



***WATER FOR GROWTH &  
SUSTAINABLE DEVELOPMENT***



# WATER FOR GROWTH AND SUSTAINABLE DEVELOPMENT

*The elimination of backlogs in basic water services and the progressive improvement in the level of water services backlogs are some of the targets set by the South African government towards the achievement of Millennium Development Goals. South Africa has made significant strides in the drive to provide safe drinking water to all people, and in ensuring there is sufficient water for economic development (particularly the mining, industrial and agricultural sectors).*

*However, it is recognized that the water sector still needs to critically assess its performance in order to identify areas requiring improvement, while ensuring efficiency in service delivery for the provision of sufficient water to support sustainable economic growth and social development (DWAF, 2008).*

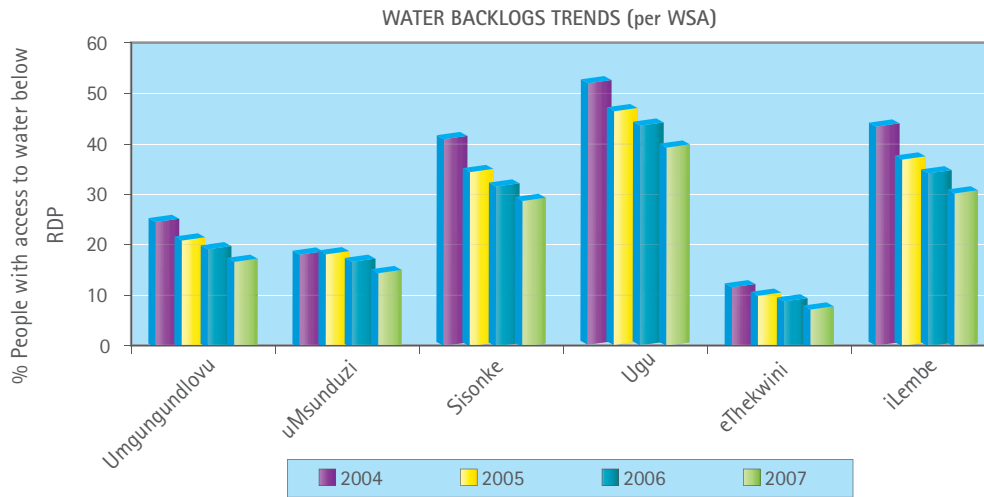
Despite the achievements made in the water sector, service delivery remains an enormous challenge. In particular the planning for the eradication of water services backlogs has been piecemeal, with a short-term focus. This resulted in several problems including non-sustainable schemes and the need for upgrades shortly after

commissioning of schemes, independently supplied schemes being implemented alongside each other, and duplication of effort. In order to address and overcome these challenges, all stakeholders need to play a meaningful role in the elimination of these backlogs. (See table below)

Table 8: KZN Water Services Backlogs

Water Service Authority	Total population	Total people with access to water below RDP level	% People with access to water below RDP level
eThekweni MM	3 395 871	272 218	8
uMgungundlovu DM	404 406	71 088	17,6
Msunduzi LM	598 773	92 485	15,4
Ugu DM	768 875	313 205	40,7
Sisonke DM	494 937	148 226	29,9
iLembe DM	605 807	189 969	31,4

Source of Data: DWAF's Water National Information System



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A holistic approach in the provision of water services has prompted Umgeni Water to adopt regional bulk supply planning for the provision of bulk water (KZN Bulk Water Strategy).

### INFRASTRUCTURE MASTER PLANNING

The environment in which Umgeni Water fulfils its function as a regional bulk water supplier is constantly undergoing change, with many factors influencing both the water demand and supply components of its business. Umgeni Water's infrastructure planning therefore needs to be continually reviewed, updated and adapted to accommodate this change, and to assist in the achievement of KwaZulu-Natal's developmental goals.

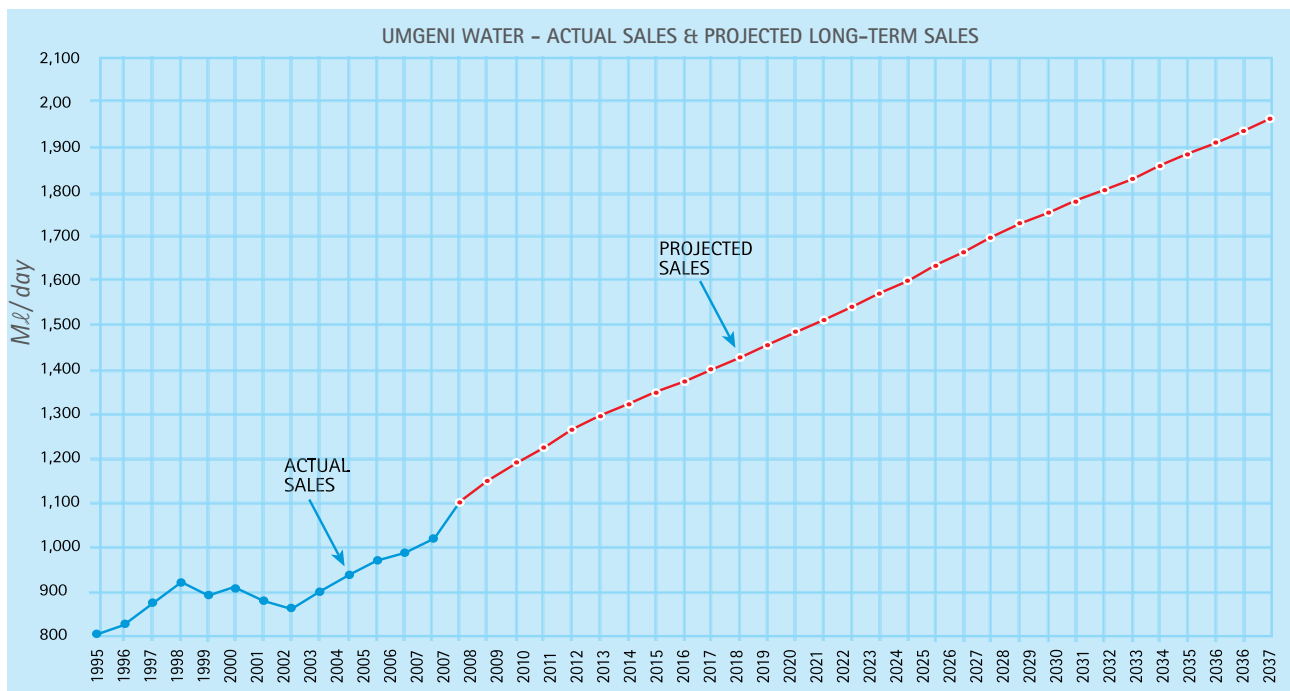
Umgeni Water produced a comprehensive technical Infrastructure Master Plan report at the end of 2004 (for the financial period 2005/06 – 2035/36) that provided an important reference and window into the organization's future infrastructure development plans. The 2008 Infrastructure Master Plan report was completed in February 2008 as an addendum to the 2004 report to document, in a holistic manner, any variations to Umgeni Water infrastructure

development plans since the 2004 report was released. The amendments, due to improved knowledge, consisted of:

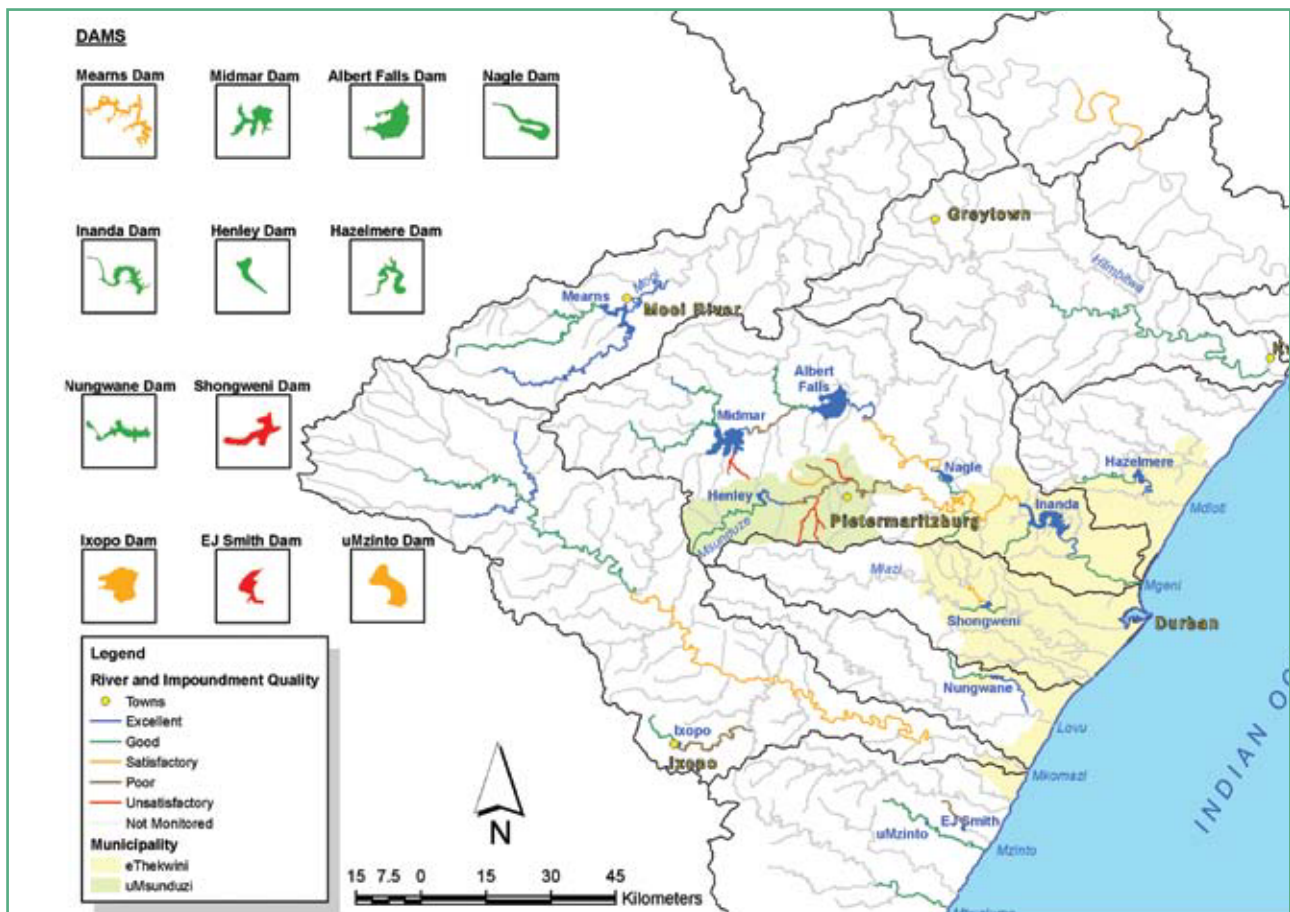
- A description of the most recent changes and trends within the primary environmental dictates that influence Umgeni Water's infrastructure development plans
- A review of historic water sales against past projections, as well as Umgeni Water's most recent water demand projections, compiled at the end of 2007.

The most recent infrastructure plans have been developed to address changes that have occurred since the 2004 Infrastructure Master Plan, and aligned to the latest water demand projections.

The Infrastructure Master Plan took cognizance of development planning at national, provincial and local governmental levels and was provided accordingly to assist in such planning. Stakeholders receiving the report included DWAF at national and provincial level, KZN's DLGTA, the WSAs and their families of local municipalities where applicable.



## Water quality status of raw water resources



### STATUS OF RAW WATER RESOURCES

The availability of an adequate quantity and quality of raw water throughout the year from the rivers and dams utilized by Umgeni Water is essential for the successful operation of the organization. Hence, water resources management is an important activity in ensuring that this availability is maximized at all times, with responsibility within Umgeni Water's area of operation currently shared between the organization and the Department of Water Affairs and Forestry.

Umgeni Water currently operates and maintains 12 dams, situated primarily on three major water resource systems: the Mgeni System (Mooi and Mgeni Rivers), the North Coast System (Mdloti River) and the South Coast System (Nungwane, Mzimayi and Mzinto Rivers).

The Mgeni System comprises four dams on the Mgeni River (Midmar, Albert Falls, Nagle and Inanda Dams), and Phase 1 of the Mooi-Mgeni Transfer Scheme (MMTS-1). The latter consists of the Mearns Weir on the Mooi River, a pump station with a maximum transfer capacity of 3,2 m<sup>3</sup>/s and a pipeline discharging into the Mpofana Stream, which flows into the Lions River before ultimately discharging into the Mgeni River upstream of Midmar Dam. The system provides a raw water resource for the greater Durban/Pietermaritzburg region, and supports the northern end of the South Coast System to a limited extent.

The North Coast System comprises Hazelmere Dam on the Mdloti River. The system serves the coastal strip and adjacent hinterland, from Verulam in the south to KwaDukuza (Stanger) in the north. Hazelmere remains a dual-purpose dam, providing water for both potable and irrigation requirements.

The South Coast System comprises a number of interlinked operational entities. The Upper South Coast System primarily supports the southern eThekweni Metropolitan area in and around Amanzimtoti and as far south as the Mkomazi River mouth. Water resources for this area are obtained from the Nungwane Dam on the Nungwane River, a tributary of the Lovu River. This resource is substantially augmented by the Mgeni system via the South Coast Augmentation pipeline.

The Middle South Coast System comprises the coastal strip from the Mkomazi River mouth (the town of Umkomaas) in the north to Hibberdene in the south. This system supports the southernmost extremities of the eThekweni Metropolitan area and the northern Ugu District municipal area. The central portion of this area is supplied from the Umzinto Waterworks, which derives its raw water from the Umzinto and EJ Smith Dams on the Mzinto and Mzimayi Rivers respectively. To the south there is a sand abstraction system on the Mtwalume River serving the Mtwalume Waterworks, and to the north a take-off from the Sappi-Saiccor abstraction works on the Mkomazi River serving the Craigieburn Waterworks.

These resources are not able to cope during drought conditions and water restrictions are often required in the Middle South Coast area. The South Coast Pipeline, which draws potable water from the Mgeni system, was commissioned by Umgeni Water in July 2008 to alleviate this problem and will provide additional water for further growth and development.

### RAW WATER QUALITY MANAGEMENT

Umgeni Water undertakes extensive water quality monitoring

of physical, chemical and biological parameters on key water resources on a regular basis. The results of this monitoring are presented in (figure 2).

Noticeable changes since the last reporting period were the significant decline in water quality in the Shongweni, EJ Smith, uMzinto and Ixopo Dams. Agricultural runoff in the Mearns impoundment continues to negatively impact on the water quality, despite the community undertaking to address water quality concerns by the establishment of a water user association. Inputs from Mpophomeni via the Mthinzima River continue to carry high pollution loads into Midmar Dam, mainly due to sewage contamination.

The quality of water in the Mgeni River immediately below Midmar Dam is excellent but declines rapidly after inputs from Howick town and unacceptable discharges from the Howick Wastewater Works. The poor effluent quality of Howick Wastewater works is

going to be improved by the impending installation of a larger chlorine contact tank. While Albert Falls Dam water is of good quality, it declines once water leaves the dam, due largely to nutrient inputs from feedlots in the catchment.

Water draining the Msunduzi system is very poor and heavily impacted by urban and industrial activities. Nagle and Inanda Dam water quality, however, remains good. The Mdloti inflow to Hazelmere Dam has generally been of good quality, as in the case of the Mvoti, Lovu, Mtwalume and Mzinto River systems.

The negative impacts to the water resources could be minimized or reversed if proper catchment interventions are implemented.

