C1.2.2	250	0	0	0	0	0	0	0	0	0	250
C1.2.3	50	200	0	0	0	50	0	0	0	0	300
C1.2.4	100	0	0	0	0	0	0	0	0	0	100
C1.2.5	part of C2.2										0
Total	**400**	**200**	**0**	**0**	**0**	**50**	**0**	**0**	**0**	**0**	**650**

13.2 Objective C2: Ensure adequate information / policies to support decision making

One of the biggest constraints of WC/WDM is the availability of important information and key performance indicators. Current availability of information is limited and restricts the effective management of both the reticulation system and consumer demand management. In the past CCT often commissioned consultants to analyse the water demand and various other key elements of Water Services.

This approach should be avoided in the future for the following reasons:

- Repeated consulting costs for collecting and analysing data
- Accuracy of information obtained could be restricted
- Information analysis is not continuous and is outdated before any related study is completed.
- Consultants hold on to information and spreadsheets and do not adequately transfer such information to Council officials

A more appropriate approach is to implement appropriate MIS that can generate all the required reports on an ongoing basis.

Telemetry could also play an important role in automating and facilitating the transfer of information between bulk zone meters and other equipment to the MIS.

The following programmes are proposed with regards to this objective:

a) Assess all management information needs and implement a uniform and centralised MIS

b) Review the telemetry systems in all districts and make proposals for further developments

c) Carry out consumer behaviour research

d) Develop key decision making policies that will govern the implementation of WC/WDM

Programme C2.1: Management Information systems

An overview of the existing MIS currently used throughout the various districts at CCT, highlighted the urgent need to determine a uniform and more centralised approach. The various districts are using different MIS systems and different modules and the level of implementation and functionality ranges significantly between the districts. The SAP system has centralised and made uniform the financial system throughout CCT, but SAP has limited applications that will assist the water department in carrying out its functions effectively and efficiently.

The following type of MIS modules and functionality should be implemented:

1. **Network asset management module**
    a. Meter management programme
    b. Pipeline management programme
    c. Asset valuations
    d. Life cycle assessments
    e. Risk assessments

2. **Demand management module**
    a. Consumer demand management queries

b. Detailed demand analysis for various fields (i.e. per district, zone, suburb, type of consumers, type of service)
c. NRW analysis, water balance
d. Tariff development analysis
e. Consumer demand analysis / end use analysis
f. Determining and monitoring various Key Performance Indicators
g. Monitoring the impact of projects
h. Demand forecasting
i. Sizing of bulk infrastructure components

3. Operation and maintenance module

a. Management of queries from call centre
b. Management of queries from metering
c. Management of proactive and preventative routines
d. Integration with telemetry system
e. Emergency alarm system
f. Pressure management functions

4. Commercial data analysis module

a. Evaluate meter readings
b. Evaluate all data quality problems
c. Evaluate problems from operator actions
d. Compares, imports and exports data between databases

It is anticipated that whatever MIS is selected, it would be necessary to modify and add additional functions in order to meet some of the requirements specified throughout the strategy. In particular it is anticipated that none of the available MIS on the market have adequate end-use demand analysis functionality.

The proposed activities of this programme that need to be budgeted for are as follows:

C2.1.1 Carry out a detailed investigation on the MIS needs and functionality required and develop a comprehensive terms of reference for tendering

C2.1.2 Acquire and implement the different modules of MIS. (Procurement and installation of system)

C2.1.3 Manage, update and maintain the MIS on an ongoing basis

Table 13-4: Budget for a management information system programme

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C2.1.1	500	0	0	0	0	0	0	0	0	0	500
C2.1.2	0	10000	10000	0	0	0	0	0	0	0	20000
C2.1.3	0	0	0	1000	1000	1000	1000	1000	1000	1000	7000
Total	**500**	**10000**	**10000**	**1000**	**1000**	**1000**	**1000**	**1000**	**1000**	**1000**	**27500**

Programme C2.2: Upgrading the telemetry system

An overview of the existing telemetry systems currently used throughout the various districts in CCT, revealed a vast range in the level of functionality. Some districts do not have a functional telemetry system while some have very comprehensive and state-of-the-art systems. The telemetry systems are used mainly for operation functions on key reticulation components such as pumps and reservoirs.

The type of functionality that telemetry systems should be considered for are as follows:

Optimising the operation and maintenance of key water supply components

- To monitor the operation of key water supply components (such as reservoirs and pumps)
- To enable the operation of key water supply components from a centralised point
- To monitor any tampering or breakdown of any of the key equipment

Monitor and control the water demand

- To monitor the level of unaccountable for water of the reticulation system.
- To gather important information regarding demands that will inform other operation, maintenance and planning functions.

The telemetry requirements for optimising the operation and maintenance of pumps and reservoirs are not budgeted under the WC/WDM strategy and should be considered under the reticulation section's budget.

The proposed activities of this programme that need to be budgeted for are as follows:

C2.2.1 Carry out a detailed investigation on the existing telemetry status and determine a uniform policy and implementation plan for the entire CCT.

C2.2.2 Implement new telemetry, for WDM functions and/or rehabilitate and upgrade existing systems

C2.2.3 Develop the required links between the telemetry system and the MIS system

C2.2.4 Manage, update, operate and maintain the telemetry system

The upgrading of the telemetry system is not considered a high priority and is therefore not budgeted in the first two years of the WDM strategy.

Table 13-5: Budget for upgrading the telemetry system

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C2.2.1	0	0	200	0	0	0	0	0	0	0	200
C2.2.2	0	0	0	5000	5000	5000	0	0	0	0	15000
C2.2.3	0	0	0	400	30	30	30	30	30	30	580
C2.2.4	0	0	0	1000	1500	1700	2000	2000	2000	2000	12200
Total	**0**	**0**	**200**	**6400**	**6530**	**6730**	**2030**	**2030**	**2030**	**2030**	**27980**

Programme C 2.3: End use and Consumer behaviour research

Previous programmes and activities relate to the development of a water balance and determining the various components of non-revenue demand and unaccounted for water. In addition to the NRW related information, it is necessary to develop an accurate database on how water is used by various consumers and set water efficiency benchmarks. Such benchmarks will assist the municipality in motivating and supporting consumers to become efficient as well as assist in managing droughts.

The estimated potential water reduction from WC/WDM was based on various assumptions regarding leakage and inefficient water use by the various categories of consumers. These assumptions need to be verified with appropriate research. The existing consumer database does not have enough information on the profile of the consumer and how the consumer uses water. In order to obtain adequate information on how consumers use water the following activities are proposed:

1. Questionnaires to all consumers.
2. Classification of consumers.
3. Opinion surveys and research water audit.
4. End use research.

