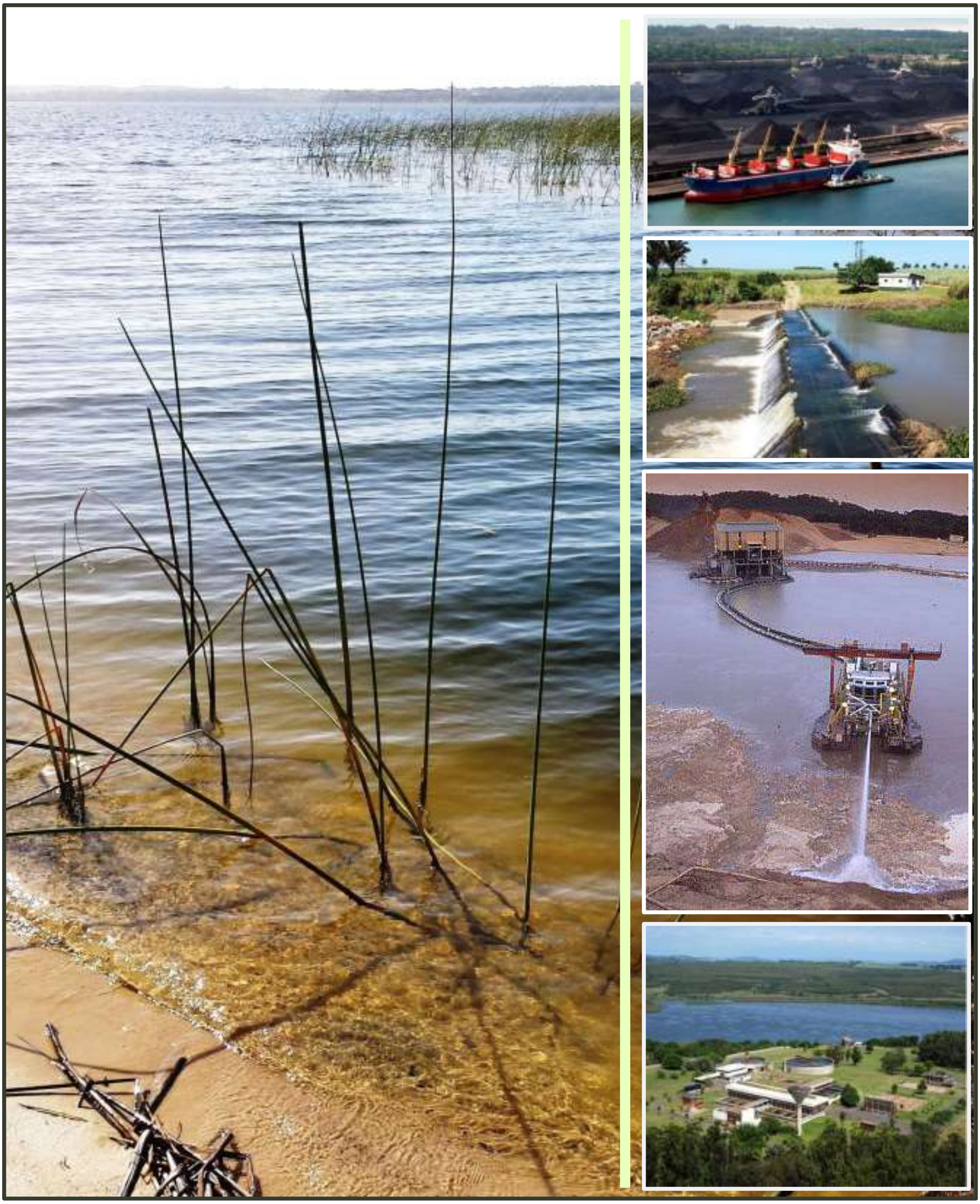

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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Extended Executive Summary

Water Reconciliation Strategy for Richards Bay and Surrounding Towns

Department of Water and Sanitation

1 December 2015

Revision: Final

Reference: 109343

Extended Executive Summary

E1 Introduction

The Study to compile the *Water Reconciliation Strategy for Richards Bay and Surrounding Towns* was undertaken by the Department of Water and Sanitation (DWS), in cooperation with uMhlathuze Water (MW), the uMhlathuze Local Municipality (also called the City of uMhlathuze (CoU)) and other key stakeholders to secure a sustainable future water supply for the supply areas currently served by the Richards Bay Water Supply System, as well as potential future supply areas. **Figure E1** shows the uMhlathuze Local Municipality area, as well as water sources, key bulk industries and some key bulk water infrastructure.

Integral to the recommendations presented in this Strategy is an integrated water resource management approach that requires the cooperative contributions of the key role-players and affected parties. The Reconciliation Strategy aims to meet the potential future water requirements in Richards Bay and surrounding towns up to 2040, and its implementation is supported by an Implementation Plan with recommended actions, responsibilities and timelines for the effective implementation of the Strategy.

E2 Overview of the Strategy Area

Richards Bay is the economic centre of the uMhlathuze Local Municipality which further comprises Empangeni, Ngwelezane, Nseleni, eSikhaleni and a number of rural villages, and is one of the strategic economic hubs of the country. Though the water resources available to the uMhlathuze Municipality are currently sufficient to cater for the existing requirements, should anticipated growth and industrial development materialise the current water sources are likely to come under stress within years. The Mhlatuze catchment has a mean annual rainfall of 1010 mm.

Richards Bay, with an estimated current population of 350 000, is an established city with well-developed industries, commercial areas and business centres. Significant industries include Mondi Richards Bay, RBM, Tronox, Foskor, Hillside and Bayside Aluminium (BHP Billiton), Tongaat Hulett Sugar Mill, Mpact and the Richards Bay coal terminal and port. Decisions by the Industrial Development Zone, and bulk industries that are considering establishment in the Richards Bay area, are directly influenced by the reality of the current and projected water and electricity situation for this region. Significant industries require assurance in the long-term that their investments will not be constrained or negated by shortfalls in water or power supply.

