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REPUBLIC OF SOUTH AFRICA

Support on the Continuation of the Reconciliation Strategy of the KwaZulu-Natal Coastal Metropolitan Area: Phase 2

STATUS REPORT: MARCH 2016

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LIST OF ABBREVIATIONS

BWSS	Bulk Water Supply Scheme
DM	District Municipality
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
KZN	KwaZulu-Natal (Province)
LTBWSS	Lower Thukela Bulk Water Supply Scheme
MM	Metropolitan Municipality
MMTS	Mooi-Mgeni Transfer Scheme
MMTS2a	Mooi-Mgeni Transfer Scheme Phase 2a (Spring Grove Dam)
NWRS2	National Water Resources Strategy 2
O&M	Operation and Maintenance
SANBI	South African National Biodiversity Institute
SCA	South Coast Augmentation
SOF	System Operations Forum
SSC	Strategy Steering Committee
TCTA	The Trans Caledon Tunnel Authority
TWP	Thukela Water Project
UEIP	uMngeni Ecological Infrastructure Partnership
uMWP-1	uMkhomazi Water Project Phase 1 (Smithfield Dam)
WC/WDM	Water Conservation and Water Demand Management
WSA	Water Services Authority
WSS	Water Supply System
WTW	Water Treatment Works

1 INTRODUCTION

1.1 BACKGROUND

In 2010 the Department of Water and Sanitation, DWS, (then Department of Water Affairs) developed the *Water Reconciliation Strategy Study for the KwaZulu-Natal Coastal Metropolitan Area*, a strategy to ensure adequate supply of water for the metropolitan areas in the central KwaZulu-Natal (KZN) region. The key objective of the Strategy is to identify, evaluate and prioritise the interventions that should be implemented to meet future water requirements. Within this context the Strategy is used as a decision support framework for making informed and timeous recommendations on interventions through a collaborative process involving stakeholders and institutions involved in the water supply cycle.

1.2 STUDY AREA

The study area of the Reconciliation Strategy extends from the Thukela River mouth on the KZN North Coast to the uMtwalume River on the South Coast and from Howick in the west to Durban in the east. It includes the eThekwini Metropolitan Municipality (MM), Msunduzi Local Municipality, as well as portions of uMgungundlovu, iLembe, and Ugu District Municipalities (DMs). The area consists of three main supply systems, namely the **Mgeni Water Supply System (WSS)**, the **South Coast WSS** and the combined **Mdloti-Mvoti WSS** (on the North Coast).

The location of the supply areas as well as the integrated nature and main sources of water are shown in **Figure 1.1**. This includes all the dams in the uMngeni catchment (Midmar, Albert Falls, Nagle and Inanda dams), the Mooi-Mgeni Transfer Scheme (MMTS) with Mearns Weir (Phase 1) and the recently completed Spring Grove Dam (Phase 2), as well as linkages between the supply systems via the Northern and Western Aqueducts, as well as the South Coast Augmentation (SCA) and Lower Thukela Bulk Water Supply Scheme (LTBWSS) conveyance infrastructure. The figure also indicates the proposed transfer from the uMkhomazi catchment to the uMngeni catchment via the uMkhomazi Water Project Phase 1 (uMWP-1).

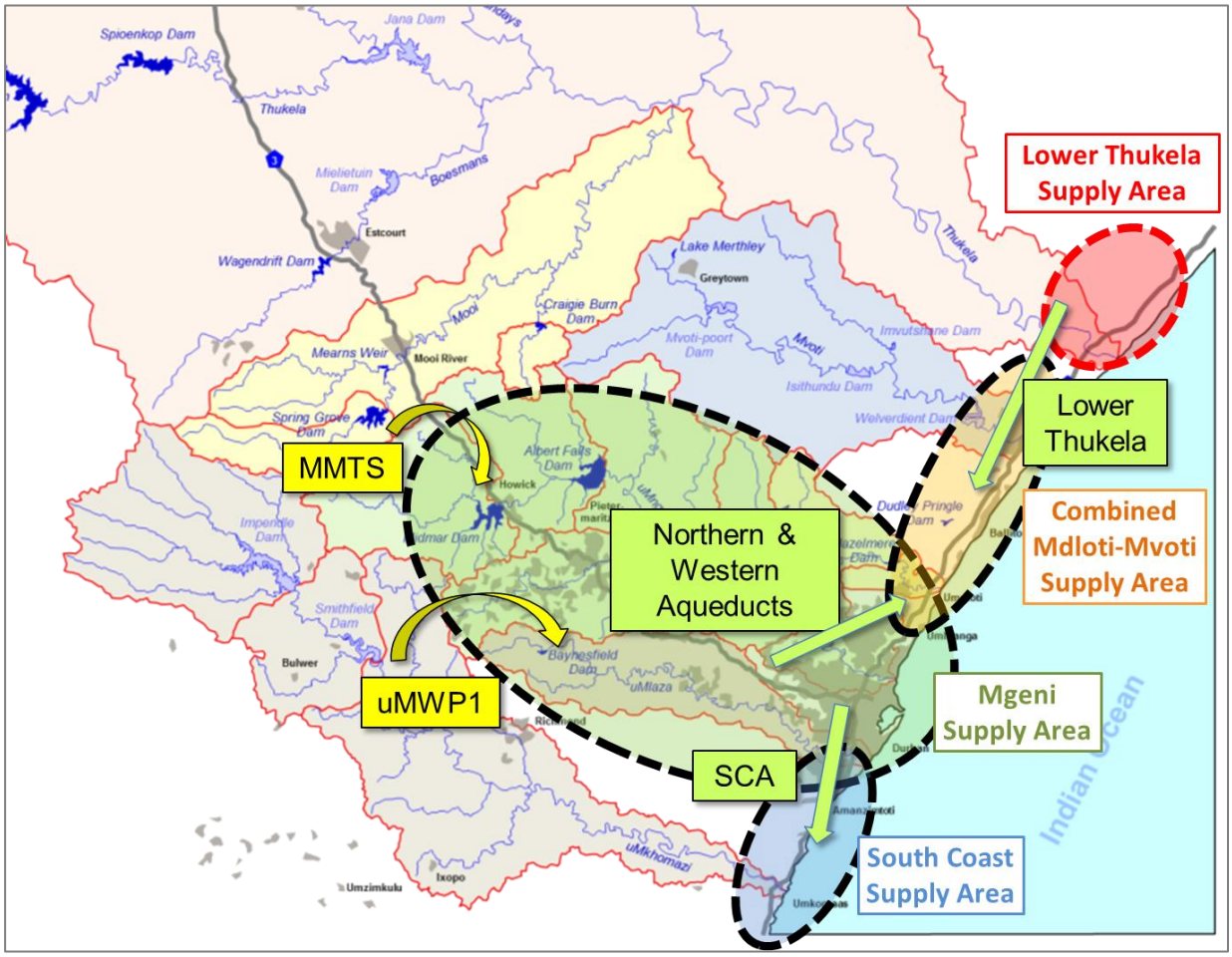

Figure 1.1: Study area of the Reconciliation Strategy

1.3 PURPOSE OF REPORT

The purpose of this document is to report on the current status of the Strategy as discussed and agreed upon at the 9th meeting of the *Strategy Steering Committee* (SSC) held on 3 March 2016. This included water supply challenges in the supply area, water requirement projections, water balances and the progress of a number of key short, medium, and long-term resource infrastructure projects required for the implementation of the Strategy.

The main focus for SSC 9 was the incorporation of the outcomes of the Classification of Water Resources in the Mvoti to Umzimkhulu Water Management Area (refer to **Section 4.1**), consideration for direct and indirect re-use (refer to **Section 5.5**) and the initiation of the Updated Strategy (refer to **Section 6**).

Finally, although the Strategy focuses on the planning of water resources over a planning horizon of 30 years, the short-term drought challenges currently being experienced in KZN were also discussed. To address short-term drought challenges in the province a number of emergency relief schemes have been

implemented, including the uThongathi River transfer scheme to support Hazelmere Dam, Hlimbitwa River transfer scheme to supply Maphumulo and the Mpambanyoni River transfer scheme to support uMzinto in the catchment of EJ Smith Dam.

Further information and previous reports on the Strategy can be obtained from the DWS website at:

https://www.dws.gov.za/Projects/KZN%20Recon/

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2 WATER REQUIREMENTS

A key component of the Reconciliation Strategy is realistic and up-to-date water requirement projections that guide the need for and timing of intervention options. Continuous updating and revision of water requirement projections ensures that the Strategy remains relevant by taking into account the various socio-economic and dynamic influencing factors that cannot be predicted with absolute certainty.

Water requirement projections are developed for three supply areas in the study area. These are:

- **North Coast** from La Mercy to Zinkwazi;
- The **Integrated Mgeni Water Supply System (WSS)**, which includes the main centres of Durban, Pietermartizburg and Howick, and the surrounding areas supplied from the uMngeni River; and
- **South Coast** from Amanzimtoti to Mtwalume.

Prior to SSC Meeting 9, water requirements projections were reviewed and updated where necessary, based on available water supply and sales figures and on data from other studies where confidence in the data was acceptable. Water requirements were projected to 2040 for the aforementioned systems, based on area specific growth rates. The incorporation of the effects of WC/WDM was included from the previous SSC meeting, and information on the WC/WDM measures and planned implementation by the WSAs is provided in **Section 4.1**. For the purposes of planning, the less aggressive WC/WDM savings targets from the Master Plans were adopted as the low road scenario. These updated water requirement projections are included in the water balances presented in **Section 3**.

2.1 NORTH COAST WATER SUPPLY SYSTEM (MDLOTI-MVOTI)

The Mdloti-Mvoti WSS's actual water requirements (green line) between 2006 and 2014 are significantly lower than the water requirement projections for this area, as shown in **Figure 2.1**. This indicates either a suppressed demand linked to the availability constraints in the region, or slower economic growth in the region than projected (that may also be linked to the non-availability of water in the area). However, it is expected in the long-term that the growth in water requirements will follow the initial projected red line.