## WATER RESOURCE MANAGEMENT

In order to maximize water availability, Umgeni Water uses hydrologically-based operating rules to determine the timing and quantity of dam releases and abstractions. During periods when dams are not spilling, results from the sophisticated hydrological

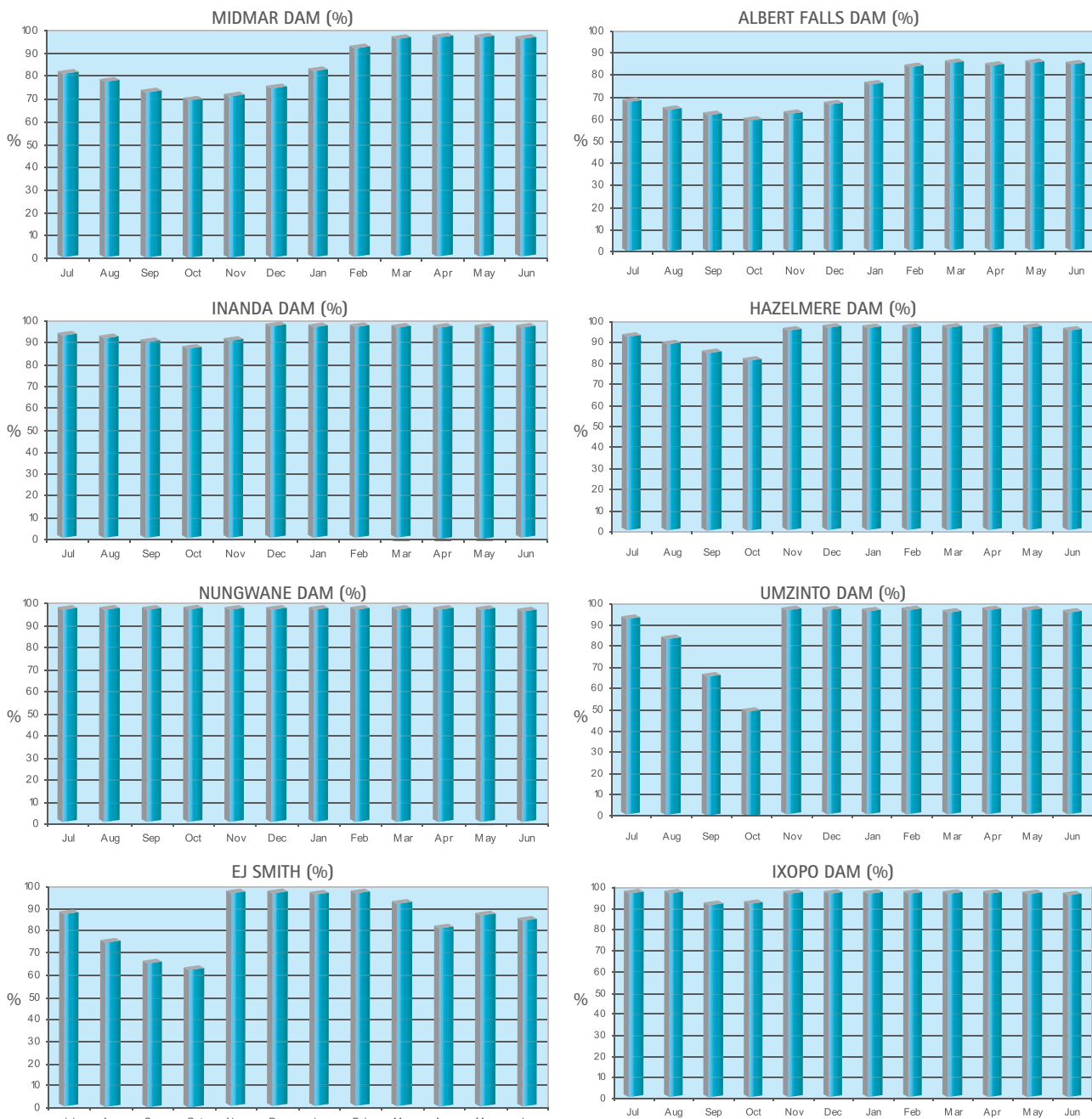


Figure 2: Quality of raw water resources in Umgeni Water supply area 2007-2008

computer simulation models are used to make storage- dependent operational decisions based on the comparison of the available yield in the system and the demands imposed on the system. These tools analyse the assurance of water supply for both short- and long-term time scales.

With the storage within the Mgeni system dams steadily declining during the second half of 2007, pumping commenced from Mearns Weir on the Mooi River to supplement the storage within Midmar Dam, and also from Inanda Dam to support the storage within Albert Falls Dam. In January 2008 the volumes required to be pumped from Inanda Dam decreased as the storage levels in both Albert Falls and Midmar Dams increased.

For the 2007/08 financial year, 40 871 Ml of water were pumped from Inanda Dam, resulting in a commensurate amount being saved in the upper part of the catchment for later use if required. In addition, 47 745 Ml of water were transferred from the Mooi River into Midmar Dam, and consequently the Mgeni system, to augment existing supplies.

The results from water resource analyses during the year indicated that in the long term the risk of supply failure in all the major systems, such as Mgeni and Mdloti, is increasing and interventions are required.

The distribution of rainfall across Umgeni Water's area of operation has been uneven for the 2007/08 rainfall season. Generally, the area experienced above-average rainfall throughout in the latter half of 2007. While for the early part of 2008, the inland region experienced below-average rainfall, while coastal areas received above-average rainfall. This resulted in all storage dams, with the exception of Albert Falls Dam, overflowing (see figure 2)

### CONSERVING SCARCE RESOURCES

Umgeni Water has been an advocate of water conservation and water demand management for many years, and has had a Water Conservation Policy in place since 1999.

In support of national government's objective to conserve water, Umgeni Water recently developed a Water Demand Management (WDM) strategy to direct future initiatives to entrench water demand management practices within its region. The strategy identifies 13 WDM initiatives (both internal and external) based

on recognized worldwide practices. As a second-tier provider, Umgeni Water has limited scope in terms of directly implementing WDM measures externally and internally.

Most of the areas where such measures can be effectively implemented are under the control of third-tier providers (Water Services Authorities). Thus, in order for Umgeni Water to successfully achieve the objectives of WDM, its major role will be more in an advisory, facilitating and assisting capacity than in the active implementation of WDM measures.

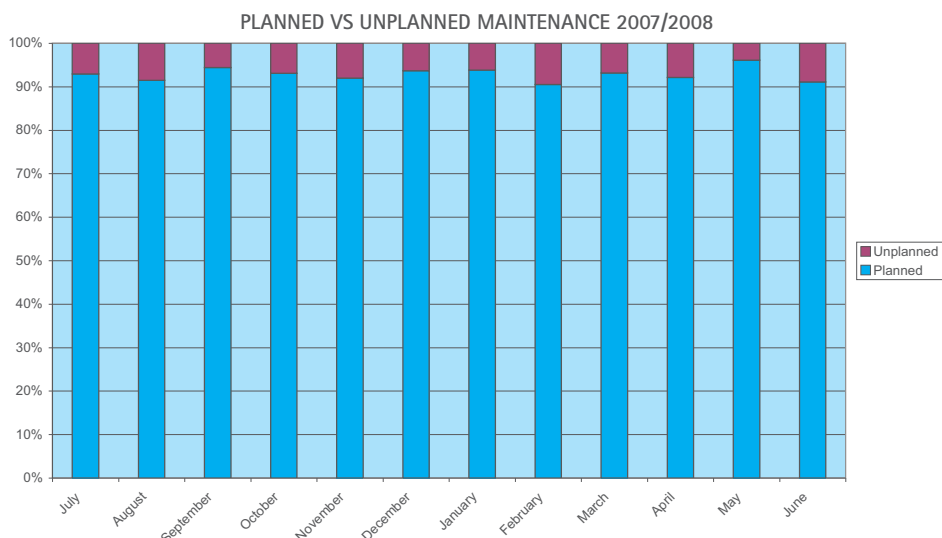
The next step in the process will be to prioritize the WDM initiatives identified in the strategy, based on factors such as potential for water saving, resource and equipment availability, and financial implications. Each initiative will be investigated in turn based on its priority. An action plan will be compiled for each initiative and agreed with relevant Water Service Authorities, where applicable, before being implemented.

### Umgeni Water's commitment to protect the scarce resource

In July 2007, Umgeni Water became the bulk potable water provider to the iLembe District Municipality (DM). In doing so Umgeni Water was required to take over a number of relatively small water supply schemes from iLembe DM. The management of two of the schemes, viz. the KwaDukuza supply from the Mvoti Waterworks and the borehole supply to Zinkwazi, proved challenging as the demand placed on each of the schemes was found to be at, or higher than, the scheme's capacity. A Water Demand Management (WDM) study was undertaken at both locations and it was found that in some areas the unaccounted-for water was as high as 50% of the total demand.