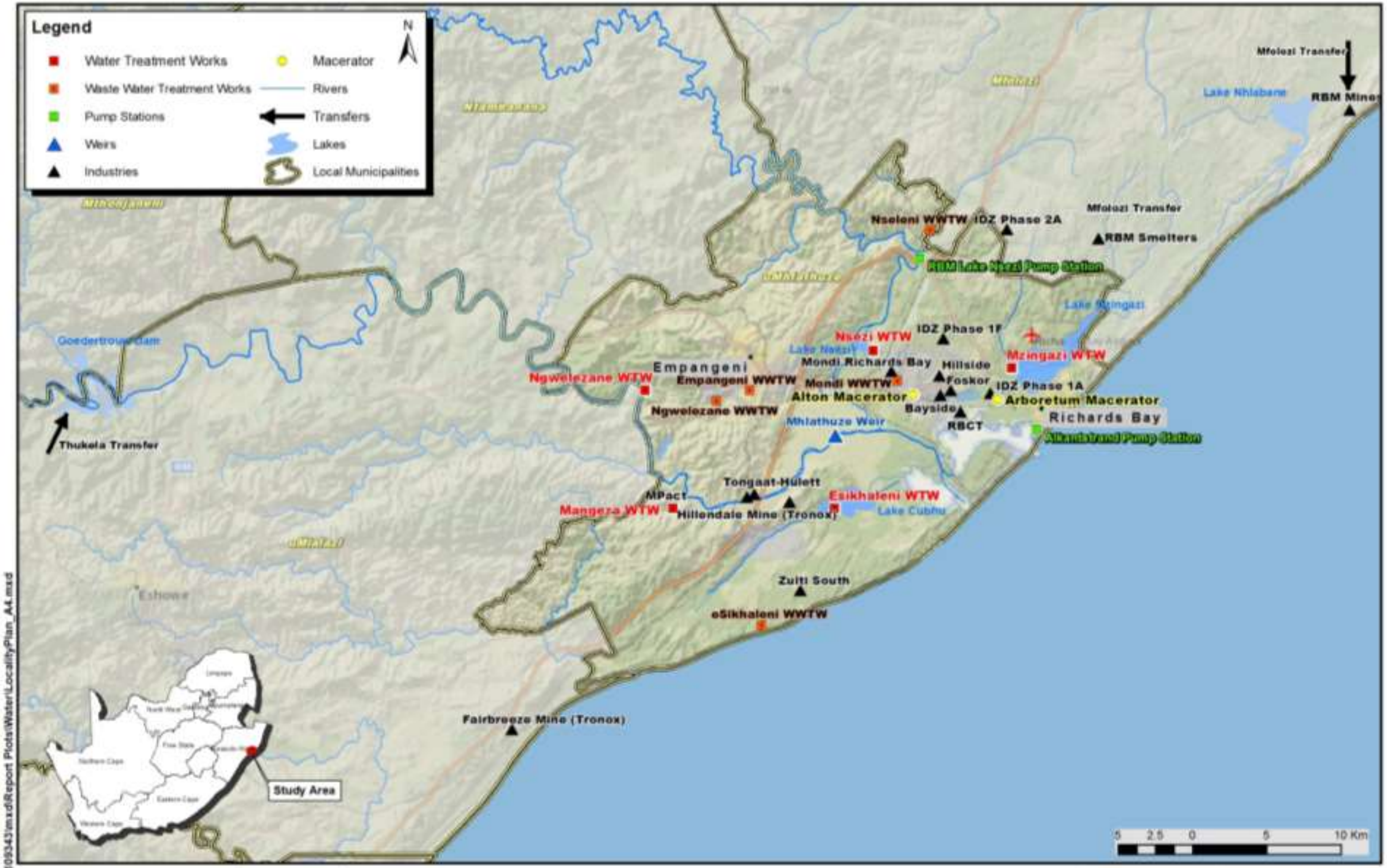

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Figure E1 | **uMhlathuze Local Municipality**

E3 Richards Bay Water Supply System

The Richards Bay Water Supply System is shown in **Figure E2** on the following page. In the strategy area, water is currently sourced from the Goedertrouw Dam, the Mhlatuze River and from various natural lakes in the catchment, and is augmented by transfers from the Thukela River and the Mfolozi River.

Lakes Cubhu, Mzingazi and Nhlabane are coastal lakes perceived to be extensions of the local groundwater, with the aquifers formed by extensive sedimentary deposits. **Lake Nsezi**, on the other hand, is a coastal lake fed by rivers originating in the granitic formation further inland. Lake Nsezi is augmented from the Mhlatuze Weir. Water from these lakes is generally of good quality, cheaper to treat than river water and is therefore preferred sources. Lake Nsezi experiences water quality problems though as a result of return flow from the Nseleni WWTW located upstream.

The **Mhlatuze River** catchment is largely unregulated, apart from the Goedertrouw Dam which supports most of the catchment's water requirements. The dam regulates the flow of the Mhlatuze River to make water available to downstream irrigators as well as to urban and industrial users in the Richards Bay area. The flow in the Mhlathuze River is supplemented by the Mfule and a number of smaller tributaries. Apart from small abstractions in the catchment for rural urban communities, the Nkwaleni, Mfule and Heatonville irrigators draw water from the river for the irrigation of sugar and citrus, between Goedertrouw Dam and the downstream weir. The Nkwaleni irrigation area is fed directly from Goedertrouw Dam.

Goedertrouw Dam, which is owned and operated by DWS, is located on the Mhlatuze River near Eshowe. The 88 m high earthfill dam had a storage capacity of 321 million m^3 when it was constructed in 1982, but the capacity of the dam is decreasing as a result of siltation.

Water is released from the Goedertrouw Dam, from where it flows for about 90 km to the **Mhlatuze Weir**, which is owned and operated by Mhlathuze Water. Water is transferred from the weir either to Lake Nsezi or directly to the Nsezi Water Treatment Works. The Mhlatuze Weir is central and vital to the operation of the WSS.

The demand pattern of the **Thukela River** is significantly affected by the existing, and potential future transfer of Thukela River water to the Vaal River System. The Thukela River is renowned for the heavy silt load that it carries. The existing Thukela emergency transfer scheme can deliver 37 million m^3/a (1.2 m^3/s) to the Mvuzane stream, a tributary of the Mhlatuze River, from where the water flows down to Goedertrouw Dam. The scheme includes a run-of-river abstraction works in the Thukela River near Middledrift and a low-lift pump station at the river, the Madungela high-lift pump-station, a 13.7 km long pipeline, and the Mkhalazi high-lift pump-station to pump the water over the watershed.

The **Mfolozi River**, which carries a high silt load is situated downstream of the confluence of the Black and White Mfolozi rivers near the south-eastern boundary of the Hluhluwe-iMfolozi Park. Water use from this seasonal river is relatively low, although low flows are fully utilised. Additional storage would be needed for increased use of water from the Mfolozi River. The mining ponds at RBM's Zulti North mine are currently supplemented by raw water from the Mfolozi River, in addition to the supply from Lake Nhlabane.

Existing **groundwater** use is restricted to rural areas and privately owned farmlands. Information on the status of boreholes is limited and unreliable.