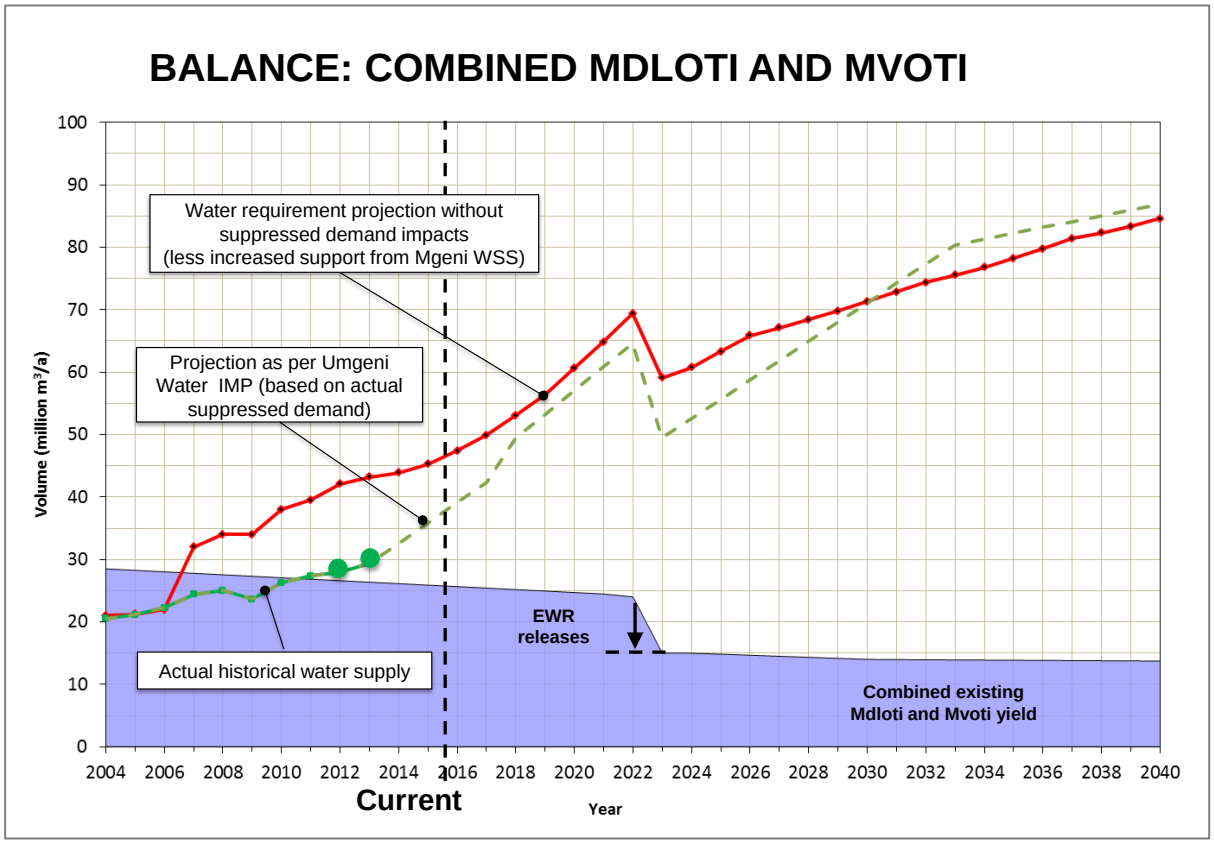

Figure 2.1: Mdloti-Mvoti WSS water requirements

Figure 2.1 shows a reduction in water requirements on the Mdloti-Mvoti WSS in 2023, represented by a decrease in the red/green water requirement projection lines. This is not a reduction in the water requirements of the system, but results from moving a portion ("shedding") of the water supply from Hazelmere Dam onto the Mgeni WSS when the proposed uMWP-1 is commissioned. This area's water will in future be supplied via the Northern and Western Aqueducts. Note that this implies the need for commissioning uMWP-1 and the new Northern Aqueduct by 2023 (as discussed in later in Section 3.2).

2.2 MGENI WSS

The water requirement projection of the Mgeni WSS is regularly updated by UW based on actual sales and supplies. Figure 2.2 shows the evolution of water requirement projections since 2001 based on actual usage through the years, and revisions in the impacts of WC/WDM initiatives. The latest annual water use volume is also highlighted. The impacts of this latest actual water use data on the water balance is shown in Figure 3.3 in the water balances section.

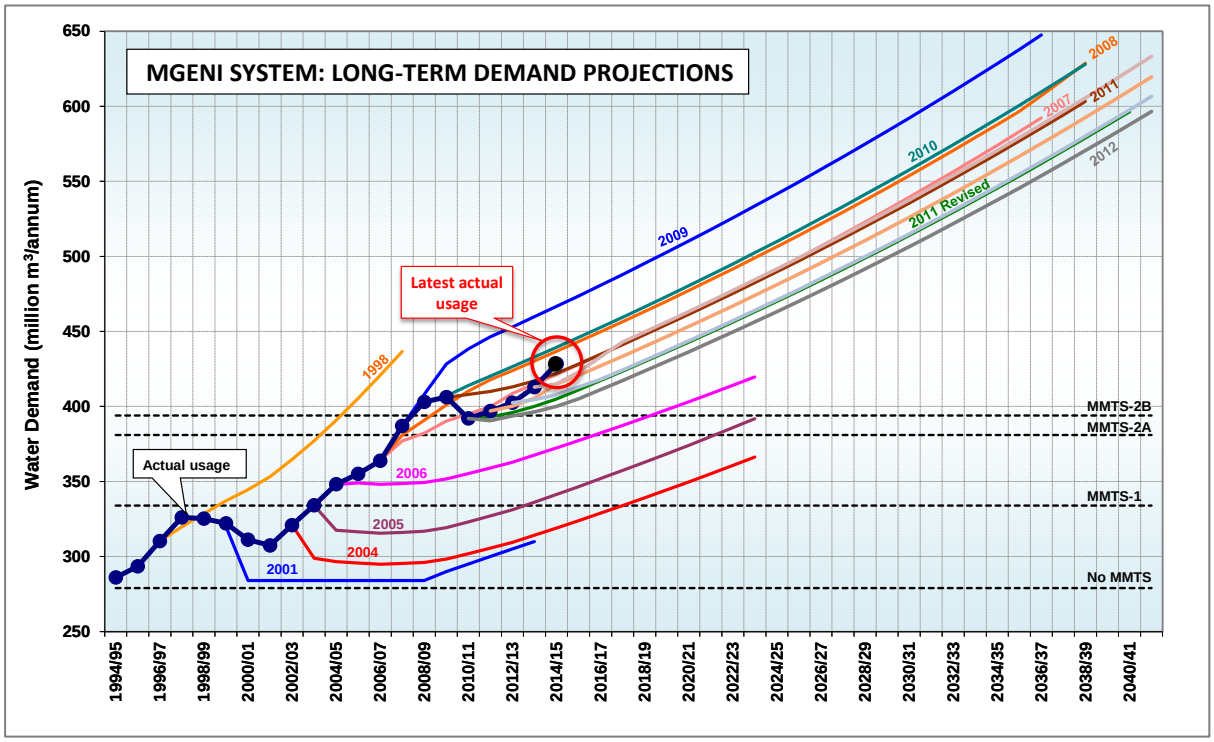

Figure 2.2: Mgeni WSS water requirements

2.3 SOUTH COAST WSS

The water requirements of the Upper and Middle South Coast WSS are shown in the water balance in **Figure 3.5**, showing water requirements projections to 2037 for WC/WDM included (red dashed line) and excluded (red solid line).

3 WATER BALANCES

3.1 NORTH COAST WATER SUPPLY SYSTEM

Due to the inter-connectedness of the Mdloti and Mvoti systems on the North Coast, the water balances of these systems have been integrated into a single water balance. In the reconciliation planning process, two intervention scenarios have been identified as long-term options for the North Coast. The first scenario involves the construction of Isithundu Dam (Figure 3.1), the second includes the recently identified indirect re-use of water via Hazelmere Dam from return flows generated in the oThongati and/or Mvoti catchments (Figure 3.2). This potential intervention has been formulated as part of eThekwini's Total Outflow Strategy.

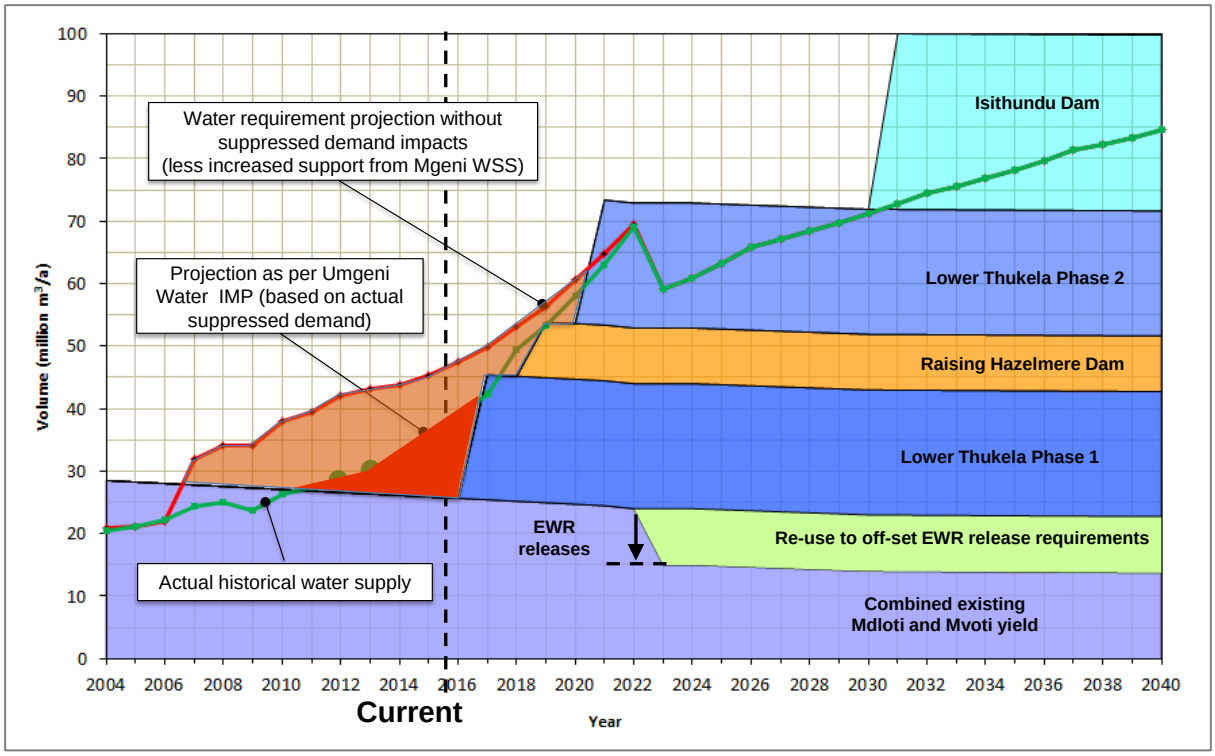

Figure 3.1: Mdloti-Mvoti water balance, scenario 1 (including the proposed Isithundu Dam)

It is noted from the relevant figures that together with the reduction/shedding of water requirements in 2023, discussed in Section 2.1, the implementation of the Reserve and associated Ecological Water Requirements (EWRs), which may require additional releases from Hazelmere Dam, is also delayed until the system is in a positive balance (i.e. when loads are shed onto the Mgeni WSS). The impact of the EWR on the existing yield of the Mdloti/Mvoti system is a decrease of approximately 10 million m^3/a (shown as a decrease in the purplish portion at the bottom of Figure 3.1 and Figure 3.2).