Questionnaire to all consumers

Such a questionnaire should target basic information from consumers. The following is the type of information the questionnaire should include:

For Industrial / commercial Consumers

- Type of industry and activity
- The annual rate of production in volume or mass or other applicable unit
- Details of water audits (if they exist)
- Type of water intensive processes
- Number of personnel working during the day
- Number of personnel that stay on premises
- Size of recreation gardens or sport fields
- Expected growth in water demand over the next 5 years

Domestic consumers

- Do they have a swimming pool
- How many people stay at the premises 80 % of the time
- Do they have a garden
- Is garden irrigated and with what system
- Do they have any leaks

General information

- Do they recycle water
- Do they have a well or a borehole

A pilot project with a sample of consumers should be initially carried out before the questionnaire is sent to all consumers. The purpose of the pilot project is to test the validity of the questionnaire and methodology. The above information should also be included in all new water applications and should be redone every five years.

Classification of consumers

The classification of consumers is currently limited to the available information on categories of use. Based on information obtained from the questionnaire, consumers can be further classified in different sub-categories. Domestic consumers should be classified according to various criteria such as level of service, value of properties and size of properties. Although consumers from one suburb could, in theory, belong to different categories, it is proposed that each suburb is classified under the different categories rather than each household. The classifications will allow for differences in water use patterns and will be crucial in the development of the end-use demand-forecasting model.

Non-domestic consumers should be classified according to the nature of business activity. This is particularly true for businesses that are water intensive. A similar classification to the one currently being developed by DWAF should be adopted. Classification of business according to the nature of activity (i.e. car wash, breweries) is essential in developing benchmarks and water use targets.

Opinion surveys and research water audits

Programme B5.3 refers to water audits for consumers. Such water audits are, however, performed on request and are for the benefit of the consumer, with the purpose of advising consumers on how to reduce their water consumption. The purpose of the research water audits is to obtain similar information but for a pre-determined and controlled sample size for various classifications of consumers. The aim of the research sample audits will be to test the information on the questionnaires and obtain information that is more detailed. The type of information will include the size of toilets, the flow rate of showers and also include more comprehensive questions to gauge consumers' knowledge, understanding and views on various WC/WDM related issues. In order to avoid duplication the research audits should also include questions regarding other Water Services related issues beside WC/WDM.

The first set of surveys could be combined with the surveys proposed in programme E2.4 "Drought management plan". Additional surveys should however be continued on an annual basis.

End use research (domestic)

The questionnaires and surveys will not be adequate to get an accurate understanding of how much water is used for each type of activity (clothing washing, toilets, etc). This would involve much smaller samples and will require the installation of flow meters and data loggers on the various water supply points. Such research could be complicated and would require volunteers who will agree to small modifications to their plumbing.

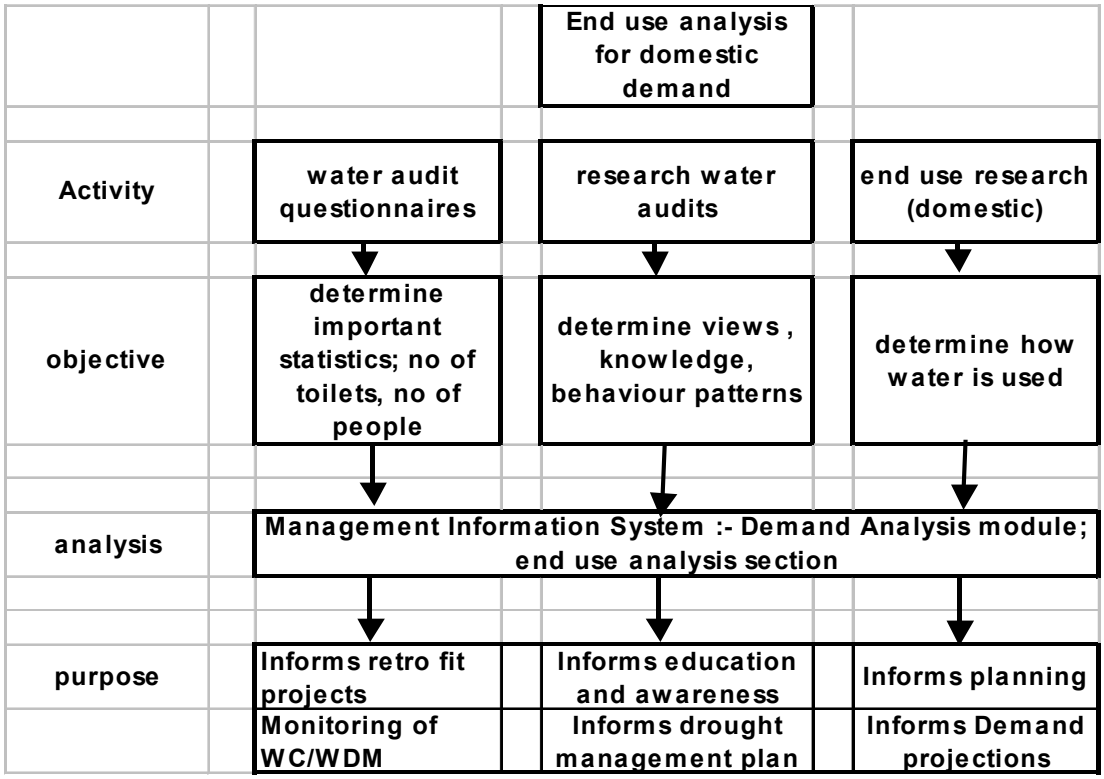
Capturing and analysing information and surveys

Once the information is received from all consumers, surveys and research, it needs to be captured into the demand analysis MIS module. The following diagram illustrates the different processes and the purpose for each activity.

Benchmarking of non domestic water use

DWAF has initiated a benchmarking project (during 2005) with the aim to develop benchmark targets for water use for all categories of water users throughout the country. Although the project is in its initial stages, the intention is to make requirements for local authorities to support this initiative. The development of benchmarks by CCT should therefore be combined with the DWAF initiative. Benchmarks can be used to develop a more appropriate tariff structure for industrial / commercial users and also to manage droughts.

