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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

WC WSS Reconciliation Strategy

Status Report
October 2014

Report

to the

Strategy Steering Committee

October 2014

Department of Water and Sanitation
Directorate National Water Resource Planning

SUPPORT TO THE CONTINUATION OF THE WATER RECONCILIATION STRATEGY FOR THE WESTERN CAPE WATER SUPPLY SYSTEM

STATUS REPORT OCTOBER 2014

APPROVAL

TITLE	:	Support to the Continuation of the Water Reconciliation Strategy for the Western Cape Water Supply System Status Report October 2014
DWS REPORT NO.	:	
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REPORT STATUS	:	Final
DATE	:	October2014

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REFERENCE

This report is to be referred to in bibliographies as :

Department of Water and Sanitation, South Africa. 2014. *Support to the Continuation of the Water Reconciliation Strategy for the Western Cape Water Supply System: Status Report October 2014*. Prepared by Umvoto Africa (Pty) Ltd in association with WorleyParsons on behalf of the Directorate : National Water Resource Planning. DWS Report No.

WC WSS Reconciliation Strategy – Status Report October 2014

Executive Summary

In early 2005, the then Department of Water Affairs and Forestry (DWAF), as the custodian of the country's water resources, in partnership with the City of Cape Town (CCT), commissioned the Western Cape Reconciliation Strategy Study to facilitate the reconciliation of predicted future water requirements with supply available from the Western Cape Water Supply System (WCWSS) for a 25-year planning horizon. The Strategy is used as a decision-support framework for making timeous and informed recommendations on those interventions that should be implemented to meet the future water requirements.

The total 'adjusted' water use in the Western Cape Water Supply System (WCWSS) in 2013/14 (based on releases from the dams and the capped allocation for the agricultural sector) was about 508.1 million m^3. Two-thirds (338.1 million m^3) was for urban use and the remainder (an estimated 170 million m^3) was allocated for irrigation (see **Table 1**). Due to the good winter rains and the fact that most of the dams of the Western Cape Water Supply Scheme (WCWSS) are nearly full, there is no need for implementing restrictions.

Table 1: Current consumption vs. Allocations and System Yield [million m^3/a]

	Allocations	2012/2013	2013/2014	System yield
CCT	385.90	312.92	306.77	
WC DM	21.64	25.29	26.86	
Stellenbosch	3.00	3.00	4.01	
Agriculture, capped	173.60	169.00	170.00	
Total	**584.14**	**510.21**	**507.65**	**596.00**

This is also partly due to the effort by the CCT and other municipalities to reduce their water consumption and water losses. The City has seen negative growth of its water requirements for the third consecutive year, despite the population increase. The non-revenue water was cut down to 21.8%, while the water losses were contained below the target of 15%, in 2013/14. The other municipalities supplied from the WCWSS have maintained their low water losses over the last years, but could not curb the increase in water requirements (see **Table 2**). However, the total savings of the domestic and industrial sector was 74 million m^3 in 2013/14, measured against the water requirement scenario from the original Reconciliation Strategy (DWAF, 2007).

Table 2: Actual vs. planned domestic use and achieved savings [million m^3/a]

	CCT		Municipal		Total Domestic		Savings
	Planned (2006/07)	Actual use (2013/14)	Planned (2006/07)	Actual use (2013/14)	Planned (2006/07)	Actual use (2013/14)	
2010/2011	344.39	326.27	34.56	26.63	378.95	352.90	26.05
2011/2012	353.00	322.04	36.52	27.05	389.52	349.09	40.43
2012/2013	361.82	312.92	38.60	28.29	400.42	341.21	59.21
2013/2014	370.87	306.77	40.79	30.88	411.66	337.65	74.02

Note: Planned domestic use is based on the original Water Reconciliation Strategy (DWAF, 2007)

Since the domestic use is the biggest sector supplied from the WCWSS and the use of the agricultural sector is capped, the decrease in domestic water consumption resulted in a decrease of the total water consumption from the WCWSS over the last three years (see **Table 3**).

Table 3: Actual vs. planned domestic and agricultural use [million m^3/a]

	Total Domestic		Agriculture		Total Use		
	Planned	Actual use	Capped	Actual use	Planned	Actual use	Adjusted
2010/2011	378.95	352.90	167.00	174.30	545.95	527.20	519.90
2011/2012	389.52	349.09	169.00	171.74	558.52	520.83	518.09
2012/2013	400.42	341.21	169.00	158.55	569.42	499.76	510.21
2013/2014	411.66	337.65	170.00	160.00 *)	581.66	497.65	507.65

Note: *) Actual agricultural use assumed, as available data not sufficient.
Adjusted water use refers to the actual domestic use plus the current capped volume for agriculture

The planning scenario (based on high water requirement growth, 50% success of water conservation and water demand management measures and no impact of climate change) indicates that the Western Cape Water Supply System's water requirements will exceed the current supply in 2022. A new supply intervention needs to be in place by that time and a decision on which intervention to implement first must be made by the October 2015 meeting of the SSC.

The DWS, the City and other municipalities are undertaking various feasibility studies to decide which potential augmentation interventions should be implemented by 2022, and their sequence. The four possible interventions that could be ready for implementation in 2022 are the Berg River-Voëlvlei (Phase 1) augmentation scheme - diverting surplus winter water into Voëlvlei Dam; seawater desalination; water re-use; and the Table Mountain Group (TMG) Aquifer.

The following recommendations follow from the assessment of the current water requirements and updated scenario planning:

1. The CCT and other municipalities must actively continue with the implementation of their approved and updated WC/WDM Strategies – Responsibility CCT, West Coast DM, and relevant LMs.
2. Regular reviews of the Reconciliation Strategy should continue in order to ensure the objectives and targets set by the Strategy are achieved – Responsibility SSC and ATSG
3. The assumptions made in the 2007 Reconciliation Strategy and in the updated CCT WC/WDM Strategy in terms of population growth projections, economic growth projections and anticipated service delivery programmes should be reviewed and updated in order to ascertain whether the assumptions surrounding the development of the High Water Requirement curves are still valid – Responsibility CCT, West Coast DM, and relevant LMs.
4. The feasibility studies required and identified in the 2007 Reconciliation Strategy Study and the 2014 Scenario Planning update need to continue or start.
5. A monitoring system must be put in place to serve as an early warning whether climate change has started to impact on water availability and/or water requirements.
6. The monitoring of the water consumption and water losses by the agricultural sector has improved, but requires further improvement so that the data is available in time for updating the water balances and water requirement scenarios. In addition, measures must be put in place to optimise the releases for the agricultural sector and reduce the water losses in canal distributions – Responsibility SSC, ATSG and agricultural sector.
7. The legality of the allocations from the system for the different sectors and users must be clarified and agreed upon by DWS and all stakeholders – Responsibility ATSG.
8. The Water Resources Yield Model (WRYM) and the Water Resources Planning Model (WRPM) need to be updated with the latest water consumption data and water requirement scenarios to confirm the available yield from the system – Responsibility ATSG.
9. The Reconciliation Strategy for the WCWSS should be re-assessed in October 2015 when actual water use numbers for 2014/15 have been verified from all user sectors and adjusted where required – Responsibility SSC and ATSG.

WC WSS Reconciliation Strategy – Status Report October 2014

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1 Introduction

1.1 WC WSS Reconciliation Strategy

In early 2005, the then Department of Water Affairs and Forestry (DWAF), as the custodian of the country's water resources, in partnership with the City of Cape Town (CCT), commissioned the Western Cape Reconciliation Strategy Study to facilitate the reconciliation of predicted future water requirements with supply available from the Western Cape Water Supply System (WCWSS) for a 25-year planning horizon. The Strategy is used as a decision-support framework for making timeous and informed recommendations on those interventions that should be implemented to meet the future water requirements. The extent of the WCWSS is shown in Appendix A.

The WCWSS comprises several dams, mostly located in the upper regions of the Berg River and Breede River catchments. The system supplies raw water to the CCT, the West Coast District Municipality (DM) for domestic supply to Swartland Local Municipality (LM), Saldanha Bay LM and Bergrivier LM, the Stellenbosch LM to augment the supply to Stellenbosch, and to agricultural users downstream of the Berg River Dam, Voëlvlei Dam and Theewaterskloof Dam. Treated water from the CCT's treatment works is provided to several towns close to the treatment works and bulk transfer pipelines.

The Strategy was completed in 2007 and since then it has been reviewed and regularly updated by the Strategy Steering Committee.

1.2 Strategy Steering Committee

One of the recommendations of the Reconciliation Strategy Study was that a Strategy Steering Committee (SSC) be formed with a clearly defined mandate and scope of work.

The objectives of the SSC are:

- To ensure and monitor implementation of the recommendations of the WC Reconciliation Strategy;
- To ensure that the necessary studies by the responsible institutions identified in the Strategy, are started timeously to ensure continued reconciliation of water supply and requirements;
- To update the Strategy to ensure that it remains relevant; and
- To ensure that the Strategy, its recommendations and progress with the implementation are appropriately communicated to all stakeholders.

The SSC has met ten times since the Strategy was completed in May 2007, with a hiatus between November 2011 and August 2013. The Committee is functioning as it was intended and the stakeholders and water users of the WCWSS actively partake and provide feedback in the meetings. The current list of SSC members is contained in Appendix B.

An Administrative and Technical Support Group (Support Group) was formed to support the SSC. The Support Group consists of *inter alia* representatives from the Department of Water and Sanitation (DWS) National Office (Directorates of National Water Resource Planning, Water Resource Planning Systems and Options Analysis), the DWS National Water Resource Infrastructure Branch, the DWS Western Cape Regional Office and the CCT (Water and Sanitation Department: Bulk Water and WDM & Strategy Branches). The Support Group meets between the SSC meetings to ensure that the recommendations following from the strategy and committee meetings are implemented.

This Status Report provides an update of the Strategy based on information received from the different users and stakeholders by October 2014.

2 Water Availability

2.1 System Yield

The WCWSS mainly comprises the following dams, which are mostly located in the upper regions of the Berg River and Breede River catchments (see **Figure 1** and **Appendix 1**):

- Theewaterskloof Dam on the Riviersonderend River
- Wemmershoek Dam
- Upper Steenbras Dam
- Lower Steenbras Dam
- Voëlvlei Dam
- Berg River Dam

The system supplies raw water to two major sectors; viz. domestic & industrial users (CCT, other municipalities and Overberg Water) and agricultural users (WUA's and irrigation boards).

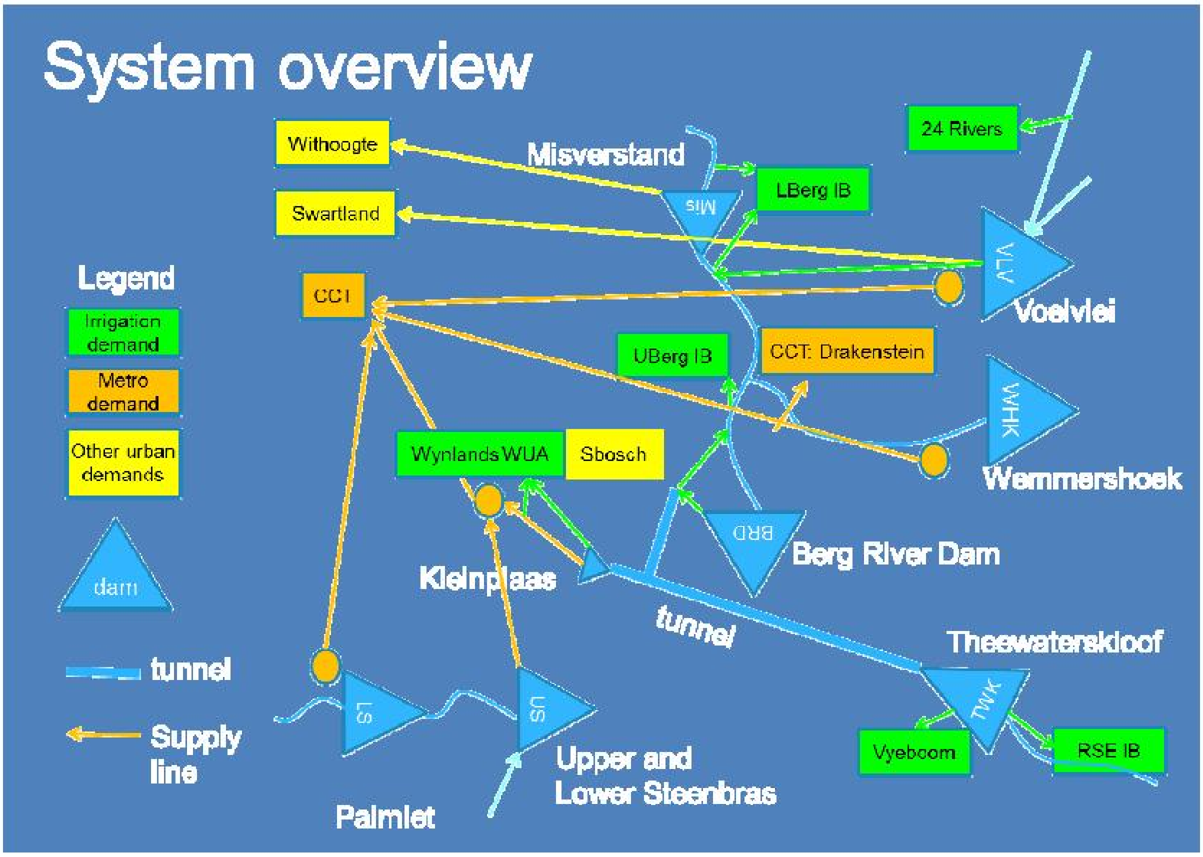


Figure 1: System Overview (DWA, 2012)

The Berg Water Availability Assessment Study by the then DWAF showed that the integrated historical firm yield of the system remained at 556 million m³/a. However the 1:50 year stochastic yield, determined with DWS's Water Resource Planning Model (WRPM) showed that the sum of the increases of the standalone 1:50 year yields of the individual dams could result in a combined yield of 579 million m³/a. This is however not the full yield of the system and an additional approximately 19 million m³/a is available if all the dams are managed and operated as a system so as to maximise the water resource situation at the end of winter each year. The updated total integrated system yield at a 98% level of supply assurance for all user categories is therefore 596 million m³/a.

The **579 million m³/a** is based on generating long-term characteristic curves and determining the yield of the system using the Water Resource Yield Model (WRYM), primarily from the major dams in the system. It excludes:

- the abstraction by the 24 Rivers Irrigation Board upstream of the Voëlvlei Dam, and,
- the CCT's small local schemes (so their water requirement is reduced by 14 million m³/a).

The abstraction by Paarl from the Berg River (although an abstraction of 0.9 million m³/a and a return flow of 8.9 million m³/a is modelled) is not reported in the water requirement table of the system and is treated like the diffuse irrigation from farm dams in the system.

The **596 million m³/a** is obtained from the Water Resource Planning Model (WRPM), rather than the WRYM. It is deduced from the maximum annual water requirements that the system can supply it before the risk of curtailments become too great. This yield depends on the operating rule applied including the severity of the curtailments that can be applied to irrigation.

The yields of the individual dams, as determined prior to the Berg WAAS, are given in **Table 4** for reference purposes.

Table 4: Capacity and yield of the dams and the system (DWA, 2012), based on legacy hydrology

Dam	Capacity [million m³]	Yield [million m³/a]
Theewaterskloof Dam	432	219
Voelvlei Dam	158	105
Wemmershoek Dam	58	54
Upper Steenbras Dam	30	40
Lower Steenbras Dam	34	
Berg River Dam	127	80
Palmiet		23
Compensation		38
Additional yield from integration		11
Total	**839**	**570**

A limited assessment was performed to examine the sensitivity of the augmentation date to various assumptions underlying the WRPM inputs (DWS, 2014). Some of the results of this limited assessment are outlined below for the following selected scenarios:

a) Original assumptions of the November 2013 Annual Operating Analysis (AOA) but with increased WDM-related savings from 33% to 80% of estimated 100% savings (the 2012/2013 measured saving is well above 80%).
b) Case (a) plus reducing maximum curtailment on urban supplies from 29% to 20% (current measures will not support curtailment of more than 20%).
c) Case (b) plus reduced agricultural supply reliabilities by increased curtailments from an average of 30% to an average of 50% across the recurrence intervals of failure of supply (once agricultural consumption reaches agricultural allocation limits, lower agricultural reliabilities kick in).
d) Case (b) plus increased water supply to Lower Berg IB of 20 million m³/a (currently the major dams are supplying about 20 million m³/a in excess of the total allocation along the Berg River).

According to scenario b) the system can meet the water requirements of 2018 (566 million m³/a) but fails in 2019 with a water requirement of 582 million m³/a. One can deduce that the WRPM yield for scenario b) is between 566 and 582 million m³/a. This yield is less than the previously reported WRPM yield of 596 million m³/a but very similar to the 1 in 50 year yields reported earlier. It must be noted that the water requirement growth scenario used for the model differs from the requirement scenarios used for the reconciliation scenarios in this report (see **Section 5.3**).

At present, the irrigators, who are not using their full allocation from the system, are receiving water at the same reliability as the urban consumers. However, when their consumption rises to equal their allocation or when their allocation from compulsory licensing has been finalized, then water will be provided at a lower reliability unless specific arrangements are made to obtain water at an increased reliability. This change in the level of supply assurance would further increase the yield of the system.

As stated above, the WRPM yield of the system also depends on the agreed operational rules, especially for drought situations. Changing the operational rules, e.g. lowering the targeted water level in the dams during dry years without restrictions, could result in an increase in available yield.

The water availability of the system also depends on the developments and water use in upstream catchments; e.g. the Klein Berg River (Tulbagh WUA), the 24 Rivers (24-Rivers Irrigation Board) and the La Motte Irrigation Board. It is recommended that their water use is clarified and modelled and the WRYM updated accordingly.

2.2 Allocations

The allocations of water from the system to the different users are currently based on the Raw Water Supply Agreement between the Department of Water Affairs and the City of Cape Town (DWAF, 2003) that was drawn up prior to the construction of the Berg River Dam. Annexure C of the Agreement stipulates the guiding principles and the actual allocations of the available yield (see **Figure 2**).

TABLE C2

RIVIERSONDEREND (RSE)/BERG RIVER SYSTEM
ADOPTED 2002/2003 SECTORAL ALLOCATIONS FOR WATER PRICING PURPOSES
(million m^3 per annum)

	Domestic/ Industrial	Irrigation	
Berg River (Voëlvlei & Misverstand Dams)		Current	Capped
Cape Town	70,4		
Swartland	4,2		
WCDC	18,6		
PPC	0,8		
Piketberg	0,7		
LBR IB		18,1	18,1
Totals	94,7	18,1	18,1
RSE / BR (Theewaterskloof Dam)			
Overberg Water	4,0		
Zonderend IB		30,8	31,5
Vyeboom		13,2	13,2
Pump from TWK Dam		1,5	1,5
Totals Riviersonderend Supply Area	4,0	45,5	46,2
Cape Town (Fixed)	90,0		
Stellenbosch	3,0		
Upper Berg IB		48,6	58,6
Banhoek IB		1,8	1,8
Stellenbosch IB		9,7	12,0
Helderberg IB		7,8	12,1
Lower Eerste River		2,8	3,1
Totals Berg-Eerste Supply Area	93,0	70,7	87,6
Grand Totals	97,0	116,2	133,8
1:50 YIELD		241,2	
Irrigation surplus		28,0	10,4
Cape Town (Temporary)	28,0		
Palmiet River (Rockview and Kogelberg Dams)			
Cape Town	22,5		
Totals	22,5		

Figure 2: Summary of allocations from the Government Water Schemes of the WCWSS (DWAF, 2003)

It is important to note that DWS has made additional allocations from Theewaterskloof Dam to *inter alia* irrigators in the Lower Berg River, and these must still be included in the future water requirement projections. Also, at present 4 000 m^3/ha of the water allocated to the Lower Berg Irrigation Board comes from sources other than the Voëlvlei Dam, but apparently the water from these other sources is insufficient and there may be pressure to transfer some of this allocation to the Voëlvlei Dam. The WRPM needs to be updated to cater for these additional water requirements.