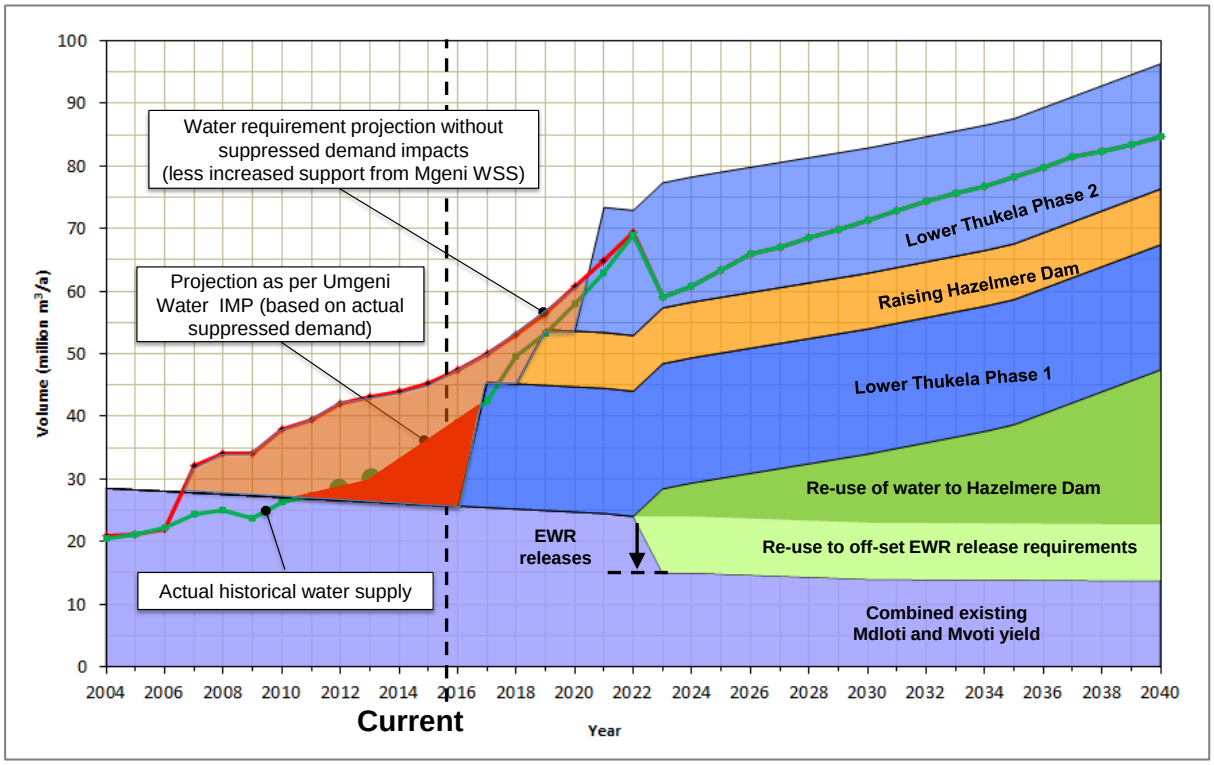

Figure 3.2: Mdloti-Mvoti water balance, scenario 2 (including re-use from Hazelmere Dam)

The second scenario, indirect re-use of water, should be implemented to not only address effluent discharge constraints in the estuaries of the rivers, but also make additional raw water available at Hazelmere Dam (Figure 3.2).

The water balances in Figure 3.1 and Figure 3.2 clearly show – and this is currently being experienced – that the North Coast is in a short-term deficit situation (shown in red). For both scenarios, the rapid growth in water requirements that is anticipated on the North Coast will require the following actions to maintain a sustained positive water balance:

- Lower Thukela BWSS1 is commissioned in 2016 (shown in a darker blue);
- The raising of Hazelmere Dam is completed by 2018 (shown in orange);
- Lower Thukela BWSS2 be commissioned by 2021 (shown in light blue); and
- Thereafter, either one of the following two alternatives:
    - Isithundu Dam be implemented and would need to be commissioned by 2026 (shown in turquoise); or
    - Indirect re-use of water via Hazelmere Dam.

Based on the estimated growth in available return flows, the proposed Isithundu Dam on the Mvoti River could be delayed beyond the planning horizon of 30 years if re-use of water is implemented. Thus, it is recommended that further studies (pre-feasibility level) for the re-use of water to Hazelmere Dam be

investigated to allow for comparison with of Isithundu Dam. Although, the next intervention is only needed around 2030 according to the water balance, the limitation of the estuary's receiving capacity will require sooner management of the returns flows.

3.2 INTEGRATED MGENI WATER SUPPLY SYSTEM

As mentioned in **Section 2**, water requirements for the Mgeni WSS were updated to show the high and low growth scenarios for the Mgeni WSS that includes WC/WDM. This water requirement projection accounts for the impacts of the following:

- The reduction in support from the Mgeni WSS to the South Coast after the implementation of either the proposed Lower uMkhomazi Bulk Water Supply Scheme or the desalination of seawater (as discussed in **Section 3.2**), resulting in a decrease in the red line in 2020.
- Moving a portion of the water supply from Hazelmere Dam onto the Mgeni WSS (as discussed earlier in **Section 3.1**), resulting in an increase in the red line in 2023.

As discussed in the *Status Report: September 2015* (DWS, 2015), there are several options and combinations of interventions to augment the Mgeni WSS, through re-use of treated effluent, desalination and the uMWP-1, to reconcile the water resources and projected water requirements. However, it was confirmed at the SSC8 that the only long-term feasible solution is the implementation of uMWP-1.

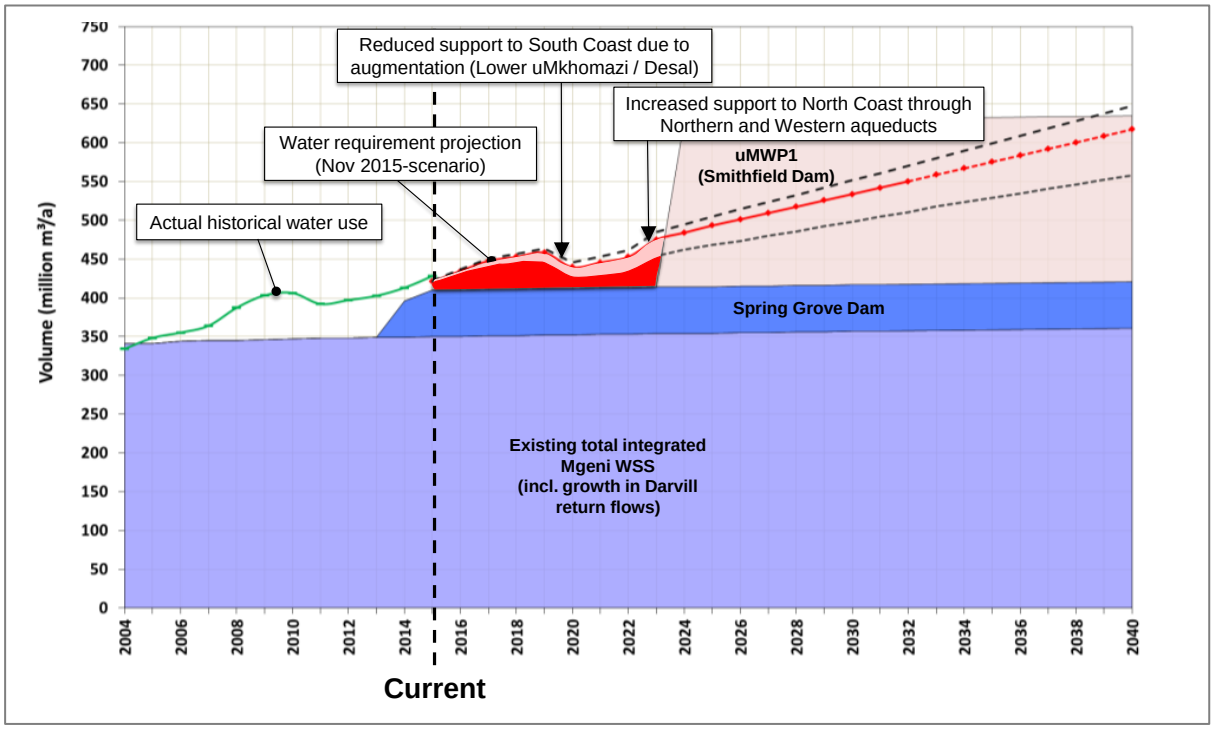

Figure 3.3: Mgeni WSS water balance with uMWP-1

From the water balance for the selected reconciliation scenario, shown in Figure 3.3, the following is noted:

- Even with the commissioning of the MMTS2 (Spring Grove Dam) in 2014/2015, the Mgeni WSS remains in a deficit. This deficit will increase at about 1.5% a year until the Mgeni WSS can be further augmented.
- If uMWP-1 is implemented without any short-term intervention, such as WC/WDM or re-use or desalination, an 8 year or longer period of potential shortfall is projected, from 2015 (current system is in deficit not taking into account the drought).
- Any delay in the uMWP-1 will increase the deficit of about 80 million m³/a in 2024 and the risk of non-supply (or supply at a very low assurance). The programme is discussed in Section 4.3.2.