Figure 13-2: Components of end use analysis



The proposed activities of this programme that need to be budgeted for are as follows:

C2.3.1 Distribute and collect consumer demand analysis questionnaires

C2.3.2 Carry out water audits and consumer behaviour, opinions and knowledge surveys

C2.3.3 Carry out an end-use research audits

C2.3.4 Capture all information on to demand analysis MIS module

C2.3.5 Initiate benchmarks of various consumers in association with DWAF

C2.3.6 Analyse water audits, develop end use analysis parameters on MIS and revise WC/WDM opportunities

Table 13-6: Budget; Water audits, benchmarks and research

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C2.3.1	0	0	400	0	0	0	0	400	400	400	1600
C2.3.2	0	0	150	150	150	150	150	150	150	150	1200
C2.3.3	0	0	250	100	0	0	0	0	0	0	350
C2.3.4	0	0	0	200	50	0	0	0	0	0	250
C2.3.5	0	0	0	150	150	150	150	150	150	150	1050
C2.3.6	0	0	0	50	50	50	50	50	50	50	350
Total	**0**	**0**	**800**	**650**	**400**	**350**	**350**	**750**	**750**	**750**	**4800**

Programme C2.4: Development of decision making policies on WC/WDM

There are a number of internal institutional related policies that need to be identified and agreed on with regard to WC/WDM. Such policies are needed for the following reasons:

- Agreement regarding the type of standard reports the MIS will need to create
- Identify the functions and roles of various personnel.
- Develop a framework for decision making

Some of the categories of the proposed decision making policies are as follows:

1. Responsibilities and accountabilities of management
2. Monitoring and assessing implementation of WC/WDM
3. Prioritising of WC/WDM initiatives
4. Monitoring and assessing KPI
5. Updating the strategy
6. Linkages with droughts and water restrictions
7. Dealing with public input, complaints and suggestions
8. Documenting and recording activities
9. Media and public engagements
10. Service Level Agreements between various sections departments within CCT
11. Control of budget and transfer of money from budgets of various sections of the water department

Many categories will depend on existing departmental policies and would not be necessary to be redeveloped.

There is no budget allocation for this programme but the following activities are envisaged.

C2.4.1 Development of draft policies

C2.4.2 Informing all personnel of policies and train if required

C2.4.3 Updating policies

13.3 Objective C3: ensure all decisions are supported by Integrated Resource Planning (IRP)

As explained in the Section B of this report, IRP is the fundamental tool that allows WC/WDM to become part of the overall planning of water supply and Water Services. Through IRP, the role of WC/WDM can be identified, prioritised and motivated.

The following programmes are proposed with regards to this objective:

a) Ensure the use of IRP principles for water resource planning
b) Review the impact of WC/WDM on proposed new bulk infrastructure

Programme C3.1: Ensure the use of IRP principles for water resource planning

The IWRP study was an independent study by CCT carried out during 2001 that assessed and compared various Water Resource augmentation schemes with various WC/WDM measures for a number of different criteria. This was the first such study and deviated from the more traditional water resource planning approach of estimating the possible impact of WC/WDM.

The IWRP study signalled the start of a new planning approach referred to in international literature on "Integrated Resource Planning or Integrated Least Cost Planning". The new planning approach begins with a premise that a wide range of traditional and innovative supply-side and demand-side resources must be considered. It encompasses a process to help the water industry planners to determine the appropriate mix of resources for meeting customer needs and the planning objectives.[1] One of the fundamental aspects of Integrated Least Cost Planning is that **it recognises that consumers do not actually want more water, what they want are the services that water provides**, such as clean hands, dishes and clothes, sanitation and pleasing landscapes.[2]

DWAF has recently completed (2006) a "Water Reconciliation study" with the aim of producing a long-term strategy for reconciling water supply with demands. The reconciliation study screened various Supply Side and Demand Side Management options and evaluated them to determine the way forward. One of the outcomes of the reconciliation study was to recognise the key role of WC/WDM in Water Resource planning. The recommendations made in the reconciliation study are as follows:

1. The CCT's WC/WDM strategy and programme should be implemented in order to ensure that no shortage of supply exists prior to the implementation of the next intervention, after the Berg Water Project (BWP).
2. The CCT should initiate a feasibility study to determine the potential of implementing additional WC/WDM interventions, beyond the CCT's 8 year WC/WDM strategy and programme.[3]

[1] Reference: American Water Works Association; Integrated Resource Planning: A balanced approach to Water Resources Decision Making (1993)
[2] Reference: Independent Pricing and Regulatory Tribunal of New South Wales; Water Demand Management: A Framework for Option Assessment, (1996)
3 Reference: DWAF WESTERN CAPE WATER SUPPLY SYSTEM :RECONCILIATION STRATEGY Scenario Planning for Reconciliation of Supply and Requirement (2006)

It is proposed that CCT takes responsibility for further evaluation of the various WC/WDM related options of the "Water Reconciliation study" for the following reasons:

- The role of a number of WC/WDM measures is not limited to Water Resources and such initiatives maybe be implemented irrespective of any water resource planning decisions.
- CCT understands the potential of WC/WDM better than any other role player
- It will be up to CCT to implement most WC/WDM measures
- Evaluation of the potential of various WC/WDM measures has already been done as part of the WC/WDM strategy (may need to be further refined however).

Historically there has always been much doubt expressed on the potential impact of WC/WDM to reconcile demand and supply for the following reasons:

- Lack of adequate examples
- Success of WC/WDM depends on the Water Services Providers commitment
- Not as tangible as a dam
- Savings achieved may not be sustainable
- Responsibility /accountability; DWAF does not have adequate control on the implementation of WDM and they may feel more secure by building a dam.

The recent water restrictions have reduced the existing demand (June 2004) from the original unrestricted demand projection by approximately 108 million m^3 per annum or approximately 27 % of the original demand. This was achieved without any significant impact on economic growth and it can be argued that the long term WC/WDM can achieve similar savings on a sustainable basis.

As part of the "reconciliation study" it is proposed that DWAF accepts the following undertaking by CCT as proposed in chapter 10.6, and negotiates a similar undertaking with all the other consumers within the Western Cape water supply area.

> **Undertaking**: CCT will commit over the next five years to implementing and monitoring a comprehensive WC/WDM strategy. Within this time no decision should be taken regarding further water augmentation schemes in order to explore the full potential of WC/WDM. After five years the full impact and potential of WC/WDM must be clearly demonstrated by CCT. All assumptions made in the current analysis on the role of WC/WDM must be tested and adequately researched.

The most problematic aspect of the traditional planning approach to the principles of IRP is demand forecasting. Traditionally, demand forecasting was undertaken by either extrapolating historic trends or using multiple regression techniques incorporating a range of variables such as population and economic growth. A more appropriate methodology is component-based forecasting or end-use analysis, which provides a mechanism for understanding the factors and technologies that affect water use including emerging trends and relying less on historic trends. This approach is universally accepted as industry best practice. It is proposed that as part of this programme a component-based forecasting model is developed by CCT.

The proposed activities of this programme that need to be budgeted for are as follows:

C3.1.1 Participate in water resource planning processes initiated by DWAF

C3.1.2 Undertake to investigate the WC/WDM measures in more detail as part of the "reconciliation study"

C3.1.3 Develop a component base demand forecasting model (link to other initiatives on end use analysis, programme C2.3)

Table 13-7; Budget IRP

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C 3.1.1	0	30	0	0	0	0	0	0	0	0	30
C 3.1.2	300	300	0	0	300	0	0	0	0	0	900
C 3.1.3	0	500	500	0	0	0	0	0	0	0	1000
Total	**300**	**830**	**500**	**0**	**300**	**0**	**0**	**0**	**0**	**0**	**1930**

Programme C 3.2: Review the impact of WC/WDM on proposed new bulk infrastructure

Although the IWRP study had initiated the start to a new planning approach, this was limited to water resource planning and needs to be further expanded to most bulk infrastructure planning of Water Services.