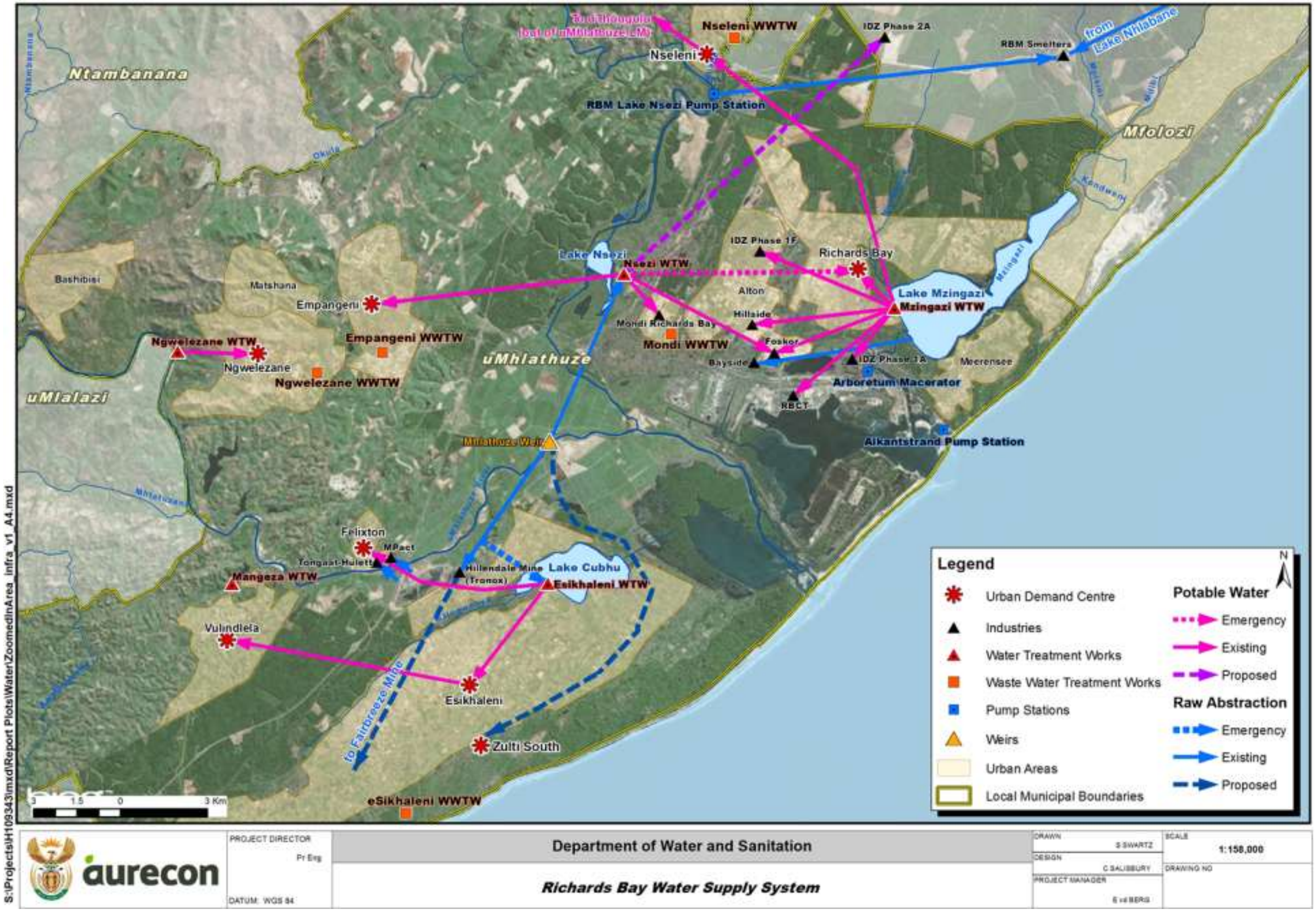

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Figure E2 | Richards Bay Water Supply System

Figure E3 | Nsezi WTW

Water treatment works in the strategy area include Mzingazi, Ngwelezane and eSikhaleni treatment works, owned by the municipality and operated by Mhlatuze Water. Nsezi WTW (**Figure E3**) that treats water abstracted from Lake Nsezi and from the Mhlatuze Weir is owned and operated by Mhlathuze Water. Mhlathuze Water holds a 108.1 million m^3/a licence for abstracting from the weir for treatment. The water users supplied by Mhlathuze Water are allotted volumes from this allocation. Mhlathuze Water's licence is not currently fully utilised.

While Richards Bay has no municipal **waste water treatment works (WWTW)**, Empangeni has a 5.5 million m^3/a (15 Mℓ/d) works. Mondi treats its own effluent on-site.

Figure E4 | Alkantstrand Pump Station

All industrial and domestic effluent from Richards Bay is pumped via Alkantstrand pump station (**Figure E4**) out to sea. Some elementary screening takes place beforehand at the Alton and Arboretum macerators), but there is no further treatment beyond screening. At Alkantstrand the effluent is diluted with seawater, and is then pumped out through the three sea-outfall pipelines which extend more than 4 km out to sea. The outfall discharge is ~51 million m^3/a (140 Mℓ/d).

In terms of **ownership and water management**, the City of uMhlathuze is the designated water services authority in terms of the Water Services Act, 1997. It is responsible for the policy setting, planning, management and oversight of water service provision in its area of jurisdiction. The Municipality controls the Lake Mzingazi and Lake Cubhu supply schemes, as well as abstraction from the Mhlatuze River, except those at the Mhlatuze Weir, which are the responsibility of Mhlathuze Water, as is the supply from Lake Nsezi. The Municipality uses Umhlatuze Water to operate and maintain municipal treatment works on behalf of the municipality. The Municipality owns and operates two macerators and Mhlathuze Water owns and operates a sea outfall pump station and pipelines, as well as the Mhlatuze Weir. The Middledrift Transfer Scheme from the Thukela River and the Goedertrouw Dam is owned by DWS. Mhlatuze Water operates the Middledrift Transfer Scheme and DWS the Goedertrouw Dam. Some of the bulk industries own and manage their own water supply and treatment infrastructure.

Key **operational issues** are:

- Concern about the structural integrity of the Mhlatuze Weir,
- Sustainable abstraction from the coastal lakes, and
- Potential centralising of water treatment.

E.4 Water Use and Future Water Requirements

Allocations and Use

Water supply in the strategy area is mainly to bulk industries, urban water users, and irrigated agriculture. Indirect water uses include dryland agriculture, invasive alien plants and commercial forestry. Some villages or rural areas are also supplied, including KwaMbonambi, Ntambanana, Khosa, Dube, Mkhwanazi north and south etc. About 5.5 million m^3/a is further supplied to rural towns and settlements in the remainder of the Mhlatuze River catchment.

Bulk industrial water use is the most significant use in this strategy area, of which the most significant is Mondi and RBM with Tronox and Foskor also being large water users. The main urban centres in the study area are Richards Bay and Empangeni. The remaining potable water supply is distributed to the smaller towns and rural areas. The total water allocation is 253 million m^3/a and the best-estimate water use is 184 million m^3/a.

In addition to the industrial development in the area there is large-scale agricultural activity. This consists principally of citrus and sugar cane, both irrigated and dryland, and commercial forestry, owned mostly by Sappi and Mondi.

The Reserve is a legal requirement that has to be complied with in the operation of the water supply system. It has an ecological component and a basic human needs component. The ecological component is the portion of the streamflow that must always be present in the rivers for healthy functioning of aquatic ecosystems.The Reserve has been determined for rivers, the Mhlatuze estuary as well as for some of the lakes, wetlands and groundwater in the area.

Table E1 shows the 2013 water uses and water allocations while **Figure E5** illustrates the best-estimate 2013 water sector usages. This is the breakdown of water use within the water supply system, which includes the Mhlatuze River catchment and some supply areas located outside the Mhlatuze River catchment. About 5.5 million m^3/a is in addition supplied to rural towns and settlements in the remainder of the Mhlatuze River catchment, which have not been included in Table E1 and Figure E5.