3. Current Situation

3.1 Current Water Requirements

3.1.1 City of Cape Town (CCT)

Allocations from the WC WSS

The total allocation for the CCT from the WC WSS is 385.9 million m³/a, according to information provided by the CCT. This includes the application for an allocation of 81 million m³/a from the Berg River Dam. According to records of the DWS the registration of allocations from the DWS owned infrastructure amounts to 210.9 million m³/a, excluding the Berg River Dam, which is not utilised by the CCT as yet (see **Table 5**). It is noted that the application for an allocation from the Berg River Dam is for 81 million m³/a, while the yield of the dam is given in **Table 4** as 80 million m³/a.

Table 5: Allocations for the CCT's bulk distribution systems (kℓ/a)

Resource Name	Ownership	Agreement	Current Allocations
Berg River Dam	DWS owned	Licence pending	81 000 000
Berg River (Voëlvlei Dam)	DWS owned	BWP agreement	70 400 000
Theewaterskloof Dam, fixed volume	DWS owned	BWP agreement	90 000 000
Theewaterskloof Dam, variable volume	DWS owned	BWP agreement	28 000 000
Palmiet River (Rockview & Kogelberg dams)	DWS owned	BWP agreement	22 500 000
Upper and Lower Steenbras Dam	CCT owned	BWP agreement	40 000 000
Wemmershoek Dam	CCT owned	BWP agreement	54 000 000
Total allocation for CCT from WCWSS			**385 900 000**
Small dams	CCT owned	-	6 300 000
Albion Spring	CCT owned	-	1 500 000
Atlantis Aquifer	CCT owned	-	5 000 000
Total allocation for CCT from own sources outside the WCWSS			**12 800 000**
Total allocation for CCT			**398 700 000**

Note: The BWP Agreement refers to the Raw Water Supply Agreement of April 2003 between the DWAF and CCT with respect to the Berg River Project (DWAF, 2003)

Clause 10.6 of the Raw Water Supply Agreement (DWAF, 2003) says: "*Until such time as the full yield of the BWP is allocated, the City will be allocated all the water in the BWP that has not been allocated to other water users. An allocation to third party users will decrease the allocation to the City by the proportionate amount allocated to third party users.*" Hence, a possible allocation to the WC DM would reduce the CCT allocation.

The Agreement in Clause 5.2 requires that a licence application be submitted for the water that has been allocated from the BWP in terms of the Raw Water Supply Agreement. The City has submitted this licence application, and is waiting for a decision by the DWS on the application.

An addendum to the Raw Water Supply Agreement between the DWS and the CCT was signed about 6 years ago, that changed the volume basis for the BWP Capital Charge from water bought from government water sources in the WCWSS, to:

CCT demand from Government Water Schemes + CCT own sources = Total CCT Demand.

The charge by the TCTA to the CCT is therefore based on the total CCT water use, which includes water from the City's dams which are part of the WCWSS (i.e. Steenbras dams and Wemmershoek) plus the smaller dams such as those on Table Mountain and the Atlantis Wellfield.

The allocation from the Theewaterskloof Dam of 118 million m³/a includes a temporary allocation of 28 million m³/a that was originally allocated to the agricultural sector, but not taken up at the time of the agreement (DWA, 2003). The agreement stipulates that this additional allocation is variable depending upon the uptake by the agricultural sector, and might be reduced over time.

Historical Water Requirements

The historical water requirements of the CCT's bulk system is summarised in **Table 6** below (information as submitted to the DWS on a quarterly basis) and shown in **Figure 3**:

Table 6: Historical bulk water use of the City of Cape Town (kℓ/a)

Description	08/09	09/10	10/11	11/12	12/13	13/14
Total treated water after WTW	325 691 626	331 895 445	336 271 703	330 040 938	320 921 722	314 773 795
Bulk water sales to External WSAs	30 256 583	29 325 817	32 879 785	33 808 187	33 034 548	32 573 237
Bulk system losses after WTWs	22 425 217	27 248 382	18 286 584	19 329 188	16 553 288	13 688 436
Treated water supplied to CCT Reticulation System	273 009 826	275 321 246	285 217 698	276 903 563	271 333 886	268 512 122
From own sources (estimate)	14 000 000	14 000 000	10 000 000	8 000 000	8 000 000	8 000 000
Total from WCWSS	**311 691 626**	**317 895 445**	**326 271 703**	**322 040 938**	**312 921 722**	**306 773 795**

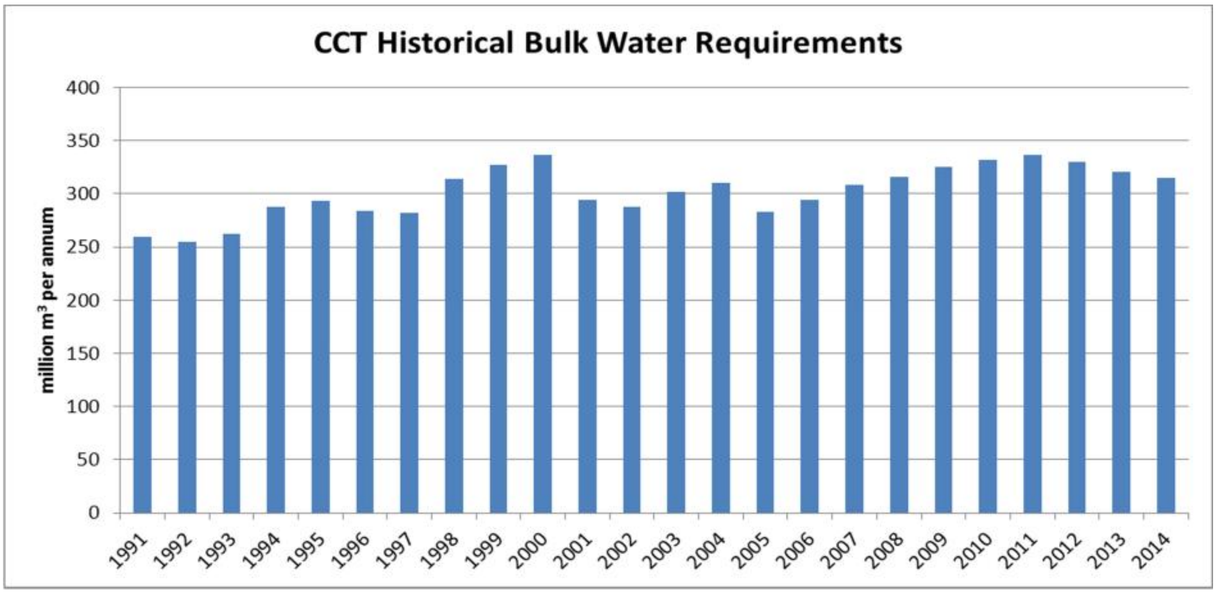


Figure 3: Historical bulk water use of the City of Cape Town

Water Use per Sector

Table 7 and **Figure 4** give an overview of the water usage per sector for the CCT for the last five years:

Table 7: Water requirement per sector for the CCT (kℓ/a)

Year	Government	Industrial	Municipal	Other	Commercial	Domestic	Total
Volume							
09/10	4 457 276	8 532 560	12 312 820	14 089 361	25 541 890	153 556 030	**218 489 936**
10/11	6 681 757	9 118 368	13 460 566	12 880 405	27 554 094	159 383 764	**229 078 954**
11/12	7 182 106	9 799 381	12 688 747	13 981 879	27 174 713	168 741 537	**239 568 364**
12/13	5 287 687	8 655 943	12 694 275	14 972 605	27 241 516	165 506 625	**234 358 650**
13/14	5 176 392	8 717 188	12 245 285	10 805 954	24 482 281	165 713 389	**227 140 489**
Percentage Annual Increase / Decrease							
09/10 – 10/11	49.91%	6.87%	9.32%	-8.58%	7.88%	3.80%	4.85%
10/11 – 11/12	7.49%	7.47%	-5.73%	8.55%	-1.38%	5.87%	4.58%
11/12 – 12/13	-26.38%	-11.67%	0.04%	7.09%	0.25%	-1.92%	-2.17%
12/13 – 13/14	-2.10%	0.71%	-3.54%	-27.83%	-10.13%	0.12%	-3.08%

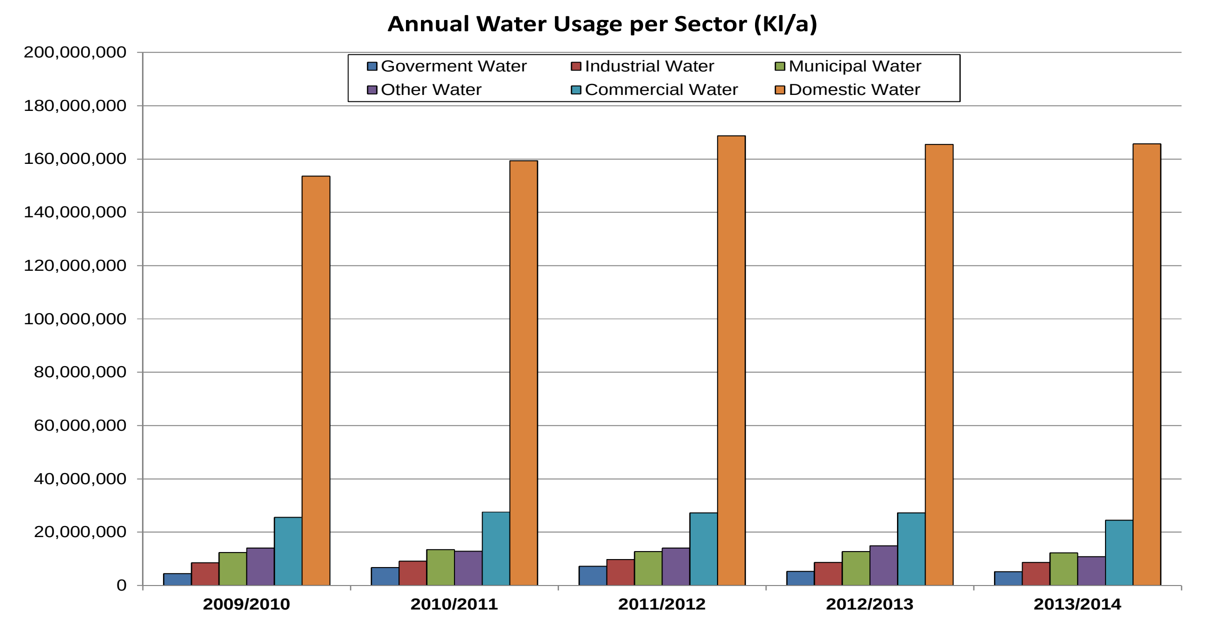


Figure 4: Water use per sector in the City of Cape Town

3.1.2 Other Municipalities

West Coast District Municipality

The West Coast District Municipality supplies potable water to Saldanha Bay, Swartland, Bergrivier and Drakenstein (only Gouda) local municipalities through their Withoogte and Swartland bulk distribution systems. **Table 8** below gives an overview of the towns supplied with potable water.

Table 8: Towns supplied with potable water by the West Coast District Municipality

Bulk System	Local Municipality	Towns
Withoogte (from Misverstand on Berg River)	Saldanha Bay	Hopefield, Langebaan, Vredenburg, Saldanha, St Helena Bay
	Swartland	Koringberg, Moorreesburg
	Bergrivier	Velddrif, Dwarskersbos
Swartland (from Voëlvlei)	Swartland	Malmesbury (Abbotsdale, Kalbaskraal, Chatsworth, Riverlands), Darling, PPC, Riebeek West, Riebeek Kasteel, Yzerfontein
	Drakenstein	Gouda

The current raw water allocations from the different sources for the West Coast District Municipality's bulk distribution systems are given in **Table 9** below.

Table 9: Allocations for the West Coast District Municipality's bulk distribution systems (kℓ/a)

Name	Resource Name	Permit Reg. Certificate	Current Allocations
Withoogte from Misverstand Weir	Berg River	No. 22062820	17 440 000 *
Swartland from Voëlvlei Dam	Berg River (Voëlvlei Dam)	No. 22062777	4 200 000
Langebaan Road boreholes	Saldanha Underground	No. 22062688	1 500 000
Minus 10% of Langebaan Road (as recommended by Monitoring Committee)			-150 000
Total Allocation for West Coast DM			**22 990 000**
Total Allocation for West Coast DM from WCWSS			**21 640 000**

*) The current licence allows the WC DM the abstraction of 17.44 million m^3/a from the Misverstand Weir. This relates to an allocation from the WC WSS of 18.6 million m^3/a to account for the river losses between the Voëlvlei Dam and Misverstand Weir.

The historical water requirements of the West Coast District Municipality over the last six years are summarised in **Table 10** below.

Table 10: Raw water abstracted by the West Coast DM for the various financial years (kℓ/a)

Source	08/09	09/10	10/11	11/12	12/13	13/14
Withoogte from Misverstand Weir	17 487 890	16 932 258	16 705 674	17 525 046	18 692 770	20 363 425
Langebaan Road Aquifer	436 312	621 476	972 433	1 088 030	931 778	0
Swartland from Voëlvlei Dam	6 661 635	6 761 867	6 636 187	6 592 732	6 595 709	6 497 447
Total for West Coast DM	**24 585 837**	**24 315 601**	**24 314 294**	**25 205 808**	**26 220 257**	**26 860 872**
Total from WC WSS	**24 149 525**	**23 694 125**	**23 341 861**	**24 117 778**	**25 288 479**	**26 860 872**

The DWS records indicate raw water abstractions of 7.75 million m^3 and 20.89 million m^3 for the 2013/14 financial year for Swartland and Withoogte, respectively. However, there seems to be an incorrect record for January 2014 for Swartland and the volume has been reduced to 6.5 million m^3. The West Coast District Municipality exceeded their allocation from the WCWSS at least for the last seven (7) years, including by 5.22 million m^3 in the last financial year.

The West Coast DM has applied to the DWS in December 2013 to increase the allocation from the System to initially 18.087 million m^3/a for the Withoogte supply area, which is to be increased to 30.3 million m^3/a by 2033, and to 6.39 million m^3/a for the Swartland supply area (to be increased to 11.1 million m^3/a by 2033).

In addition to the direct supply from the WCWSS, the Bergrivier LM abstracts water from the Berg River for domestic supply to Piketberg, with 692 860 m^3 for 2013/14. The Saldanha Bay LM also operates a wellfield at Hopefield. It is envisaged that the West Coast DM will take over the operation and management of that wellfield.

Drakenstein Local Municipality

The Paarl and Wellington distribution system is an integrated system, with potable water supply from the WCWSS and raw water supply from the Municipality's own sources, which include the Berg River, Bethel and Nantes dams and the Antoniesvlei / Withoogte scheme. Saron and Bainskloof are also supplied with bulk raw water from the Municipality's own sources. Gouda is supplied with potable water by the West Coast District Municipality from their Swartland WTW and Hermon is supplied with potable water from the WCWSS. The current allocations for the towns in the Drakenstein Municipality's management area given in **Table 11** below.

Table 11: Allocations for the towns in the Drakenstein Municipality's management area (kℓ/a)

Town	Resource Name	Permit Reg. Certificate	Current Allocations
Paarl and Wellington	Wemmershoek	CCT Agreement	25 800 000
Paarl	Nantes and Bethel dams	No. 22058657	200 00
Paarl	Berg River	No. 22087162	2 109 000
Wellington	Antoniesvlei / Withoogte	No. 22058675	403 000
Saron	Leeu River (Klein Berg River)		465 415

The historical water requirements and the bulk water supply to the towns in Drakenstein Municipality's management area over the last six years are summarised in **Table 12** below:

Table 12: Bulk water supply to the towns in the Drakenstein Municipality's management area (kℓ/a)

Towns	Source	08/09	09/10	10/11	11/12	12/13	13/14
Paarl and Wellington	Berg River, Bethel and Nantes dams	322 375	393 488	1 036 156	632 409	916 163	1 013 000
	Antoniesvlei	305 527	314 970	392 103	249 286	157 594	357 319
	WCWSS (CCT)	14 859 770	15 216 342	15 392 072	15 771 466	15 739 475	15 735 197
Saron	Leeu River	596 876	571 893	594 291	588 423	556 050	567 976
Gouda	Swartland (WC DM)	147 998	145 658	159 918	154 788	174 238	187 765
Hermon	WCWSS (CCT)	33 763	33 927	41 925	47 962	37 346	35 304
Bainskloof	Wit River	5 322	3 789	4 708	4 057	3 855	4 406
Total Drakenstein LM		**16 271 631**	**16 680 067**	**17 621 173**	**17 448 391**	**17 584 721**	**17 900 967**

Note: Water supply from the WCWSS to the Drakenstein Municipality is covered under the CCT bulk water and the Swartland bulk water

Stellenbosch Local Municipality

The Stellenbosch area is supplied with raw water from mainly two sources, namely the Eerste River and the WCWSS. Water from the Eerste River in the Jonkershoek Valley is diverted by means of a weir and a gravity pipeline to two off-channel storage dams in Ida's Valley. The registered abstraction from this source is 7.224 million m^3/a. During the summer water is being drawn from the WCWSS. This is obtained via a pipeline leading from the Stellenboschberg Tunnel outlet to the Paradyskloof WTW. A volume of 3 million m^3/a is available from this source.

Franschhoek, which includes the smaller settlements of Groendal, La Motte, Wemmershoek and Robertsvlei is currently supplied with water from local sources in the catchments of the Mount Rochelle Nature Reserve and Perdekloof and with potable water from the WCWSS (Wemmershoek Dam). Robertsvlei is supplied from a single borehole. The WARMS registrations for the perennial streams in the Mount Rochelle Nature Reserve is 0.221 million m^3/a, for the Perdekloof Weir 0.577 million m^3/a and for the Du Toits River 0.104 million m^3/a (see **Table 13**).

The Dwarsrivier system includes Pniel, Kylemore, Lanquedoc, Johannesdal and Groot Drakenstein. These areas are supplied with potable water from the WCWSS (Wemmershoek Dam). The local sources, which are currently not in use, include the Pniel Mountain Stream (0.053 million m^3/a), Pniel Spring (0.025 million m^3/a) and the Pniel Kloof Street Borehole (0.079 million m^3/a).

Table 13: WARMS registrations for the towns in Stellenbosch Municipality's management area (kℓ/a)

Town	Resource Name	WARMS REGISTRATION	REGISTERED VOLUME
Franschhoek	Perdekloof Weir	22059237	576 648
	Mount Rochelle Fountain	22078305	220 752
	Du Toits River	22059433	103 680
	Wemmershoek (CCT)	CCT Agreement	Not fixed
Dwarsrivier	Wemmershoek (CCT)	CCT Agreement	Not fixed
Klapmuts	Wemmershoek (CCT)	CCT Agreement	Not fixed
Stellenbosch and Rural Areas	Theewaterskloof	22095527	3 000 000
	Jonkershoek	22059898	7 224 000
	Theewaterskloof and upper Steenbras (CCT)	CCT Agreement	Not fixed

The historical water requirements and the bulk water supply to the towns in Stellenbosch Municipality's management area over the last six years are summarised in **Table 14** below (treated water):

Table 14: Bulk water supply[1)] to the towns in the Stellenbosch Municipality's Management Area (kℓ/a)

Towns	Source	08/09	09/10	10/11	11/12	12/13	13/14
Franschhoek	WCWSS, Mount Rochelle, Perdekloof, Du Toits River	1 501 213	1 454 406	1 472 275	1 441 052	1 225 758	1 510 757
Dwarsrivier	WCWSS	862 570	718 970	666 729	767 947	753 839	960 432
Klapmuts	WCWSS	359 033	382 617	376 656	320 030	384 255	341 180
Stellenbosch	WCWSS, Eerste River	10 509 918	9 678 316	10 273 397	7 927 739	7 596 420	9 739 157
Total Stellenbosch Municipality		**13 232 734**	**12 234 309**	**12 789 057**	**10 456 768**	**9 960 272**	**12 551 526**
Treated water from WCWSS (CCT)		4 042 460	3 332 407	1 043 385	1 087 977	1 814 041	4 482 156
Raw water from WCWSS [2)]		**2 944 896**	**2 681 935**	**3 290 000**	**2 930 000**	**3 000 000**	**4 014 052**

Note: 1) Supply to Dwarsrivier and Klapmuts, and partly to Franschhoek and Stellenbosch is treated water purchased from CCT;
2) estimated for 2010/11, 2011/12 and 2012/13

Overberg Water

Overberg Water is a bulk water services provider (WSP), supplying potable water to rural communities and some towns for domestic use and stock watering. The water board operates the Rûensveld West and Rûensveld East Schemes, which abstract water from the Riviersonderend River. The water is treated and distributed to rural users and for stockwatering. Collectively, the transfers from the two Rûensveld schemes total about 4 million m^3/a.