Umgeni Water together with iLembe District Municipality implemented WDM initiatives (as identified in the WDM Strategy), including leak detection, at iLembe. These initiatives resulted in a reduction in each system's unaccounted-for water, and the total demand on the water supply infrastructure was reduced. Both the Mvoti Waterworks supply and Zinkwazi water supply are now being managed at levels where the systems are regarded as stable. WDM is ongoing in both these areas and the challenge is to further reduce the unaccounted-for water to ensure that the bulk supply is at least 1,5 times the demand.

The Albert Falls system (Albert Falls and Nagle Dams) has been in



Resource Conservation mode since November 2007. Pumping from Inanda Dam (50 to 100 Ml/d) has been implemented to reduce the abstraction required from the Albert Falls system, thereby reducing the stress on upstream raw water resources in the Albert Falls system. Umgeni Water has implemented operating rules in both the Inanda/Wiggins and Nagle/Durban Heights systems to satisfy the raw water demand at Durban Heights Waterworks, while complying with Resource Conservation requirements in the upstream catchment area.

### WATER SECURITY

In order to assure the security of supply for bulk potable water to its customers, Umgeni Water has in the past few years embarked on an ambitious infrastructure development programme. The development of new infrastructure must be complemented by competent management of existing infrastructure to ensure efficient and optimal operation.

Asset management at Umgeni Water falls within the ambit of the Operations Division, with the key objectives being to provide a desired level of service in the most effective manner for present and future customers. In terms of service delivery, Umgeni Water has made a commitment to provide a bulk water supply service in an efficient, equitable, cost-effective and sustainable manner.

The high standard of bulk water supply services provided ensure their affordability, continuity, regularity, quality and sustainability, and the basic allocation of potable water by the customer to its

end consumers at all times. The detailed asset quantities, costs, maintenance history and schedules, and other key data are kept in the computerized asset management system. Such data is constantly analysed to predict the reliability of assets and, where deviations exist, a proactive correction is undertaken.

A balance between planned and unplanned maintenance is needed to reach the optimum asset availability and most cost-effective maintenance programme. This is currently set at a target of 90% planned and 10% unplanned. The organization has successfully met the set targets as shown in the figure below.

### EXPENDITURE ON ASSET AND MAINTENANCE CAPACITY AND CONDITION

All assets are able to meet the current average annual daily demands (AADD). Whilst some assets are indicated as being over-stretched, there are planned interventions to address the bottlenecks. Hydraulic modelling is frequently undertaken to ensure that the infrastructure does not fail to meet the demand, and operation and maintenance strategies and plans respond to the results of such models.

The asset management team regularly conducts inspections on all infrastructure as part of ongoing system operations. These include personal and scientific/technological inspections used in predicting failures. The majority of all assets have reasonable lengths of remaining useful life based on age and condition.

The table below presents the expenditure on asset maintenance for the period 2005-2008. The results indicate an above-inflation increasing trend for key components of the maintenance spend. A significant increase in the renewals expenditure has resulted in the increased availability of all infrastructure and a continuous sustainable water supply service with minimal planned disruptions. This trend confirms the alignment of renewals expenditure with the capacity utilization of productive infrastructure, i.e. expenditure on asset care is not lagging plant utilization (figure 3).

Table 9: Asset maintenance expenditure (2005-2008)

Work type	2005/06 Costs		2006/07 Costs		2007/08 Costs	
	Actual spent R'000	% of Total	Actual spent R'000	% of Total	Actual spent R'000	% of Total
Planned & corrective maintenance	42 874	75	40 772	66	50 181	63
Safety	686	1	810	1	529	1
Projects & renewals	8 095	14	15 767	26	24 735	31
Callouts & breakdowns	5 432	10	3 969	6	4 743	6
<b>TOTAL</b>	<b>57 087</b>	<b>100</b>	<b>61 318</b>	<b>100</b>	<b>80,188</b>	<b>100</b>
% Revenue		5		5		6

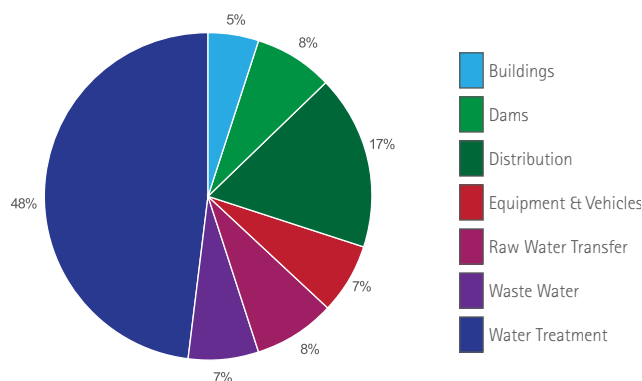
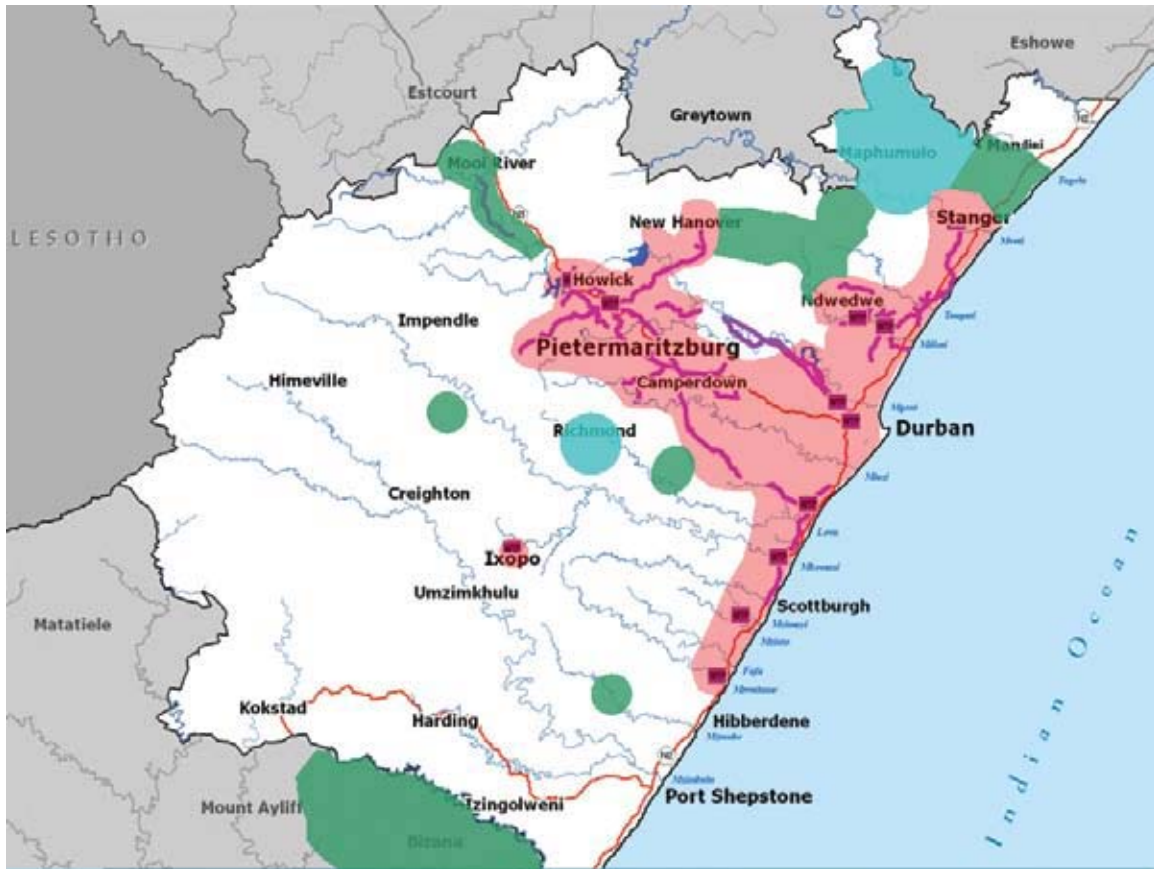


Figure 3: Asset Management Costs by system

## BULK POTABLE INFRASTRUCTURE DEVELOPMENT

During the year under review Umgeni Water continued with the planning, design and implementation of water supply infrastructure projects. Focusing on the augmentation of Umgeni Water's existing bulk infrastructure, and the extension of bulk supply networks into previously unserved areas, these projects are in line with the KwaZulu-Natal Bulk Water Services Plan and the Provincial Spatial Economic Development Strategy.