3.2.1 Imbalance in the Mgeni WSS

Currently the distribution of water in storage in the various Mgeni WSS dams is not ideal, as shown in Figure 3.4. The storage levels in the upper dams, namely Midmar Dam and Albert Falls Dam, are low, while the level in Inanda Dam is higher. Normally the desired operation is to keep the upper dams fuller than lower dams to minimise spillage and for operational purposes (e.g. the water in Inanda cannot be supplied to users higher up in the WSS such as Pietermaritzburg). This imbalance can be described to the following factors:

- The variable distribution of rainfall across the catchment, e.g. escarpment and coastal rainfall appears to have been higher than the rainfall in the midlands.
- The impact of the current drought with the lowest consecutive 2 years rainfall in history.
- Not maximising existing pumping capacity, i.e. Inanda pumping below full capacity due to infrastructure issues, the operational constraints of shifting Hazelmere supply areas onto Durban Heights WTP to address drought challenges at Hazelmere, and the cost of pumping vs. benefits before full onset of the drought.
- Greater inflows to Inanda due to other sources of water potentially increasing volumes in Inanda, i.e. WWTP return flow growth and runoff from urban areas.

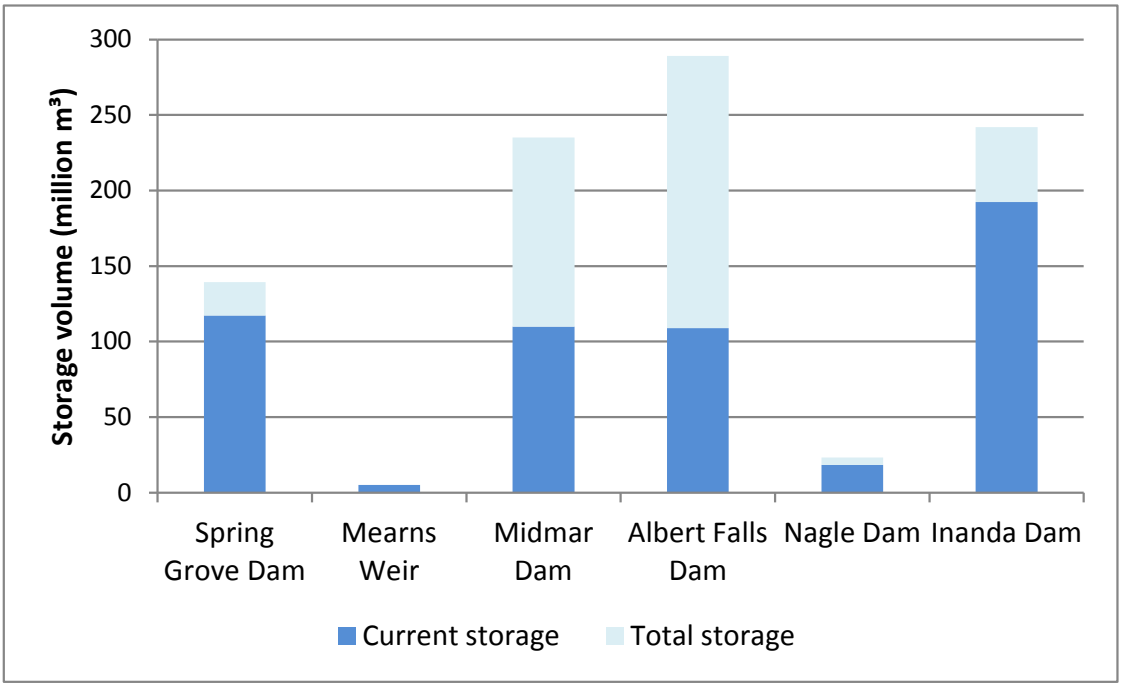

Figure 3.4: Dam storage levels in the Mgeni WSS, 23 February 2016

To balance the Mgeni WSS, specifically during a critical drought period, water should be kept in the upper dams of the Mgeni WSS, as much as possible. This imbalance should be addressed through optimised system operations, including an increase in the pumping from Inanda Dam. At the SSC9 meeting, Umgeni Water reported that they are currently refurbishing and upgrading the pumps at Inanda to enable a pumping capacity of up to 250 Mℓ/day.

Similarly, the transfer from the Mooi River via the Mooi Mgeni Transfer Scheme (MMTS) also needs to be maximised.

The MMTS is designed to pump either or a combination of 3.2 m³/s from Mearns Weir and 4.5 m³/s from Spring Grove Dam. Currently, pumping from the MMTS is limited for environmental and flooding reasons, to the receiving stream capacity of about 4.5 m³/s in the Mpofana River.

A potential drought management emergency response could be pumping a greater volume from the Mooi River via the recently completed MMTS2. The potential short- and medium term benefits of pumping at higher volumes was tested with the WRPM (Water Resource Planning Model). These initial investigations indicated that although the storage in Spring Grove Dam will be significant lower, the storage in Midmar and Albert Falls dams will improve over the short term, but with limited long term benefit.

These preliminary results need to be tested and refined, within the understanding of the Mpofana River's environmental and flooding limitations. Also, the infrastructure limitations of the MMTS transfer need to be considered.

3.3 SOUTH COAST WSS

The water balance for the South Coast WSS is shown in **Figure 3.5**. The existing water availability represents both local resources (shown in light blue) as well the support from the Mgeni WSS through the South Coast Augmentation (SCA) pipeline (shown in dark blue). Projected water requirements are shown as red lines, with and without the planned implementation of WC/WDM initiatives.

Figure 3.5 also shows the future augmentation of the South Coast by the implementation of either the proposed Lower uMkhomazi Bulk Water Supply Scheme (Ngwadini Dam, as discussed **Section 4.4.2**) or the desalination of seawater (both shown in green) with earliest implementation in 2019/2020. (Both these proposed interventions are in the feasibility planning phase.) As such, a shortfall is already experienced, and may continue the implementation of an intervention.

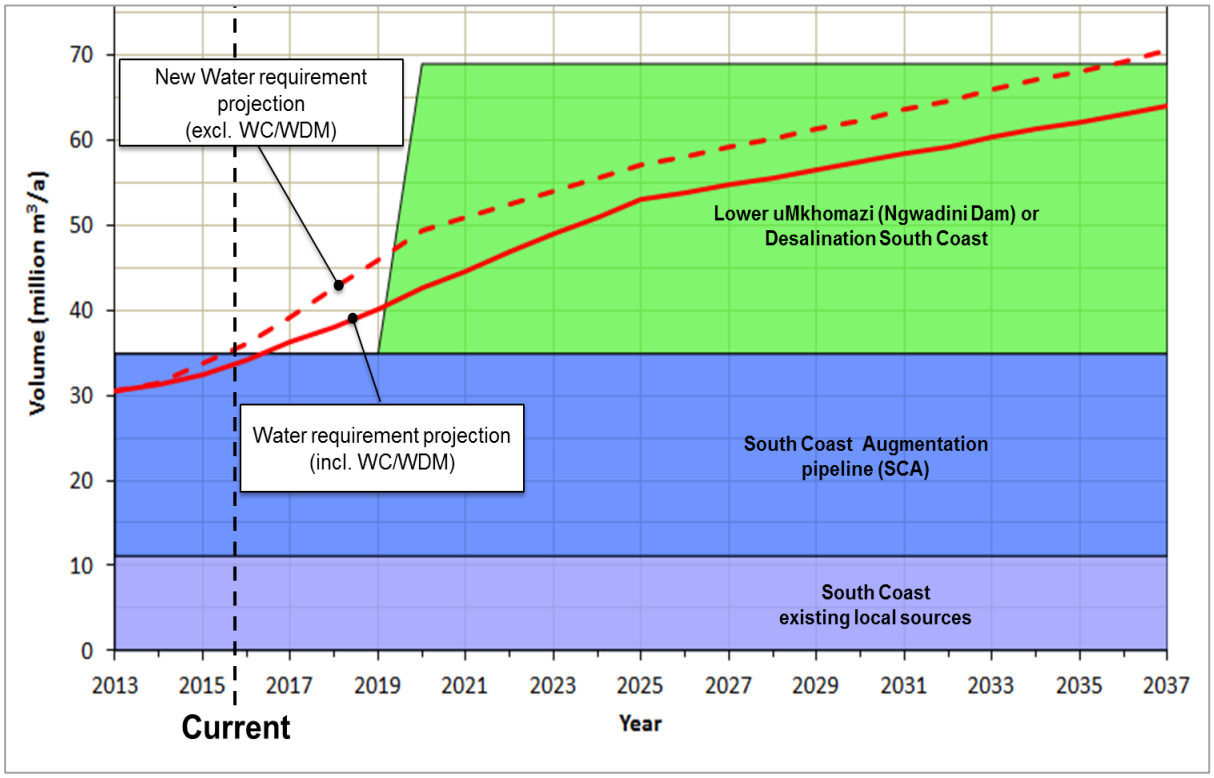

Figure 3.5: South Coast water balance with support from Mgeni WSS

WC/WDM initiatives will be a key measure in minimising risk over this period, as well as for long term sustainable supply once the system is augmented.

The water balance in Figure 3.6 illustrates that once the South Coast is augmented, the support that is currently provided from the Mgeni WSS through the SCA can be reduced, making additional water available for use as a short term reprieve for the Mgeni WSS.