In order to ensure implementation of IRP throughout the supply chain it is recommended that a planning protocol be developed to guide all bulk infrastructure planning for Water Services by CCT. The new planning protocol should not be totally distinct from what is currently being practiced but must contain functions that are not generally found in traditional water supply planning. There are four main considerations whereby the new planning protocol must deviate from the current planning practises:

- Integration of planning throughout the supply chain to achieve the best results to society (end consumer) and to meet **specific project objectives**. Current water resource planning practices focus on the best-perceived solution from a water resource perspective only.
- Evaluation criteria must be comprehensive and include social, economic, and environmental.
- Water demand-side management measures must be considered as an alternative capacity option and not a separate function or campaign.
- Evaluation criteria must be looked at from the life cycle of the different measures and not just on implementation.

A detailed comparison of traditional planning and Integrated Resource Planning on which the planning protocol must be based on, is illustrated in Table 13-8 below.

Table 13-8: Comparison of traditional planning and Integrated Resource Planning[4]

CRITERIA	TRADITIONAL	INTEGRATED RESOURCE PLANNING
Planning orientation		
- Resource options	Supply options with little diversity	Supply and Demand-side management; efficiency and diversity encouraged
- Resource ownership and control	Centralized and utility owned	Decentralized; utilities, customers and others
- Scope of planning	Single objective, usually to add supply capacity	Multiple objectives as determined in the planning process
- Evaluation criteria	Maximise reliability	Multiple criteria, including cost control, risk management, environmental protection and social

[4] Adopted from a paper by Janice A. Beecher; published in the June 1995 AWWA Journal :"Integrated resource planning fundamentals"

Planning process		
- Nature of process	Closed, inflexible, and internally oriented	Open, flexible and externally oriented
- Judgement and preferences	Implicit	Explicit
- Conflict Management	Conventional dispute resolution	Consensus-building
- Stakeholders Identity and focus	Utility	Multiple interests
- Stakeholders' role	Disputants	Participants
Planning issues		
- Supply reliability	High priority	A decision variable
- Environmental quality	A planning constraint	A planning objective
- Cost considerations	Direct utility system costs	Direct and indirect costs, including environmental and social externalities
- Role of pricing	A mechanism to recover costs	An economic signal to guide consumption
- Efficiency	An operation concern	A resource option
- Trade-offs	Hidden or ignored	Openly addressed
- Risk and uncertainty	Should be avoided or reduced	Should be analysed and managed

Just as the IWRM study on Water Resources identified that WC/WDM measures can offer alternative solutions to the traditional augmentation of Water Resources, similarly wastewater treatment plants and water supply bulk infrastructure can be significantly influenced by WC/WDM. This is particularly true for wastewater treatment plants where the hydraulic loading is the key constraint. There are numerous South African and international examples were the reduction of water demand has resulted in the postponement or shelving of plans to build additional wastewater treatment plants, bulk sewage pipelines, reservoirs, water supply pipelines and pumps.

The proposed activities of this programme that need to be budgeted for are as follows:

C 3.2.1 Develop a planning protocol to be used by CCT for all Water Services bulk infrastructure planning

C 3.2.2 Implement a retro-fit pilot study in one basin to determine the impact of WC/WDM on wastewater collection and treatment. (part of the cost is linked to activity B5.1.2)

C 3.2.3 Review the possible impact of WC/WDM on the planning of the wastewater system and prioritise certain WC/WDM initiatives. Incorporate WC/WDM into the master plan of the wastewater system. (The cost allocated is only an additional allowance over and above the normal costs of carrying out a sewage master plan.)

C 3.2.4 Review the possible impact of WC/WDM on the planning of the bulk-water supply system and prioritise certain WC/WDM initiatives. Incorporate WC/WDM into the master plan of bulk water supply (The cost allocated is only an additional allowance over and above the normal costs of carrying out the master plan.)

Table 13-9: Budget for determining impact on bulk water supply and wastewater

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C3.2.1	50	0	0	0	0	0	0	0	0	0	50
C3.2.2	0	150	0	0	0	0	0	0	0	0	150
C3.2.3	0	0	200	0	0	0	0	0	0	0	200
C3.2.4	0	150	100	0	0	0	0	0	0	0	250
Total	**50**	**300**	**300**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**650**

13.4 Objective C4: Monitor the impact of WC/WDM measures and KPI

Vital to the sustainability of any WC/WDM strategy is to monitor the impact of various initiatives and also to monitor key performance indicators regarding water supply.

The following programmes are proposed with regards to this objective:

a) Monitor the impact of WC/WDM measures
b) Determine Key performance indicators and benchmarks and evaluate performance

Programme C 4.1 Monitor the impact of WC/WDM

Monitoring the impact of various WC/WDM programmes and measures is essential for the following reasons:

- To calculate the financial benefits of the various measures (this will enable the further motivation for funding of the various programmes).
- To learn from the implementation of the various projects. This will enable the Council to modify and review the WC/WDM strategy and re-prioritise the various initiatives.
- To determine the impact of WC/WDM on water resource and bulk infrastructure planning.
- To enable the assessment of future demand projections more accurately

The monitoring of the impact of the various studies needs to be according to the same evaluation criteria listed in the IWRM study. These are as follows:

- Demand reduction (ie yield)
- Financial
- Socio –economic
- Buy-in
- Environmental

Monitoring of the various interventions can be complicated as it may be difficult to distinguish which initiative has resulted in certain behaviour changes. In order to ensure that there is a uniform approach to monitoring the impact, it is necessary to review and develop a methodology for each criterion and for each WC/WDM programme that is expected to reduce demand.

The monitoring will largely consist of two types of field exercises: monitoring the impact on demand, and monitoring the opinions and understanding of consumers. In order to ensure adequate resources are allocated to this function it is proposed that staff are dedicated to the role of monitoring and analysing all information regarding all of the WC/WDM projects.