- The **Rûensveld West Rural Water Supply Scheme** abstracts water from the Riviersonderend River. Water is released from the Theewaterskloof Dam into the Riviersonderend River and abstracted and treated at the Maraisdal Water Treatment Works, which is located adjacent to the river about 5 km downstream of the Theewaterskloof Dam. The quality of the water is good. From there a gravity main supplies treated water to the town of Caledon (supplementing the town's groundwater source) and to farms between Caledon and Riviersonderend and in the vicinity of Napier. In addition to the town of Caledon, water is provided for domestic use, livestock, and to 370 farms. The capacity of the scheme is approximately 2.4 million m^3/a, with about 30% of the requirement being for livestock. However, Caledon's allocation from the scheme is apparently about 2.19 million m^3/a.
- The **Rûensveld East Rural Water Supply Scheme** abstracts water from the Riviersonderend River, halfway between Riviersonderend and Swellendam. The water is treated in close proximity to the abstraction point. The main feeder pipeline extends in a southerly direction to Bredasdorp, and further on to near Waenhuiskrans (Arniston). With branch pipelines, the scheme covers an area of some 1 750 km^2. It supplies about 65% of the rural population in its supply area, as well as providing water for livestock. The raw water is of a good quality for domestic use. The towns of Bredasdorp, Arniston, Protem and Klipdale receive water from this scheme. The scheme has a capacity of 0.85 million m^3/a.

The historical water requirements and the bulk water supply to the Rûensveld West and Rûensveld East Schemes over the last five years vs. their allocations are summarised in **Table 15** below. The discrepancy in allocation needs to be resolved.

Table 15: Raw water abstracted and treated water supplied by Overberg Water for the various financial years (kℓ/a)

Source	Allocation	09/10 *)	10/11 *)	11/12 *)	12/13	13/14
Ruensveld West	1 914 000	2 190 000	2 330 000	2 230 000	2 280 165	2 340 155
Ruensveld East	897 000	900 000	1 000 000	900 000	896 175	881 084
Total raw water abstracted	**2 811 000**	**3 090 800**	**3 333 200**	**3 191 100**	**3 176 340**	**3 221 239**
Ruensveld West	N/appl.	N/av.	N/av.	N/av.	2 074 785	2 151 031
Ruensveld East	N/appl.	N/av.	N/av.	N/av.	744 436	695 764
Total treated water supplied	**N/appl.**	**N/av.**	**N/av.**	**N/av.**	**2 819 221**	**2 846 795**
Bulk transmission and treatment losses	**N/appl.**	**N/av.**	**N/av.**	**N/av.**	**11.2%**	**11.6%**

*) Raw water consumption per sub-system approximated, end-user consumption not available

Summary

The total urban supply from the WCWSS is indicated in the table below and shown in **Figure 5**.

Table 16: Raw water abstracted by the different municipalities for the various financial years (kℓ/a)

Source	08/09	09/10	10/11	11/12	12/13	13/14
Bulk water CCT	325 691 626	331 895 445	336 271 703	330 040 938	320 921 722	314 773 795
Bulk water CCT, own sources (approximated)	14 000 000	14 000 000	10 000 000	8 000 000	8 000 000	8 000 000
Bulk water CCT, WCWSS	311 691 626	317 895 445	326 271 703	322 040 938	312 921 722	306 773 795
Bulk water Withoogte	17 487 890	16 932 258	16 705 674	17 525 046	18 692 770	20 363 425
Bulk water Swartland	6 661 635	6 761 867	6 636 187	6 592 732	6 595 709	6 497 447
Bulk water Stellenbosch	2 944 896	2 681 935	3 290 000	2 930 000	3 000 000	4 014 052
Bulk water Overberg Water	3 110 000	3 090 800	3 333 200	3 191 100	3 176 340	3 221 239
Bulk water Piketberg and PPC	1 500 000	1 500 000	1 500 000	1 500 000	1 500 000	1 500 000
Urban total from WCWSS	**338 786 047**	**344 271 505**	**352 903 564**	**349 088 716**	**341 210 201**	**337 648 719**

*) Bulk water abstraction from CCT own sources approximated based on allocation and current utilisation

**) Bulk water consumption from WCWSS for Withoogte and Overberg Water estimated, based on raw water abstraction and assumed river and storage losses

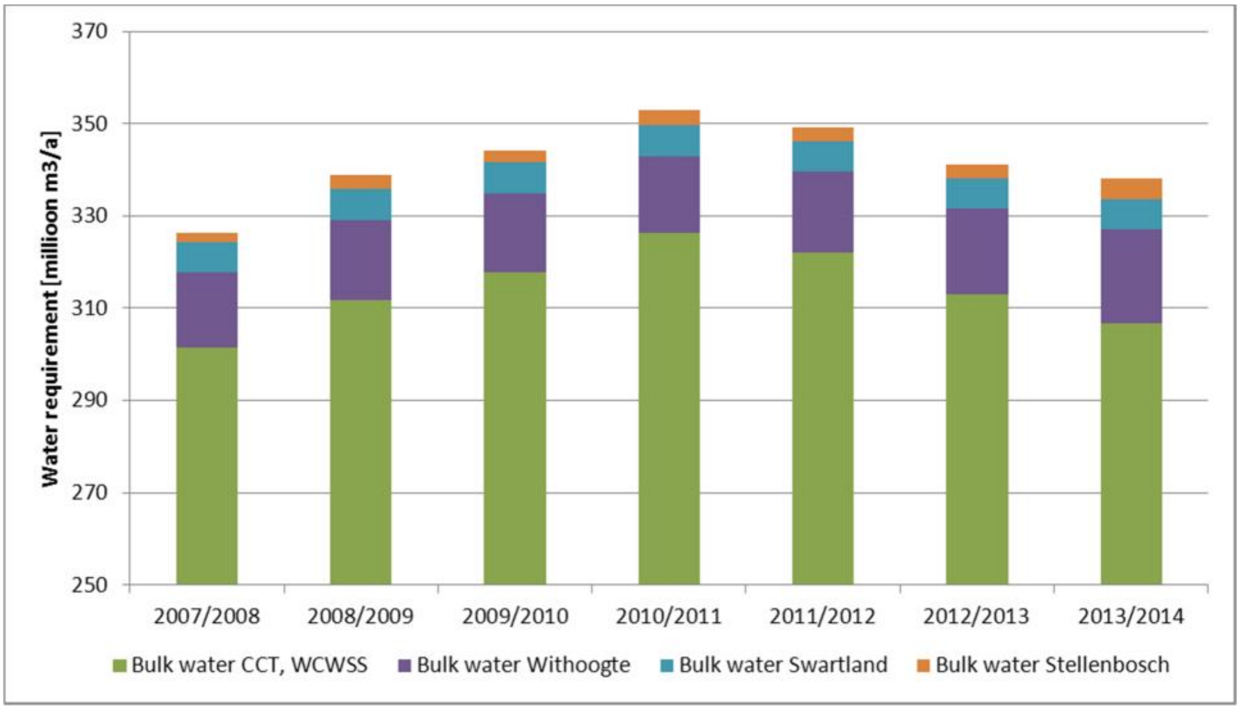


Figure 5: Historical urban bulk water requirements from the WCWSS

3.1.3 Agriculture

The agricultural sector has a capped allocation of 173.6 million m^3/a from the WCWSS for irrigation, based on the size of land (ha) under potential irrigation and the relevant quotas as determined for the Government Water Scheme under the old Water Act (1956). The Raw Water Supply Agreement (DWAF, 2003) states that "*all lawful scheduling in terms of [section] 63 (Government Water Scheme scheduling) and/or section 88 (Irrigation Board scheduling) of the previous Water Act, 1956, …, should be treated as existing lawful water uses, …*"

The agricultural use from the WCWSS is measured by the releases from the dams and or the abstraction from canals and pipelines. The volume provided between July 2012 and June 2013 was 135.38 million m^3 (see **Table 17**), while the volume provided by the DWS between July 2013 and June 2014 was approximately 160 million m^3. The actual water use figures for 2013/14 are not complete yet.

The agricultural users considered for the water balance are grouped into the following WUA's and irrigation boards:

- Lower Berg Irrigation Board
- Berg River Main Irrigation Board, comprising Berg River IB (3 quota zones), Noord-Agter Paarl IB, Suid-Agter Paarl IB, Perdeberg IB, Riebeek Kasteel IB, Riebeeck Wes IB (2 districts), Simondium pumping scheme and Simonsberg IB;
- Zonderend Irrigation Board
- Vyeboom Irrigation Board
- Banhoek Irrigation Board
- 24-Rivers Irrigation Board
- Wynland Water Users Association (Districts: Stellenbosch, Helderberg and Eerste River)

The abstraction by the 24-Rivers IB from the 24 Rivers canal to the Voëlvlei Dam is recorded for reporting purposes, as it impacts on the water availability from the Voëlvlei Dam. However, their use is not considered in the water balance, as they do not abstract directly from the WC WSS.

The abstraction by Overberg Water was previously lumped under the agricultural use, but it is considered domestic use and, hence, reflected under urban use.

Table 17: Agricultural use for the last three years [million m^3]

WUA, IB	Capped	2011/12	2012/13	2013/14 *)
Berg River Scheme (Voëlvlei Dam &Misverstand Weir)				
Lower Berg IB	18.1	29.07	22.88	27.20
24 Rivers IB *)	11.5	19.74	19.74	
Riviersonderend / Berg River Scheme (Theewaterskloof Dam, Berg River Dam)				
Zonderend IB	31.5	34.07	31.90	25.87
Vyeboom IB	13.2	8.92	8.73	8.04
Pump from Theewaterskloof Dam	1.5	1.43	1.43	
Upper Berg IB	58.6	48.02	45.90	30.73
Banhoek IB	1.8	1.71	1.71	2.03
Wynlands WUA : Stellenbosch District	12.0	11.46	9.60	
Wynlands WUA : Helderberg District	12.1	10.04	9.15	
Wynlands WUA : Eerste River District	3.1	4.09	4.09	2.39
Irrigation surplus	10.4			
Total	**162.3**	**148.81**	**135.38**	**130**

*) Water consumption by 24-Rivers IB recorded for reporting purposes, but not included in totals

**) Data on agricultural use for 2013/14 are not fully available yet; total use assumed to be slightly lower than 2012/13

It must be noted that the agricultural sector did most probably not use the full volume and it is anticipated that a significant quantity of water released from the Berg River Dam and from the Voëlvlei Dam was not abstracted by agriculture and ended up flowing into the Berg River estuary.

For planning purposes the actual water requirement for agriculture was "adjusted" to take into account the variability of rainfall, possible additional releases and the fact that the agricultural sector can still grow into their capped allocation (see **Figure 6**). It is important to use the "adjusted" total water requirement for planning purposes as it is in times of drought when the agricultural sector will maximise their water use from the WCWSS, as their farm dams may then not be full.

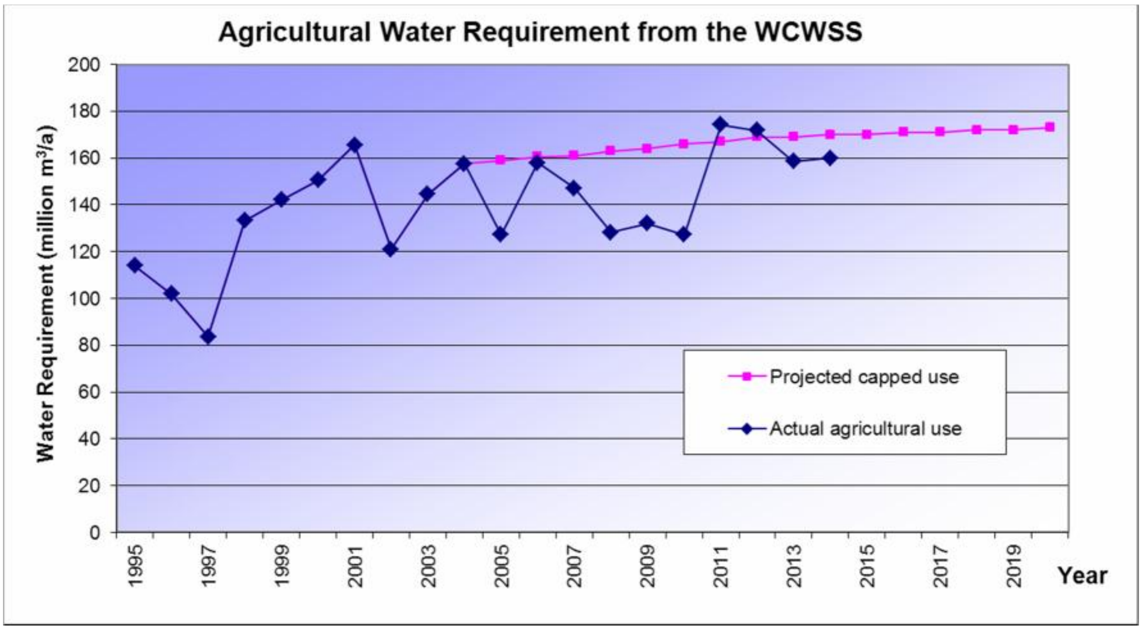


Figure 6: Historic agricultural use and adjusted use

3.1.4 Summary

The actual sectoral water use (based on releases from the dams) in the WCWSS for 2013/14 was as follows:

- Urban: 337.6 million m^3/a
- Irrigation releases: 160.0 million m^3/a
- TOTAL (estimated): 497.6 million m^3/a

The "adjusted" total water use from the WCWSS using the capped amount for agricultural use is given below.

- Urban: 337.6 million m^3/a
- Irrigation capped: 170.0 million m^3/a
- TOTAL 507.6 million m^3/a

3.2 Water Balance

A comparison between the estimated total water requirement from the WCWSS and the high water requirement curve developed during the Reconciliation Strategy Study (refer to **Figure 7**) shows that the adjusted total water requirement falls below the high water requirement curve. The "adjusted" total water usage from the WCWSS for 2014 is approximately 508 million m^3/a, compared to the existing WCWSS available yield of 596 million m^3/a.

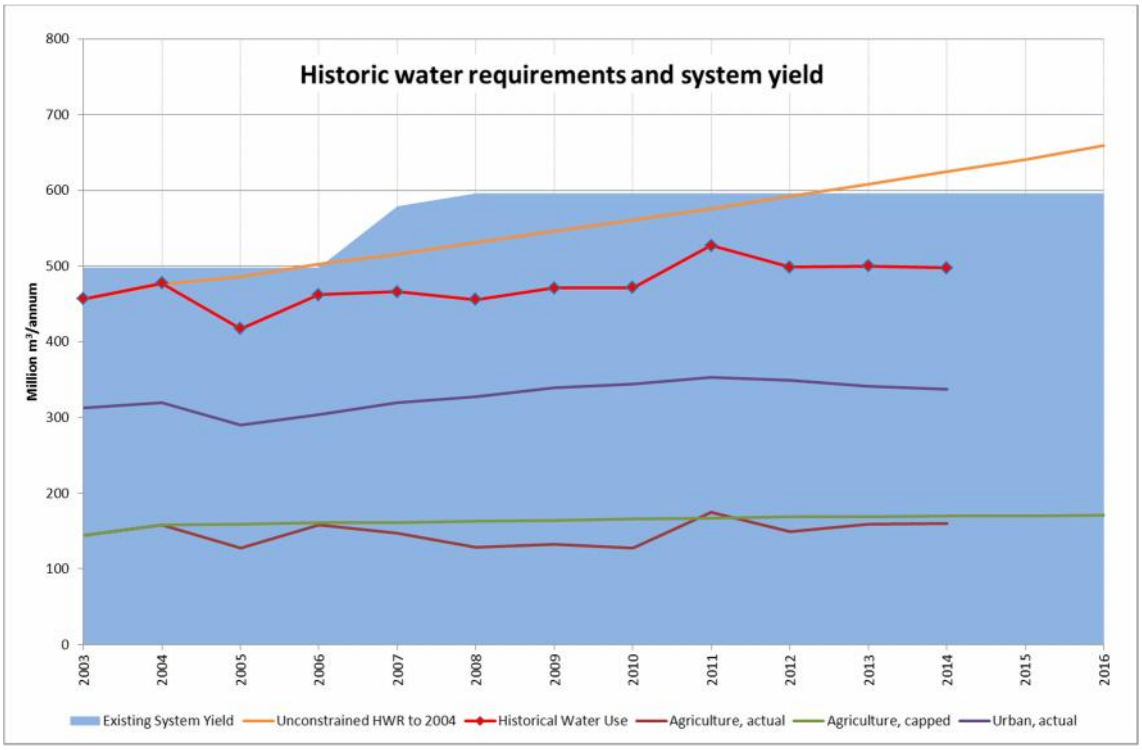


Figure 7: Total water requirement from and total yield of the WCWSS

4. Progress with Implementation of the Strategy

4.1 Water Conservation / Water Demand Management (WC/WDM)

4.1.1 City of Cape Town (CCT)

WC/WDM Strategy (2007)

The CCT's WC/WDM Strategy (2007) identified and stated 5 goals that the strategy will endeavour to achieve over the ensuing ten years (up until 2016/17). These five goals consist of both quantitative and qualitative techniques which both have a direct and indirect impact on the water requirements.

Table 18: Strategy Goals (after WCWDM Strategy, 2007)

Quantitative	**Goal A**	CCT must reduce and maintain non-revenue water (NRW) to below 15% of the total average water requirement and within accepted international benchmarks.
	Goal B	Water wastage by consumers to be reduced and maintained below 2% of the total water requirement by 2012 and most consumers must achieve water efficiency benchmarks by 2016.
	Goal E	Reduce projected potable water requirement to an average growth rate of no more than 1% p.a. for the next 10 years and conserve CCT water resources.
Qualitative	**Goal C**	Ensure by 2009 and maintain on-going effective management systems and implement IWRP in all decisions regarding augmentation, bulk infrastructure development and water efficiency projects.
	Goal D	CCT must adopt WC/WDM as one of the key delivery strategies and must give priority to its implementation and ensure an on-going enabling environment.

Success of implementation

Significant savings have been reported through the strategy's implementation for the period 2007-2011. Most of these savings were achieved through pressure management and treated effluent re-use. The projected estimated maximum potential savings will potentially be achieved provided WC/WDM have full resource co-operation. **Table 19** below gives an overview of the historic non-revenue water trend for the CCT.