Table E1 | Summary of 2013 Water Uses and Allocations

Supply Sector	Usage		Allocation	
	Annual (million m³/a)	*Daily (Mℓ/d)*	*Annual (million m³/a)*	*Daily (Mℓ/d)*
Bulk Industry	55.9	153.3	91.3	249.2
Urban	40.0	109.6	36.9	101.0
Irrigation	88.5	242.5	125.0	342.5
TOTAL	**184.4**	**505.4**	**253.2**	**692.7**

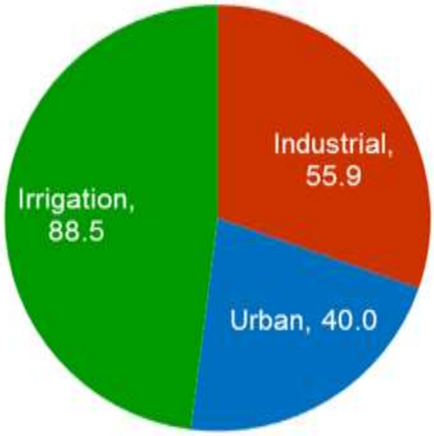

Figure E5 | Mhlathuze 2013 Sector Usage (million m^3/a)

Historical Water Use:

Total historical water use from the water supply system has shown a slight decline over the past five years. This is as a result of a decrease in use by bulk industrial users in recent years who successfully implemented water efficiency measures that resulted in water savings. As a result of this, the scope for saving water through improved water efficiency in the industrial sector has been reduced, although there are still opportunities for improvement.

Future Water Requirements Scenarios

Richards Bay is a developing city with the potential for the establishment of significant further bulk industries, given the proximity of the port and the industrial development zone. It is expected that future industrial growth will, over the medium term, mainly be driven by further development of large export-orientated industrial developments.

The uMhlathuze Local Municipality has experienced an estimated population growth rate of about 1, 5% per year between 2001 and 2011. The future demography will also largely be influenced by economic opportunities and potential. Moderate population growth in the uMhlathuze area is probable, influenced by migration from rural areas into Richards Bay in search of employment opportunities.

In addition to existing water use, the future water requirements scenarios are composed of increased use by existing users, additional new water users supplied from the Mhlatuze catchment, and the potential for significant urban water supply outside the municipal boundary. Future water requirements scenarios have been compiled for Low Growth (L), Low to Medium Growth (L-M), Medium Growth (M) and High Growth (H) respectively, as shown in **Figure E6**.

These scenarios make allowance for water supply to the following water supply components *in varying degrees*:

- Increased municipal supply to current urban water users, for domestic, rural domestic (including tribal areas), municipal, light industrial and commercial uses,
- Increased supply to additional rural domestic and tribal areas located within the Mhlatuze River catchment,
- Significant increased domestic supply to people living outside the WSS and the Mhlatuze catchment (including rural and tribal areas), and
- Current bulk industries and identified IDZ bulk industries,
- Allowance for new mine development, e.g. for the identified Jindal mine, and additional further as yet unidentified bulk industries,
- Irrigation at existing levels within the Mhlatuze catchment.

The expected sharp increases in future water requirements from 2016 to 2018 for the various scenarios is as a result of the Fairbreeze and Jindal mines going into production. The sharp increases in 2022 and 2032 are the result of the forecast IDZ expansion.

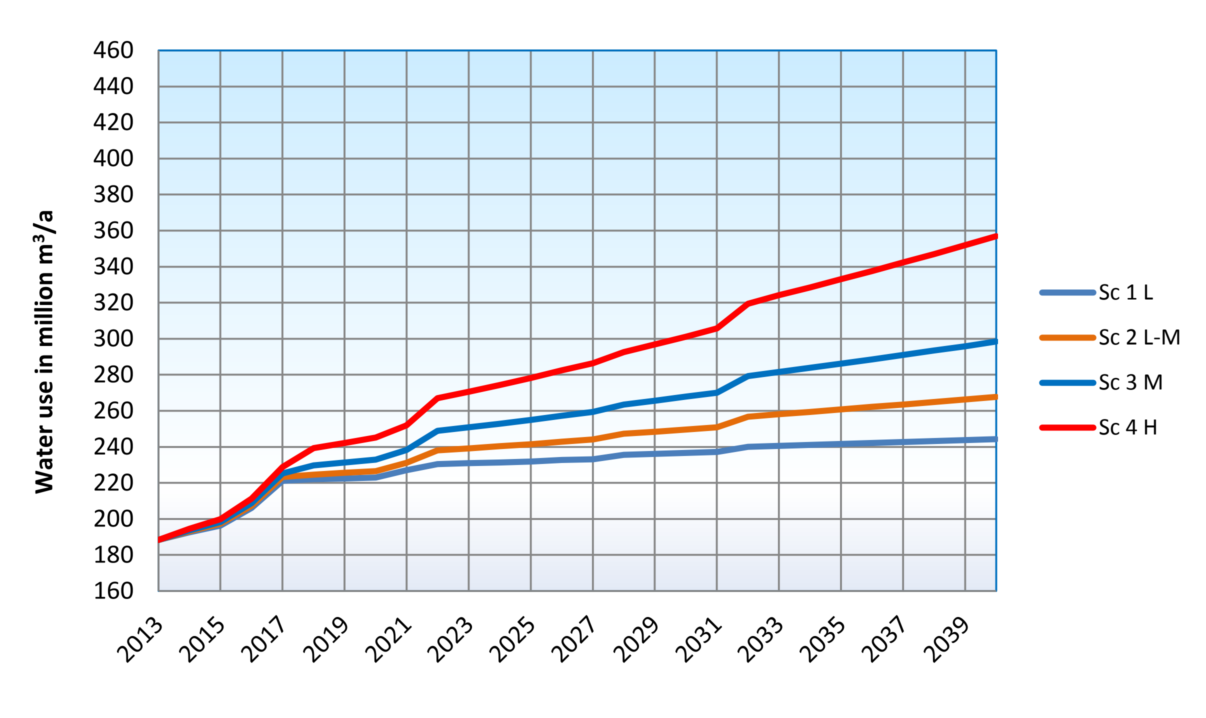

Figure E6 | 'Best-Estimate' future water requirements scenarios

E5 Water Availability

A review of the previous water resource modelling studies undertaken for the Mhlatuze catchment was done and the most representative Water Resources Yield Model (WRYM) simulation computer programme configuration for the Richards Bay WSS for the catchment was identified. This yield model was obtained and updated with the latest water use estimates and configurations of potential interventions. The yield model was used to determine an updated assured water availability for the Mhlathuze River catchment of individual system storages, for the water supply system and for potential surface water augmentation schemes. There is concern that the existing levels of abstraction from the lakes in the strategy area may not be sustainable. The confidence in the sustainable lake yields should be improved.

The Water Resources Planning Model (WRPM) was also updated and reliable system yields were determined. Allowance has been made for a continuous reduction in yield as a result of the decreasing storage in Goedertrouw Dam due to sedimentation. The Planning Model makes provision for:

- The growth of water requirements over time,
- The addition of new bulk water infrastructure,
- The curtailment of demand types during droughts according to different reliability classification tables.

The water demands on the system are categorised into different reliability classes, indicating how often water supply to specific water use groups can be curtailed, e.g. for irrigation. Some of these criteria may be difficult to achieve in practice and may need to be revisited.

The reliable yield of the existing system when water is supplied according to the different reliability classes was determined as 247.3 million m^3/a.

It was estimated by this analysis that the next intervention is required (before WC/WDM interventions are implemented) by:

- 2033 for the low-growth water requirements,
- 2022 for the medium-growth water requirements, and
- 2020 for the high-growth water requirements.