The proposed activities of this programme that need to be budgeted for are as follows:

C 4.1.1 Develop a detailed methodology for measuring the performance criteria for each type of WDM project (test and refine)

C 4.1.2 Monitor the impact of all WC/WDM on an ongoing basis

Table 13-10: Budget: Monitor WC/WDM results of WC/WDM

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C 4.1.1	100	0	0	0	0	0	0	0	0	0	100
C 4.1.2	0	300	600	600	600	600	600	600	600	600	5100
Total	**100**	**300**	**600**	**600**	**600**	**600**	**600**	**600**	**600**	**600**	**5200**

Programme C 4.2: KPI & benchmarks on WC/WDM

The WSDP identified the following general KPI for the WC/WDM strategy:

- Bulk water supply targets
- Reduction of per capita consumption
- NRW,
- Effluent recycled

These KPI are further defined and modified. It is also proposed that various levels of KPIs are developed in order to hold accountable various officials and ward councillors for the implementation of WC/WDM. Table 13-11 below indicates the proposed KPI indicator structure. Where there is an "X" it indicates a KPI should be developed. KPI should be developed for the next four years.

Table 13-11: Key performance Indicators structure

Type of KPI	KPI	Whole city	District / bulk	Zone	Suburb
Demand	Bulk water sales	X			
	Growth rate over last 2 years	X	X	X	X
Non revenue demand	Bulk losses	X	X		
	Reticulation losses	X	X	X	
	Apparent losses – metering	X	X	X	
	Apparent losses - billing	X	X	X	X
	Non paying consumers	X	X	X	X
Consumption characteristics	Average domestic per capita cons.	X	X	X	X
	Average industrial consum.	X			X
	Average commercial consum.	X			X
	Minimum night flow		X	X	
Social	Level of payment	X	X	X	X
	Knowledge on WC/WDM	X	X		X
	Views on WC/WDM	X	X		X
Alternative Water Resources	Water reused	X	X		X
	Water recycled	X	X		X
	Borehole water	X	X		X
	Rain harvesting	X	X		X

Benchmarks for each KPI and each level should be developed for the next four years. Table 13-12 should be completed and each person responsible must ensure that the benchmarks are achieved.

Table 13-12: CCT WC/WDM Key Performance Indicators

Type of KPI	KPI	2006	2007	2008	2009	Responsible person
Demand	Bulk water sales					
	Growth % over last 2 years					
Non revenue demand	Bulk losses					
	Reticulation losses					
	Apparent losses – metering					
	Apparent losses - billing					
	Non paying consumers					
Consumption characteristics	Average domestic per capita consum.					
	Average industrial consum.					
	Average commercial consum.					
	Minimum night flow					
Social	Level of payment					
	Knowledge on WC/WDM					
	Views on WC/WDM					
Alternative Water Resources	Water reused					
	Water recycled					
	Borehole water					
	Rain harvesting					

The proposed activities of this programme that need to be budgeted for are as follows:

C 4.2.1 Develop key benchmarks for all KPI and categories, and assign responsibility

C 4.2.2 Monitor the key benchmarks for all KPI bi- annually.

Table 13-13: Budget for monitoring, benchmarks and KPI

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
C 4.2.1	100	100	50	50	50	50	50	50	50	50	600
C 4.2.2	0	50	50	50	50	50	50	50	50	50	450
Total	**100**	**150**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**1050**

13.5 Objective D1: Ensure adequate financial resources

The biggest obstacle to the sustainable implementation of WC/WDM is perhaps the allocation of adequate financial resources. The budget of CCT's Water Department has been significantly reduced during the 2003/2004 financial year and again during the 2006/2007 financial year, which had a negative impact on a number of very important functions including WC/WDM. There are a number of challenges that are affecting the availability of funds for the water department's budget requirements. They are the current financial situation of the CCT overall finances, the current water tariffs, the high level of outstanding debt, the funding of the Berg river water resource project and the large infrastructure budget required for wastewater and water supply projects to meet the development needs. The lack of "ring-fencing" of the Water Services department at CCT is however perhaps the biggest challenge that has an impact on budgets.

WC/WDM was often considered one of the first programmes to be affected whenever there were budget reductions. In contrast, most of the WC/WDM projects will actually result in a financial benefit to the Council and should not be considered a liability. As indicated in the previous chapters, the overall implementation of WC/WDM could result in a financial benefit exceeding R 200 million per year. The problem is that such savings are not direct and are often not recognised. Furthermore, such savings occur over a window of five to ten years but budgeting and financial planning in CCT occurs on a yearly basis.

There are two main programmes proposed to ensure adequate financial resources for WC/WDM.

a) The first is the establishment of a WC/WDM fund, which must be replenished from the savings achieved from WC/WDM and the revenue collected from the sale of treated and from the water restriction levy.

b) Seeking funding and joint ventures

Programme D1.1: Establishment of a WC/WDM fund

In order to overcome the financial constraint to WC/WDM it is proposed that 7% of the water department's operational budget is initially allocated to WC/WDM related projects (i.e. approximately R 70 million per year). Consideration should also be given to maintaining the 10% water restriction tariff in order to fund WC/WDM. It is proposed that the Water Restriction Fund should be changed and referred to as the Water Conservation Fund. In addition to the WC fund a fictitious savings fund should be established which calculates the savings resulting from WC/WDM measures. The savings fund should be replenished by the calculated financial benefits from the projects implemented the previous year. The following illustrates an example of how the funding of WC/WDM should be structured.

Table 13-14: WC/WDM savings fund

Year	From budget R x 1000	Savings fund - R million			Total WC/WDM R x 1000
		Total savings	Used for WC/WDM	Surplus	
1	47685	0	0	0	47685
2	66335	23843	23843	0	90177
3	0	81159	55740	25419	55740
4	0	89184	51245	37939	51245
5	0	81992	48190	33802	48190
6	0	77104	39960	37144	39960
7	0	63936	35030	28906	35030
8	0	56048	35080	20968	35080
Total	114020	473266	289088	184178	403107

Example:

- In year 4 the savings achieved (R 88 864 000) from year 3 are calculated as 1.6 x the total investment made in year 3 (R 55 540 000 x 1.6)
- The amount needed for the WC/WDM strategy in accordance with the summary cost tables is R 51 395 000.
- The surplus is the difference between the amount saved and the amount needed R 88 864 000 – R 51 395 000)

It should be noted that some of the WC/WDM related projects will not yield a direct saving but are necessary in order to sustain the KPI. The above model indicates however that in principle, the total amount to be spent on WC/WDM will be recovered in savings and there will be a surplus.

There is no cost allocation for any of the activities required under this programme. The measures that should be implemented under this programme are as follows:

D1.1.1 Allocate an initial budget for WC/WDM of R 47.7 million for the first year and R 90.4 million for the second year.

D 1.1.2 Develop an agreed methodology for calculating the financial savings achieved from the various WC/WDM measures

D1.1.3 Establish a fictitious WC/WDM fund that money is allocated from the savings achieved.

D1.1.4 Retain the current 10% water restriction tariff and rename it as the WC/WDM tariff

Programme D1.2: Seek funding and joint ventures

There are a number of possible avenues to obtain donor funding. Some of these are as follows:

- MIG. Municipal Infrastructure Grant
- Directly from DWAF
- Foreign Aid institutions

Although the Municipal Infrastructure Grant is primarily for service provision projects, CCT should hold discussions with the management of the fund to consider the possibility of funding a number of the proposed WC/WDM projects.