Table 19: Historic non-revenue water trend for the CCT (as taken from the CCT's Long-Term WC/WDM Strategy)

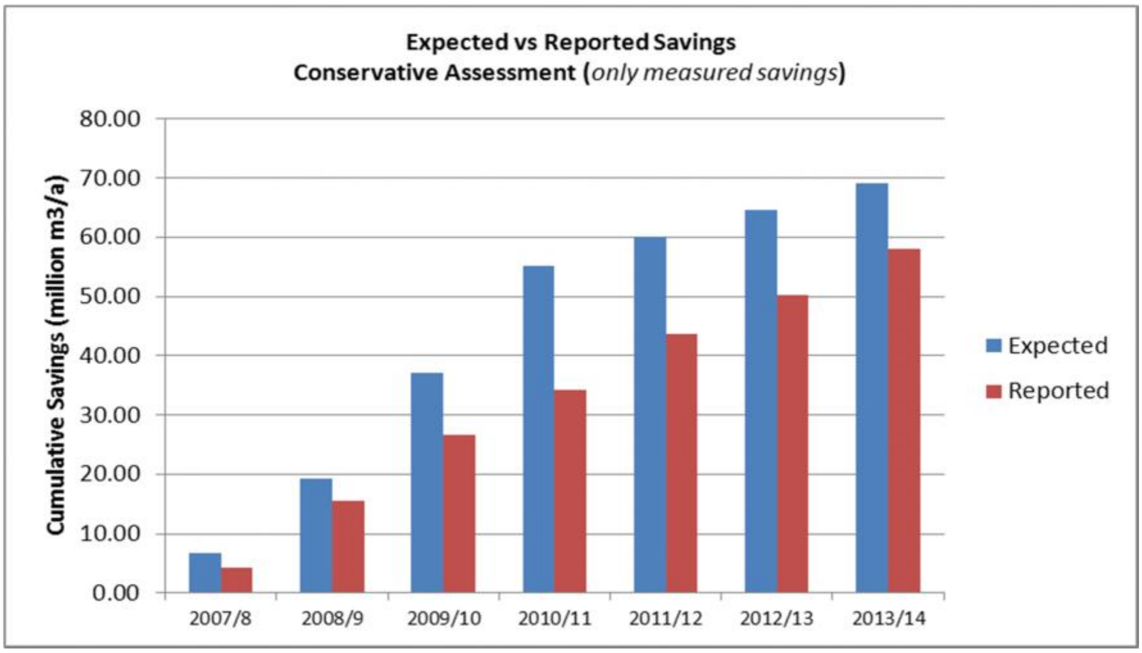
Description	08/09	09/10	10/11	11/12	12/13	13/14
Total System Input (Kl)	325 691 626	331 895 445	336 271 703	330 040 938	320 921 723	314 773 795
Non-Revenue Water (Kl)	75 901 218	84 107 521	78 159 401	67 541 133	64 297 222	68 756 743
Non-Revenue Water (%)	**23.30%**	**25.30%**	**23.20%**	**20.50%**	**20.00%**	**21.80%**
Non-Revenue Water (R)	R196 584 155	R217 838 479	R222 754 293	R203 974 222	R207 037 055	R235 148 063
Number of metered connections	Not available	Not available	617 323	623 191	627 589	634 071
Water Loss (Kl)	73 595 268	78 496 376	69 549 908	50 543 518	46 474 020	46 306 011
Water Loss (%)	**22.60%**	**23.70%**	**20.70%**	**15.30%**	**14.50%**	**14.70%**
Water Loss (R)	R190 611 744	R203 305 614	R198 217 238	R152 641 424	R149 646 345	R 158 366 557
Material Financial Losses (Kl)	Not available	Not available	Not available	23 198 853	20 571 297	27 068 904
Material Financial Losses (R)	Not available	Not available	Not available	R70 060 535	R66 239 576	R92 575 651

The CCT has focussed on a number of WC/WDM interventions in the last few years. The following statistics from the 2010/2011 and 2011/2012 financial years summarise some of the achievements with the implementation of the Strategy and give an indication of the extensive WC/WDM measures which have already been implemented:

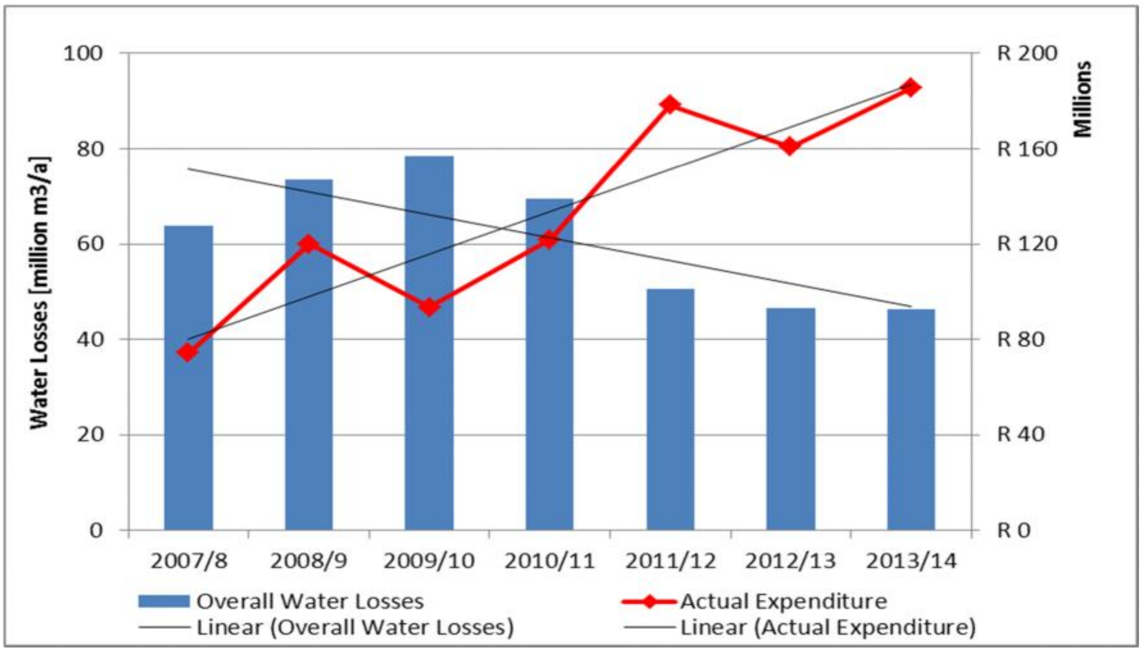
- More than 36 000 non-functional consumer water meters were replaced;
- WDM flow-limiting devices installed in about 26 000 households;

- 95 users were supplied with treated effluent which accounts for 30 Mℓ/day of re-use (potable water replacement = 12.66 Mℓ/day);
- Pressure management was successfully implemented in Crossroads / Plumstead / Retreat / Marina Da Gama / Lavender Hill / Goodwood / Monte Vista / Bishop Lavis / Bonteheuwel / Thornton / Kalkfontein with estimated savings = 4.56 Ml/day;
- Integrated Leaks Repair project at numerous schools and indigent households;
- Awareness and education workshops.

The cumulative savings since implementation of the WC/WDM Strategy in 2007 were 58 million m³ in the 2013/2014 financial year, out of 69 million m³ anticipated savings (see **Figure 8a**). This is also reflected in the reduction of water losses from 80 million m³ in 2009/2010 to below 50 million m³ in 2012/2013 and 2013/2014 (see **Figure 8b**).



a)



b)

Figure 8: WC/WDM Expenditure and Savings; a) Actual and anticipated savings achieved through implementing WC WDM measures; b) Expenditure vs. reduction in water losses

Updated WC/WDM Strategy

The CCT updated their Long-Term WC/WDM Strategy during June 2013. The purpose of the WC/WDM Strategy is to ensure the long-term balance between available water resources and water requirements, to postpone the need for expensive capital infrastructure projects for as long as it is economically viable and to minimise water wastage.

The five strategic goals, as initially developed in the 2007 WC/WDM Strategy, were improved to include additional and revised strategic goals. Some of the targets were also altered in order to re-align with current and forecasted CCT growth trends. The updated WC/WDM Strategy include the following five goals:

- A: CCT must by 2015/16 reduce and maintain the water losses to below 15% of the total average annual water requirement and within accepted international benchmarks.
- B: Ensure an on-going effective management system and implementation of the Integrated Water Leaks Repair Project (IWLRP).
- C: Mobilise resources according to the WC/WDM Strategy requirements.
- D: CCT must by 2020 reduce and maintain the non-revenue water to below 20% of the total average annual water requirement and within accepted international benchmarks.
- E: Reduce the projected potable water requirement to an average growth rate of no more than 2% p.a. for the next 10 years and conserve Cape Town's available water resources.

The Strategy aims to save up to 50 million m^3 of water over the planning horizon of 10 years until 2020/2021 (see **Figure 9**). The annual budget for implementing these measures varies between R150 m and R400 m.

The quantitative goals A and D were achieved in the 2012/2013 financial year. The non-revenue water (NRW) was cut down to 19.8%, while the water losses were contained below the target of 15% (see **Table 19**). In addition, the CCT was able to sustain the annual growth in water requirements below the target of 2%, despite the estimated increase in population of about 3.5%/a. The number of metered connections increased from 617 323 in 2010/11 to 634 071 in 2013/14.

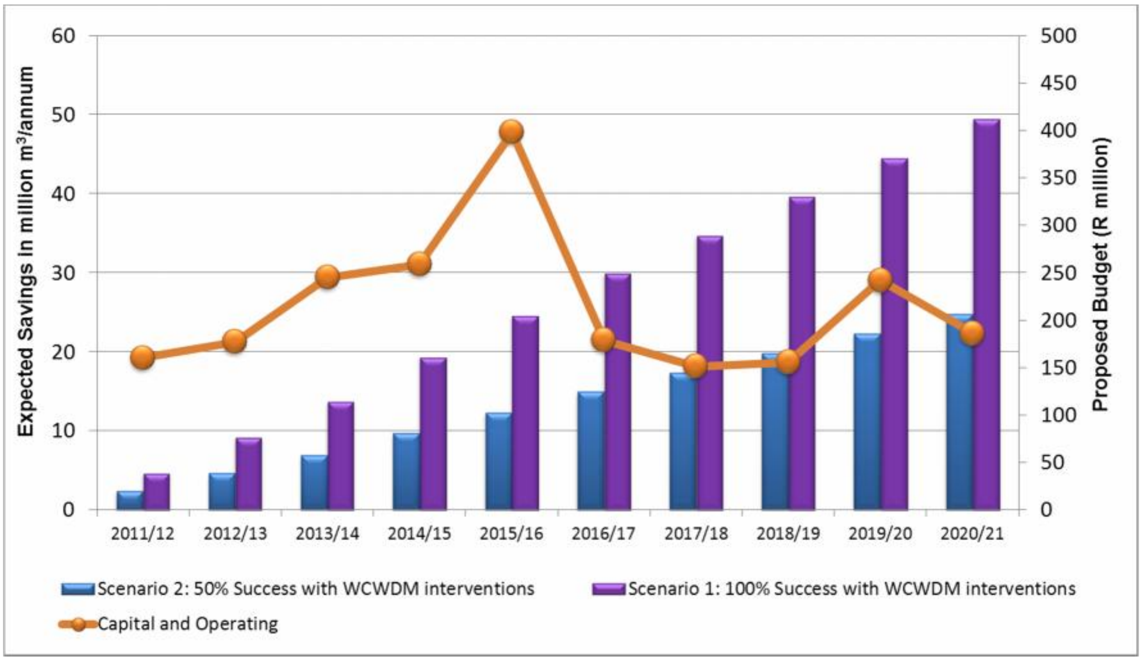


Figure 9: Proposed budget for WC/WDM measures and potential savings

The successful implementation of WC/WDM projects continued during the 2013/2014 financial year, while additional projects were initiated as part of the roll-out of the updated WC/WDM Strategy:

- Current initiatives (financial year 2013/2014) of the Pressure Management Project focus on Masiphumelele, Mountainside, Dennehoek, Lynns View, Sunningdale, Pelikan Park, Ottery, Bardale and Bothasig. This will be extended in the 2014/2015 financial year to Wynberg, Brick and Clay, Dagbreek, Milnerton, Elsies River, Newlands, Empire Vredekloof, Kenridge and Aurora. The average savings are 9 million m^3/a, and the target has been adjusted to 11 million m^3/a.
- The Leak Detection Initiative was implemented in Highbury Park, Eersterivier, Gugulethu, Langa and Mfuleni; other areas to follow – Estimated target savings = 2.2 million m^3/a.
- The Zone Metering Initiative is a supporting program to various initiatives such as leak detection, pressure management, leak repair projects, building retrofits and treated effluent, and is used for the prioritization of Pressure Management projects and aids in an accurate account of water in a specific zone.
- Industrial Meter Audits have been initiated. The initial phase of the replacement programme was the investigation. It is estimated that meter replacement will improve accuracy and thus reduction in leakage by 10%. Further savings will come from the formalization of unauthorized connections.
- Roll out of water conservation devices in indigent households through the Integrated Water Leaks Repair Project (IWLRP). Over 85 000 installation have been completed across the City in area-based installations (IWLRP) and *ad-hoc* installations. IWLRP accounts for 28% of the total installations with a calculated savings of 0.235 million m^3/a. *Ad-hoc* work accounts for 72% of the total installations with an estimated total calculated saving of 0.983 million m^3/a (based on an average decrease of 56 l/day per installation from an average consumption of 417 l/day to an average consumption of 361 l/day).
- Repairs and maintenance of assets, e.g. pipe replacement project. The majority of pipe bursts reported are on the main distribution branches of a network (with factors such as pressure on the main line, duration of the leaking water based on the reaction time from time of the reporting of bursts, and the time the area is isolated) it is estimated that an average of 324 kl is lost on every burst pipe event. An average of 1.465 million m^3/a can be saved if the programme is fully implemented and all burst pipes are controlled. There is a general downward trend in burst water mains (from a yearly average of 451 bursts/month to an average of 279 bursts/month from 2012/13 to 2013/14).

Water Networks	**Annual Comparison**		
	2013/14	**2012/13**	**2011/12**
Repair to Burst Water Mains	2 199	2 266	2 839
New Mains Installed (m)	27 025	13 815	878
Water Mains Replaced (m)	23 561	39 877	34 525

- Several projects to reduce the use of potable water by substituting potable water with other possible water sources are underway; e.g.
    - Using of springs to offset potable water; 9 high-yielding springs have been identified with potential for use as an alternative source; in total 1.8 million m^3/a can be harvested from the known springs with the potential of increasing it to 2.3 million m^3/a).
    - Registration of private boreholes;
    - Harvesting of storm water to offset potable water;
    - Using of boreholes, springs sources and/or treated effluent for greening of parks and public spaces;
    - Roll out of providing treated effluent to suitable users. Currently in summer months, an average of 1 200 Ml/month has been produced and over the past year a total of 12.426 million m^3. The targeted potential is 60 million m^3/a.
- In addition, the CCT has initiated projects to support the WC/WDM measures and to establish their impact on water consumption and the environment.

4.1.2 Other Municipalities

West Coast District Municipality

The West Coast District Municipality and the Local Municipalities supplied with potable water through their bulk systems are very effective with the implementation of their WDM strategies. The treatment and bulk distribution losses of the West Coast District Municipality's bulk systems are summarised in **Table 20** below.

Table 20: Bulk water requirements and losses for the West Coast District Municipality (Kℓ)

Description	08/09	09/10	10/11	11/12	12/13	13/14
Raw Water	24 585 837	24 315 601	24 314 294	25 205 808	26 220 257	26 860 872
Treated Water	23 083 499	22 769 765	22 777 941	23 692 176	24 550 591	24 896 806
Treatment Losses	1 502 338	1 545 836	1 536 353	1 513 632	1 669 666	1 964 066
Treatment Losses (%)	**6.11%**	**6.36%**	**6.32%**	**6.01%**	**6.37%**	**7.31%**
Water Sales	21 790 185	22 076 522	21 496 174	22 490 474	23 328 832	23 662 082
Bulk Distribution Losses	1 293 314	693 243	1 281 767	1 201 702	1 221 759	1 234 724
Bulk Distribution Losses (%)	**5.60%**	**3.04%**	**5.63%**	**5.07%**	**4.98%**	**4.96%**

The total annual volume of non-revenue water and the percentage of non-revenue water for the internal distribution systems of Saldanha Bay, Swartland and Bergrivier local municipalities, which are supplied with bulk potable water by the West Coast District Municipality, are summarised in **Table 21** below.

Table 21: Non-revenue water of the Local Municipalities supplied by the West Coast District Municipality (Kℓ and %)

Description	08/09	09/10	10/11	11/12	12/13	13/14
Saldanha Bay	2 139 400	1 749 147	1 447 311	1 698 381	1 262 633	2 214 531
	16.50%	**13.89%**	**11.57%**	**12.61%**	**9.40%**	**15.80%**
Swartland	797 850	694 931	898 877	844 816	978 215	676 819
	15.08%	**13.44%**	**16.26%**	**15.27%**	**17.73%**	**12.39%**
Berg Rivier (Velddrif and Dwarskersbos)	N/av.	171 395	170 128	70 224	84 311	89 866
	N/av.	**16.30%**	**15.60%**	**6.90%**	**8.30%**	**9.05%**

Drakenstein Municipality

The implementation of a WDM Strategy by Drakenstein Municipality has been extremely successful and has reduced the water requirements of the towns significantly. The overall percentage of non-revenue water for Drakenstein Municipality was calculated as 14.65% for the 2013/2014 financial year. **Table 22** below gives a summary of the non-revenue water for the various distribution systems in the Drakenstein Municipality's management area.

Table 22: Non-revenue water for the various distribution systems in Drakenstein Municipality's management area (Kℓ and %)

System	08/09	09/10	10/11	11/12	12/13	13/14
Paarl and Wellington	2 129.013	1 624.675	1 818.452	1 839.764	2 031.439	2 395.480
	13.75%	**10.20%**	**10.81%**	**11.05%**	**12.08%**	**14.00%**
Saron	136.935	163.005	148.941	63.060	60.456	183.080
	22.94%	**28.50%**	**25.06%**	**10.72%**	**10.87%**	**32.23%**
Gouda	17.222	22.791	26.965	30.885	34.809	60.212
	11.64%	**15.65%**	**16.86%**	**19.95%**	**19.98%**	**32.07%**
Hermon	19.953	13.562	18.365	16.885	1.958	-17.173
	59.10%	**39.97%**	**43.80%**	**35.20%**	**5.24%**	**-48.64%**
Bainskloof	N/av.	0.452	0.579	1.649	0.671	1.646
	N/av.	**11.93%**	**12.30%**	**40.65%**	**17.41%**	**37.36%**
Total for Drakenstein LM	**2 303.123**	**1 824.485**	**2 013.302**	**1 952.243**	**2 129.333**	**2 623.245**
	14.15%	**10.94%**	**11.43%**	**11.19%**	**12.11%**	**14.65%**

The Drakenstein Municipality implemented a water loss reduction project in Saron in 2010/11, which showed a significant decrease in non-revenue water for the subsequent financial years of 2011/12 and 2012/13. It appears as if this success could not be maintained, as the non-revenue water increased significantly in the 2013/14 financial year. The municipality quoted the increased vandalism of their infrastructure as the major reason for the increase in non-revenue water over the last financial year. Theft of equipment and electrical cables, and vandalism of pump stations result in significant water losses from the distribution system.

The non-revenue water for Hermon showed a declining trend over the last two years, with negative non-revenue water recorded for 2013/14: It appears that there are problems with the water sales data from the Finance Department, which resulted in higher water sales than water produced.