E6 Comparison of Future Water Requirements with Existing Water Availability

The potential shortages in water supply by 2040, for the various water requirements scenarios, when compared with the reliable system yield are as indicated in **Table E2**. This does not yet allow for the implementation of water efficiency measures.

Table E2 | Potential shortfall by 2040 for water requirements scenarios

Water Requirement Scenario	2040 Water requirement (million m^3/a)	Potential shortfall (million m^3/a)
Scenario 1: Low growth	244.4	2
Scenario 2: Low-Medium growth	267.8	23
Scenario 3: Medium growth	298.4	56
Scenario 4: High growth	356.9	115

E7 Interventions

An **intervention** can be any measure that could potentially make additional water available i.e. that improves the water balance of the Richards Bay WSS. It can therefore be demand-side (lowering of water requirements) or supply-side (increasing the water supply) focussed.

Identification and Screening of Interventions

About 45 potential interventions, which could contribute to meeting the future water requirements of the Richards Bay system, were identified and some new potential interventions were formulated. The list of these initial potential interventions has been termed the "Long List" of interventions, classed under twelve categories in terms of intervention types. Potential interventions in the Long List of interventions were interrogated by the Study Team to ascertain which of these could be seriously considered for further evaluation. Following review by key stakeholders, agreement was reached on which interventions to evaluate in greater depth. The outcome of this screening process was the identification of the interventions that should be evaluated further, called the "Short List" of interventions.

Table E3 provides descriptions of the short-listed interventions.

Table E3 | Descriptions of evaluated interventions

Intervention	Description of intervention
Bulk industrial WC/WDM:	Water efficiency measures by bulk industrial water users, of which Mondi, RBM, Tronox and Foskor account for 96% of current water use.
Urban WC/WDM:	Water efficiency measures by the urban water supply sector (especially the City of Mhlathuze) and the Uthungulu DM.

Intervention	Description of intervention
Rainwater harvesting:	Collection and storage of rainwater for commercial, industrial or domestic use, especially the harvesting of rainwater from roofs for non-potable domestic uses.
Sustainable supply from coastal lakes:	Determination of groundwater contributions to lake yields and total lake yields at an acceptable confidence, for Lakes Mzingazi, Cubhu and Nhlabane.
Increased capacity of the Thukela-Mhlatuze Transfer Scheme:	Further phases of the increased transfer from the Thukela River at Middledrift (phases 1, 2 and 3) for a variety of infrastructure combinations to increase the transfer rate to 2.7 m^3/s, 5.7 m^3/s and 8.7 m^3/s respectively (from the existing 1.2 m^3/s).
Coastal pipeline from the lower Thukela River:	Shared use of bulk water abstraction and treatment infrastructure developed in the lower Thukela River at Mandini by Umgeni Water to transfer water to Richards Bay with either a raw water of clear water pipeline and to supply coastal communities along the way. Options of 110 Mℓ/day and 55 Mℓ/day transfers were investigated.
On-channel transfer scheme/s from the Mfolozi River: Kwesibomvu Dam:	An on-channel earthfill dam on the Mfolozi River about 7 km upstream of the N2 road bridge that would transfer water to Nsezi WTW and provide a regional water supply to Mtubatuba and other small towns. Two dam sizes were evaluated.
Off-channel transfer scheme/s from the Mfolozi River:	Pumping from a weir in the Mfolozi River about 4 km upstream of the Kwesibomvu Dam site to an off-channel earthfill dam at the Nkatha Pan. The scheme would transfer water to Nsezi WTW and provide a regional water supply to Mtubatuba and other small towns. Different rates of pumping from the Mfolozi River to the dam were investigated, as well as two dam sizes.
Raising of Goedertrouw Dam:	A 2.8 m raising of the dam wall by building a concrete wave wall on the existing earthfill dam wall, and increasing the capacity of the spillway through a labyrinth spillway configuration.
Dam on the Nseleni River:	A new earthfill dam on the Nseleni River tributary of the Mhlatuze River just upstream of the Bhejane township, from where water could be released to flow down to Lake Nsezi for abstraction. Three dam sizes were evaluated.
Groundwater schemes:	Three wellfields were assessed, which are located to the west of Empangeni and to the south-west respectively and will supply into existing or new reservoirs.
Arboretum Effluent Reuse Scheme:	This firstly involves construction of a regional activated sludge WWTW and biological nutrient removal process with membrane bioreactors at the Arboretum pump station/macerator site that can accommodate both the existing and future domestic load of the Arboretum and Alton pump stations. The treated effluent will be sold directly to industrial users or alternatively pumped for discharge into Lake Mzingazi for indirect reuse.
Seawater desalination:	Seawater will be fed by an intake in the Richards Bay harbour or a marine intake to a site close to the Alkantstrand pump station, where the reverse osmosis desalination plant will be situated. Potable water will be pumped to the Mzingazi WTW for blending and distribution.

Evaluation of selected interventions

Pertinent information on technical, financial, ecological and social aspects was assembled or generated and where necessary, improved at desktop level. Savings to be achieved as a result of water efficiency measures and scheme yields were determined and schemes were costed. Preliminary implementation programmes were developed for each intervention, and used in the scenario evaluation.

At the stakeholder workshop held on 4 February 2015 in Richards Bay, the findings of the Interventions evaluation were presented to a group of key stakeholders, who provided comment and contributions regarding variations or refinements of the interventions.

The key features of selected evaluated interventions are shown in **Table E4** and the scheme locations in **Figure E7** thereafter.

The schemes that can significantly increase the yield of the WSS are:

a) Increased capacity of the Thukela-Mhlathuze Transfer Scheme,
b) Kwesibomvu Dam on the Mfolozi River. Due to the very high ecological impacts that this scheme would have, it was regarded as preferable to consider an off-channel dam instead,
c) Off-channel transfer scheme from the Mfolozi River,
d) Coastal pipeline from the lower Thukela River,
e) Desalination of seawater.

Medium-sized schemes to be considered, are:

a) Arboretum Effluent Reuse Scheme, and
b) Dam on the Nseleni River.

Feasible interventions that will provide limited additional yield include Urban and Bulk Industrial water efficiency, and the raising of Goedertrouw Dam.