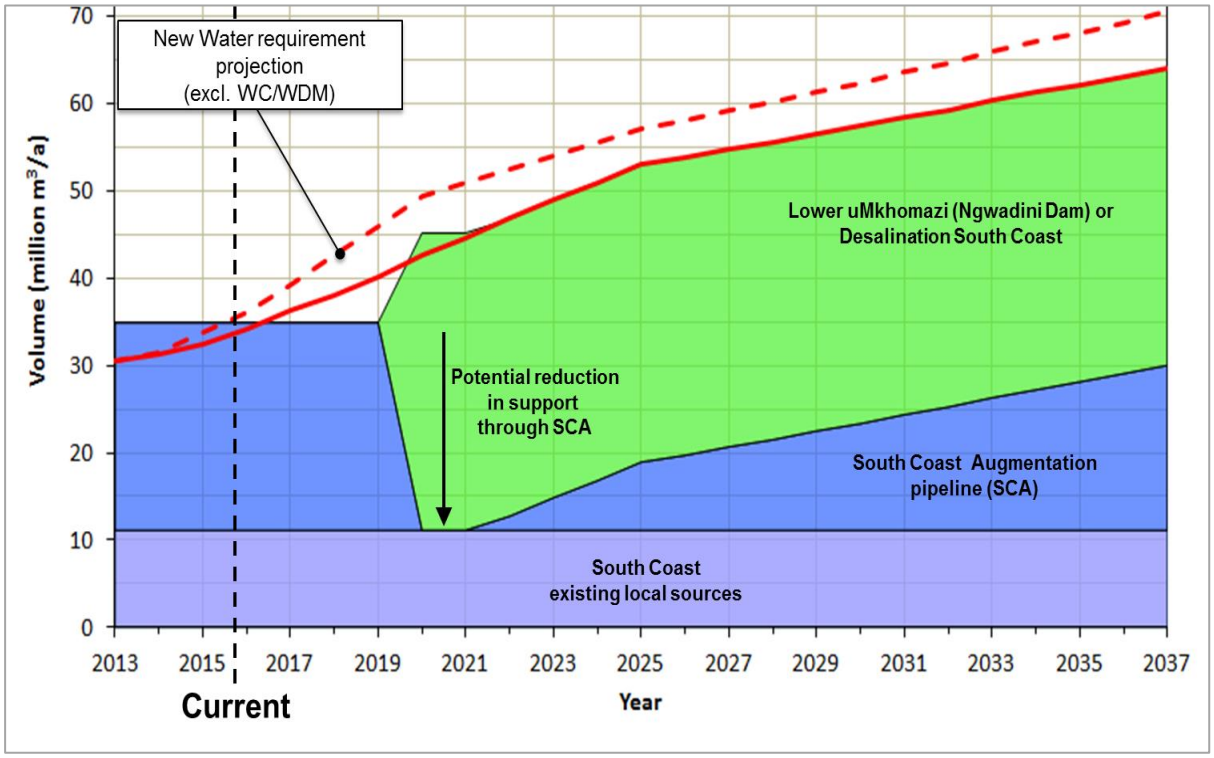

Figure 3.6: South Coast water balance with reduction in support from Mgeni WSS

4 STATUS OF RECONCILIATION STRATEGY

An important aspect of updating the Strategy is the progress on the implementation and/or revision of target dates for the implementation of planned schemes and other intervention options, as well as the updating of water requirement projections (as described in **Section 2**). Target dates for intervention options were revised based on feedback from SSC members and discussions prior to SSC Meeting 9, and the updated list is provided in **Appendix A**.

4.1 WC/WDM

Water conservation and water demand management (WC/WDM) is an important intervention for dealing with short- and medium-term water supply challenges. Due to the interconnectedness of the water supply systems in the Strategy area, a failure by any of the WSAs to implement and maintain appropriate WC/WDM initiatives will have a significant impact on all other users.

DWS presented an overview of the implementation of WC/WDM in the province and summarised challenges and success with implementing WC/WDM. It was noted that:

- KZN's average of 46% non-revenue water is higher than the national average of 37.2% (2013).
- Ugu had the best performance at 30.9% and uMgungundlovu the worst at 66.1%.
- The municipalities have a focussed strategy with associated budgets to implement WC/WDM initiatives.

As decided at SSC Meeting 7 (confirmed at SSC8), all the municipalities (that are WSAs) will continue to provide feedback at future meetings on WC/WDM implementation and progress.

4.2 NORTH COAST INFRASTRUCTURE

The North Coast has been experiencing rapid growth in recent years, increasing the water requirements above the available resources and infrastructure capacities.

4.2.1 Raising of Hazelmere Dam

The raising of Hazelmere Dam by 7 m with a piano key weir to increase the gross storage capacity from 23.9 to 43.7 million m^3 will augment the water supply to the North Coast area (from the Mdloti to the Thukela River) and sustain irrigation downstream of the dam.

Construction commenced in July 2015 and anticipated project completion is June 2017. The resettlement process of moving the affected 15 houses, has started.

4.2.2 North Coast Pipeline and Hazelmere Supply Infrastructure

In line with the planned raising of Hazelmere Dam and anticipated increase in available water, Umgeni Water has proceeded with upgrading the water treatment and supply infrastructure linked to the dam. Progress is as follows:

A new raw water pipeline from Hazelmere Dam to the Hazelmere water treatment works (WTW), thee upgrade of the Hazelmere WTW from 45 to 75 Mℓ/d and a pump station at the WTW are completed and commissioned.

The WTW and new infrastructure can only be operational at the increased capacity on a sustained basis once the raising of Hazelmere Dam has been completed.

4.2.3 Lower Thukela Bulk Water Supply Scheme

The expected growth in the water requirements in the KwaDukuza area will be met from the Lower Thukela Bulk Water Supply Scheme (LTBWSS). The scheme involves the abstraction of water from the lower Thukela River (near the SAPPI mill) and treatment at a regional WTW. Construction started in February 2014, comprising the abstraction works, pump stations, de-silting works, WTW and storage reservoirs. The construction of a gravity pipeline from the Mvoti reservoir to Darnall is also underway. It is anticipated that the scheme will be commissioned by mid-2016.

4.2.4 Direct reuse of treated wastewater: Siza Water's wastewater recycling at Frasers Wastewater Treatment Works

Siza Water, the water service provider (WSP) in the iLembe Municipality, provided re-use water (approximately 500 kℓ/day) as a drought mitigation measure for the filling of swimming pools and construction activities (not drinking

water) from their Frasers Wastewater Treatment Works (WwTW), a Green Drop Accredited Plant, that mostly receives domestic sewer.

Siza Water reported that in January 2014 they found an appropriated treatment method to treat the water to meet the SANS 241:2014 Drinking Water Quality standards, as was verified by two independent laboratories. Prior to investing in a full recycled plant, public acceptance for recycled water were tested with a survey and the relevant communication material. 97% of homes (linked to municipal account number) that participated voted in favour of such a process. A full recycled plant was implemented, injecting recycled water into the water network from December 2015.

4.2.5 Mvoti River Feasibility Study

The Mvoti River Feasibility Study involves assessing the development of a large dam on the Mvoti River, either at Isithundu or Welverdient, with a regional WTW and bulk distribution infrastructure. As discussed in **Section 3.1**, this proposed intervention can be delayed beyond the 30-year planning period. The DWS will only continue with the study when future planning in the Reconciliation Strategy indicates another intervention is required, probably around 2022.

4.2.6 Desalination of seawater at Tongaat

Umgeni Water investigated the feasibility seawater desalination plants on the north and south (discussed in **Section 4.4.1**) coast as an alternative water supply source. The proposed Tongaat plant on the North Coast, was sized to 150 Mℓ/d, based on the capacity of existing and proposed bulk water supply infrastructure in this area, which can be utilised to convey the potable water from the plants to the various distribution points.

However, during the Reconciliation Strategy it became clear that the Tongaat plant may not be required in the long-term as the LTBWSS (discussed in **Section 4.2.3**) and raising of Hazelmere Dam (see **Section 4.2.1**) will address the short-term needs, while the medium- to long-term needs will be addressed by the uMWP-1 (see **Section 3.1**).

4.3 INTEGRATED MGENI WATER SUPPLY SYSTEM

The following interventions are planned and/or implemented in the Integrated Mgeni WSS:

4.3.1 Mooi-Mgeni Transfer Scheme

The Mooi-Mgeni Transfer Scheme (MMTS) was developed to augment water supply to the Mgeni WSS, and comprises the Mearns Weir, the recently commissioned Spring Grove Dam on the upper Mooi River and the associated conveyance infrastructure. Once fully commissioned in its entirety, MMTS (including Phase 2A and B) will increase the current yield of the Mgeni System by 60 million m^3/a (at Inanda Dam).

The Trans Caledon Tunnel Authority (TCTA) implemented Phase 2A on behalf of DWS and Spring Grove Dam was completed in 2014. Furthermore, the 15 km Phase 2B pump pipeline has been completed and testing started early 2016.

4.3.2 uMkhomazi Water Project

The first phase of the uMWP-1 comprises a new dam at Smithfield on the uMkhomazi River, water conveyance infrastructure (including a 32 km tunnel), a balancing dam and WTW in the uMlaza valley, as well as a gravity potable water pipeline connecting the uMWP to the Umgeni Water bulk distribution network. Although augmentation of the Mgeni WSS is required from 2017 onwards, the uMWP can only be implemented by 2023. Institutional arrangements to ensure the timely implementation of this scheme are therefore of critical importance.

Feasibility studies currently being finalised by DWS and Umgeni Water provide the project layout and size of infrastructure components, for both the raw water and potable water components of the scheme. The specialist Environmental Impact Assessment (EIA) is underway and the aim is to present submissions to the relevant authorities by November 2016.

The following risks were identified:

- The period of time to finalise off-take agreements between the TCTA, UW and the Municipalities;
- Environmental approval / appeals which may have a time and cost implication;
- Changing of legislative requirements, such as Mining EIA requirements, etc. which may have a time and cost implication;
- The time and process to obtain funding (incl. grant funding from NT);
- The DWS resource capacity to manage and initiate such a project;
- The procurement of service providers / contractors;
- The acquirement of land, some that is subjected to land claims; and
- Socio-economic issues on site.

4.3.3 Direct reuse of treated wastewater: eThekwini Municipality's outflow strategy

The eThekwini Municipality's Outflow Strategy investigates several direct and indirect re-use options, including availing treated water for the release of environmental water requirements, summarised below.