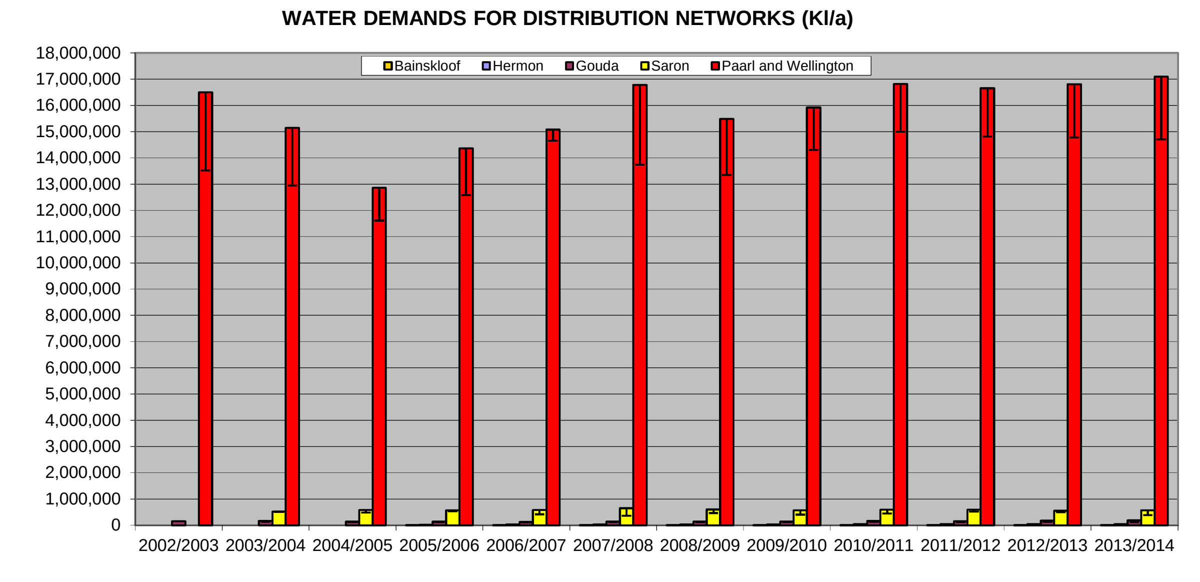


Figure 10: Trend of water requirement and non-revenue water in Drakenstein Municipality (black lines indicate non-revenue water)

Stellenbosch Municipality

The then DWA supported Stellenbosch Municipality during 2011/2012 with the development of a detailed WC/WDM Strategy. The monthly records of the water consumption, as submitted to the DWS, indicate a significant decrease in water losses and non-revenue water for all supply systems in the Stellenbosch Municipality (see **Table 23**). However, the very low non-revenue water for 2012/13 might not be correct, as some of the monthly bulk meter readings seem to be incorrect.

Table 23:Non-revenue water for the various distribution systems in Stellenbosch Municipality's Management Area (Kℓ and %)

System	08/09	09/10	10/11	11/12	12/13	13/14
Franschhoek	455 606	403508	434 804	593 898	201 312	295 486
	30.3%	**27.7%**	**29.5%**	**41.2%**	**16.4%**	**19.6%**
Dwarsrivier	406 622	254 501	157 780	252 509	117 398	190 216
	47.1%	**35.4%**	**23.7%**	**32.9%**	**15.6%**	**19.8%**
Klapmuts	169 742	171 611	151 980	103 130	64 890	71 411
	47.3%	**44.9%**	**40.3%**	**32.2%**	**16.9%**	**20.9%**
Stellenbosch	2 358 780	1 669 066	1 603 485	1 321 472	572 002	1 538 666
	22.4%	**17.2%**	**15.6%**	**16.7%**	**7.5%**	**15.8%**
Total for Stellenbosch LM	**3 390 750**	**2 498 686**	**2 348 049**	**2 271 009**	**955 602**	**2 095 779**
	25.6%	**20.4%**	**18.4%**	**21.7%**	**9.6%**	**16.7%**

4.1.3 Agriculture

Water use efficiency in the agricultural sector can be measured by crop yield per unit volume of water used; i.e. either the same crop yield by using less water or producing more crops using the same volume of water. The Fruitlook project was established by the Department of Agriculture to support the farmers with decisions to improve their water use efficiency. The web-based system provides information on 9 growth parameters per registered plot, using satellite imagery: evapotranspiration deficit, crop factor, biomass developed, biomass-water-use efficiency, nitrogen content etc.

The DWS, Directorate: Water Use Efficiency together with the agricultural sectors have developed the water use efficiency accounting report (WUEAR) system many years ago to determine the inflow to each scheme, water usage as well as the water loss. In the previous strategy steering committee meeting it was requested that the agricultural sector reports on their water loss status, utilising the WUEAR and to submit it to the DWS WC RO. The activities undertaken to reduce water losses should also be reported on.

The following irrigation boards and water user associations are listed and catered for in the Reconciliation Strategy:

- Lower Berg Irrigation Board
- Berg River Main Irrigation Board
- Zonderend Irrigation Board
- Vyeboom Irrigation Board
- Banhoek Irrigation Board
- 24 Rivers Irrigation Board
- Wynland Water Users Association (Districts: Stellenbosch, Helderberg and Eerste River)

In addition, there are a number of smaller agricultural users abstracting water directly from the system or the rivers. The total water allocation for all these agricultural water users is currently capped at 170 million m^3/a growing to a maximum cap of 173.6 million m^3/a will apply from 2022 onwards.

Examples of the WUEAR for the Zonderend River WUA and the Wynland WUA are shown in **Table 24** and **Table 25**, respectively.

Table 24: Summary of Water Use Efficiency Accounting Report for the Zonderend River WUA

Year	Total inflow to scheme	Full quota	Agricultural usage	Industrial and municipal usage *)	Total usage	Total loss	
	x10^3 m^3	x10^3 m^3	x10^3 m^3	x10^3 m^3	x10^3 m^3	x10^3 m^3	%
2009/2010	**31270.6**	36105.0	**20362.1**	**3090.8**	23452.9	7817.7	25.0
2010/2011	**38424.9**	36105.0	**25485.5**	**3333.2**	28818.7	9606.2	25.0
2011/2012	**32574.4**	36105.0	**21239.7**	**3191.1**	24430.8	8143.6	25.0
2012/2013	**29964.3**	36105.0	**19296.9**	**3176.4**	22473.3	7491.0	25.0
2013/2014	**29091.6**	36105.0	**18597.5**	**3221.2**	21818.7	7272.9	25.0

*) Usage by Overberg Water for domestic use and stock watering

Table 25: Summary of Water Use Efficiency Accounting Report for Wynland WUA (Stellenbosch District)

Year	Total inflow to scheme	Full quota	Agricultural usage	Industrial and municipal usage *)	Total usage	Total loss	
	x10^3 m^3	x10^3 m^3	x10^3 m^3	x10^3 m^3	x10^3 m^3	x10^3 m^3	%
2010/2011	**10862.0**	12040.4	**10692.2**	**136.0**	10828.2	33.8	0.3
2011/2012	**10709.9**	12040.4	**9917.4**	**136.0**	10053.4	656.5	6.1
2012/2013	**9300.0**	12040.4	**8977.7**	**136.0**	9113.7	186.3	2.0
2013/2014	**6124.8**	12040.4	**N/av.**	**N/av.**	N/av.	N/av.	

*) Allocated, scheduled usage by farmers for domestic use, not metered separately

The losses between water releases and water consumption are estimated by the Zonderend River WUA to be 25% (see **Figure 11**), equally split between evaporation losses and seepage losses. The Wynland WUA has actual readings of water inflow and water consumption, allowing the accurate calculation of water losses. The high losses of 6.1% in 2011/2012 (see **Figure 12**) were due to a main supply line breakage in January 2012. The split of losses between pipe breakage, maintenance work and faulty flow meters is estimated. The lack of measurement is an issue that should be dealt with by the sector in collaboration with the DWS WC RO.

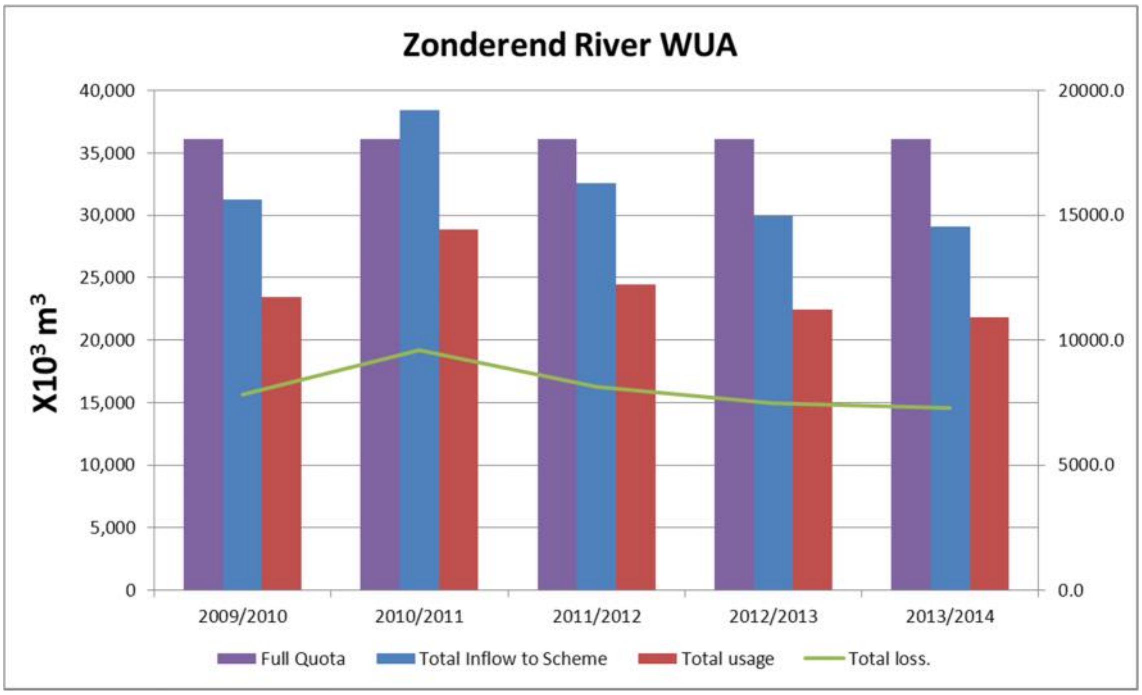


Figure 11: Water balance for Zonderend River WUA

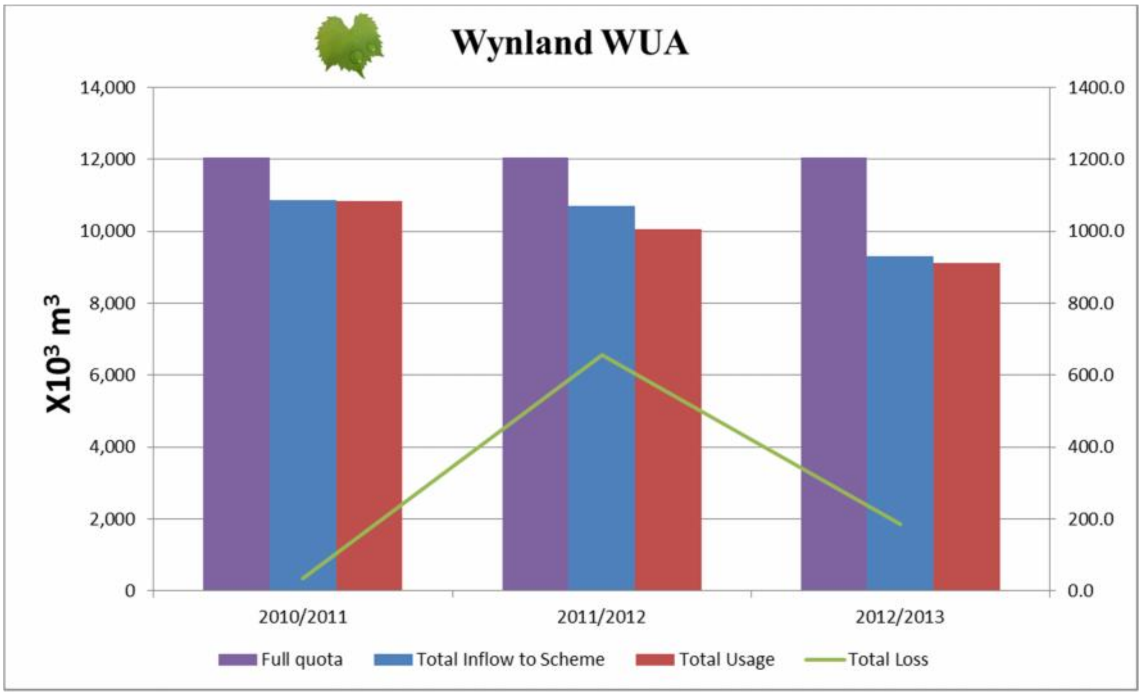


Figure 12: Water balance for Wynlands WUA (Stellenbosch District)

4.2 Feasibility Studies

This section of the status report details the progress the DWS and the CCT have made in the investigation and or implementation of the supply-side interventions. Investigations into possible supply-side interventions by the other municipalities that would impact on their water requirements from the WCWSS are discussed as well.

4.2.1 Department of Water and Sanitation Studies

Berg River-Voëlvlei Augmentation Scheme / Berg-Breede (Michell's Pass) Water Transfer Scheme

The DWS, through the Directorate: Options Analysis has undertaken a full feasibility study to further investigate two potential surface water development options to augment the WCWSS. Each of these options is based on the diversion of surplus winter water into existing or new bulk storage facilities (dams). The schemes which were studied are the Berg River-Voëlvlei Augmentation Scheme (BRVAS) and the Breede-Berg (Michell's Pass) Water Transfer Scheme. The implementation of the latter augmentation option will be subject to confirmation of water availability in the Breede River Basin.

Based on the feasibility investigations, the First Phase Augmentation of the Voëlvlei Dam was selected as the best surface water option which now needs to be compared with the non-surface water options being investigated by the CCT. The incremental yield of the scheme was found to be 23 million m^3 at a level of assurance of supply of 98% (1 in 50 years failure). The unit reference value of the water was estimated to be R1.52/m^3 at a social discount rate of 8% per annum (at 2012 costs). A decision has been made to go ahead with the EIA for the Berg River-Voëlvlei Augmentation (Phase 1) Scheme. It was anticipated to make the PSP appointment for the EIA in October 2013. However, there is no confirmation yet that a PSP had been appointed.

Langebaan Road Aquifer Artificial Recharge

The first pilot study did not provide the expected results; hence, it was decided to undertake a comprehensive feasibility study to relook at different methods and different sites for the recharge of the Aquifer. The project did not start yet due to procurement issues. The final proposal for the Langebaan Road Aquifer Artificial Recharge Feasibility Study will be discussed at a meeting between the CSIR and DWS hopefully before the end of this year. It was expected that an appointment would be made in 2014, however, this process has been further delayed and no appointment of the consultant has been made yet. This delay impacts on the lead times for implementation of the scheme, as detailed in Section 3.3.2.

4.2.2 CCT Studies

Water reclamation

The tender for the water reclamation feasibility study was advertised earlier in 2013 and several tenders were received. The tender was awarded to Aurecon and the contract was signed on 29 May 2014. The contract period is approximately 12 months and the CCT expects to be able to give an initial report back/presentation on the two most feasible re-use options at the SSC meeting scheduled for March 2015.

The required lead time for implementation of water re-use for water supply augmentation depends on the selected option, but it can be expected to be about eight (8) years from start of the feasibility study – this includes the EIA process, construction and linking up to the current water distribution network.

Seawater desalination feasibility study

WorleyParsons were appointed in July 2012 to conduct the large-scale seawater desalination feasibility study. The initial contract period was twelve (12) months, but will take longer than anticipated, until December 2014, due to additional work being conducted. Two possible sites were identified, one of which is at the Koeberg Power Station (ESKOM).The design capacity of the plant will be 150 Mℓ per day, with the possibility of upgrading it with a further two phases up to 450 Mℓ per day. Phasing will require that some of the infrastructure will need to be sized for the final capacity, e.g. the marine intake and outlet works. The use of the ESKOM site and marine infrastructure could result in possible savings for the CCT. The lead time for implementation is also at least about eight (8) years, including the feasibility study, EIA, construction and linking up to the current water distribution network.

The CCT plans to establish a monitoring plant to test the pre-treatment processes and collect data on sea water quality for a period of 18 – 24 months.

TMG Aquifer

The exploratory phase of this study was completed in 2012, but there has been a delay in the appointment of the consultant for the Pilot Phase due to legal complications on how to proceed. The pilot wellfield was originally designed for 5 million m^3/a to be abstracted continuously for 1 or 2 years. The CCT decided to amend the scope of the study and to extend the exploration to a new site identified during the exploratory phase. This would include drilling additional exploration boreholes, deepening one borehole and carrying out pumping tests, after which the study reports will be amended and the feasibility of a full-scale production scheme assessed. This phase is to be completed by end June 2017. The CCT still awaits approval from its Supply Chain Management Bid Adjudication Committee and City Manager to appoint the consultants.

The CCT currently runs a baseline monitoring programme, which will continue until a decision for the full-scale development is taken, at which point the monitoring programme requirements will be revised if necessary.

As part of the extended feasibility study, the CCT envisages applying for a licence to abstract water from the aquifer for full-scale production. This would expedite the possible implementation of the scheme, if found feasible and favourable. Depending on the EIA requirements, it would take at least two (2) to three (3) years after the CCT's decision for full-scale production before abstraction can commence.

Lourens River Diversion

The proposed scheme is a weir with an off-channel earth dam. Water quality in the river has long been a problem due to the impacts of an urban catchment and this is difficult to control. The area that was identified previously for the earth dam has since been incorporated into a housing development. Hence, it is becoming more unlikely that the CCT will be able to develop the scheme as a feasible augmentation option. However, the CCT will advertise for tenders for the Lourens River Feasibility Study in 2015, which would include the option of linking bulk water supply with elements of flood management in the upper reaches of the Lourens River. Currently the CCT is busy with the terms of reference and tender specifications.

Cape Flats and Newlands aquifers

The feasibility for utilizing the Cape Flats Aquifer for storage of treated effluent is part of the water re-use feasibility study. A situation assessment of the Cape Flats Aquifer was carried out by Umvoto Africa that took into account land use planning issues, water quality, flooding issues, different possible uses of the aquifer and management options. The results of the situation assessment was presented and discussed at the ATSG meeting #3 and the SSC meeting #11. A workshop with officials from the CCT and DWS took place in August 2014 to determine how to take the presented options forward: The main options include:

- Bulk Water supply
- Flood mitigation & fire control
- Food security & community greening
- Local scale sanitation i.e. informal settlements and schools
- Ecosystems and catchment management
- Local community building heating/cooling

The CCT Directorate: Water and Sanitation is actively involved and in the process of establishing a multi-disciplinary and multi-departmental steering committee to take these options to pre-feasibility and feasibility level, and to implement pilot schemes.

4.2.3 Other Municipalities

West Coast District Municipality

Desalination

The West Coast District Municipality started with a comprehensive study in 2007 to identify a sustainable long-term alternative water source for the region, in order to ensure sustainable economic development. Various alternative sources and combinations thereof were evaluated and eventually a 25.5 Ml/day sea water desalination plant in the Saldanha Bay area was identified as the most cost beneficial alternative, to be developed in 3 phases as the water requirements grow.

The West Coast District Municipality is therefore proposing to construct and operate a sea water desalination plant in the Saldahna Bay area using reverse osmosis (RO) technology. The intake capacity of the plant will be approximately 60 Mℓ/d (21.9 million m^3/a) producing 25.5 Mℓ/d (9.3 million m^3/a) at final capacity. Approximately 36 Mℓ/d (13 million m^3/a) brine will be discharged into the sea. It will have a lifespan of 25 years with the potential of an extended lifespan.

The environmental screening and technical evaluation reduced the ten possible sites, which were originally identified, to two proposed sites to be evaluated, i.e. the site at Arcelor Mittal in the Industrial Development Zone (IDZ) of Saldanha Bay and a site in Danger Bay. The Danger Bay site was identified as the most suitable site and the EIA approval was obtained during August 2013 for this site and the concomitant bulk infrastructure.

The proposed desalination plant and bulk infrastructure will cost an estimated R500 million, R300 million more than the original cost estimate. The first phase will include the construction of the desalination plant with a capacity of 8.5 Mℓ per day and the bulk infrastructure, with a capacity of 25.5 Mℓ per day. The desalination plant will be upgraded in three phases of 8.5Mℓ per day up to the final capacity of 25.5 Mℓ per day. Funding of this plant is currently a major challenge, as the DM is not in a position to co-fund a project of this extent.