Table E4 | Summary Interventions Table

Intervention	Incremental Yield (million m^3/a)	Comparative cost (URV) in R/m^3	Environmental and socio-economic impacts	Implementation programme (years)	
				Conven-tional	Fast-tracked
Bulk industrial WC/WDM	2.8	*Range*	Minimal	5	-
Urban WC/WDM	4.0	*Range*	Minimal	10	-
Rainwater harvesting	*200kl/a per household*	*Minimum of R11.04/kl*	Limited	1	-
Sustainable supply from coastal lakes	-9.9	0	Positive, with negative impacts of replacing lost yield	4.5	-
Increased capacity of Thukela-Mhlatuze (Middledrift) Transfer Scheme	47.3	7.07	Moderate	8.75	6
	94.6	4.76	Moderate	8.75	-
	94.6	3.92	Moderate	7.75	-
Coastal pipeline from lower Thukela River (treated water option)	20.0 1)	4.96	Limited to moderate	8	5
	40.0 1)	5.23	Limited to moderate	9	-
Kwesibomvu Dam on Mfolozi River	66.6 2)	4.21	Significant	10.25	-
Mfolozi River Off-channel Dam	56.9 2)	5.87	Moderate to significant	9.5	7
Raising Goedertrouw Dam	3.9	1.61	Minimal	4.5	-
Dam on Nseleni River (1 MAR)	7.0	1.96	Significant, but mitigatable	8.5	-
Groundwater schemes	1.55	4.93 to 10.69	Moderate	8.5	-
Arboretum Effluent Reuse Scheme	10.95	6.97	Moderate	6.5	-
Seawater desalination (harbour intake)	21.9	7.82	Limited to moderate	7.75	5.5

1) 5 Million m^3/a of this will be supplied to coastal communities en-route
2) 20 Million m^3/a of this will be supplied to the greater Mtubatuba and surrounding rural areas
3) Conventional intervention implementation programme times are shown – programmes can be fast-tracked

Figure E7 | Locality Plan of all schemes

E8 Water Balance Scenario Planning

What is scenario planning?

The **driving factors** for the identification of future water balance situations to evaluate are:

a. Which future water requirements should be considered, and what will the associated future shortfall in water supply be by 2040?

b. Are there potential interventions that are so attractive (so-called 'baseline' interventions) that they should form part of all future scenarios?

c. Which interventions should be considered in addition to the baseline interventions?

d. What other issues would influence the future water balance and would need to be considered further?

The key question is:

"Which interventions should be implemented and in what order to avoid a shortfall in supply?"

Scenario planning is:

- Evaluation of various ways to maintain a long-term system water balance and learning lessons,
- Scenarios are combinations of selected interventions,
- They are useful to evaluate further influences on the water balance and to test stakeholder perspectives.

Scenario planning helps to identify the more favourable interventions or groups of interventions that could be implemented to meet future supply shortfalls for potential future water requirements, and identifies when such interventions should be implemented. Scenario planning was done to determine the potential implementation dates of interventions for each water balance scenario within the strategy evaluation period, from now up to 2040, to avert any shortfalls in supply.

Important further influences on the future water balance to consider are:

- Climate change,
- Reducing storage capacity of Goedertrouw Dam,
- National perspective on the future allocation of Thukela River water,
- Future availability and cost of Thukela River water, and
- Fast tracking of intervention implementation programmes.

Baseline Interventions

Four small, attractive interventions have been identified that are referred to as the 'baseline' interventions, which will be included in (almost) all the scenarios postulated. These are:

- **Bulk industrial WC/WDM** and **Urban WC/WDM**: these have comparatively low costs and are the most acceptable in terms of environmental sustainability,
- **Raising Goedertrouw Dam**: very cost-effective, will have low impacts and is quick to implement,
- **Dam on the Nseleni River**: very cost-effective and its impacts can, to a reasonable extent be mitigated. In addition it could provide some operational advantages.

The baseline interventions (**Figure E8**), shown in comparison to the low-growth, medium-growth and high-growth water requirements and the existing system yield, can provide a combined yield of 17.7 million m^3/a, depending on the success achieved with water efficiency measures.

In the graph, dotted red lines show the position of the various water requirement projections, before the implementation of WC/WDM measures, which lowers the lines by the amount saved. The height of the augmentation schemes (orange and yellow coloured blocks added on top of the existing system yield) are commensurate with the yield of each scheme.

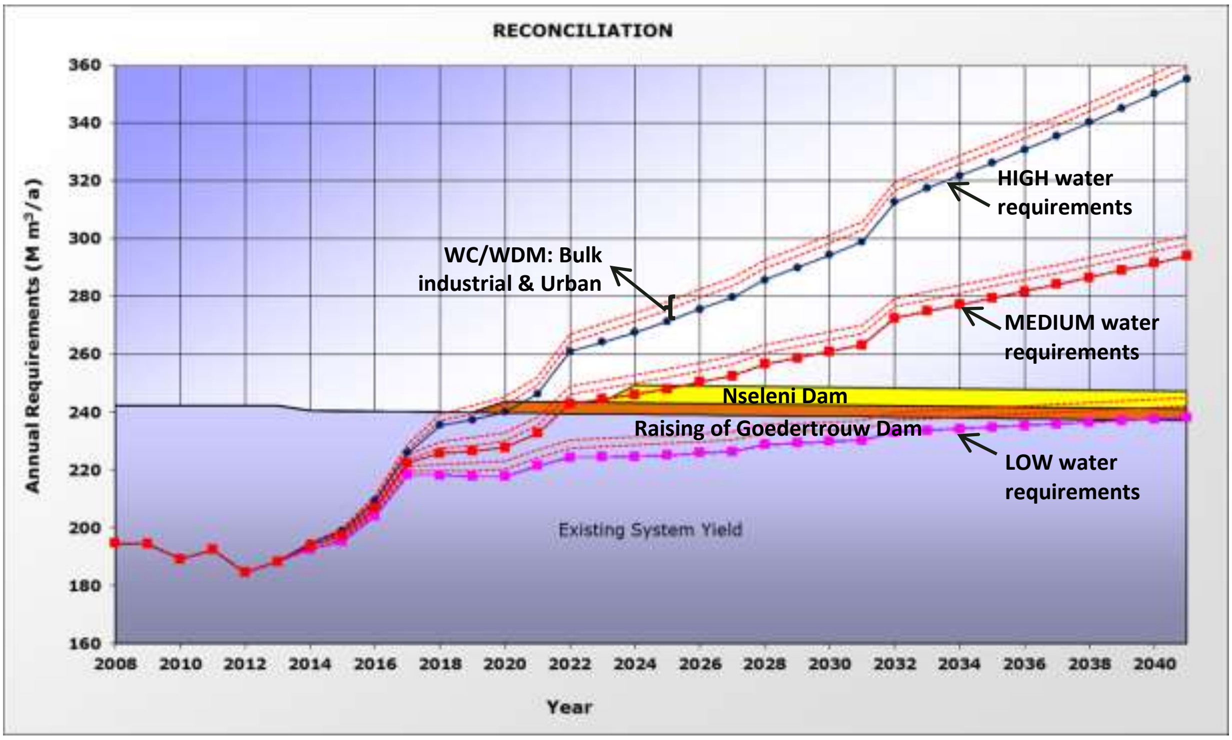

Figure E8 | **Baseline interventions showing Water Use Scenarios**

Water Balance Scenarios

A series of scenario themes were postulated to test specific future situations or different approaches to meet the potential shortfall. A significant range of scenarios that could address these various themes was developed. Because there is little point in evaluating scenarios where no specific lessons can be learnt from such evaluation or where the solution is so evident, some identified scenarios were not evaluated further. Following initial assessment and screening of these scenarios, a range of scenarios was recommended for more detailed evaluation.

The **Reconciliation Planning Support Tool** (RPST) was customised for the Richards Bay system, to undertake scenario planning and to determine the implementation dates of interventions for the selected scenarios.

Scenario findings

Scenario analysis demonstrated that the shortfall for the **Low-growth Water Requirements Scenario** can be met by effective industrial and urban water efficiency measures.