Umgeni Water's Infrastructure Projects  
 (Red) Implementation stage (Blue) Design Stage (Green) Planning Stage

The two bulk water supply projects completed during the financial year 2007/08 encompass the R5 million Rand Greendale Pipeline and the R230 million South Coast Bulk Water Supply Project.

The main objective of the Greendale Pipeline project is to ensure the sustainability of supply to the Howick Reservoir within the uMgungundlovu District Municipality area. The project entailed replacing the existing 2,5 km of pipe with a larger diameter steel pipe.

The South Coast Bulk Water Supply Project was Umgeni Water's most significant construction project, involving the construction of approximately 40 km of 800mm diameter steel pipe along the South Coast from Amanzimtoti to Park Rynie to supply areas within eThekweni Metro and Ugu District Municipality. Other components of the project include three bulk potable water reservoirs, two booster pump stations, a 300 mm diameter pipeline supplying the Mgbobhozi and Mfume areas, and two off-take lines to supply the existing Ugu Municipality bulk reservoir.

The table below shows the planned average annual daily demands (AADD) for the two municipalities to be catered for by the South Coast pipeline.

Table 10: Water demands for the South Coast pipeline

Municipality	Water demand (2005)	Water demand (2035)	People served
eThekweni Metro	15,65 MI/d	51,5 MI/d	858 333
Ugu District Municipality	1,3 MI/d	26 MI/d	433 333

Projects prioritized in terms of the five-year Capital Expenditure Programme are briefly described below:

- **North Coast Pipeline from Ballito to KwaDukuza**

In order to meet the rapid growth in water demands along the North Coast, both in the eThekweni Metro and iLembe District Municipality areas, it is necessary for Umgeni Water to augment its current supply system with an additional pipeline. Environmental authorization for the project was received in October 2007, with construction scheduled for the 2008/09 financial year.

- **'61 Pipeline upgrades between DV Harris and Umlaas Road**

In order to meet future growth in eThekweni's Outer West area and future increased water requirements in its Northern area, it is necessary to increase the supply capacity in Umgeni Water's

pipeline system from Midmar Dam to Umlaas Road Reservoir and beyond. The planning investigation for the detailed feasibility of the component between ED4 and the Umlaas Road Reservoir was completed, while the components between DV Harris and World's View Reservoir, and between ED2 and ED4, are currently undergoing design review. Implementation of these projects is scheduled to commence in the forthcoming financial year.

- ***Richmond Pipeline***

This 29 km pipeline will be an extension to Umgeni Water's current supply system, and will supply communities in the Richmond, Ndaleni, and Thornville areas within the uMgungundlovu District Municipality. The project is discussed in further detail under the social investment component of this report.

- ***'57 Pipeline upgrade***

The existing '57 Pipeline from Umlaas Road to Point M, which is the eThekweni Metro boundary with uMgungundlovu District Municipality, also needs to be upgraded to meet future water demands in the eThekweni Metro area. The design for this project was completed in the reporting period and implementation is scheduled to start during the 2007/08 financial year.

- ***Durban Heights Booster Pump Station***

The project entails the installation of a booster pump station at Durban Heights Waterworks to address the low residual pressures at the ends of the branched nodes off eThekweni's Northern Aqueduct pipeline. The implementation of the project is scheduled for the first quarter of the forthcoming financial year.

- ***Ngcebo Bulk Water Supply (Phase 1)***

This project, which involves abstracting water from the uThukela River and treating it at the existing Middledrift Waterworks, will supply potable water to the sub-phases 1, 2 and 3 of Ngcebo, within the iLembe District Municipal Area. The design for the project was completed during the year under review and implementation is scheduled for the forthcoming financial year. Details of the project are provided in the social investment section of this report.

- ***Ngcebo Bulk Water Supply (Phase 2)***

This phase of the project is aimed at supplying Maphumulo and Maqumbi areas with potable water, and consists of two sub-phases. The first sub-phase entails the supply of 2 MI/d to Maphumulo from the Hlimbithwa River, followed by the supply of up to 10 MI/d once a proposed new dam on the Imvutshane River has been constructed. The project is still in the planning stage, with implementation scheduled once the environmental studies and design have been completed.

- ***Augmentation of the Wartburg Supply System***

A planning investigation into extending the Wartburg System to supply the areas of Efaye and Ozwatini indicated that, due to increases in demand, the existing system is approaching its ultimate supply capacity. The system will need to be augmented to provide additional capacity before it can be extended to Efaye and Ozwatini, and a detailed feasibility study has been undertaken. This project is now in the design phase and will ultimately serve existing and new communities within the uMgungundlovu and iLembe District Municipality areas. This project is scheduled for implementation in July 2010.

- ***SCA Pipeline Booster Pump Station***

The operational capacity of the existing South Coast Augmentation (SCA) pipeline, which feeds Amanzimtoti Reservoir, is insufficient to meet future water demands. This planning investigation revealed that the need to upgrade this SCA pipeline could be delayed by utilizing the existing SCA system with increased pumping capacity. Design and construction of the new pump station will shortly commence.

Other infrastructure projects that Umgeni Water is involved with include:

- ***Groenekloof to Garlington Pipeline***

The design of this 5,5 km length of pipeline is currently under progress. Once it has been constructed it will serve new developments within the uMgungundlovu District Municipality area.

- ***Blythedale Pipeline***

Bulk water supply to the new and proposed developments in the Blythedale area of iLembe District Municipality is to be provided via a branch pipeline from the new North Coast pipeline from Avondale Reservoir. A detailed feasibility study of this branch pipeline was undertaken to enable it to be constructed at the same time as the main pipeline. Environmental studies were completed in the year under review, and the Record of Decision is pending from the Provincial Department of Agriculture and Environmental Affairs.

- ***Southern iLembe Bulk Water Supply Assessment***

This planning investigation assessed, at a reconnaissance level, the options available to meet future bulk potable water requirements within the southern portion of iLembe District Municipality, and provide a basis on which further studies at a greater level of detail can be undertaken.

## **ENSURING SAFE AND RELIABLE WATER SUPPLY**

### ***Management of bulk distribution systems***

#### ***Inter Dependence of Systems***

Nagle / Durban Heights and Inanda / Wiggins Systems

The Umgeni Water's Central Areas potable water distribution systems are interlinked in a manner that ensures flexibility enabling load shifting when necessary. The Nagle/ Durban Heights system and the Inanda/Wiggins systems are unique in that they only serve one customer ie. eThekweni Municipality, but are also able to load shift supply from the Nagle/Durban Heights system to the Inanda / Wiggins system. Durban Heights waterworks, which is part of the Nagle/Durban Heights system, currently load shifts approximately 100 MI/d to Wiggins Waterworks system, which is part of the Inanda / Wiggins system. This is achieved by the using a High Lift pumpstation that is located at Wiggins Waterworks.

The implementation of continuous pumping has enabled us to load shift the demand off Durban Heights waterworks thereby optimizing the utilization of both plants. The implementation of load shifting between these systems has been successful and is now being implemented on a continuous basis. This has been possible in part due to eThekweni Water Services being able to modify the operating rules for their reticulation reservoirs, thereby creating an environment for continuous pumping from Wiggins waterworks.

### *Nagle / Durban Heights and North Coast System*

Durban Heights waterworks is interconnected to the North Coast System via a pipeline linking the Phoenix Res 2 and Mountview Reservoirs. The Mountview Reservoir is normally supplied by the Hazelmere waterworks which is part of the North Coast system. A gravity supply feed is therefore possible from Durban Heights waterworks to the Hazelmere Waterworks operational area system via the Phoenix to Mountview link. It is an option that is available to be used whenever the Hazelmere is unable to supply its operational area due to planned or emergency shutdowns of the plant. This interconnection of systems has been effective in ensuring continuity of supply to our customers and ensuring our compliance with the Bulk Supply Agreement requirement concluded between Umgeni Water and the eThekweni Municipality.