DWAF's available budget to assist in WC/WDM projects may not be significant but it is important to initiate a number of WC/WDM joint ventures. DWAF's direct involvement in some of the WC/WDM initiatives can assist in achieving a more common understanding on the role of WC/WDM.

Joint ventures with private business could assist with the cost of a number of WC/WDM related activities. The following type of joint ventures should be considered:

1. Joint advertising campaigns or sponsorships. Private companies who have an environmental programme could be approached to sponsor various WC/WDM advertising campaigns. (i.e. Netbank environmental fund)
2. Water intensive companies could be approached to fund water leaks projects during droughts instead of reducing the water allocation to them.

Consideration should also be given to appointing service providers for various projects on a risk reward basis. The advantages of such an approach are, however, not important because most projects will not yield any direct financial savings.

There is no cost allocation for any of the activities required under this programme. The measures that should be implemented under this programme are as follows:

D1.2.1 Hold discussion with manager for MIG fund

D1.2.2 Apply for MIG funding on numerous WC/WDM measures

D1.2.3 Identify joint venture projects with DWAF

D1.2.4 Develop a risk reward pilot project

D1.2.5 Identify and approach private companies with environmental campaigns for sponsorships or joint advertising.

D1.2.6 Hold discussions with water intensive industries

13.6 Objective D2: Ensure adequate human resources and processes

The human resource issue must be addressed under the following programmes:

a) Development of a suitable WDM section
b) Development of working procedures and responsibilities for all Water Services sections

The majority of the human resources capacity to implement the WC/WDM strategy will be from the reticulation section and the new proposed WDM section. The development of a suitable WDM section is described in programme D2.1 and the human resource requirements for the reticulation section as well as other sections within CCT are described in programme D2.2.

Programme D2.1: Development of a suitable WDM section

Ensuring adequate human resources to implement the WC/WDM strategy on a sustainable and long-term basis is essential. Figure 13-3 illustrates the proposed organisation structure that is in line with the recommendations and proposals of the various programmes and projects.

Under the WDM manager there will be five sub sections and the following proposed positions:

a) **WC/WDM Reticulation sub-section**. This sub-section will deal mainly with the reduction of water losses and pressure management. Its role is to work closely with the reticulation section and coordinate the implementation of various WC/WDM initiatives. The following staff are proposed under this sub-section:

   WC Reticulation engineer: Responsible for all the activities under this sub-section. Estimated average budget responsible for is approximately R 11 million per annum. Will also be directly responsible for determining and analysing the level of NRW.

   Leak detection technicians x 2: Responsible for identifying reticulation leaks using specialised equipment.

   PRV technician: Responsible for the installation and settings of all PRV and control valves.

   Zone meter technician: Responsible for reading all bulk meters, ensuring integrity of zones and placing data loggers for MNF analysis.

   Telemetry technician: Responsible for maintaining all telemetry equipment associated with WDM and maintaining the communication linkages with the MIS.

b) **WC/WDM communication and media sub-section**. This sub-section will deal with general awareness, marketing, education, promotions and media related activities of the strategy.

   Communication and media co-ordinator: Responsible for all the activities under this sub-section. Estimated average budget responsible for is approximately R 7.4 million per annum.

   CLO high-income areas x 4: Responsible for communicating, interacting with consumers in the high-income areas. Will be directly involved with a number of projects, particularly retro-fitting and water audits.

   CLO supervisors low-income areas x 2: Responsible for communicating, interacting with consumers in the low-income areas. Will be directly involved with the special projects in such areas as described under objective A.2. Their main functions will be to supervise and manage CLOs hired from the community.

   School education officer x 2: Responsible for implementing all WC/WDM related initiatives in schools.

   Media, publications and web officer: Responsible for all media releases, for organising general events and exhibitions, for answering any quires from the public and maintaining the web page on WC/WDM.

c) **WC/WDM research and conservation sub-section**. This sub-section will deal with most research functions as well as water resource conservation related activities. (i.e. pollution control).

   WC/WDM research and conservation coordinator: Responsible for all the activities under this sub-section. Estimated annual budget responsible for is approximately R 6.7 million per annum.

   WC/WDM officers; Responsible for clean-up river campaigns and implementing various projects on alternative Water Resources.

Ground Water officer: Responsible for research and analysis on ground water as well as promoting and monitoring the use of ground water by consumers.

MIS analyst: Responsible for maintaining, updating and carrying out standard reports on the MIS system. Will also be responsible for monitoring KPI.

Research analyst: Responsible for managing any research project and compiling reports. Will also be responsible for monitoring the impact of all WC/WDM projects.

Administration and data capturing: Responsible for entering on the MIS all data obtained from audits and questioners for the various projects. Will also be responsible for clerical functions of the various projects.

d) **WC/WDM Large projects sub-section**. This sub-section will deal with the project management of all large-scale WDM projects. These will include the comprehensive leak projects in low-income areas, the development of the recycling plants and the implementation of large-scale retro fitting projects.

WC/WDM special projects principal engineer: Responsible for all the activities under this sub-section. Estimated annual budget responsible for is approximately R 19 million per annum. Will also be directly responsible for project managing some of the projects.

Project chief technicians: Responsible for project managing the implementation of the various projects.

Project support technicians: To assist chief technicians in various tasks including monitoring work completed, processing invoices, and payments of suppliers and contract workers.

Plumbing leak repair teams x 8: Responsible for identifying and repairing leaks as well as retro-fitting new plumbing fittings in all low-income areas. (these may be contract workers rather than full time employees)

e) **Consumer demand management sub-section**. This sub-section will deal with most support initiatives to consumers in all areas except in low-income areas which are dealt with under the large projects sub-section.

Consumer Demand Management coordinator: Responsible for all the activities under this sub-section. Estimated annual budget responsible for is approximately R 5.6 million per annum. Will also be directly responsible for managing some of the projects.

Large consumer advisors x 2: Responsible for supporting and auditing the water supply and effluent discharge of all large consumers throughout CCT. Their functions will also include advising the consumers on how to reduce their water consumption and checking the meters for accuracy.

Enforcement officer x 5: Responsible for ensuring that all by-laws and standards as well as any water restrictions are enforced. Their role will be to police and fine offenders.

Water audit domestic consumers x 4: Responsible for carrying out water audits at consumers premises. They will either respond to requests by consumers or carry out sample audits as part of an ongoing research.

Plumbing expert: Responsible for managing the implementation of a plumber's registration initiative, managing the plumbing industry forum, carrying out research on various plumbing fittings and managing a number of related pilot projects (i.e retro fitting of Council buildings)

Horticultural expert: Responsible for managing the horticultural industry forum, implementing a number of waterwise gardens, advising the parks department, carrying out related research and implementing a number of related pilot projects.