It is quite difficult to identify a scenario that represents the most likely scenario at this point in time, given the uncertainty regarding what future water requirements will actually be. The closest is likely this **Medium-growth Water Requirements Scenario** (**Figure E9**) that illustrates the implementation of a fast-tracked Mfolozi River off-channel transfer scheme, in addition to the four baseline interventions. Alternatively a fast-tracked Thukela Middledrift transfer scheme could be considered, or a fast-tracked desalination scheme.

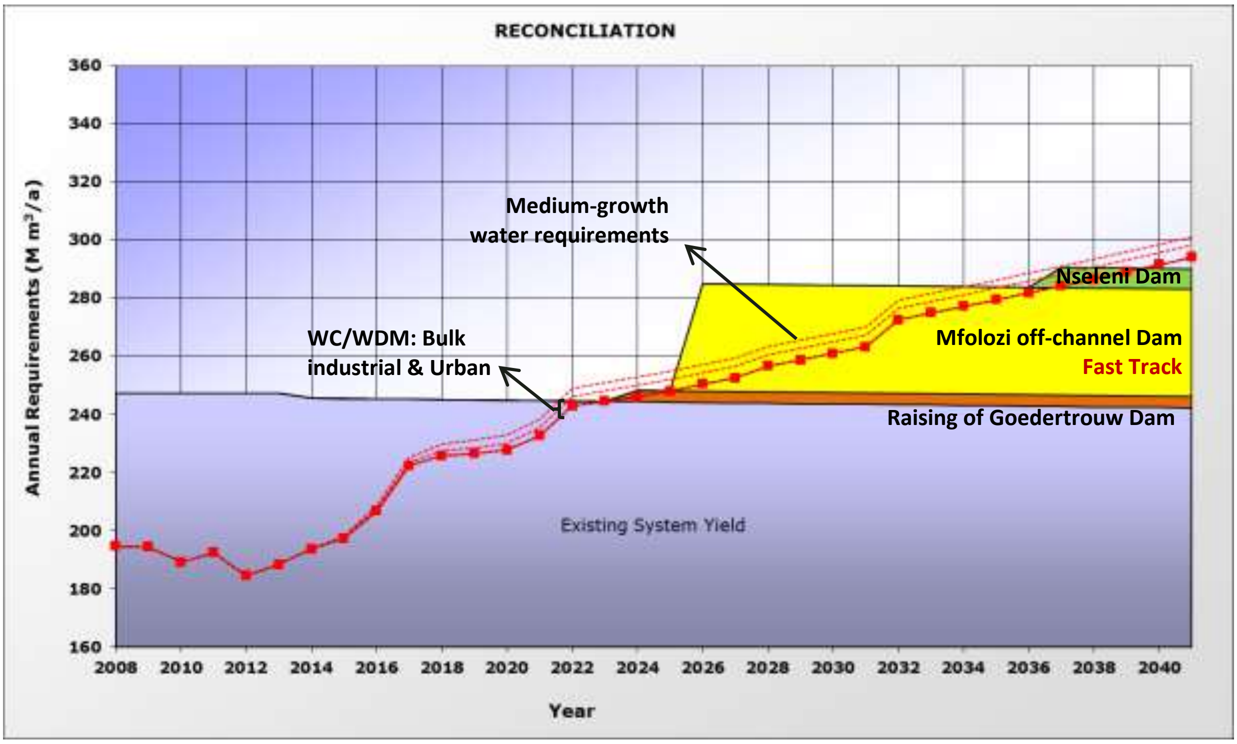

Figure E9 | **Medium-growth Water Requirements Scenario**

The selected **High-growth Water Requirements Scenario** (**Figure E10**) shown below demonstrates how fast tracking of the implementation of the Mfolozi off-channel scheme improves the water balance in the medium term by implementing the scheme earlier.

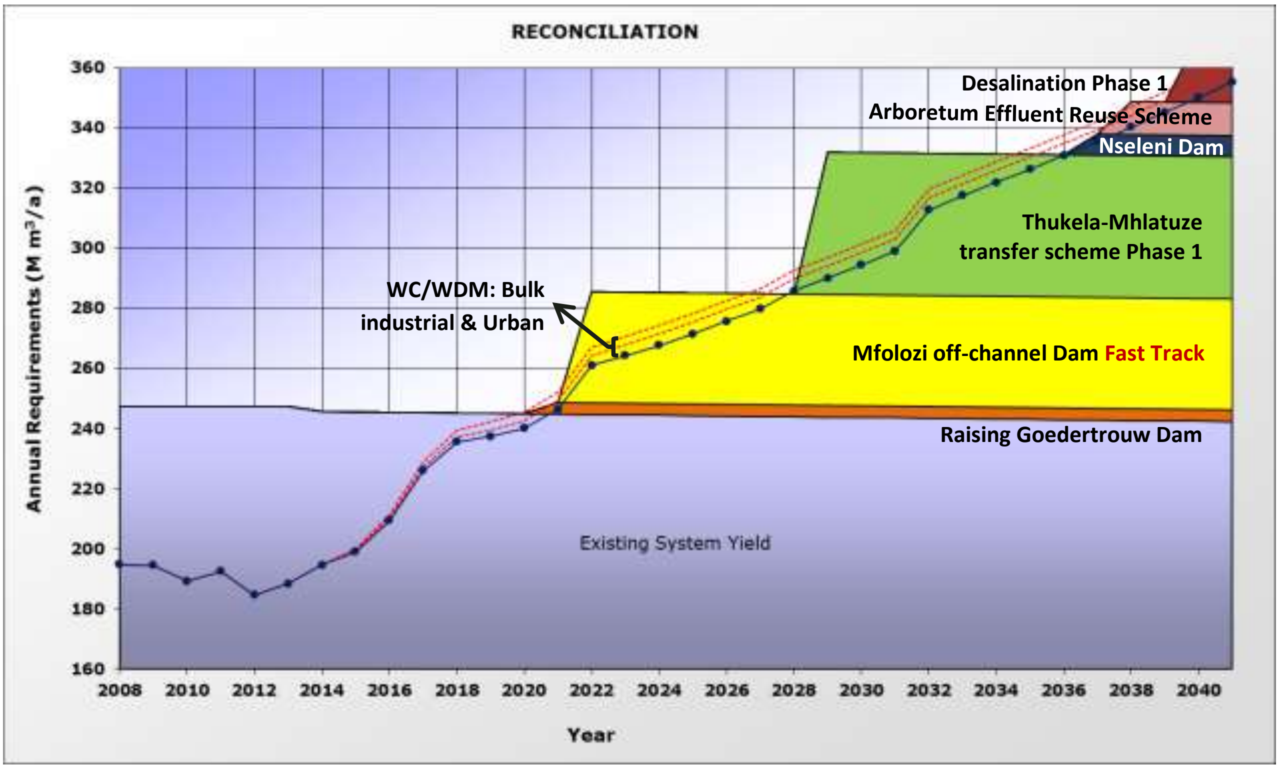

Figure E10 | **High-growth Water Requirements Scenario – theme Mfolozi fast-track**

Several variations of especially the High-growth Water Requirements scenarios were evaluated.