### *Inanda / Wiggins , Nagle / Durban Heights and South Coast Systems*

The Inanda/Wiggins Systems and Nagle/Durban Heights systems both have the ability to supply potable water to the South Coast systems. Wiggins Waterworks currently supplies potable water to the Southern eThekweni areas via the South Coast Augmentation pipeline. The Amanzimtoti waterworks, which is part of the South Coast system, is augmented by the potable water supply from Wiggins waterworks. Wiggins waterworks currently augments the South Coast system on a continuous basis. The feed to the South Coast pipeline is also supplied by both Wiggins and Amanzimtoti waterworks. In addition, the South Coast system can also be supplied by Durban Heights Waterworks via the Southern Aqueduct which is linked to the South Coast augmentation pipeline. This is currently only utilized in cases where Wiggins waterworks is unable to supply the South Coast system due to any planned or emergency situations.

### **CASE STUDY – CHALLENGES TO SUSTAINABLE WATER SUPPLY TO ILEMBE WSA**

*Since taking over the operations of the 37 water schemes in the KwaDukuza, Ndwedwe and Maphamulo Local Municipalities within the iLembe DM supply area, Umgeni Water has been faced with numerous challenges involving sustainable water supply.*

*The Mvoti WW is designed to supply 12 MI/day to the town of KwaDukuza. Despite maintaining a regular supply of an average of 12 MI/day, the town experienced numerous water shortages with certain areas without water for periods of up to four days. Umgeni Water instituted a complete investigation into the bulk distribution pipeline from the balancing reservoirs at the waterworks to the distribution reservoirs in Saunders Street. It was found that bulk distribution pipelines were leaking at some points and the air valves had been converted into standpipes. UW replaced all the air valves on the distribution pipelines and repaired the leaks.*

*An investigation into the distribution network revealed numerous leaks on various reticulation pipelines. The leaks were reported to iLembe WSA and subsequently repaired. Umgeni Water undertook the logging of all the outlet flow*

*meters on the distribution reservoirs and determined high night flows, indicating further leaks in the reticulation. iLembe WSA undertook inspection to determine and repair all reticulation leaks.*

*Despite the above interventions the supply from Mvoti WW was insufficient to meet the KwaDukuza demand. UW instituted the operation of the Emergency Pump Station off the Hazelmere System to augment supply to KwaDukuza. Umgeni Water has increased water production at Mvoti WW to an average of 15MI/day by operating an additional raw water pump and optimizing the treatment processes.*

*The coastal resort of Zinkwazi is supplied by boreholes. On numerous occasions, particularly during holiday seasons and when the reticulation pipelines burst, water shortages were experienced. The interim solution was to deploy water tankers to augment the water supply.*

*Umgeni Water undertook a complete investigation of the borehole production capacities and logging of the reservoir outflow demands. This determined that the supply was in excess of the demand and that leaks within the reticulation system depleted the reservoir storage capacity. Umgeni Water has further automated the operation of the boreholes and the high-level pump station to ensure sustainability of water supply.*

*Umgeni Water, through its water quality monitoring programme, determined that the disinfection systems at a number of the remote abstraction schemes were ineffective. Umgeni Water implemented a programme of disinfection system upgrade at some 16 water schemes to ensure effective disinfection and subsequent improved water quality.*

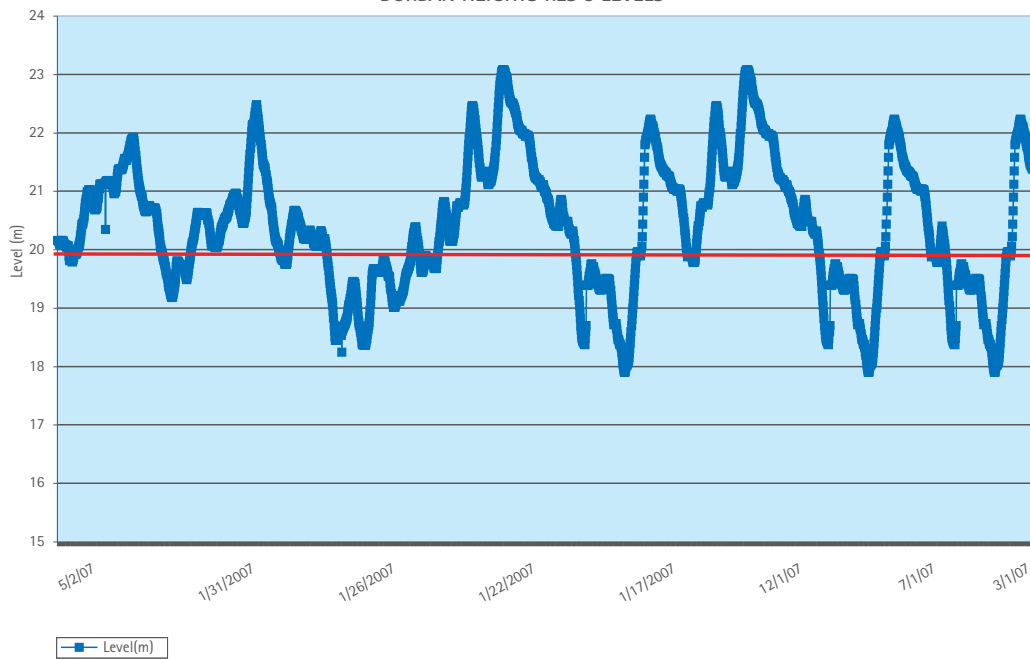
### *Assurance of supply*

Interventions made in respect of Durban Heights Reservoir 3 Operating Rules were reported in the 2006/07 Annual Report. This reservoir serves as a critical node of bulk supply to the northern reaches of eThekweni Municipality. The escalating growth in the area of supply resulted in an increased pressure head requirement, requiring the reservoir level to be continuously maintained above 20 m, thus reducing the range of operational level.

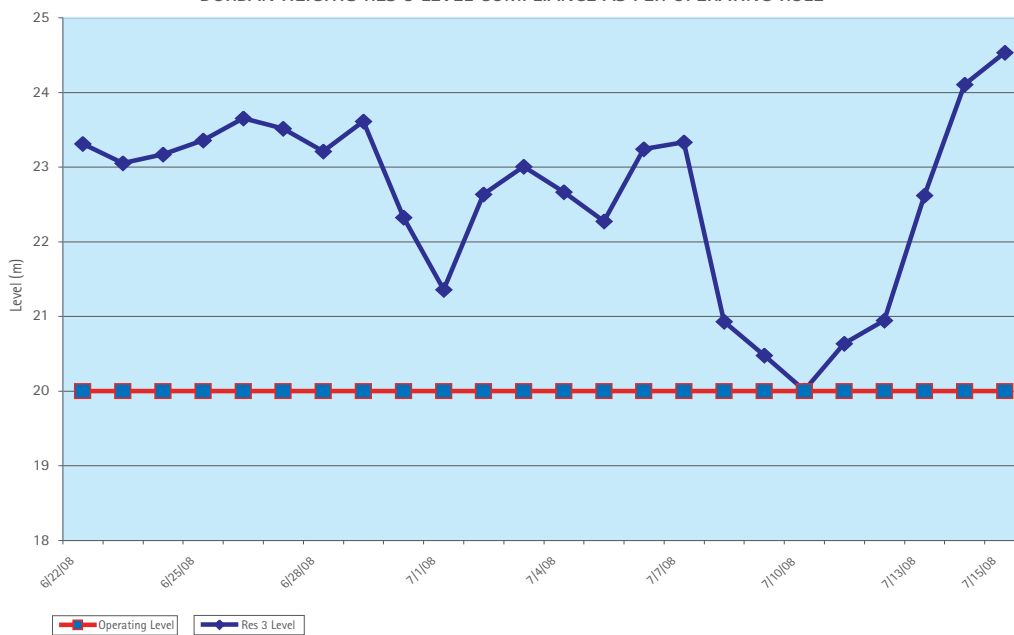
Following many operational challenges and proactive decision-making, a sustainable balance of storage level above 20 m has been reached, thereby minimizing interruption of supply to consumers. A high level of focus was required from Umgeni Water and eThekweni Municipality to control and smooth peak demands negatively influencing Reservoir 3 storage levels, i.e. sudden draw down Reservoir 3 that would be difficult to mitigate immediately at Durban Heights. A graphical trend of the compliance to operating rule before and after optimization is outlined in the figures that follow on the next page.