Due to the significant challenge of implementing such a comprehensive strategy, it is proposed that for the first two years a **specialist professional service provider** should also be hired on contract basis to assist the WDM manager. Such a specialist should assist the WDM manager in getting the WDM section established and initiating most of the programmes in the strategy.

Allowance for training and capacity building of all new posts must be made. Such training could include the following activities:

a) Study tours
b) Enrolment on tertiary education costs
c) Attending international and national conferences and workshops
d) Carrying out literature research

The proposed activities of this programme that need to be budgeted for are as follows:

D2.1.1 Develop job descriptions and get approval for organisation structure and new posts

D2.1.2 Advertise and fill in new posts

D2.1.3 Train and support capacity building of new employees

D2.1.4 Employee a specialist service provider on a 2 –year contract basis

Table 13-15: Budget development of suitable WC/WDM section

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
D2.1.1	200	0	0	0	0	0	0	0	0	0	200
D2.1.2	100	100	0	0	0	0	0	0	0	0	200
D2.1.3	100	100	100	100	100	100	100	100	100	100	1000
D2.1.4	cost spread over budgets of various programmes										0
Total	**400**	**200**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**1400**

Programme D2.2: Development of WC/WDM working procedures and responsibilities

The human resource requirements are not limited to the appointment of various new posts and also relate to working environment, working processes and work ethic amongst the various sections within the water department. People who will be involved with WC/WDM can be divided into the following categories:

a) Personnel who have to change the way they perform their current work. (For example a plumber may now have to sometimes do preventative maintenance rather than reactive maintenance)

b) Dedicated WC/WDM personnel. These employees will have dedicated responsibilities
c) Personnel whose scope of work will increase. These will be employees whose current scope of work will increase to include the implementation of various WC/WDM functions.
d) Managers who will be responsible for performance against the various key performance indicators.

The following types of working procedures are proposed for the staff that will be involved with WC/WDM:

1. All consumers will be considered ambassadors to WC/WDM.
2. Training and capacity building
3. Regular feedback
4. Reporting and performance management according to WC/WDM KPIs
5. Matrix approach
6. Regular team meetings
7. Incentive bonuses linked to demand reduction achievements.

It is imperative that the responsibilities of the other sections within the water department are also adequately addressed. In this regard, it is proposed that service level agreements or memoranda of agreements between the various sections are developed and signed.

The proposed activities of this programme that need to be budgeted for are as follows:

D2.2.1 Develop responsibilities for various sections and sign service level agreements between the various sections

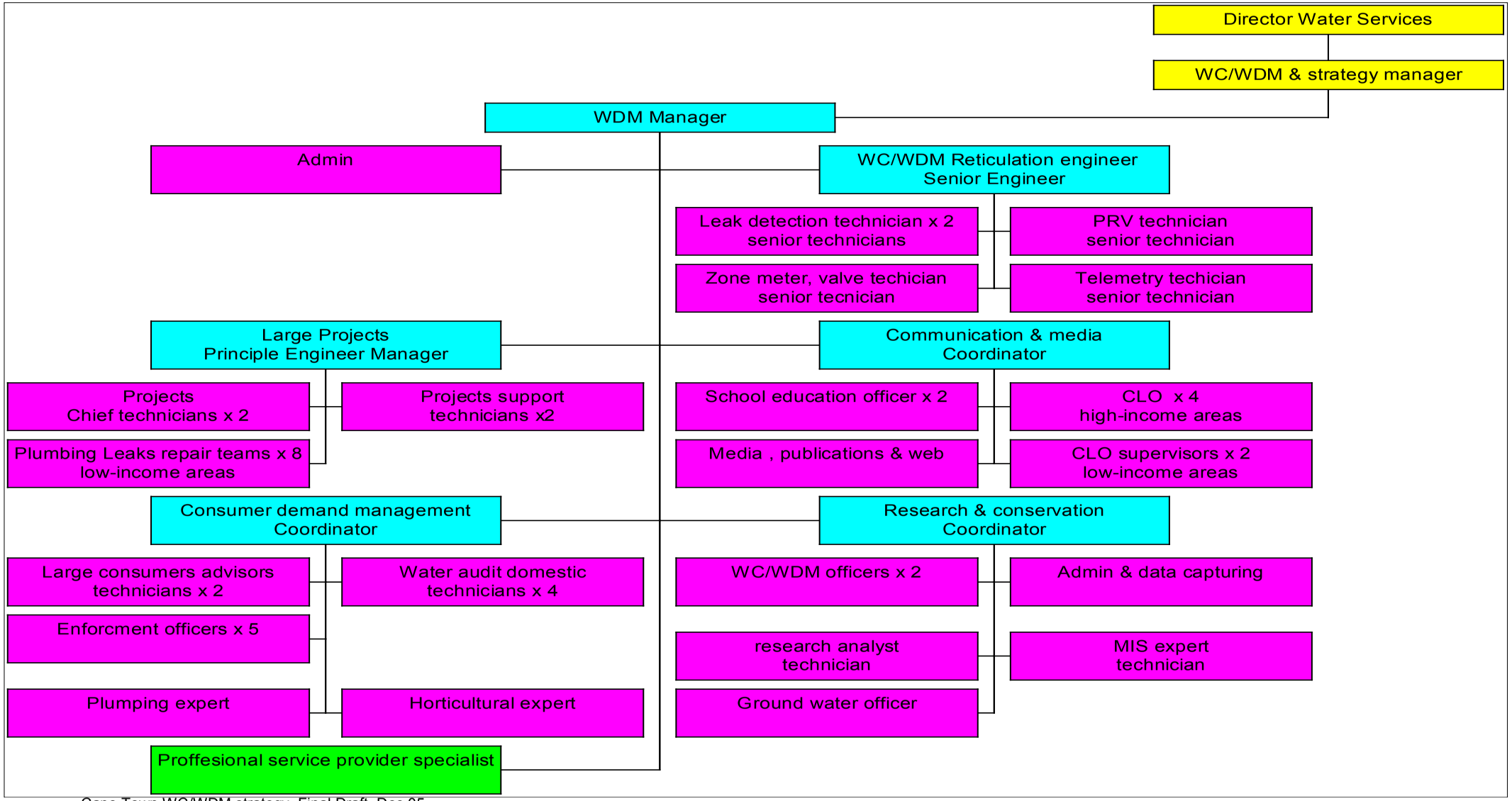
D2.2.2 Develop a WC/WDM working procedure and ethic policy

D2.2.3 Determine new job functions within reticulation section, re-allocate personnel to WC/WDM related functions and modify, if necessary, employees job descriptions.