- Re-use and desalination options in the North:
  - Pumping effluent from Phoenix WwTW to Hazelmere Dam for indirect use, including releases to the environment.
  - Indirect re-use from Tongaat WwTW through pumping to a furrow, from where water is abstract and treated at Tongaat Water Treatment Plant (WTP).
  - Although the eThekwini MM did a viability study in 2009 of the direct re-use from the treated effluent from the KwaMashu and Northern WwTWs works, public concerns and negative sentiment halted the process. It seems unlikely that this option will be pursued to address short-term water supply issues in the area.
  - Possible desalination plants at Tongaat / La Mercy, and the existing Genazzano WwTW site (3 to 12 Mℓ/day).
- Re-use in the South:
  - Direct re-use through pumping of the Kingsburgh WwTW effluent to be treated at the Toti WTP.
- Re-use in the Central area:
  - A remix plant is proposed at the Central WwTW. As eThekwini believes that a remix water system could reduce the deficit, they have proposed the installing of a Demonstration Plant providing approximately 6.25 Mℓ/day with a possible ultimate scenario of 100 Mℓ/day where 50% seawater is mixed with 50% sewage.
  - Durban Water Recycling Plant where 47.5 Mℓ/d of municipal wastewater will be treated near potable standard for direct reuse in industrial processes.

Due to the scarcity of water resources, eThekwini is actively investigating these projects for implementation.

4.4 SOUTH COAST INFRASTRUCTURE

4.4.1 Desalination of seawater at Lovu

As discussed in Section 4.2.6, Umgeni Water investigated the feasibility of desalinating seawater as an alternative water supply source. The feasibility study of the 150 Mℓ/d plant, located at Lovu on the South Coast is currently being finalised. The size of this plant is based on the capacity of existing and proposed bulk water supply infrastructure in this area, which can be utilised to convey the potable water from the plant to the various distribution points. Current estimates show that the total cost of the infrastructure will be approximately R4 200 million (2015), bringing the cost of water to around R 13/kℓ. The EIA is underway and the feasibility study will be completed in the near future. Implementation can potentially be achieved by 2019/20201.

The feasibility of the implementing the Lovu Desalination plant as the next intervention, depends on an economic comparison with the proposed Lower uMkhomazi Bulk Water Supply Scheme (BWSS) (discussed below).

4.4.2 Lower uMkhomazi Bulk Water Supply Scheme

The Lower uMkhomazi BWSS, an alternative augmentation scheme to the proposed Lovu desalination plant (discussed above), consists of an abstraction works on the uMkhomazi River, a 50 m high off-channel storage dam at Ngwadini (on a tributary of the lower uMkhomazi River), a second abstraction works near Goodenough Weir, a 100 Mℓ/d WTW, pump station and pipeline to deliver water to the South Coast supply area. The project can be developed in two phases, first developing the abstraction works near Goodenough and treatment infrastructure, with phase 2 the Ngwadini off-channel storage dam and abstraction works being constructed in parallel. Phase 1 could start to deliver water while phase 2 is being completed. The estimated capital cost is approximately R2 800 million (2015) for both phases.

Umgeni Water's detailed feasibility study will be completed early 2016. The EIA is also currently underway. The estimated implementation date of the scheme is March 2022 for both phases, however, the first phase can be implemented by 2020.

Umgeni Water will prioritise these augmentation options by mid-2016.

4.5 OTHER IMPACTS AND INTERVENTIONS

4.5.1 Thukela Water Project Desktop Study

The Thukela Water Project (TWP) is a major proposed water resources development located in the upper Thukela River catchment. Although the TWP has been planned as an augmentation scheme for Vaal River System, the possibility has been proposed of advanced implementation of selected components of the project as a regional water supply option for KZN. In particular, the project could provide medium-term augmentation to the lower Thukela and, therefore, a portion of the Reconciliation Strategy area. However, initial investigations showed that the Thukela Water project as a KZN development would be mostly comparable to the option of the 2nd phase of the uMkhomazi Water project as a regional solution, and thus mostly a longer term option towards the end of the planning horizon.

4.5.2 Catchment care: uMngeni Ecological Infrastructure Partnership

The *uMngeni Ecological Infrastructure Partnership* (UEIP) is a committee dedicated to maintaining and investing in "ecological infrastructure" (i.e. naturally functioning ecosystems that deliver valuable services to people) as a means to contribute to water security and improve water quality in the uMngeni River catchment. This partnership, between government, business, academia and civil society, is headed by the South African National Biodiversity Institute (SANBI) and is supported by a number of the SSC member institutions[1].

UEIP is currently undertaking the following pilot projects and research:

- Baynespruit Rehabilitation Project - Msunduzi Municipality;
- Save Midmar Project - uMgungundlovu Municipality;
- Palmiet Rehabilitation Project – eThekwini Municipality;
- Research on the demonstration of how healthy ecological infrastructure can be utilized to secure water for the benefit of society and the green economy through a programmatic research approach based on selected landscapes; and
- Investing in ecological infrastructure to enhance water security in the uMngeni River catchment research.

[1] *UEIP Partners: University of KwaZulu-Natal, Water Research Commission, Institute of Natural Resources, Msunduzi Municipality, uMgungundlovu Municipality, eThekwini Municipality, Department of Environmental Affairs, Department Water and Sanitation, Provincial Department Agriculture and Environmental Affairs, Umgeni Water, Ezemvelo KZN Wildlife, Endangered Wildlife Trust, Wildland Conservation Trust, WWF, Msinisi Resorts and Game Reserves, WESSA, Duzi uMngeni Conservation Trust, SAPPI, Mondi, South African Sugar Association*

The SSC recognises the importance of maintaining ecological infrastructure within the Reconciliation Strategy area and, as such, indicated their continued commitment to collaboration between the Strategy and the UEIP.

It is conceptually feasible that catchment care could result in improve water resources, however due to a lack of quantifiable data at this early stage of this project, this initiative has not been considered in the options assessed for this Strategy.

4.5.3 Rainwater harvesting

At SSC Meeting 8 the potential benefits of rainwater harvesting and on-site water management solutions were discussed. It was requested by the SSC that the benefits of rainwater harvesting be further explored as a way of improving water use efficiency in the Reconciliation Strategy area. In particular, the potential for implementing such approaches and technologies at new developments should be encouraged. Rainwater harvesting can also be a tool to assist in improving water users understanding of water resources variability and the need for good water use practices.

4.5.4 Classification of significant water resources in the Mvoti to uMzimkulu Water Management Area

The detail classification of the water resources in the Mvoti to uMzimkulu Water Management Area study was recently completed, results soon to be gazetted. The recommendations from the study is summarised below for the different catchments.

Please note the following acronyms used:

- WRC = Water Resources Class
- IUA = Integrated Unit of Analysis
- EWR = Ecological Water Requirement
- EC = Ecological Category
- PES = Present Ecological State
- REC = Recommended Ecological State

a) uMkhomazi River System, U1

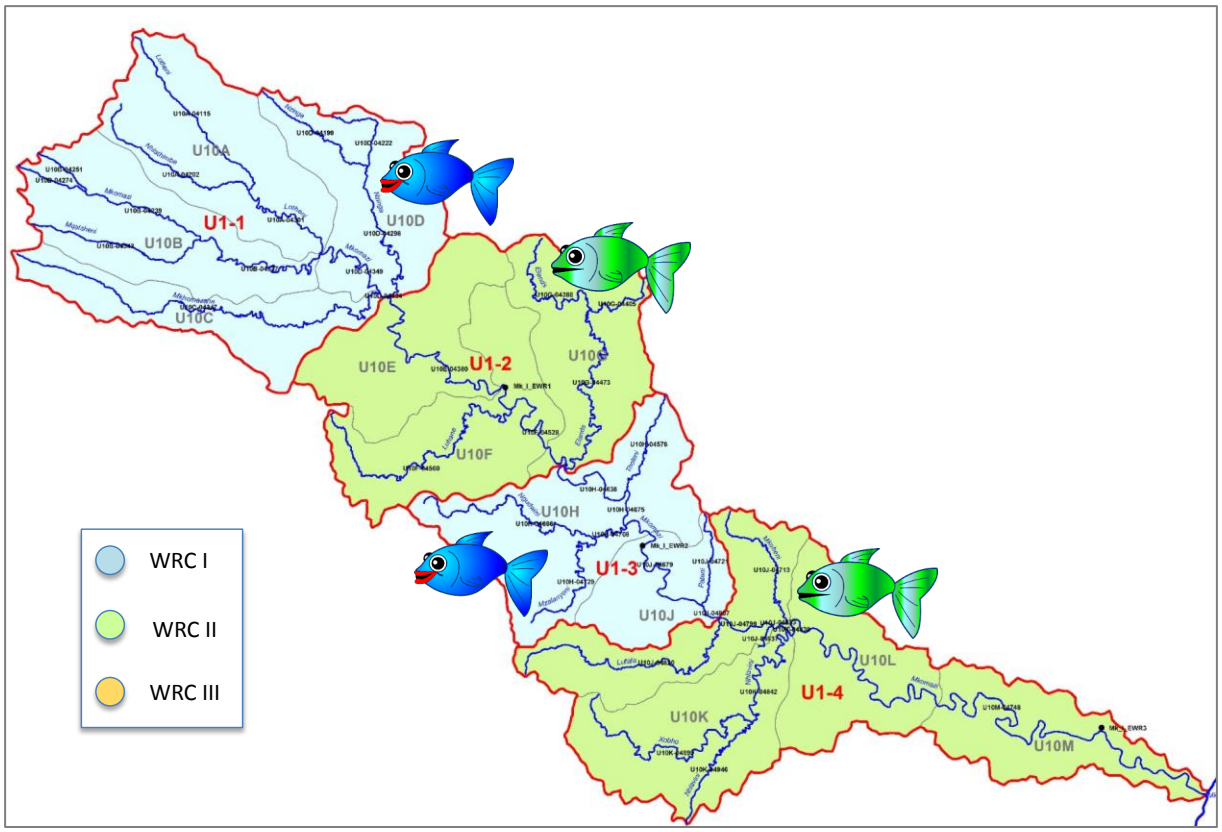

Figure 4.1: Classification of the uMkhomazi River System, U1

Table 4.1: Catchment configuration, proposed classes & implications for the uMkhomazi River catchment