Increased storage capacity at Withoogte

Although the modelling results from the “Analysis of Management Options at Misverstand Weir” to mitigate the potential impact on salinity of the Berg Water Project and Voëlvlei Augmentation Scheme (DWA, 2006) indicated that the incremental impact of the Berg Water Project and Voëlvlei Augmentation Scheme could be mitigated through the provision of an additional 0.25 million m^3 of off-channel storage capacity, the re-analysis showed that the desired 98% level of assurance would not be achievable. To obtain a 98% level of assurance an additional 0.7 million m^3 of storage would be required over and above the readily available 0.5 million m^3 storage at Withoogte.

Drakenstein Local Municipality

Drakenstein Municipality completed a Bulk Water Supply Study during May 2009. One of the recommendations from the study was that the Municipality must proceed with the construction of the new Meulwater WTW on Paarl Mountain. The construction of the new WTW was identified as the most cost effective way to utilise more yield from the Bethel and Nantes Dams and from Drakenstein Municipality’s allocation from the Berg River. In addition to this, the Paarl Mountain WTW was also required to address potential water quality concerns.

The new 8 Mℓ/d Meulwater WTW was put into operation during January 2012. One of the recommendations from the Drakenstein Bulk Water Supply Study was that all future source interventions of the Drakenstein Municipality should be benchmarked against the current and proposed bulk water supply tariff of the CCT. Another recommendation was that the proposed CCT/Drakenstein LM Agreement should also be updated to include Drakenstein Municipality’s "entitlement" from the Berg Water Project, future water resource development principles and the operation procedures for an integrated system.

Stellenbosch Municipality

Stellenbosch Municipality completed a study on “Bulk Water Supply Improvements for Stellenbosch Municipality” during June 2012. The study included several source augmentation options for the four water distribution systems in Stellenbosch Municipality’s Management Area (see **Table 26**). Some of these options would require an increase in allocation from the WC WSS.

An updated water supply agreement between Stellenbosch Municipality and the CCT for the provision of bulk potable water also needs to be finalised.

Table 26: Augmentation options for the water distribution systems, Stellenbosch Municipality

System	Augmentation options investigated
Stellenbosch	• Upgrade of existing Ida’s Valley water supply scheme to Stellenbosch with increased Jonkershoek Weir abstraction allocations. • Upgrade of existing Ida’s Valley water supply scheme to Stellenbosch with increased allocation from Kleinplaas Dam. • Upgrade of existing Paradyskloof water supply scheme with increased DWS allocations. *) • Raising of existing Ida’s Valley Dam. • New bulk water supply scheme from the Berg River Dam to Stellenbosch. • New bulk water supply scheme from the new Jonkershoek Dam to Stellenbosch. • Re-use of treated sewage water from the existing WWTWs for irrigation of sport fields and parks. • Conduct water pressure demand management, by implementation of pressure reducing valves. • Conduct water meter audits and water loss investigations. • Rainwater harvesting. • Groundwater development.
Dwars River	• New water supply scheme via Boschendal Estate (New bulk supply scheme from Berg River or Theewaterskloof Tunnel) *) • Re-use of treated sewage water • Pressure demand management. • Water meter audits and water loss investigations. • Rainwater harvesting. • Groundwater development.
Franschhoek	• Upgrade of existing Wemmershoek water supply scheme to Franschhoek with increased CCT allocations. • New additional parallel Wemmershoek water supply scheme with increased CCT allocations. • New bulk water supply scheme from the Berg River Dam or Theewaterskloof Tunnel to Franschhoek. *) • Replacement of existing Perdekloof water supply scheme’s non-pressurized gravity mains and relocation of Franschhoek WTW. • Re-use of treated sewage water from the existing WWTW for irrigation of sports fields and parks. • Conduct water pressure demand management, by implementation of pressure reducing valves. • Conduct water meter audits and water loss investigations. • Rainwater harvesting. • Groundwater development
Klapmuts	• Increased CCT allocations. • Re-use of treated sewage water from the future upgraded WWTW for irrigation of sports fields and parks. • Conduct water pressure demand management, by implementation of pressure reducing valves. • Conduct water meter audits and water loss investigations. • Groundwater development. • Rainwater harvesting.

*) Scheme would require an additional allocation from the WCWSS

4.3. Other considerations

4.3.1 Berg River Water Quality

Pollution in the Berg River catchment of the Western Cape is a cause of concern especially to communities, farmers and industries in the various municipalities of the West Coast and Cape Winelands regions. Various stakeholders have implemented initiatives to address the pollution concerns raised. The Berg Water Partnership (formerly known as the Berg Water Quality Task Team (WQTT)), was established to address the pollution issues in order to ensure sustainable resource use efficiency and ecological integrity and to coordinate the various initiatives being implemented. This is a multi-stakeholder task team comprising of a number of different institutions including National, Provincial and Local Government Departments as well as NGOs, academic institutions, Water User Associations and others – all coordinated by the DWS.

An Action Plan has been compiled for the Berg River catchment with the focus on the following tasks:

- Task 1: Water Quality Monitoring
- Task 2: Upgrading of Wastewater Treatment Works and training of Process Controllers
- Task 3: Upgrading of Informal Settlements
- Task 4: Promotion of Best Practice in Agriculture
- Task 6: Value of Water
- Task 7: Stakeholder Education
- Task 8: Pollution Incident Management

Various stakeholders are contributing to the implementation of different aspects of these tasks with overall co-ordination by the DWS.

In support of the Berg River Partnership, the Western Cape Government also prioritized the Berg River Catchment and recently developed and endorsed the implementation of a Berg River Improvement Plan (BRIP) to address water security concerns (i.e. quality and quantity) in the Berg River catchment. The plan identifies short (≤ 5 years) and long-term (5 – 30 years) interventions, and their financial implications.

The Provincial Berg River Improvement Plan also identified 6 tasks aligned with the DWS – Berg River Partnership Action Plan for implementation specifically by the Provincial Departments:

- Task 1: Implement a Berg River Water Quality Monitoring Regime
- Task 2: Upgrade Wastewater Treatment Works and Train Process Controllers
- Task 3: Upgrade storm water run-off and Informal Settlements
- Task 4: Advocate Best Practice in Agricultural and Agro-Industrial Processes
- Task 5: Riparian Zone Rehabilitation and Bio-remediation
- Task 6: Pricing Water Management in the Berg River Catchment

4.3.2. Industrial Development Saldanha Bay (GreenCape)

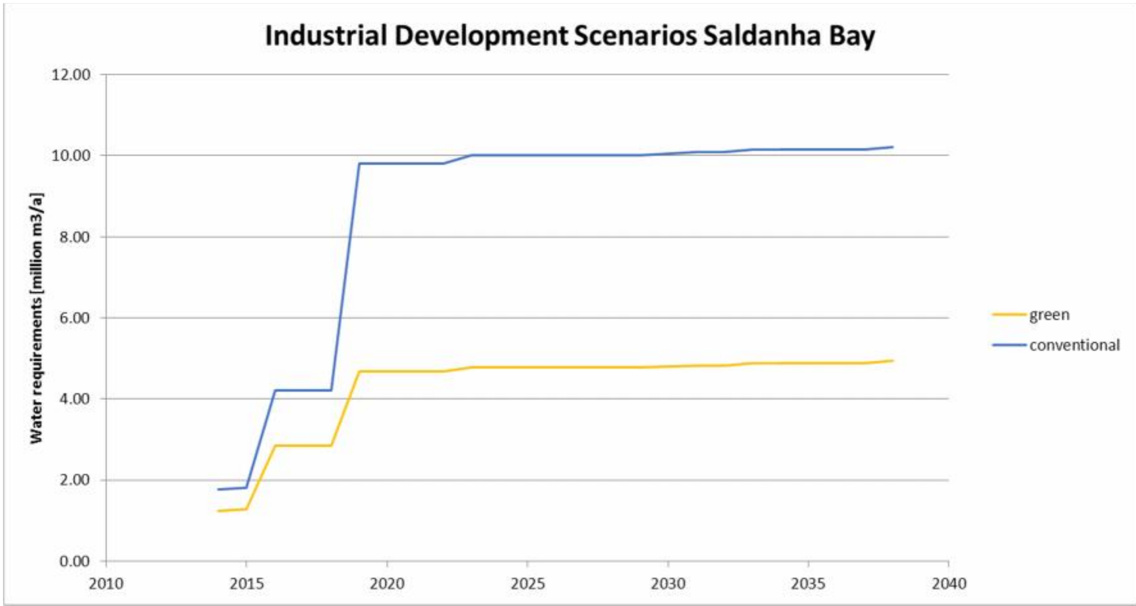
The Provincial Department of Economic Development and Tourism (DEDAT) initiated a project to unlock the potential for economic development in the Saldanha Industrial Development Zone (IDZ). The department appointed GreenCape, a sector development agency established by the Western Cape Province, to manage the project.

Based on current development plans, GreenCape prepared a list of possible projects and their water requirements under two scenarios; viz. conventional water use and 'green' water use (see **Table 27**). 'Green' or 'smart' water use means efficient and productive water use, and includes WDM measures such as recycling of water on site and use of alternative water sources.

The estimated water requirements for these projects are shown in **Figure 13a**. Compared to the water requirement growth scenario, used in the updated Reconciliation Strategy for the West Coast DM supply (i.e. 4%/a), only the development of projects with conventional water use would critically impact on the water supply situation (see **Figure 13b**).

Table 27: List of possible projects for economic development in Saldanha Bay LM, including water requirements and start year (GreenCape, 2014)

Project / Industry Description	Water Requirements		Expected Year of Commencement
	Green (kl/d)	Conventional (kl/d)	
Wind turbine component manufacturing and assembly	169	169	2033
Solar component manufacturing and assembly	13	13	2038
Rare Metals Industries - Titanium slag beneficiation to sponge & Zirconium beneficiation	2500	7650	2019
Zircon beneficiation (milling) to zircon powder	62	141	2031
Offshore supply base	53	53	2038
Vessel repair and maintenance services dry dock	53	53	2038
Hot Briquetted Iron (HBI) production	264	600	2023
Downstream Industrial	800	800	2014
Port	600	600	2014
Customs control area (CCA)	400	400	2014
Receipt and export zinc concentrate at Saldanha port	80	80	2030
Saldanha Separation Plant ("SSP project") for REE's transported in from Zandkopsdrift Mine (in N Cape)	636	1730	2016
Steenkampskraal Rare Earth [Monazite & Thorium]	636	1730	2016
Phosphate mine	45	112	2016
Import and storage terminal	190	190	2014
Proposed Chlorine, Caustic and HCl Plant	3000	3000	2016
Zinc Beneficiation in Saldanha	2500	7650	2019
Fishmeal Plant at Saldanha	105	105	2014
LPG Handling facility (Bottling in CT)	120	120	2014
Fish meal processing plant	105	1414	2014
Limestone quarry and cement plant	102	124	2015
Crude oil storage tank farm	543	610	2014
Application for phosphate prospecting right	543	610	2014



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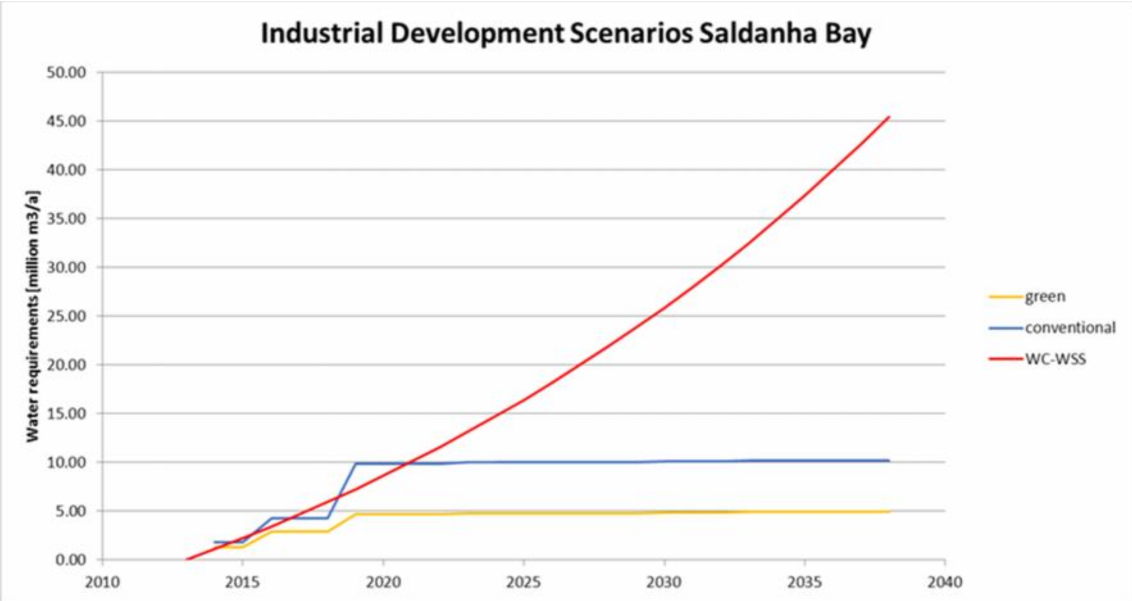

b)

Figure 13: Water requirement scenarios for the proposed economic development scenarios for Saldanha Bay LM (Green Cape, 2014); a) green and conventional scenarios, b) with current water requirement growth scenario for West Coast DM part of WC WSS

4.3.3. Impact of upstream users

The water availability of the system also depends on the developments and water use in upstream catchments. The agricultural water use in some of these catchments is increasing, as is evident in the increased number of farm dams and land under irrigation. Hence, the actual water use for the Tulbagh WUA (Klein Berg River), the 24-Rivers Irrigation Board (24-Rivers) and the La Motte Irrigation Board (Berg River) need to be measured and confirmed. Similarly, the increased domestic water use in some of the catchments must be monitored continuously; e.g. Tulbagh and Wolseley in the Klein Berg River catchment.

It is recommended that the current land use and water use in all upstream catchments be clarified/verified and the WRYM updated accordingly.

5. Strategy Update October2014

5.1. Water Requirement Scenarios

Two basic water requirement scenarios have been developed for use in the reconciliation scenarios. The possible impact of WC/WDM measures is not included in the water requirement scenarios, but considered under the reconciliation scenarios (see **Section 5.3**).

5.1.1. Start year

It was decided to project the water requirements forward from the adjusted water use of the 2012/2013 financial year, ending July 2013, as per the 2013 Status Report. The reasoning for this decision is given below and shown in **Figure 14**.

- The WCWSS Water Reconciliation Strategy (2007) used a 3% growth scenario, starting in 2004, due to the drought measures and restrictions in 2005.
- The Status Report 2011 used a 3.01% growth scenario, starting in 2007, following the trend in growth between 2005 and 2009.
- The slowdown and subsequent reduction in growth of water requirement in the years 2011 to 2014 is mainly due to the effect of implementing WDM measures, and it can be expected that these reductions will be maintained.

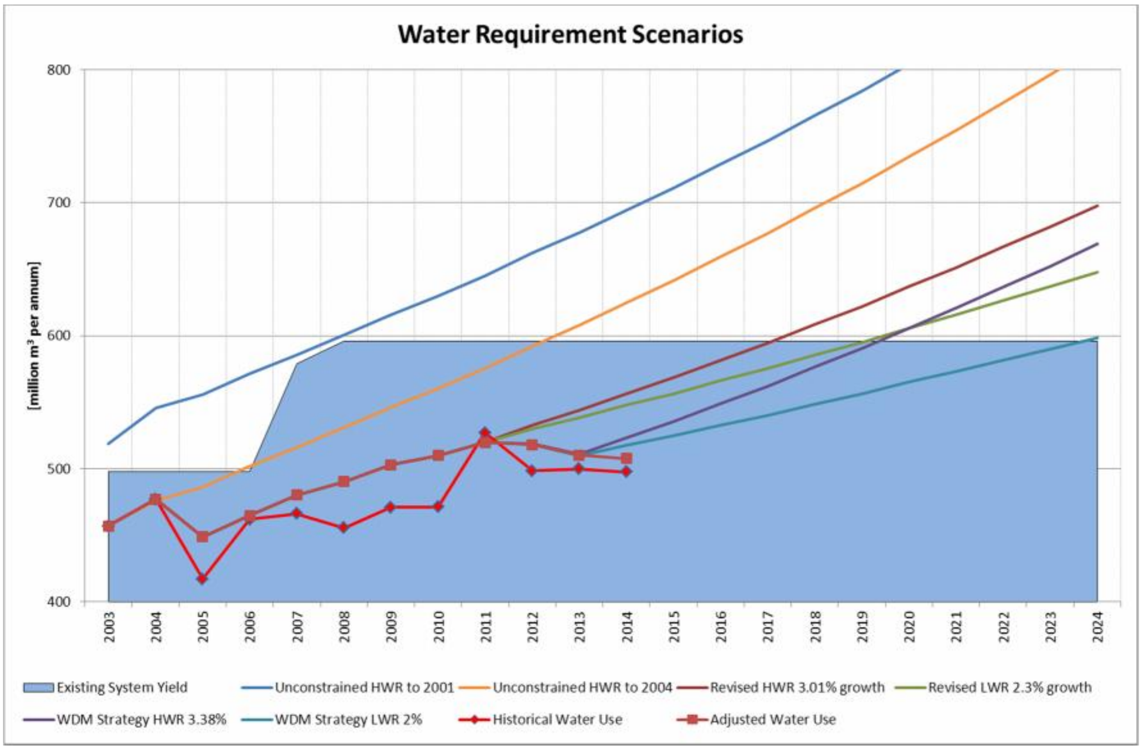

Figure 14: Water requirement scenarios with different start year of projection

5.1.2. Low-growth scenario

The low-growth scenario applies the average annual growth rate in water requirements of the urban sector between 2007 and 2011 of 2.3%, plus the capped agricultural use. The annual water use growth rate prior to 2007 was about 5% due to the recovery from the drought restrictions in 2004/2005, while the growth rate in 2012 and 2013 was negative due to the successful implementation of WDM measures. Hence, the selected range can be considered a realistic growth in water requirement.

5.1.3. High-growth scenario

The high growth scenario adopts the high growth scenario for water requirements from the City's WDM Strategy (3.38%) for the CCT and 4% for the West Coast DM and Stellenbosch supply areas, plus the capped agricultural use.

5.2 Intervention Implementation Programme

5.2.1. Available interventions

Based on the current status of the feasibility studies (see **Section 4.2**), the following interventions are considered available for possible implementation, when a new supply-side augmentation intervention is required:

- Berg River-Voëlvlei (Phase 1) Augmentation Scheme
- Desalination of seawater
- Large-scale water re-use
- Large-scale TMG Aquifer development

5.2.2. Leadtimes and programme

The updated implementation programmes for the Berg River-Voëlvlei (Phase 1) Augmentation Scheme, desalination, water re-use, and the TMG Aquifer scheme are shown in **Appendix C** of this Report. The comparative fast-tracked programmes for these schemes are also shown in **Appendix C**. Fast-tracking an intervention could be achieved through either minimising the time taken by the approval processes, and/or running the environmental approval process (EIA) and scheme design as parallel processes. The expected lead times per intervention are detailed in **Table 28** below:

Table 28: Lead time programme for the different steps of implementation for the relevant interventions

INTERVENTION PROGRAMMES	Feasibility (years)			Construction/Implementation (years)					Implementation lead time
Scheme	Lag time (budget delay)	TOR / Appoint Consultant	Feasibility Study / EIA / Reserve	Lag time (budget delay)	TOR / Appoint Consultant	DWA / DEA&DP Approval	Design / tender prepar. & award	Construct / Implement / Council Bylaw	
Michell's Pass Diversion			1.5	1	1	1.5	2	2	**9**
Voëlvlei Phase 1			1	1	0.5		2	2.5	**7**
Cape Flats Aquifer	0.5	0.5	2.5	1	1	1.5	1.5	2	**10.5**
Artificial Recharge: West Coast		0.5	2.5	1	1	1.5	2	1.5	**10**
TMG Scheme			3	1	0.5	0.5	1	2	**8**
Water Re-use			2	1	0.5	0.5	1.5	2.5	**8**
Seawater Desalination			2	1	0.5	0.5	1.5	2.5	**8**
Lourens River		1	2	1	1	1.5	2	1.5	**10**
Raise Lower Steenbras	1	1	2	1	1	1.5	2.5	3	**13**
Voëlvlei Phases 2 & 3	1	1	2	2	1	2	2.5	2.5	**14**

The construction programme for any of these interventions would be quite tight and is based on a number of construction activities being implemented in parallel.