Conclusions

The most important observations and lessons learnt from the scenario assessment are:

a. Should low growth in future water requirements realise in the long-term, scenario evaluation demonstrates that the shortfall can be met by improved water efficiency measures.

b. Should medium growth in future water requirements realise in the long-term, scenario evaluation demonstrates that the shortfall can be met by the implementation of one significant bulk water supply scheme, in addition to the baseline interventions, and that there would be medium-term benefit to fast-track the first significant scheme to be implemented.

c. Should high growth in future water requirements realise in the long-term, scenario evaluation demonstrates that several bulk water supply schemes would need to be implemented over the strategy evaluation period, of which the first significant scheme to be implemented would need to be fast-tracked.

d. Three significant available schemes (that would make large quantities of water available) have been identified to meet the future water requirements of the Richards Bay WSS. These are:

   - Mfolozi River off-channel dam transfer scheme,
   - Increased transfers from the Thukela River, either the Thukela Middledrift Scheme or the Lower Thukela Coastal Pipeline, or
   - Seawater desalination.

   Although each of these schemes have their respective strong and weak points, it is not yet clear which of these three schemes are preferable. The choice of project needs to be confirmed with higher resolution analysis, such as a pre-feasibility study.

e. The Arboretum Effluent Reuse Scheme is a medium-sized scheme that seems promising.

f. There is still significant uncertainty regarding the potential influence of climate change.

g. The reducing capacity of Goedertrouw Dam as a result of siltation has a negative influence on the yield of the system.

h. The future availability and cost of Thukela River water for transfer to the Mhlatuze River needs to be clarified.

E9 Stakeholder Engagement and Capacity Building

A stakeholder engagement process was followed for the development of the Reconciliation Strategy to create awareness of the project at a broad-based level throughout the system supply area and potentially affected areas. The stakeholder process continued throughout the study, although stakeholder interaction was mainly concentrated around:

- Targeted meetings with staff from water management institutions and significant water users,
- Stakeholder meetings and strategy deliverable workshops held in Richards Bay with key stakeholder representatives,
- Providing contributions to selected Mhlathuze Catchment Management Forum meetings, and
- Distribution of draft and final reports by email, inviting comment and contributions.

Targeted meetings were held with officials from Mondi, RBM, IDZ, DWS KZN Regional Office in Durban, Mhlathuze Water and the CoU. Most of the existing and potential future water sources and existing bulk water infrastructure was visited by the study team along with officials. A questionnaire was distributed to the large water users and the study team engaged extensively with significant water users. Reports were distributed to key stakeholders, inviting comments and contributions.

The participation at the stakeholder meetings and workshops was regarded as a success because participants were generally satisfied with the level of information provided by the study team. The participants demonstrated a good level of understanding. The existing owners of the RBWSS infrastructure, namely DWS, uMhlathuze Water and the CoU generally demonstrated a good working relationship during the formulation of the Strategy.

Identified participants from the DWS KZN regional office, uMhlathuze Water and RBM were trained in the background to and selected aspects of reconciliation strategy development. In total, three capacity building and training sessions were held.

E10 Implementation Arrangements

A number of institutions are involved in the planning and operation of the system. These institutions should take part in the strategy revisiting process, should be consulted and should take the responsibility to steer the strategy implementation in the right direction. The establishment of appropriate implementation committees would facilitate this.

It is therefore recommended that a Richards Bay **Strategy Steering Committee** (SSC) be established towards the end of the Reconciliation Strategy Study. Organisations to be represented on the SSC would need to be identified and would be invited to nominate representatives on the SSC. Meetings should be held on a six-monthly basis.

The SSC would have as its main functions and objectives:

a. To ensure that the strategy remains relevant and is regularly updated,

b. To monitor and co-ordinate the implementation of the relevant actions identified in the strategy, and

c. To make recommendations on long-term planning activities required to ensure reconciliation of requirements and supply.

It is further recommended that an **Administrative and Technical Support Group** (ATSG) be constituted, to provide administrative and technical support to the SSC. ATSG will be responsible for general administrative and technical support and will arrange SSC meetings.

A **Strategy Implementation Plan** was developed with close stakeholder interaction. The Plan identifies the actions to be taken, the responsible authorities and the timing of actions, in support of the implementation of the reconciliation strategy. Action items have been identified under eleven categories. For some actions, responsibilities would still need to be assigned at the appropriate time. In terms of the timing of implementation items, the plan distinguishes between essential actions, very high, high or medium priorities.

E11 Recommendations

Establish a **Strategy Steering Committee**, supported by an **Administrative and Technical Support Group**, as soon as possible.

Evaluation of a suite of interventions is recommended to ensure that the growing water requirements of the system can be met in the long term. While it is unknown what the water requirements will actually be in the future, a sensible approach is to ensure implementation-readiness should high-growth future water requirements realise. It is therefore recommended that the planning of the more attractive projects be done up to at least pre-feasibility or even feasibility level. It is also good practice to evaluate a larger range of projects than may eventually be required, because some of the projects may be found less attractive after more detailed evaluation.

The following recommendations are made:

1. **Implement** the following interventions:
   a) **Urban WC/WDM,** comprising a range of measures and the continuation of existing initiatives,
   b) **Bulk industrial WC/WDM**, comprising the continuation of existing initiatives essentially aimed at the significant industrial water users, but also at other industrial water users,
   c) **Raising of Goedertrouw Dam** by 2.8 m, following confirmation by feasibility evaluation.

2. The **DWS** should undertake a **priority study** that addresses the following components, with components a) and b) being addressed simultaneously:
   a) Mfolozi River catchment and development component that involves the updating of the Mfolozi River catchment hydrology, assessment of water requirements, system modelling, identification of catchment development needs and options, evaluation of development scenarios, identification of recommended development options and feasibility studies of selected priority Mfolozi basin development options.
   b) A Comparison Pre-feasibility component, to *inter-alia* compare the following development options, and to select one or more augmentation schemes to evaluate further at feasibility level:
      - Increased capacity of the Thukela-Mhlathuze Transfer Scheme at Middledrift and potential phasing thereof,
      - Coastal transfer pipeline from the lower Thukela River at Mandini,
      - The preferred Mfolozi River transfer scheme to the Richards Bay WSS.

      As part of this component, consider the current availability of Thukela River water and the water available for later transfer phases, taking into account existing and planned developments for transfer to the Vaal River System, the frequency of Thukela water being transferred to the Vaal System, as well as other water requirements from the Thukela River.

c) Feasibility Study/ies of the selected scheme/s.

3. In addition, there are opportunities for the evaluation and potential implementation of the following development options:
   a) A dam on the Nseleni River,
   b) Use of treated effluent from the Arboretum macerator site, and
   c) Seawater desalination.

4. Further recommended actions are:
   a) Implement a policy for rainwater harvesting to augment municipal supplies for outdoor and indoor non-potable domestic uses,
   b) Determine groundwater contributions to lake yields at an acceptable confidence, and revise the operating rules of abstraction to ensure a sustainable supply from the three coastal lakes of the WSS, namely Lakes Mzingazi, Cubhu and Nhlabane,
   c) Support the removal of invasive alien plants, especially in the catchments above dams in the WSS,
   d) Investigate the reduction of illegal/commercial afforestation in the immediate vicinity of the coastal lakes and implement practical measures to curb illegal afforestation,
   e) Encourage the responsible development of groundwater for local use.