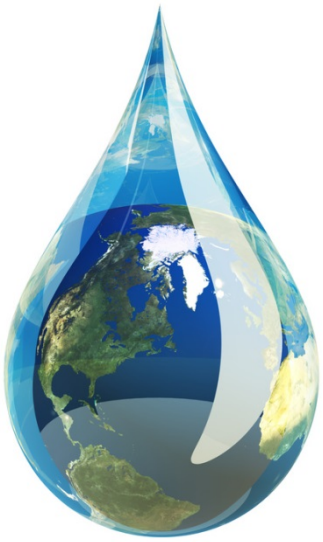
ANNEXURE E:

WATER CONSERVATION AND DEMAND AS WELL AS NON-REVENUE AND WATER LOSS REDUCTION PLAN

MIDVAAL
LOCAL MUNICIPALITY

ENGINEERING SERVICES

WATER CONSERVATION AND DEMAND AS WELL AS NON- REVENUE AND WATER LOSS REDUCTION PLAN



September 2014

Prepared by: Johan Vorster Pr. Eng

INDEX

ACKNOWLEDGEMENTS

The Author would like to express its appreciation for the MMC: Engineering Services and the HOD: Engineering Services and his staff for their valuable input and comments received during the preparation of this plan.
I would also like to thank the Executive Secretary of the Municipal Manager for assisting with the layout and typing of this document.

EXECUTIVE SUMMARY:

To ensure that all water supply institutions across the world define their water losses in a similar way, the International Water Association (IWA) has developed a standard water balance now utilized abroad and in SA by most municipalities including the MLM.

Non-Revenue Water (NRW) is defined as the volume of water supplied by the municipality for which no income is received. It should be noted that the Standard International Water Association (IWA) water balance is a volumetric water balance and not a financial balance.

Most South African municipalities are sitting with high NRW figures, and are all experiencing the same challenges in lowering NRW.

The current National NRW figure for SA is 36.7%, but this is highly influenced by data for the metropolitan and large city municipalities which account for more than 80% of the data.

The current Midvaal Local Municipality NRW figure is 32.4% which is much lower than the 36.7% National IWA Water Balance of 2012.

South African municipalities should aspire towards a NRW figure of 20%, representing desirable and good performance. The effort required within the SA environment to reduce NRW below 20% may not be regarded as feasible nor cost effective, because of the extensive effort required with regards to the outlay of resources (human & financial) to achieve this goal. Having said this, the room for NRW improvement for MLM is 32,4% (current figure) minus 12.4% (desirable figure) = 20,0%. In adopting the above figure of 20,0%, the annual targeted Reduction of NRW over a 5 year period is reflected in **Table 11** below:

Table 11: Targeted NRW Reduction over a 5 Year Period

Analysis of NRW Reduction over a 5 Year period:									
YEAR	FINANCIAL YEAR	Targeted Annual NRW Reduction	Annual NRW Remaining Value	Reduction in NRW					
				Annual Figures	Compounded	Cumulative	Annual Figures	Compounded	Cumulative
		(persentage)	(percentage)	(Kilolitre)	(Kilolitre)	(Kilolitre)	(Rand)	(Rand)	(Rand)
0	2013/14	0,0%	32.4%	n/a		n/a	n/a		n/a
1	2014/15	3,0%	29.4%	456 701	456 701	456 701	R 4 169 223	R 4 169 223	R 4 169 223
2	2015/16	2,7%	26.7%	419 930	876 631	1 333 332	R 3 833 541	R 8 002 764	R 12 171 987
3	2016/17	2,4%	24.3%	382 528	1 259 159	2 592 491	R 3 492 098	R 11 494 862	R 23 666 849
4	2017/18	2,2%	22,1%	360 083	1 619 242	4 211 733	R 3 287 197	R 14 782 059	R 38 448 908
5	2018/19	2,1%	20,0%	353 323	1 972 565	6 184 298	R 3 225 486	R 18 007 545	R 56 456 453
Total Accumulated Savings over the 5 year period:						6 184 298			R 56 456 453

Note: That all financial figures are calculated at current water purchase and sales prices
Saving in Real Losses @ R6,063/kl
Saving in Apparent Losses and Unbilled Authorised portion @ R12,195/kl

A Water Conservation and Water Demand Management (WC/WDM) project has been initiated for Gauteng by the Department of Water Affairs (DWA) in order to save 15% of all water used, and all Gauteng municipalities are involved. Even with 'Project 15%' fully effective, the system will in all probability experience water supply shortages by the year 2015 up to 2019, and additional augmentation is essential. Unfortunately the "DWA Project 15%" target is currently not being met by MLM.