IUA	Class	River	PES	REC	REC Comment	Target EC
U1-1	I	Nzinga	B/C	B	Difficult to achieve the REC as catchment management would be required to amongst others manage sedimentation.	B
U1-1	I	uMkhomazi	B/C	B	Difficult to achieve the REC as catchment management would be required to amongst others manage sedimentation.	B
U1-2	II	Elands	C	B	Target improvement especially in the upper reach. Buffer zone, alien removal, water quality practices. Also flow improvements but should be able to reach at least a B/C without any improvement in flow.	B
U1-3	II	Ngudwini	B/C	B	Address erosion to reduce sedimentation (overgrazing, forestry, informal agriculture). As none of the scenarios are relevant to this SQ, the improvement is valid irrespective of the recommended scenario.	B
U1-4	II	Mkobeni	C	B	Riparian buffer zone in forestry and agricultural areas. Also alien removal. As none of the scenarios are relevant to this SQ, the improvement is valid irrespective of the recommended scenario.	B
U1-4	II	Lufafa	B/C	B	Erosion control, riparian buffer. Due to the catchment scale of the problem, this is deemed to be difficult and the PES must be maintained.	B/C
U1-5		uMkhomazi Estuary	C	B	Remove sand mining from the upper reaches to increase natural function, i.e. restore intertidal area. Restoration of vegetation in the upper reaches and along the northern bank in the middle and lower reaches, e.g. remove alien vegetation and allow disturbed land to revert to natural land cover (is already on upwards trajectory). Curb recreational activities in the lower reaches through zonation and improved compliance. Reduce/remove cast netting in the mouth area through estuary zonation or increased compliance.	B/C

Below the conclusions and recommendations for the uMkhomazi River System:

- Recommended Scenario is MK21 which includes: 2040 development demands, meeting the REC (total flows), Smithfield Dam, Ngwadini off channel storage;
- nodes require improvements based on non-flow-related/anthropogenic issues that have to be addressed;
- Smithfield Dam has to have specific EWR releases so that the operating rules will not impact on the Class and the overall state of the river;
- with the implementation of Smithfield Dam the geomorphology, fish, invertebrates will be in worse state than present; and
- if Smithfield Dam is implemented and operated according to the recommended scenario, GDP and jobs will improve.

b) uMngeni River System, U2

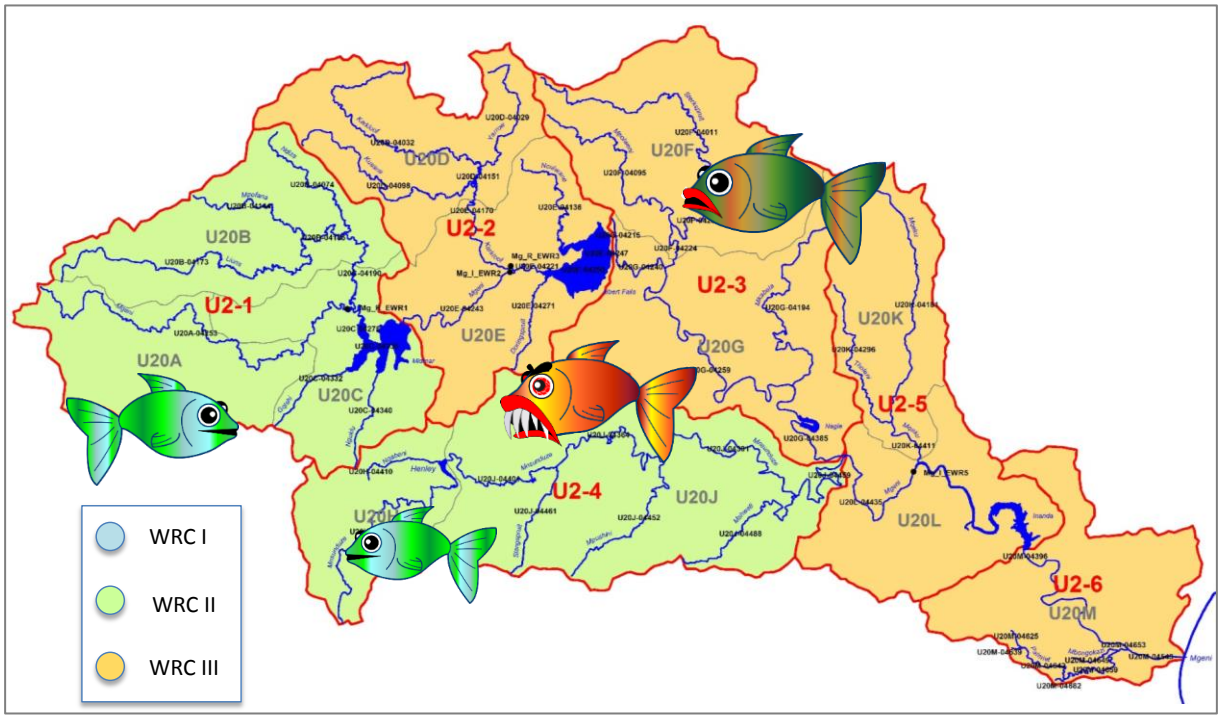

Figure 4.2: Classification of the uMngeni River System, U2

Table 4.2: Catchment configuration, proposed classes & implications for the uMngeni River catchment

IUA	Class	River	PES	REC	Implication	Target EC
U2-1	II	Ndiza	B/C	B	Reinstate riparian zone in forestry.	B
		Lions	C	B	Reinstate riparian zone in forestry and wetland buffers. Address irrigation return flows (wq) & town runoff	B
		Lions	B/C	B	IBT a given - constant flows, no seasonality, but reinstating wetland buffers (off channel) and riparian river zones	B

IUA	Class	River	PES	REC	Implication	Target EC
		Gqishi	B/C	B	Riparian zone buffer to be improved.	B
U2-2	III	Yarrow	B/C	B	Agricultural area - wetland buffers,	B
		Karkloof	B/C	B	Reinstate riparian buffer zone and wetland buffers.	B
U2-4	III	uMnsunduze	D/E	D	Water quality improvement	D
		Mpushini	B/C	B	Water quality from Ashburton amongst others.	B
		Mshwati	B/C	B	Lower section in worse state. Reinstate riparian zone, address erosion.	B
U2-5	III	Tholeni	C	B/C	Riparian zone buffer to be improved.	B/C
		Mqeku	B/C	B	Riparian zone buffer to be improved.	B

Below the conclusions and recommendations for the uMngeni River System:

- current and planned system operating rules (ultimate demand and return flows) can be implemented in the future;
- scenarios analysed focused on assessing how future operation conditions could influence the ecological health, however, there will mostly be improvements except for the period just after augmentation of the uMngeni system;
- scenarios analysed achieved the REC and did not reduce the yield of the uMngeni system;
- in all future scenarios releases were analysed with the prevailing operation rules, in the case of Inanda Dam releases of 1.5 m³/s was assumed; and
- future scenarios will have a positive impact on GDP and jobs.

c) Mvoti River System, U4

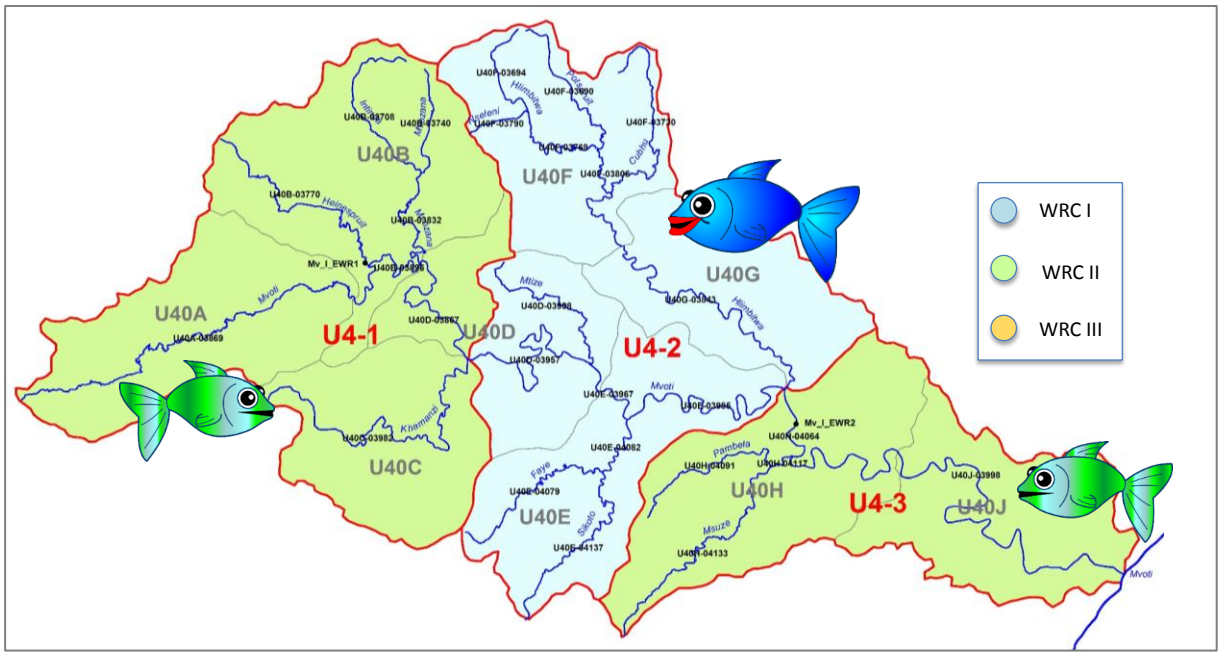

Figure 4.3: Classification of the Mvoti River System, U4

Table 4.3: Catchment configuration, proposed classes & implications for the Mvoti catchment

IUA	Class	River	PES	REC	Implication	Target EC
U4-1	II	Mvoti	B/C	B	Improve riparian buffer in forestry and agriculture areas.	B
U4-1	II	Khamanzi	B/C	B	Improve riparian buffer in forestry and agriculture areas.	B
U4-3	II	Pambela	B/C	B	Reinstate riparian zone.	B
U4-3	II	Nsuze	B/C	B	Reinstate riparian zone.	B
U4-3	II	Nsuze	B/C	B	Reinstate riparian zone, erosion control.	B
U4-4		Mvoti Estuary	D	C	Improvement of oxygen levels in the estuary, through for example, removal of the high organic content from the Sappi Stanger effluent. Reduce the nutrient input from the catchment by 20%. Remove the sugarcane from the Estuary Functional Zone.*	C

Below the conclusions and recommendations for the Mvoti River System:

- recommended scenario includes: updated water demands, development of demands and return flows, meeting the REC (low flows), the implementation of the Mvoti River Development Project (Isithundu Dam) and future Imvutshane Dam;
- nodes require improvements based on non-flow-related/anthropogenic issues that have to be addressed;
- the proposed Isithundu Dam with specific EWR releases will have no impact on the Class, however, river components (geomorphology and fish) will be degraded from the present state; and
- if the dam is implemented and operated according to the recommended scenario, GDP and jobs will improve.

d) Class Implications for future use: Central Cluster Integrated Unit of Analysis Estuaries

- All wastewater from uThonghati is reused (via Hazelmere Dam).
- Increase wastewater discharged into uMdloti estuary.
- However, indirect re-use could take many years to implement.
- Interim approach to accommodate development pressure: Allow further discharge into uThonghati. (Ecological health will reduce to very poor over medium term)
- Design waste water treatment works for expansion for indirect reuse. (Target Ecological Category over long term will be an improvement of the current state)
- EWR must be implemented at uMngeni and pumping scheme operated for Umhlanga.