DURBAN HEIGHTS RES 3 LEVELS



DURBAN HEIGHTS RES 3 LEVEL COMPLIANCE AS PER OPERATING RULE





#### Case Study – SOUTH COAST AREA FLOOD EVENT JUNE 2008

*In mid-June 2008 the Middle South Coast area experienced abnormally high rainfall and flash flooding over a two-day period, causing extensive damage to infrastructure, including bulk water supply systems. Besides water supply failures, this led to emergency responses by a number of affected sectors, with the event being declared a disaster by the Ugu District Municipality. Umgeni Water contributed to a joint operations and maintenance task team in a well coordinated recovery plan that successfully restored bulk water supplies within two days. This also entailed fast-tracking the commissioning of the South Coast bulk pipeline regional supply system into the area, which effectively speeded up the recovery period.*

*Umgeni Water Corporate Stakeholder Management Unit, together with the District Municipality, ensured end consumers were kept informed of the situation with regard to water supply interruptions. The total costs to rectify the major effects on the bulk water supply infrastructure access roads, dams, treatment works, remote pump station sites and pipelines amounted to close to R1 million. Overall, the cooperative and committed response by both Umgeni Water and Ugu DM, whose employees worked tirelessly during the recovery period, mitigated the possible effects of far more extensive supply interruptions to end consumers. The benefit of a more assured bulk water supply to the area through the recently completed regional bulk system was experienced first-hand in this occurrence, where the existing standalone systems reliant on river abstraction and small dams were more severely compromised, as they are during drought periods as well.*

#### Gearing up for 2010

The construction of the Moses Mabhida 2010 Soccer World Cup stadium is taking shape, with the project team projecting completion six weeks ahead of schedule. While the World Cup and KwaZulu Natal Tourism are the main features aimed at providing memorable experiences for millions of soccer supporters and their families, there are critical sub-projects that are running in parallel to complement the main show. In the list of important sub-projects, security is one of the key priorities and a reliable supply of good quality water remains a critical success factor.

To add to the concept of the World Cup Readiness project reported

in the previous financial year, the following milestones have been achieved:

- GSM Notification Project: This project has been implemented and entails the transmission of messages with key operational parameters to individuals' cellphones. This will enable enhanced operational efficiencies in managing Umgeni Water's processes and monitoring customers' infrastructure.
- eThekweni/Umgeni Water SCADA (Supervisory Control and Data Acquisition) Information Sharing Project: This project is currently in the final phase of implementation. Once completed, Umgeni Water and eThekweni Water Services will be able to share and view key operational parameters of both organizations, using radio telemetry.
- Business Intelligence Dashboard Project: A project brief has been formulated and a Project Manager appointed. The project is currently in the scoping phase and will incorporate Geographic Information System, Hydraulic Modelling, SCADA and Database reporting technologies. These will work in synergy to produce an active business intelligence dashboard. Once completed, all key operational data will be stored in a common database and reports can be automatically generated. It will also enhance the accessibility of the organization's operational intelligence, with information emanating from the various sites stored in a common database. The advantage is that operations personnel will be able to visually monitor key operational parameters in real time on Umgeni Water and eThekweni Metro systems. The reaction times to mitigate the effects of possible or imminent failures at our plants will be reduced.

#### Ensuring Safe Drinking Water Potable water quality compliance

During the period under review, Umgeni Water continued its commitment to provide potable water which is safe for lifetime consumption. This was achieved through implementation of relevant water quality monitoring programmes and assessment of water quality throughout the organization's bulk water supply chain. The South African National Standard SANS 241: 2006 Drinking Water was used to assess compliance for the twelve bulk waterworks as well as the off-site and reticulation reservoirs fed by the bulk waterworks.

In addition, from 01 July 2007 Umgeni Water took over the management and operation of Mvoti Waterworks and other small

water supply schemes in KwaDukuza, Ndwedwe and Maphumulo Local Municipalities within the jurisdiction area of iLembe District Municipality.

Overall volume-weighted compliance for the bulk waterworks, based on health-related chemical and microbiological tests, was 99,88% (figure 4). Of a total of 7 433 analyses conducted, 32 results were non-compliant with the national standard, and of these, 29 non-compliant results were recorded at Mvoti Waterworks. These non-complaint results were mainly attributed to filter problems experienced at Mvoti Waterworks resulting in turbidity failures. Despite these challenges, the overall potable water produced in the 2007/08 financial year was classified as excellent quality according g to SANS 241: 2006. The chemical and microbiological compliance per waterworks is shown in Table 11.

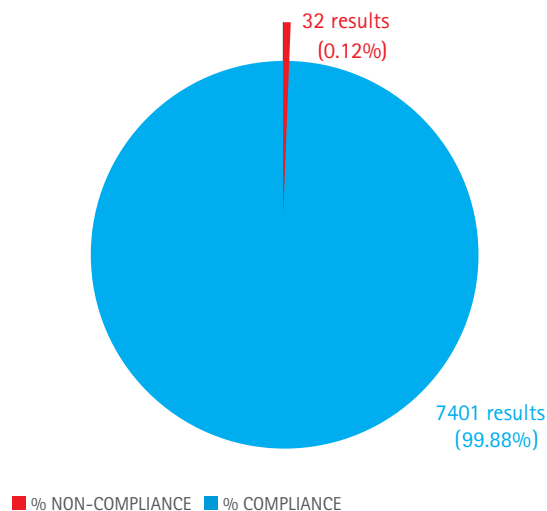


Figure 4: 2007/8 Potable water quality compliance for Umgeni Water's bulk waterworks during 2007/08

Table 11: Potable water compliance per waterworks

Bulk waterworks	Average daily volume treated (Ml/d)	% Total treated volume	% Compliance with SANS 241: 2006	
			Chemical	Microbiological
Durban Heights	532	47,2%	100	100
Wiggins	240	21,3%	100	100
Midmar	211	18,7%	100	100
DV Harris	53,4	4,7%	100	100
Hazelmere	40,0	3,6%	100	100
Amanzimtoti	9,8	0,87%	100	100
Umzinto	11,0	0,98%	100	100
Craigieburn Final	-	-	100	100
Craigieburn-Saiccor Mix Final	6,6	0,59%	100	92,0*
Mtwalume	5,3	0,47%	99,3 <sup>#</sup>	100
Ixopo	1,7	0,15%	100	100
Ogunjini	1,3	0,12%	100	100
Mvoti	15,5	1,4%	89,5 <sup>\$</sup>	99,0

# A single non-compliant chemical result (turbidity of 8,97 NTU) recorded for Mtwalume bulk water supply was attributed to the plant operating above its designed capacity at the time.

\* Two non-compliant *E.coli* results (both samples contained 2 per 100 ml) were reported for Craigieburn-Saiccor Mixed Final, attributed to a partly treated but not disinfected flow received from a non-Umgeni Water source, combined with a lack of chlorine contact time in the onsite mixing chamber. Samples collected at the Magabheni Reservoir fed by the Craigieburn-Saiccor Mixed Final were clear of microbiological contamination since the water had adequate disinfection contact time.

\$ Twenty-seven turbidity failures were reported for Mvoti WW, with results ranging from 5,12 to 13,1 NTU, and two *E.coli* failures. While the disinfection problem has already been addressed, a plan to resolve the filter problems has been developed and improvement in the final water turbidity is expected.

**SANS 241 Classification:**

- Excellent water quality: ≥ 99% compliance with Microbiological requirements, ≥ 95% compliance with Class I Chemical requirements and ≥ 97% compliance with Class II Chemical requirements.
- Good water quality: 98% compliance with Microbiological requirements, ≥ 90% compliance with Class I Chemical requirements and ≥ 95% compliance with Class II Chemical requirements
- Fair water quality: ≥ 97% compliance with Microbiological requirements, ≥ 85% compliance with Class I Chemical requirements and ≥ 90% compliance with Class II Chemical requirements.
- Poor water quality: <97% compliance with Microbiological requirements, <85% compliance with Class I Chemical requirements and <90% compliance with Class II Chemical requirements

Most bulk waterworks achieved 100% compliance for both the chemical and microbiological requirements defined in the national drinking water standard, with the exception of Craigieburn-Saiccor Mixed Final, Mtwalume and Mvoti Waterworks.

Figure 5 details historical potable water quality compliance over the past five years. The number of non-compliant results has increased over the past year, due to challenges experienced in the iLembe area. As a result, Umgeni Water did not achieve its target of 99,99% compliance with SANS 241: 2006.