The expected possible year of first water delivered for the different intervention options is shown in **Table 29** below, based on the current status of the studies and the assumed lead times above:

Table 29: Year of first water supplied by intervention option

Intervention option	**Year of first water**	
	Standard	**Fast-tracked**
Berg River-VoëlvleiAugmentation Phase 1	2^{nd} half 2021	2^{nd} half 2020
Water Re-use	1^{st} half 2022	1^{st} half 2021
Seawater Desalination	2^{nd} half 2022	2^{nd} half 2021
TMG Aquifer Scheme	1^{st} half 2023	1^{st} half 2022

5.3. Reconciliation Scenarios

In order to obtain a good understanding of the range of possible implementation dates of the next required supply-side intervention, three scenarios were developed taking account of updated water requirements, the potential effectiveness of implementing WC/WDM measures and achieving the targeted savings, potential climate change impacts, the current *status quo* of the feasibility studies, and implementation progress with interventions.

The following three scenarios were investigated:

1. Scenario 1: 2013 Base Scenario: Revised Integrated System Yield, "High water requirement", CCT WC/WDM strategy 100% successful (2014 to 2020), no climate change impact

2. Scenario 2: 2013 Planning Scenario: Revised Integrated System Yield, "High water requirement", CCT WC/WDM strategy 50% successful (2014 to 2020), no climate change impact

3. Scenario 3: "Worst-Case" Scenario: Revised Integrated System Yield, "High water requirement", CCT WC/WDM strategy 50% successful (2014 to 2020) with possible negative impacts of climate change on the yields of the different water resources.

Many more scenarios exist between the 2013 Planning Scenario and the "Worst-Case" Scenario, but if solutions could be found for these two scenarios, all other eventualities should be covered. Should the adjusted total water requirement follow a lower trajectory than the High Water Requirement Curve, then the required implementation date of interventions could be delayed and more options for implementation would become available to select from.

5.3.1. Base Scenario – High Growth with 100% successful WC/WDM

The 2013 Base Scenario assumes that the CCT is able to achieve 100% of their WC/WDM targets and anticipated savings for the period 2014 to 2020, based on the updated WC/WDM Strategy and programme.

Under this scenario the requirement for water would exceed the available supply in 2024.

The following interventions would be available for implementation by 2024:

- Berg River-VoëlvleiAugmentation (Phase 1)
- TMG Aquifer Development
- Large-scale water re-use
- Desalination of seawater.

The following interventions will not be available for implementation by 2024:

- Michell's Pass Diversion – subject to a Water Availability Assessment Study in the Breede River to determine the available yield
- Raising of Steenbras Lower Dam – Feasibility Study not commenced and much longer lead time required to implement
- Development of the Lourens River Diversion, Cape Flats or Newlands Aquifer – not available for implementation by 2024 as the CCT, with its current limited human and financial resources, has decided to focus its attention on initiating water re-use and desalination feasibility studies as their first priority.

After the implementation of one of the four options by 2024, a whole range of options then become available to be implemented over time. A possible reconciliation of supply and requirement based on lowest Unit Reference Value (URV) is shown in **Figure 15** below, taking into account those interventions that could potentially be implemented in time. This represents only one potential development sequence. Other potential development sequences could include other surface water or groundwater interventions. In **Table 30** the interventions which have been used in **Figure 15** are listed in sequence of implementation as shown.

Table 30: Possible intervention implementation programme for Reference Scenario

INTERVENTION SELECTION		YEAR	YIELD (million m³/a)	Total Lead Time	Required Study Start Date	Time to full yield / saving	Study Status Completed
1	Berg River-Voëlvlei Phase 1	2024	23	7	2017	1	F
2	TMG Scheme 1	2025	20	8	2017	1	PF
3	Re-use Option 1	2026	40	8	2018	2	PF
4	TMG Scheme 2	2028	30	9.5	2018.5	2	PF
5	Re-use Option 2	2030	40	8	2022	2	PF
6	Desalination Phase 1	2032	50	8	2024	2	PF
7	Desalination Phase 2	2034	50	8	2026	2	PF
8	Desalination Phase 3	2035	50	8	2027	2	PF

Note: It is important to note that the implementation dates almost follow year-on-year, due to the relative small yields of the different schemes and because the implementation of schemes is shown in phases.

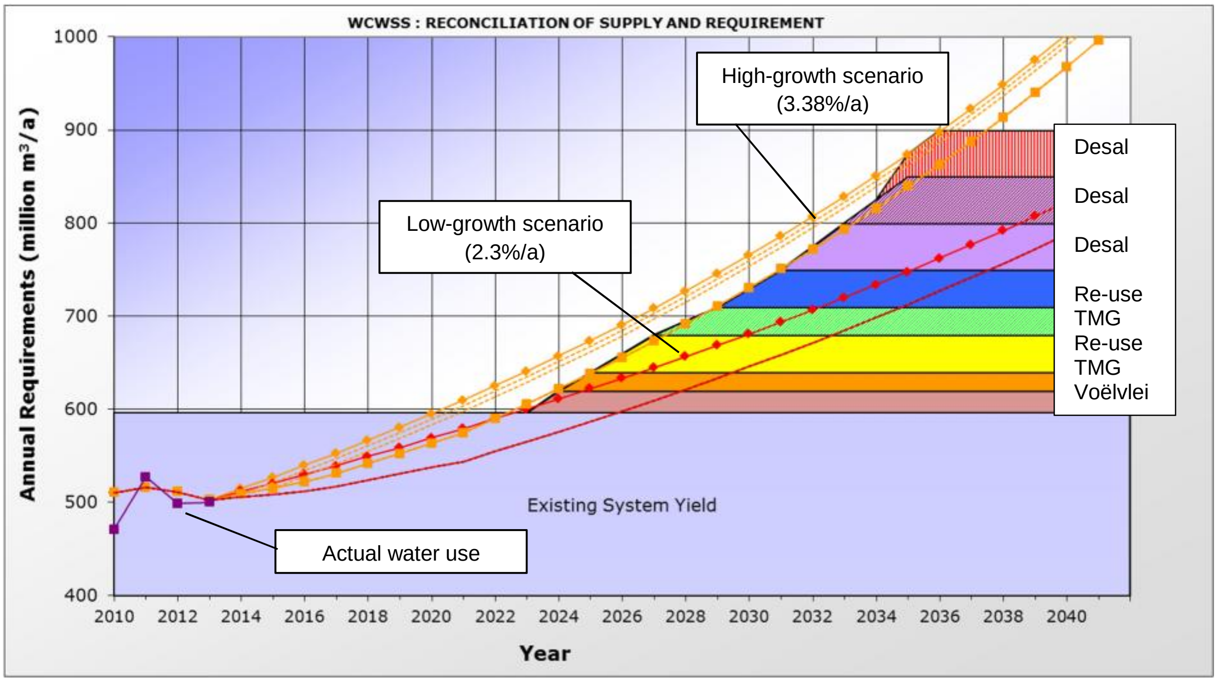

Figure 15: Reconciliation of water supply and requirement for the Reference Scenario

5.3.2. Planning Scenario – High Growth with 50% successful WC/WDM

This scenario assumes that the CCT is only able to achieve 50% of its year-on-year WC/WDM targets for the period 2014 to 2020, based on the updated WC/WDM Strategy and programme.

Under this scenario the requirement for water would exceed the available supply in 2022.

All four possible interventions listed in **Section 5.3.1** above would be available for implementation in 2022. However, the TMG Aquifer Scheme would need to be fast tracked.

A possible reconciliation of supply and requirement for the WC/WDM 50% successful scenario is shown in **Figure 16**. This represents only one potential development sequence. **Table 31** lists the supply-side interventions which have to be implemented in order to ensure the reconciliation of supply and requirement up to 2040 under this scenario.

Table 31: Possible intervention implementation programme for Planning Scenario

INTERVENTION SELECTION		YEAR	YIELD (million m^3/a)	Total Lead Time	Required Study Start Date	Time to full yield / saving	Study Status Completed
1	Berg River-Voëlvlei Phase 1	2022	23	7	2015	1	F
2	TMG Scheme 1	2024	20	8	2016	1	PF
3	Re-use Option 1	2025	40	8	2017	2	PF
4	TMG Scheme 2	2027	30	9.5	2017.5	2	PF
5	Re-use Option 2	2029	40	8	2021	2	PF
6	Desalination Phase 1	2031	50	8	2023	2	PF
7	Desalination Phase 2	2033	50	8	2025	2	PF
8	Desalination Phase 3	2035	50	8	2027	2	PF

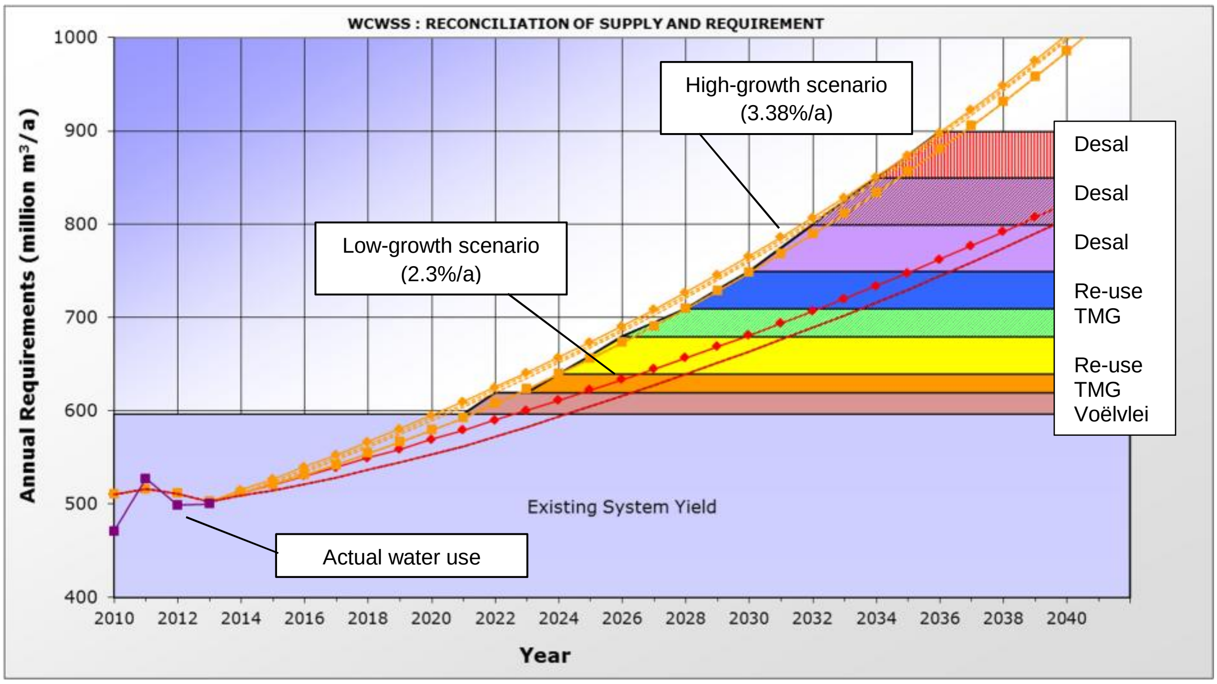

Figure 16: Reconciliation of water supply and requirement for the Planning Scenario

5.3.3. Worst Case Scenario – High Growth and climate change

The Worst-Case Scenario assumes that the CCT is only able to achieve 50% of the WC/WDM targets proposed in the updated WC/WDM Strategy and Programme, and that climate change will impact on the available yield of the WCWSS by decreasing the available yield by 15% over the 25-year planning horizon.

Under this scenario the requirement for water would exceed the available supply in 2021.

Only the Berg River-Voëlvlei Augmentation (Phase 1) Scheme would be available for implementation by 2021, if the EIA process is initiated before the end of 2014.

It would be very costly to implement additional interventions to offset the potential decrease in yield as a result of climate change. Interventions should therefore only be implemented if proof of a long-term decrease in rainfall were to be found. It is therefore important to monitor for any trend changes in rainfall and run off and to understand the possible impacts of climate change on water requirements. A possible reconciliation of supply and requirement for the Worst-Case Scenario is shown in **Figure 17**. This represents only one potential development sequence. However, it is noted that additional schemes would need to be implemented, not considered in the previous scenarios; e.g. DWS Artificial Recharge Scheme at Langebaan Road Aquifer and extension of water re-use and or seawater desalination.

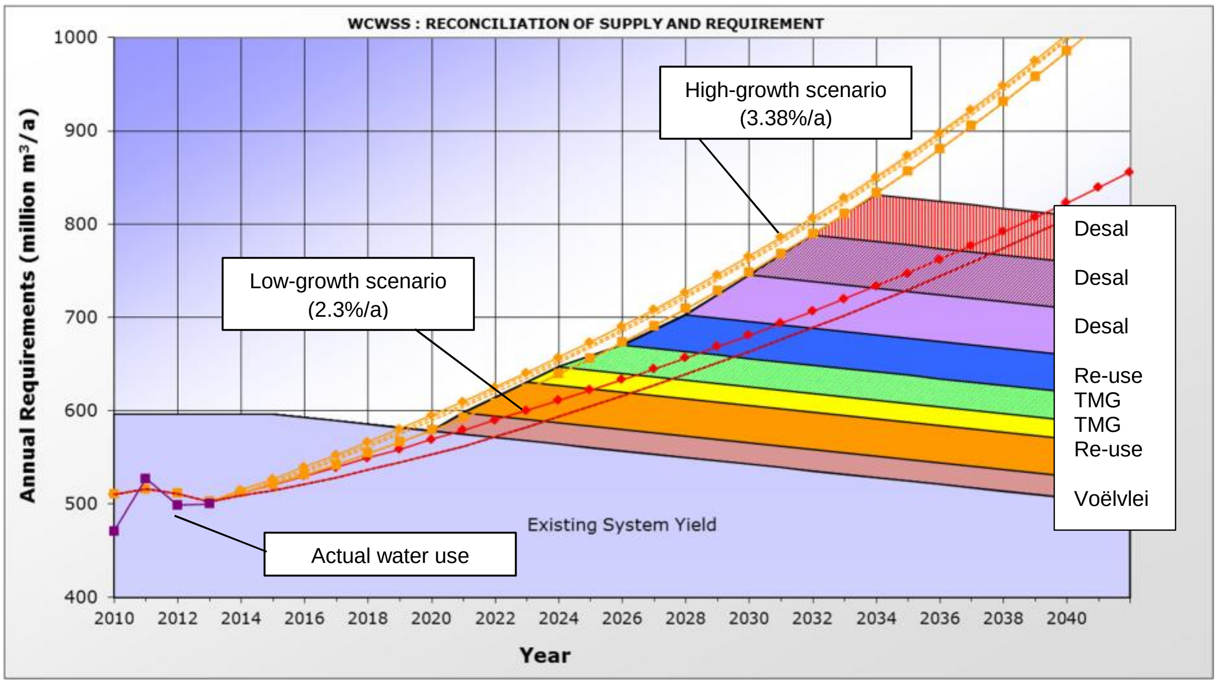

Figure 17: Reconciliation of water supply and requirement for the "Worst Case" Scenario (impact of climate change)

5.4. Implementation of the Ecological Reserve

The ecological Reserve requirement of the Berg River downstream of the Berg River Dam was built into the design and operational rules for the scheme. Dams constructed prior to the Berg River Dam are not yet releasing the ecological Reserve requirements. Based on the 2014 Planning Scenario, it is proposed that the ecological Reserve on "old dams" should only be phased in after 2022 and when a new augmentation intervention has been put in place. Should the Reserve be implemented within the next few years (see **Figure 18**), it might not be possible to implement interventions in time to offset the loss in yield due to the required environmental flow releases. The implementation of the Reserve should be phased in, in a planned manner, based on the implementation dates of future water augmentation schemes. **Figure 19** illustrates a possible scenario for the implementation of the ecological Reserve after 2022.

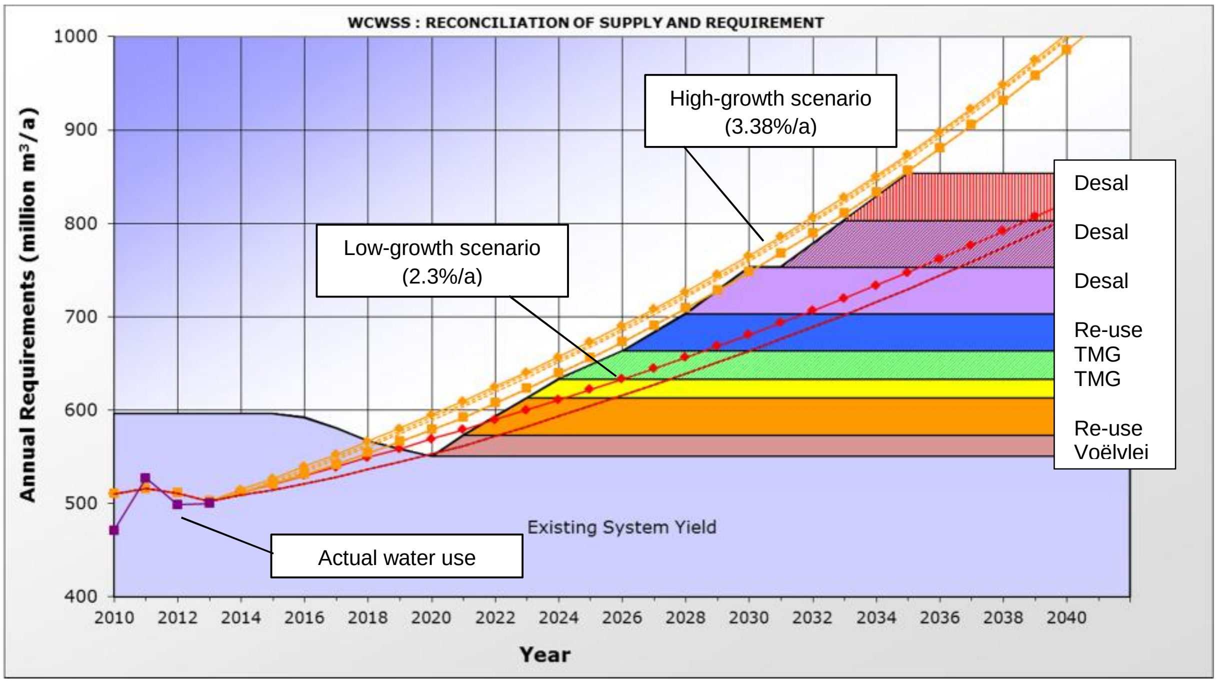

Figure 18: Impact of implementing the Ecological Reserve from 2016 onwards on the reconciliation of water supply and requirement