Table 13-16: Budget WC/WDM working procedure and responsibilities

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
D2.2.1	50	0	0	0	0	0	0	0	0	0	50
D2.2.2	50	0	0	0	0	0	0	0	0	0	50
D2.2.3	0	100	0	0	0	0	0	0	0	0	100
Total	**100**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**200**

Figure 13-3: Proposed organization chart for the WC/WDM section



13.7 Objective D3: Ensure adequate transparency, stakeholder buy in and commitment

The following programmes are proposed with regards to this objective:

a) Political and management buy-in
b) Partnerships, cooperation, collaboration and integration with other government bodies, and key stakeholders including DWAF
c) Ensure public participation and transparency

Programme D3.1: Political and management buy -in

A sustainable WC/WDM programme is a relatively new function within most municipalities within South Africa and senior management and Councillors do often not appreciate it. CCT's current senior management and Council commitment level however is very high due to the ongoing water restrictions and drought over the last few years. It is important however that this commitment and buy-in is maintained and intensified to ensure adequate support for the strategy.

An annual workshop with Councillors is deemed necessary to explain the various aspects of WC/WDM and the strategy. Unlike supply side management, Councillors need to be better informed on WC/WDM because of the various activities that directly influence consumers. Councillors also need to become ambassadors of WC/WDM and assist the WDM section to gain the support and cooperation of the public.

Political champions and patrons could also play an important role in enhancing the image and profile of WC/WDM. It is important that respected political leaders are seen in the forefront of WC/WDM. The message that political patrons and champions need to bring across is that WC/WDM applies to all, it is a noble cause and it is to the benefit of society at large.

It is also proposed that consideration should be given for WC/WDM to become a **Mayoral Flagship Project**. By making WC/WDM a Mayoral Flagship Project it will raise the profile and importance of WC/WDM. The motivation for proposing that WC/WDM is made into a Mayoral Flagship Project is as follows:

- The consequences of not implementing a WC/WDM strategy adequately could result in long-term water supply shortages for Cape Town.
- It will improve level of services and ensure sustainability and affordability in low-income areas.
- It will result in significant long-term financial savings for Cape Town.
- It will optimize water supply efficiency and reduce Non-Revenue Water to optimal levels.
- It can help alleviate a number of the bulk infrastructure constraints in both the water supply and effluent systems.

The proposed activities of this programme that need to be budgeted for are as follows:

D3.1.1 Hold annual workshops with Councillors

D3.1.2 Appoint political champions and patrons / Mayoral Flagship project

D3.1.3 Submit annual progress report to Council

D3.1.4 Carry out pilot retrofit programme to Councillors and senior management

Table 13-17;Budget Political and management buy-in

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
D3.1.1	20	20	20	20	20	20	20	20	20	20	200
D3.1.2	100	100	100	100	100	100	100	100	100	100	1000
D3.1.3	0	0	0	0	0	0	0	0	0	0	0
D3.1.4	0	50	100	0	0	0	0	0	0	0	150
Total	**120**	**170**	**220**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**1350**

Programme D3.2: Partnerships and cooperation with other institutions

WC/WDM can be aligned to a number of objectives and functions of different institutions and stakeholders, therefore, making it feasible to create partnerships that will assist in implementation. Some of the potential benefits that partnerships should strive to achieve are as follows:

a) Assistance in implementing various activities
b) Financial support
c) Assistance in changing consumer opinions, perceptions, knowledge.
d) Avoiding duplication and mixed messages
e) Sharing of information and experiences

The level of interaction with various stakeholders will vary between the different stakeholders. Some of the proposed stakeholders that CCT should engage with are as follows:

1. DWAF
2. Department of Provincial and Local Government (DPLG)
3. Western Cape Provincial Government
4. Community based NGOs
5. Other metro municipalities
6. Neighbouring municipalities
7. Other large water consumers in the Western Cape

Of great significance is CCT's proposed interaction, co-operation and potential partnership with neighbouring municipalities and other large consumers in the Western Cape. The aim of such interaction would be to assist each other in reducing the water resource problems they share.

The following are some of the specific campaigns that CCT needs to directly interact with and possibly align with:

a) CCT's electricity demand management campaign as well as ESKOM's campaign.
b) Western Cape provincial government's environmental campaign.
c) DWAF WC/WDM campaign

There is no cost allocation for any of the activities under this programme. The measures that should be implemented are as follows:

D3.2.1 Hold regular discussions with other water users in the region and identify any joint ventures.

D3.2.2 Hold discussions with the electricity department and Eskom explore the possibility of joint initiatives and aligning each other's strategy.

D3.2.3 Hold discussions with other key stakeholders with environmental campaigns and explore the possibility of aligning each other's strategy.

Programme D3.3: Transparency and public participation

The success of a large section of the WC/WDM strategy will depend on the acceptability of the strategy by the community and key role players. Before large-scale acceptance is obtained from the public, a number of perceived constraints will need to be overcome. Some of these are as follows:

1. Consumers may have a preference for further water resource augmentation instead of a comprehensive WC/WDM strategy
2. Consumers may not trust the Council
3. Consumers may not fully understand the strategy and the motivation
4. Consumers may reject any activity within their homes, due to security and privacy.

A launch event of the strategy is deemed important to signal the start of a more supportive approach to water use efficiency. Such a launch should be carefully planned and organised and headed by a political champion and patrons. The launch can signify to the public the following key aspects:

- Council's commitment to ensuring sustainable service delivery for all
- Council's commitment to environmental protection
- Council's commitment to distribution efficiency
- Council's commitment to supporting consumers to become water efficient
- Council's commitment to ensuring financial efficiency

The proposed activities of this programme that need to be budgeted for are as follows:

D3.3.1 Publish and print 2000 copies of a summary version of the strategy

D3.3.2 Hold individual meetings with key stakeholders

D3.3.3 Advertise the strategy and invite public comment

D3.3.4 Hold various community workshops to discuss the strategy

D3.3.5 Hold a launch event for the strategy

D3.3.6 Establish a stakeholder and community representative advisory committee

Table 13-18: Budget, transparency and public participation

No.	Year 1 x R 1000	Year 2 x R 1000	Year 3 x R 1000	Year 4 x R 1000	Year 5 x R 1000	Year 6 x R 1000	Year 7 x R 1000	Year 8 x R 1000	Year 9 x R 1000	Year 10 x R 1000	Total
D3.3.1	50	0	50	0	50	0	50	0	0	0	200
D3.3.2	0	0	0	0	0	0	0	0	0	0	0
D3.3.3	50	0	50	0	50	0	50	0	0	0	200
D3.3.4	50	50	0	0	0	50	50	0	0	0	200
D3.3.5	0	100	0	0	0	0	0	0	0	0	100
D3.3.6	0	0	0	0	0	0	0	0	0	0	0
Total	**150**	**150**	**100**	**0**	**100**	**50**	**150**	**0**	**0**	**0**	**700**

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