- No further waste must be discharged into the uMkhomazi estuary.
- Further waste could be discharged in the Little Amanzimtoti and Mbokodweni as long as estuaries stay within acceptable standards for human use, e.g. recreation

4.6 MANAGEMENT OF SYSTEM OPERATION AND DROUGHT INTERVENTIONS

Further to the above interventions, the *Umgeni Water Supply System Operations Forum* (SOF) has been established to focus on improving system operation and the management of water restrictions in the event of a drought.

At the 8th SSC meeting, the key discussion points and decisions from the 2015 SOF were presented. At the SSC 9 meeting, the results of an early 2016 SOF in December were shared summarised as follows:

- There is a need for immediate reduction of water consumption (50% for Agriculture and 15% for Domestic/Commercial/Industrial)
- A restriction notice will be published in the Government Gazette during the course of March 2016.
- The Joint Operating Committee (JOC) which has been set-up to implement and manage the reduction in water use required and meets fortnightly to discuss initiatives, progress and achievements.
- Media campaigns creating awareness to the general public about the current water shortages are continuing.
- There is an urgent need for WSAs to expedite the implementation of their respective Water Saving Plans.

It was agreed that while resolution of the drought situation in KZN required short-term actions, the ongoing **long-term planning and implementation of the Reconciliation Strategy** was critical to managing the possible impact of similar future water scarcity situations.

Furthermore, while water restrictions are not desirable and need to be carefully considered, water restrictions are sometimes unavoidable, and could be particularly prevalent over the next 8 years as part of the strategy to manage periods of compromised water availability. A key to managing the short term challenges is timeous and informed decision making.

5 INITIATION OF UPDATED RECONCILIATION STRATEGY

The original Water Reconciliation Strategy Study for the KwaZulu-Natal Coastal Metropolitan Areas commenced in 2006, followed by 3-year continuation study, the Maintenance of the Water Reconciliation Strategy for the KwaZulu-Natal Coastal Metropolitan Areas – Phase 1. The Water Reconciliation Strategy for the KwaZulu-Natal Coastal Metropolitan Areas, was published in 2010.

The following high level activities were recommended in the 2010-Strategy (the status and progress are reported in **Section 4**):

- Implementation of priority infrastructure projects:
  - MMTS 2 – Spring Grove Dam and transfer;
  - Raising of Hazelmere Dam; and
  - North Coast Pipeline and Hazelmere Dam supply infrastructure.
- Execution of priority studies:
  - uMkhomazi River Transfer Scheme (uMWP);
  - Mvoti River Development;
  - Lower Thukela Bulk Water Supply Scheme; and
  - Re-use of treated sewage effluent.
- Manage the short term deficit situations through the continuous implementation of WC/WDM and early drought restrictions;
- Revise the water requirement projection for the Mvoti Supply Area and monitor the actual water use;
- Update water balances based on the revised water requirement projections;
- Implement mechanisms for the monitoring and management of the poor water quality in the Msunduzi, lower Mgeni River System and Mooi River System;
- Investigate rainwater harvesting as a viable alternative supplementary source if used in conjunction with the normal municipal supply, that will be economic beneficial to both the municipality and the end user; and
- More investigation into the viability of desalination of seawater.

In March 2014, Phase 2 (the current study) of the continuation study commenced, almost 2 years after completion of Phase 1, with the aim to update the Reconciliation Strategy.

The 2016 Updated Reconciliation Strategy will consider the following components:

- The study area was expanded to include the future uMkhomazi River Project, the integrated Mgeni WSS, the South Coast Supply area, and the combined Mdloti-Mvoti supply area in the north, as shown in **Figure 1.1**.
- The Updated Strategy is based on the previous 2010 Strategy, with input from the Strategy Steering Committee (SSC 6th to 10th).
- All water requirements have been updated to 2016, and the related water balances have been updated.
- The reconciliation scenarios have been development, with the prioritising of interventions options.
- A risk assessment on the impact of shortages on the integrated Mgeni WSS has been developed.

The draft report will be presented at the 10th SSC (18 August 2016) for comments by the SSC members. The final report will then be presented at the 11th SSC (February 2017), for sign-off and to publish.

6 REFERENCES

DWS, 2014. *Continuation of the Reconciliation Strategy of the KwaZulu-Natal Coast Metropolitan Area: Phase 2, Status Report: August 2014,* Pretoria, South Africa: DWS.

DWS, 2015. *Continuation of the Reconciliation Strategy of the KwaZulu-Natal Coast Metropolitan Area: Phase 2, Status Report:February 2015,* Pretoria, South Africa: DWS.

Appendix A

List of Intervention Options

Appendix table A.1: Updated list of intervention options and target dates

Main scheme	Start date	End date	Comment/s
Mgeni Water Supply System			
Mooi-Mgeni Transfer Scheme (MMTS2)			
MMTS2 Phase 2A (DWS/TCTA)			
Spring Grove Dam	-	-	Completed
Upgrade Mearns pump station and pipeline (3.2 m^3/s)	In progress	Early 2016	Testing Feb 2016
Water delivery via MMTS2	In progress	Early 2016	
MMTS2 Phase 2B (DWS/TCTA)			
Construction	Oct 2014	Apr 2015	-
Delivery via MMTS2B (1.8 m^3/s)	-	Dec 2015	-
uMkhomazi Water Project Phase 1 (DWS)			
Feasibility Study (Raw Water)	Oct 2011	Nov 2015	Completed
Feasibility Study (Potable Water)	Aug 2012	Jul 2014	Completed
Feasibility Study EIA	Nov 2012	Nov 2016	Draft EI report to be submitted in Feb 2016
Decision to proceed with uMWP-1, offtake agreements and obtaining funding	Dec 2016	early 2018	-
Detailed design	Jan 2017	End 2018	-
Construction	Early 2019	Oct 2023	-
Delivery (220 million m^3/a, or 214 million m^3/a with release to Lower uMkhomazi)	-	Oct 2024	-
North Coast Water Supply System			
Hazelmere Dam Raising (DWS)			
Decision to continue with raising of dam as an option	-	Apr 2015	Completed
Finalise design/tenders	May 2015	Jun 2015	Completed
Construction	**Jul 2015**	**Jul 2017**	
Delivery (raise dam from 86 masl to 93 masl)		2018/2019	DWS estimate (K Bester)
North Coast Pipeline and Hazelmere Supply Infrastructure (Umgeni Water)			
Construction pipeline from Honolulu to Mvoti pump station	-	Jun 2014	Pump station to Ballito experienced delays
Upgrade Hazelmere WTW	-	Jun 2014	Completed
Lower Thukela Bulk Water Supply Scheme (Umgeni Water)			
Construction Phase 1	Feb 2014	Jun 2016	Underway - 1st delivery by April 2016
Delivery Phase 1 (55 Mℓ/d)	-	Dec 2016	-
Construction Phase 2	Jul 2017	Dec 2018	Uncertain
Delivery Phase 2 (55 Mℓ/d, total 110 Mℓ/d)	-	Jan 2019	-

Main scheme	Start date	End date	Comment/s
Mvoti River Scheme (DWS)			
Feasibility Study	Apr 2017	Apr 2020	Estimated start date (timeline moved) due to possible alternative of re-use
EIA (including estuary)	Jun 2017	Apr 2020	
Detailed design	Aug 2020	Jul 2022	-
Construction	Oct 2022	Oct 2025	-
Delivery	-	Apr 2026	-
North Coast Desalination of seawater – Lovu (Umgeni Water)			
Feasibility Study	Jan 2012	Mar 2015	Completed
Funding procurement, design and tender phase			Option not feasible due to uMWP-1. To be consider in future again.
Construction			
Delivery (150 Mℓ/d)			
Hazelmere reuse (eThekwini MM)			
Feasibility Study for Regional Wastewater Works			
Direct reuse of treated wastewater (eThekwini MM)			
Tender preparation and adjudication	Jan 2015	Jun 2015	-
Tender award, financing and site establishment	Jun 2015	Jun 2016	-
Construction and commissioning	Jul 2016	Jul 2018	-
Delivery (41 million m^3/a)	-	Jul 2018	-
South Coast Water Supply System			
Lower uMkhomazi Bulk Water Supply Scheme (Umgeni Water)			
Feasibility Study	Jul 2014	Apr 2016	Finalisation of study
EIA (including estuary)	Mid 2015	End 2016	
Detailed design	Early 2017	Early 2018	
Construction (Delivery of 100 Mℓ/d)	-	Mar 2022	Yield available before & after uMWP-1 with releases
South Coast Desalination of seawater - Tongaat (Umgeni Water)			
Feasibility Study	Jan 2012	Mar 2015	Completed
Funding procurement, design and tender phase	Jan 2016	Jul 2017	1 year assumed starting 2016
Construction	Jul 2017	Jun 2019	2 years assumed
Delivery (150 Mℓ/d)	-	Jul 2019	Tongaat options