2006-2008 Potable water quality target	2006/7 Performance	2007/8 Performance
99,99 % compliance	99,99%	99,88%

The off-site and reticulation reservoirs (including the small water supply schemes) achieved 99,61 and 96,67 percent compliance respectively against the drinking water standard (see Figures 6 and 7).

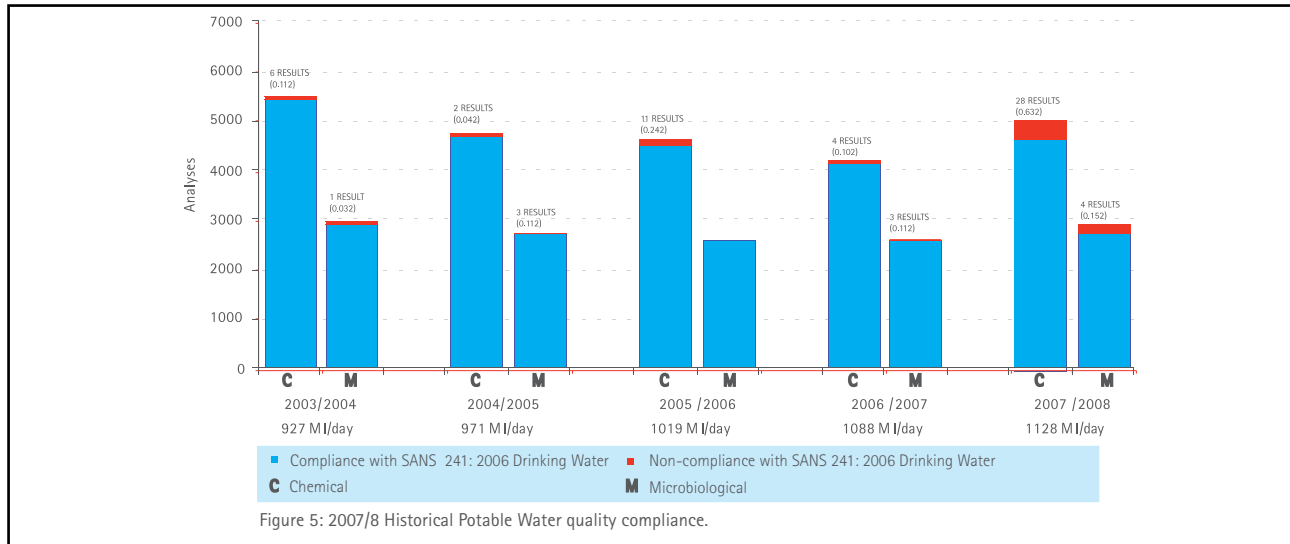
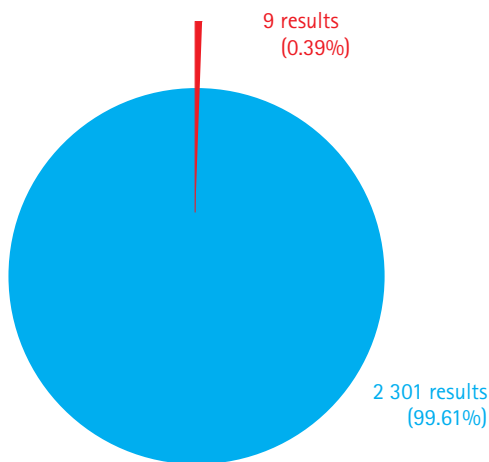
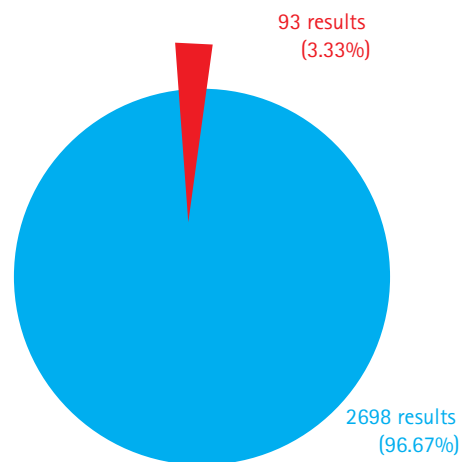


Figure 5: 2007/8 Historical Potable Water quality compliance.



■ % NON-COMPLIANCE ■ % COMPLIANCE

Figure 6: 2007/8 Potable compliance for off-site reservoirs



■ % NON-COMPLIANCE ■ % COMPLIANCE

Figure 7: 2007/8 Potable compliance for reticulation reservoirs

The majority of the non-compliant results for the reservoir sites and small water supply schemes were due to microbiological and turbidity failures reported at multiple sites in the iLembe area. To address the microbiological failures, new chlorine dosing units have now been installed, and improvements in the microbiological quality of the water have been observed at most sites.

In areas where microbiological failures have remained a problem (including unimproved small schemes such as iSithundu at iLembe DM), community awareness was undertaken. Communities were informed of the water quality problems in the area and advised of the precautionary measures to be undertaken before using the water for consumption and other domestic purposes. This awareness initiative was undertaken in collaboration with the iLembe District Municipality and the Department of Health. The Department of Water Affairs and Forestry was also informed of the water quality problems in this area.

### Innovation, research and development (IRD)

The IRD team in Umgeni Water has taken a strategic decision to focus on the implementation and demonstration of appropriate technologies to satisfy the social and human needs in the industry.

INNOVATION RESEARCH DEVELOPMENT	Learning and growth	
	New 5 research programme	
	UKZN MOU	
	Improved Service Delivery	
	Focus on human and social constructs	
	Innovation Scheme	
	External Organisations	WRC
		Universities
		Water research commission
		DPLG
Other water boards		
Department of Science and Technology		
	DWAF	

In order to accelerate and promote creativity and problem-solving in Umgeni Water, an innovation scheme has been developed to reward staff for innovative ideas that can be implemented to improve operational efficiency. The framework of the policy has been developed and the team will embark on a staff consultation road show to gain comment and input at all levels within the organization.

The IRD team has driven the development of a chair at the University of KwaZulu-Natal. The primary objectives of the chair will be to:

- ensure that the university is aware of the needs of the water industry and uses its expertise to address the challenges faced by Umgeni Water

- direct more graduates into the water industry by encouraging postgraduate studies in water and sanitation.

Umgeni Water has worked with the Department of Science and Technology, HSRC, DWAF, Amatola Water and CSIR to develop a national strategic proposal to use technological innovation to identify bottlenecks in the service delivery of water and sanitation services in the country.

The provinces of KwaZulu-Natal and the Eastern Cape have the highest backlogs in South Africa and have been identified as pilot project areas with a budget of R100 million over the next three years. iLembe and OR Tambo District Municipalities will be the focus areas to kick-start the initiative. Importantly, the softer issues have been identified as a critical bottleneck, and the skills of the HSRC will be used to ensure that the human and social aspects are addressed. Umgeni Water will also be working with the HSRC to identify the social and economic improvements that are realized when Umgeni Water brings in new bulk water services to a community.

Contractual Research Output is on-track and three strategic WRC projects were completed and published over the last year. Project topics included fluoridation, ozonation and improvement of disinfection in small treatment plants. Feedback from the WRC on the quality of the research output has been highly complimentary, and Umgeni Water has been encouraged to undertake additional research work.

Seven new project proposals have been developed and will be considered for research over the next five-year period. These projects will also be submitted to the WRC, the Department of Science and Technology and DWAF for co-funding.

These include:

- Demonstration of high-rate clarifiers
- Rural demonstration treatment plants using membranes and solar energy pumps
- Research into whether organic-based polymers are having a negative impact on our filters and should we change back to alum?
- Demonstration of self-cleaning filter media
- Home treatment systems
- Fate of organic compounds in water treatment plants
- Evaluation of membranes for recycling of Darvill Wastewater effluent.

Learning and growth is a key performance area of the organizational Functional Excellence Strategic Objective. A total of ten papers were presented at the May 2008 WISA biennial conference, with a diversity of topics ranging from design to maintenance of operational excellence. Papers presented included Troubleshooting Water Treatment Plants, Design Challenges of the South Coast Pipeline, Ozonation, Fluoridation, Water Safety Plans and Development of Water Quality Guidelines. There has been a request to present these papers internally and two one-day sessions (Izintaba and Ulwandle) will be held during the next six months.



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