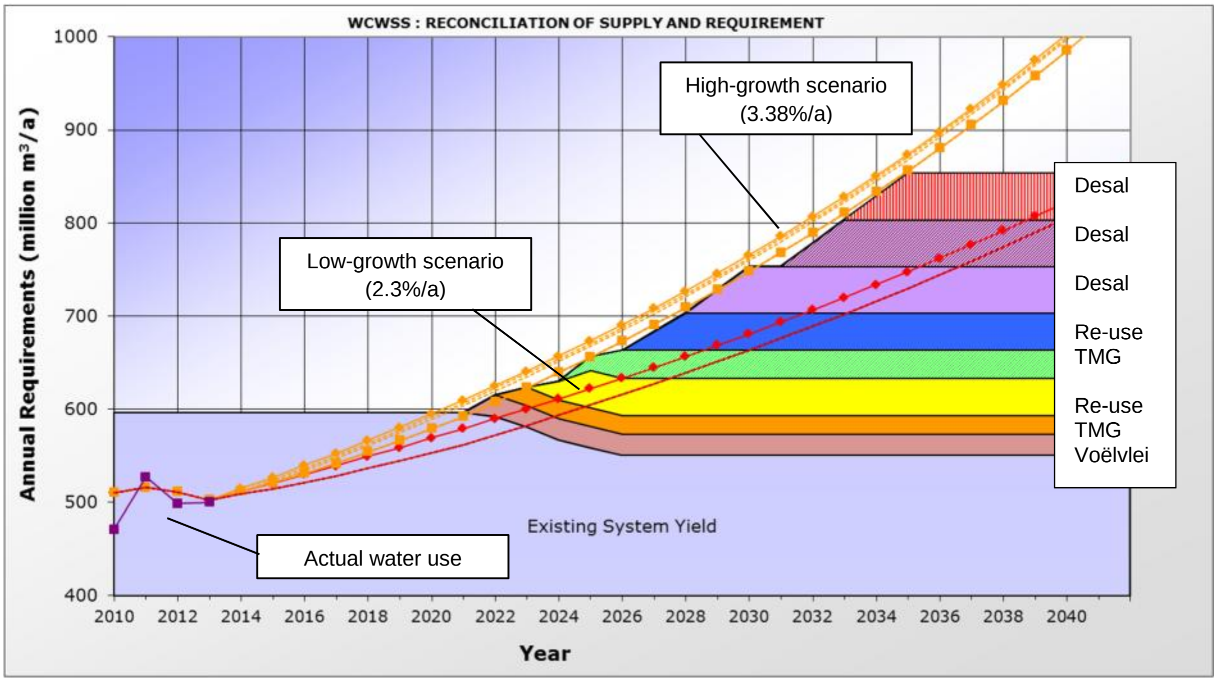

Figure 19: Impact of implementing the Ecological Reserve from 2022 onwards on the reconciliation of water supply and requirement

6. Conclusions and Recommendations

6.1. Conclusions

The following conclusions can be drawn from the 2014 scenario planning and strategy update:

- The CCT's approved WC/WDM Strategy and its implementation by the CCT show positive results, in that water losses and actual water consumption were reduced significantly over the last two years.
- The successful implementation of WC/WDM by all users in the System remains absolutely critical to ensure the on-going reconciliation of supply and requirements.
- The planning scenario (high water requirement growth, 50% success of WC/WDM measures) indicates that the water requirement would exceed the current system yield in 2022, by which time a new supply-side intervention need to be ready for augmenting the water supply.
- The WC/WDM savings and reduction in water requirements mean that the implementation of the next intervention could be delayed by approximately three (3) years.
- It should not be necessary to fast-track a supply-side intervention, unless the ecological Reserve of the old dams is implemented within the next few years.
- Feasibility studies are being undertaken by both the DWS and the CCT to determine which of the four potential augmentation interventions that are on the table should be implemented by 2022, and the possible sequence of the interventions. A decision on which of these interventions to implement first will have to be made at the latest at the October 2015 meeting of the SSC.
- Most of the feasibility studies by the CCT are behind schedule but due to the successful implementation of the WC/DM measures, this is currently not too critical. However a decision on the next augmentation intervention cannot be postponed after October 2015.
- The choice of which intervention to implement will be dependent on the growth in water requirements. If the growth in water requirements is lower than the high water requirement curve, then it may be possible to implement the intervention with the lowest URV. If the water requirements grow at the projected high growth rate, it is important to continue with the feasibility studies for other interventions to enable informed decisions on which project needs to be implemented first and which to follow .
- The Decision Support System (DSS) which is currently being developed for the WCWSS includes a real-time monitoring system which helps to improve the management of releases from the major dams and to also reduce potential losses incurred under previous operating rules.
- It is important to implement a system to monitor potential indicators of climate change and to monitor the CCT's success in implementing their WC/WDM Strategy measures.
- There is uncertainty surrounding the actual extent of invasive alien plant infestation in the catchment areas of the dams of the WCWSS and this need to be addressed by Working for Water. Clearing of the riparian zones of invasive plants is also seen as a potential way of making some water available to meet ecological water requirements.
- There is uncertainty about the actual agricultural consumption due to the lack of sufficient measurement points along the river reaches and at the off take points.
- There is uncertainty regarding the correct and legal allocations from the system to the different users.
- The numbers used in the regular WRYM and WRPM updates, the annual water balance, and the reconciliation scenarios are not aligned and this need to be addressed.

6.2. Recommendations

The following recommendations follow from the assessment of the current water requirements and updated scenario planning:

1. The CCT and other municipalities must actively continue with the implementation of its approved and updated WC/WDM Strategy – Responsibility CCT, West Coast DM, and relevant LMs.
2. Regular reviews of the Reconciliation Strategy should continue in order to ensure the objectives and targets set by the Strategy are achieved – Responsibility SSC and ATSG
3. The assumptions made in the 2007 Reconciliation Strategy and in the updated WC/WDM Strategy in terms of population growth projections, economic growth projections and anticipated service delivery programmes should be reviewed and updated in order to ascertain whether the assumptions surrounding the development of the High Water Requirement curves are still valid - Responsibility CCT, West Coast DM, and relevant LMs
4. The feasibility studies required and identified in the 2007 Reconciliation Strategy Study and the 2014 Scenario Planning update need to continue or start, namely:
    a. Berg River-Voëlvlei(Phase 1)Augmentation – DWS to commence EIA process in 2014;
    b. Langebaan Road Aquifer Artificial Recharge Scheme – DWS to commence with a comprehensive feasibility study and pilot project in 2015;
    c. Table Mountain Group Aquifer (TMG) development – CCT to commence with extended Exploratory Phase in 2014;
    d. Cape Flats and Newlands Aquifer development – CCT to start feasibility studies in 2015;
    e. Lourens River Diversion – CCT to start tender process for appointing a PSP in 2014; study to commence in 2015;
    f. Water Re-use – CCT to conclude feasibility study in 2015;
    g. Desalination of seawater – CCT to conclude feasibility study in 2014/early 2015;
    h. Michell's Pass Diversion Scheme – DWS to commence Breede WAAS in 2016 to confirm water availability;
    i. Raising of Steenbras Lower Dam – DWS/CCT to commence with feasibility study;
    j. Clearing of invasive alien vegetation - on-going and extent should be significantly increased especially in the riparian zones of the Berg, Breede, Sonderend and Sandveld rivers and their major tributaries.
5. A monitoring system must be put in place to serve as an early warning whether climate change has started to impact on water availability and/or water requirements - Responsibility DWS, WC DoA and SAWS.
6. The monitoring of the water consumption and water losses by the agricultural sector has improved, but requires further improvement so that the data is available in time for updating the water balances and water requirement scenarios. In addition, measures must be put in place to optimise the releases for the agricultural sector and reduce the water losses in canal distributions. – Responsibility DWS and WC DoA, monitoring SSC and ATSG
7. The legality of the allocations from the system for the different sectors and users must be clarified and agreed upon by the DWS and all stakeholders. – Responsibility DWS, ATSG
8. The Water Resources Yield Model (WRYM) and the Water Resources Planning Model (WRPM) need to be updated with the latest water consumption data and water requirement scenarios to confirm the available yield from the system. – Responsibility ATSG
9. The Reconciliation Strategy for the WCWSS should be re-assessed in October 2015 when actual water use numbers for 2014/15 have been verified from all user sectors and adjusted where required. – Responsibility SSC and ATSG

7. References

- Conward Consulting, April 2007. COCT Long-Term Water Conservation and Water Demand Management Strategy, Water & Sanitation.
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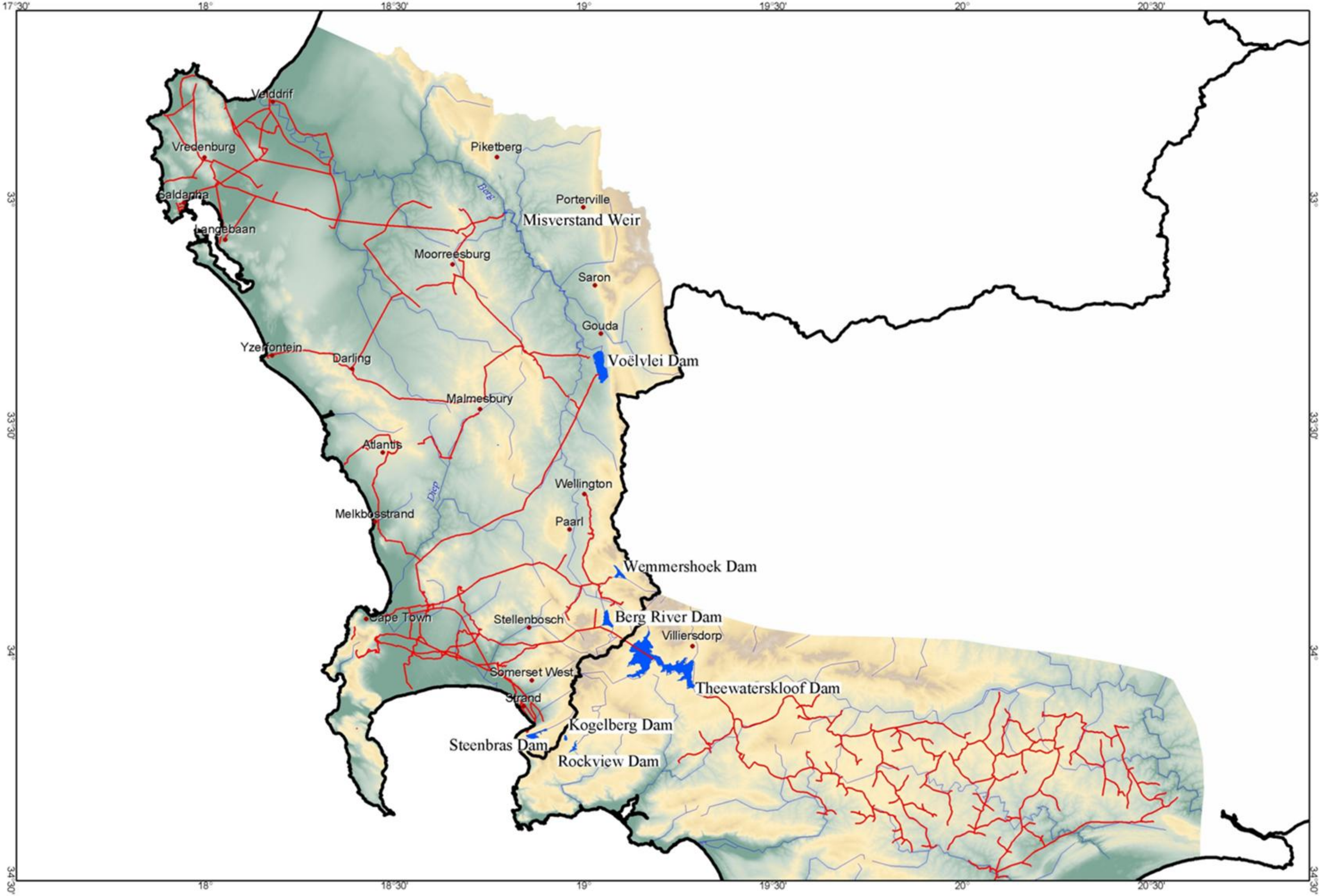
Appendices

Appendix A: Extent of WCWSS



17°30'
18°
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Velddrif
Vredenburg
Saldanha
Langebaan
Piketberg
Porterville
Berg
Misverstand Weir
Moorreesburg
Saron
Gouda
Yzerfontein
Darling
Voëlvlei Dam
Malmesbury
Atlantis
Diep
Wellington
Melkbosstrand
Paarl
Wemmershoek Dam
Cape Town
Stellenbosch
Berg River Dam
Villiersdorp
Somerset West
Theewaterskloof Dam
Strand
Kogelberg Dam
Steenbras Dam
Rockview Dam

Appendix B: List of SSC members

ORGANISATION	MEMBER	POSITION
Western Cape Provincial Government		
Department Agriculture	André Roux	Chief Director
	Peter Keuck	Chief Engineer
DPLG and Housing	Niel Muller	
Cape Nature	Pierre de Villiers	
DEA&DP	Catherine Bill	Planning Branch
	Zaahir Toefy	Environmental Branch
Local Government	Dr Hildegarde Fast	
	Izak Toerien	
	Marius Brand	Director: Municipal Infrastructure
Local Authorities		
City of Cape Town	Peter Flower	Director: Water & Sanitation
Bulk Water	Barry Wood	Manager
	Paul Rhode	Head: Bulk Water Resource & Infrastructure Planning
Wastewater Treatment	Kevin Samson	Manager
WDM & Strategy Branch	Zolile Basholo	Manager
	Collin Mubadiro	Head: WDM Operations
	Jaco de Bruyn	Head: Water Services Development
West Coast DM	Nic Faasen	
	Henk Matthee	Director Engineering Services
Drakenstein	Andre Kowalewski	
Stellenbosch	Dries van Taak	
	Andre van Niekerk	Director: Engineering Services
Witzenberg	Nathan Jacobs	Manager Water and Sewerage
Bergrivier	Jaco Breunissen	Senior Engineer Civil
Department of Water and Sanitation		
Regional Office	Rashid Khan	Chief Director
	Ashia Petersen	Director Institutional Establishment
	Anneke Schreuder	Berg Proto CMA
	Derril Daniels	Manager Berg Proto CMA
	Boniswa Hene	Director Regulatory Support
	Wilna Kloppers (alt)	Water Resource Protection
	Thembi Masilela	Director Water Sector Support
	Simpiwe Mashicila	RBIG Programme Manager
	Nicolette Vermaak	Groundwater

ORGANISATION	MEMBER	POSITION
Chief Directorate: Integrated Water Resource Planning (Head Office)		
Chief Director	Livhuwani Mabuda	Chairperson
National Water Resource Planning	Tendani Nditwani	Acting Director
	Isa Thompson	CE: South
Options Analysis	Menard Mugumo	CE: South
Water Resource Planning Systems	Dr Beason Mwaka	Director
	Fanus Fourie	- Groundwater Planning
	Jenny Pashkin	Systems operation
Water Use Efficiency	Paul Herbst	Director
	Nosipho Sombane (alt.)	
Climate Change	Dr Smangele Mgquba	Director
Water Resources Infrastructure: Southern Operations (EC & WC)		
Operations	Dewald Coetzee	Director
	Bertrand van Zyl	Chief Engineer
CMAs		
Berg - Olifants-Doorn	Derril Daniels	
Breede – Gouritz	Phakamani Buthelezi	
	Jan van Staden	
WUAs / IBs		
Berg River Main IB	Willie Enright	
	WD Bourbon-Leftley	
Sentraal-Breede WUA	Louis Bruwer	
Winelands WUA		
Overberg Water	Richard Edson	CEO

Appendix C: Implementation Programmes

Voelvlei Phase 1	YEARS - NORMAL PROGRAMME																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
Feasibility																														
Feasibility Study	X	X	X																											
Decision to proceed / TOR				Z																										
Lag time (approvals and budget)					X	X																								
EIA							X	X																						
Environmental Authorisation									X																					
DWA Licensing and Reserve							X	X	X																					
Construction / Implementation																														
Decision to proceed								Z																						
Lag time (approvals and budget)									X																					
TOR / Appoint Consultant										X																				
Design											X	X	X																	
Tender preparation & award													X	X																
Construction															X	X	X	X	X											
First water																				Z										

	YEARS - FAST TRACKED																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
Feasibility																														
Feasibility Study	X	X	X																											
Decision to proceed / TOR				Z																										
Lag time (approvals and budget)					X	X																								
EIA							X	X																						
Environmental Authorisation									X																					
DWA Licencing and Reserve							X	X	X																					
Construction / Implementation																														
Decision to proceed						Z																								
Lag time (approvals and budget)							X																							
TOR / Appoint Consultant								X																						
Design									X	X	X																			
Tender preparation & award												X	X																	
Construction														X	X	X	X	X												
First water																		Z												

Desalination	YEARS - NORMAL PROGRAMME																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
TOR / Appoint Consultant		X																												
Pre-feasibility			X																											
Feasibility																														
Feasibility Study			X	X	X	X																								
Water Quality Monitoring							X	X	X	X																				
Decision to proceed / TOR								Z																						
EIA									X	X																				
Environmental Authorisation											X																			
Construction / Implementation																														
Decision to proceed											Z																			
Lag time (approvals and budget)											X																			
TOR / Appoint Consultant												X																		
Design													X	X	X															
Tender preparation & award															X	X														
Construction																	X	X	X	X	X									
First water																						Z								

	YEARS - FAST TRACKED																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
TOR / Appoint Consultant		X																												
Pre-feasibility			X																											
Feasibility																														
Feasibility Study			X	X	X	X																								
Water Quality Monitoring							X	X	X	X																				
Decision to proceed / TOR								Z																						
EIA									X	X																				
Environmental Authorisation											X																			
Construction / Implementation																														
Decision to proceed								Z																						
Lag time (approvals and budget)									X																					
TOR / Appoint Consultant										X																				
Design											X	X	X																	
Tender preparation & award													X	X																
Construction															X	X	X	X	X											
First water																				Z										

Water re-use	YEARS - NORMAL PROGRAMME																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
TOR / Appoint Consultant				X	X																									
Pre-feasibility						X																								
Feasibility																														
Feasibility Study						X	X	X																						
Decision to proceed / TOR								Z																						
EIA									X	X																				
Environmental Authorisation											X																			
Construction / Implementation																														
Decision to proceed											Z																			
Lag time (approvals and budget)											X																			
TOR / Appoint Consultant												X																		
Design													X	X	X															
Tender preparation & award															X	X	X													
Construction																	X	X	X	X	X									
First water																					Z									
	YEARS - FAST TRACKED																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
TOR / Appoint Consultant				X	X																									
Pre-feasibility						X																								
Feasibility																														
Feasibility Study						X	X	X																						
Decision to proceed / TOR								Z																						
EIA									X	X																				
Environmental Authorisation											X																			
Construction / Implementation																														
Decision to proceed								Z																						
Lag time (approvals and budget)									X																					
TOR / Appoint Consultant										X																				
Design											X	X	X																	
Tender preparation & award													X	X	X															
Construction															X	X	X	X	X											
First water																			Z											

TMG Aquifer	YEARS - NORMAL PROGRAMME																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
Feasibility																														
Exploratory Phase	X																													
Decision to proceed						Z																								
Extended Exploratory Phase						X	X	X	X	X	X																			
DWA Licensing and Reserve									X	X	X																			
Construction / Implementation																														
Decision to proceed / TOR												Z																		
Lag time (approvals and budget)													X																	
TOR / Appoint Consultant														X																
EIA															X															
Environmental Authorisation																X														
Design																	X	X												
Tender preparation & award																			X											
Construction																				X	X	X	X							
First water																							Z							

	YEARS - FAST TRACKED																													
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15	
	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026	
Feasibility																														
Exploratory Phase	X																													
Decision to proceed						Z																								
Extended Exploratory Phase						X	X	X	X	X	X																			
DWA Licensing and Reserve																														
Construction / Implementation																														
Decision to proceed / TOR												Z																		
Lag time (approvals and budget)													X																	
TOR / Appoint Consultant														X																
EIA															X															
Environmental Authorisation																X														
Design															X	X														
Tender preparation & award																	X													
Construction																		X	X	X	X									
First water																					Z									