WC/WDM is one of the most important functions performed by municipalities in reducing NRW. Without the proper implementation and functioning of holistic WDM initiatives attending to all aspects relating to water wastage and non-revenue generating serviced properties, and without involving all the relevant role-players such as Engineering, Finance, Communications, etc. and also without Political and Senior Management

support, there will be little chance of success in lowering NRW. The following programmes are recommended for implementation in order to reduce Non-Revenue Water in MLM from 32,4% to 20% within the next 5 years:

- Establishment of a WC/WDM Steering Committee
- Calculation and Preparation of Monthly Water Balance
- Accurate and Clear Water Supply and Distribution Plans
- Master Planning of Water Systems
- War on Leaks
- Timeous leak Detection & Repairs
- Sectorization and Zoning of Distribution Areas and Bulk Metering of Zones.
- Asset Management and Water Infrastructure Replacement Programme
- Cathodic Protection of Steel Pipes
- Pressure Management of Water Distribution Zones
- Meter Management Plan
- Indigent leak Repair Programme and Retro Fitting of Toilet Plumbing
- Telemetry of Water Supply and Distribution Systems
- Valve Audit, Replacement, Marking and Numbering as well as Plan Updating.
- Consumer Data Base Audit
- Organization and Human Resource Plan
- Consumer Awareness Education Programme (New)
- Indigent Household Water Restriction Cap (New)
- Revenue Enhancement Strategy (New)

The estimated cost to implement above-mentioned programmes over the five year period, amounts to R64 730 000 as summarised in Table 13. On average an amount of R1 500 000 has been provided annually on the MLM Water budget. (Estimated total of R7 500 000 for five years) The additional budget required to implement this plan amounts to R57 230 000 over the five year period which is approximately the same as the estimated saving of R56 456 453 (Table 11) by reducing the NRW from 32,4% to 20% over the five year period. The project should be self-funding from the fourth year (2017/18) as depicted in graph 2:

Graph 2: Non-Revenue Water Reduction Plan – Financial Model

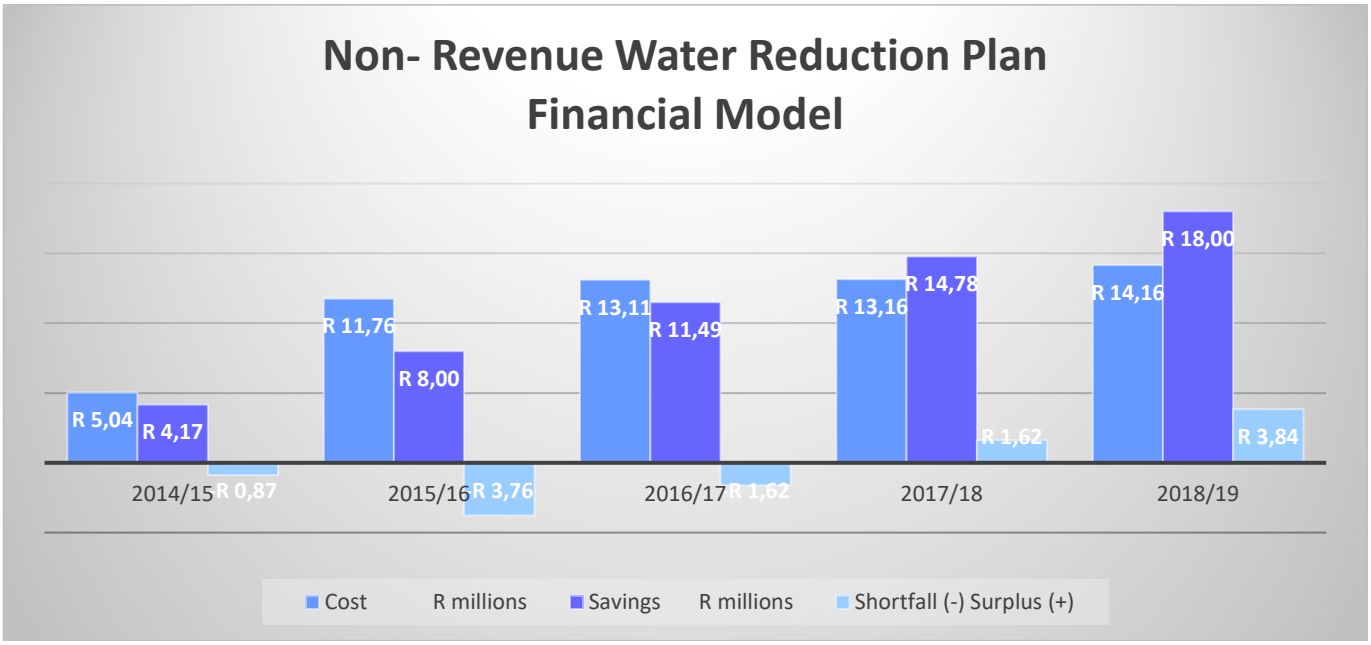


Table 13: 5 Year Non-Revenue Water Reduction Plan Budget

Programme	Estimated Annual Budget					Total	Budget Allocation
	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019		
Calculation and Preparation of Monthly Water Balance	R100 000	R140 000	R150 000	R160 000	R170 000	R720 000	Opex
Accurate and Clear Water Supply & Distribution Plans	-	R50 000	R60 000	R70 000	R80 000	R260 000	Opex
Master Planning of Water System	R240 000	R250 000	R260 000	R270 000	R280 000	R1 300 000	Opex
War on Leaks	R300 000	R320 000	R340 000	R360 000	R380 000	R1 700 000	Opex
Leak Detection & Repairs	R500 000	R550 000	R600 000	R650 000	R700 000	R3 000 000	Opex
Sectorization and zoning of distribution areas and metering of zones	R200 000	R500 000	R550 000	R600 000	R650 000	R2 500 000	Opex and Capex
Asset Management and Water Infrastructure Replacement Programme	R 4 400 000	R5 000 000	R5 500 000	R6 000 000	R6 500 000	R27 400 000	Capex
Cathodic Protection of Steel Pipes	0	800 000	R700 000	R800 000	R900 000	R3 200 000	Capex
Pressure Management of Water Distribution Zones	R200 000	R500 000	R600 000	R700 000	R800 000	R2 800 000	Opex and Capex
Meter Management Plan	R500 000	R800 000	R900 000	R1 000 000	R1 100 000	R4 300 000	Capex

Indigent Leak Repair Programme and retro fitting of toilet plumbing	R100 000	R150 000	R200 000	R200 000	R200 000	R850 000	Opex
Telemetry of water Supply and Distribution System	-	R500 000	R500 000	R600 000	R600 000	R2 200 000	Opex and Capex
Valve Audit, Replacement and Numbering as well as plan update	-	R200 000	R250 000	R250 000	R300 000	R1 000 000	Opex & Capex
Consumer Database Audit	-	R500 000	R1 000 000	-	-	R1 500 000	Opex
Organisation and Human Resource Plan	-	R3 000 000	R3 000 000	R3 000 000	R3 000 000	R12 000 000	Opex
Consumer Awareness Education Programme	Newly Proposed						
Indigent Household Water Restriction Cap.	Newly Proposed						
TOTAL	R6 540 000	R13 260 000	R14 610 000	R14 660 000	R15 660 000	R64 730 000	

It is recommended that the proposed Non-Revenue Water Reduction Plan be implemented by the HOD: Engineering Services, that the additional Opex and Capex amounts be provided in the following 5 year budget programme and that a six monthly progress report be submitted to the Mayoral Committee.

INTRODUCTION:

The Water Services Act, Act 108 of 1997 (RSA, 1997a) stipulates that all spheres of government must provide water supply services in an efficient, equitable and sustainable manner. The Act also requires municipalities that have been given Water Services Provider status to provide measures to promote water conservation and demand management which should be included in their Water Conservation and Water Demand Management (WC/WDM) strategy and business plan and Water services Development Plan (WSDP).

This report deals with Water Conservation and Water Demand Management as well as Non-Revenue Water and Water Loss Management Challenges that South Africa and especially Midvaal Local Municipality is faced with. The report discusses the principles of both as well as issues related to these two important aspects of water management in general. The report focuses on what are the specific challenges and how these challenges should be addressed. It furthermore proposes how Midvaal Local Municipality (MLM) should structure its strategy, plans, programmes and projects to be successful in addressing the challenges it is faced with.

The concepts of water conservation and water demand management as well as non-revenue water and water loss are briefly discussed.

Water Conservation and Water Demand Management – WC/WDM

Definitions:

Water Conservation:

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

Water Demand Management:

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

It is often mentioned that South Africa's fresh water resources will be fully utilised within the next twenty to thirty years if the current growth in water demand is not altered. Conversely it can be argued that there is as much water as we will ever need in the sea considering that the technology exists to desalinate water. The question that needs to be asked is can South Africa afford to pursue such options and what are the economic, social and environmental costs of continuing to misuse and utilise our current available fresh water resources inefficiently. The opportunity of Water Conservation and Water Demand Management (WC/WDM) exists because most of the time consumers use water for the service they derive from it and not for the water itself. Through new technologies combined with a change in behaviour water usage can be reduced significantly without necessarily changing the desired outcome or the quality of life of individuals.

The need for WC/WDM in the Municipal Water Services Sector, is essential and perhaps of the highest priority despite the fact that this sector uses less than 15% of South Africa's fresh water resources. Together with Industry this is the sector with the largest expected future growth in demand which requires the continuous development of new water resources and new infrastructure. The need to implement WC/WDM is also based on economic efficiency objectives due to the significant cost in the provision of water services. It is estimated that the potential economic benefit of WC/WDM over the next fifteen years in the Water Services Sector in South Africa is approximately R50 billion. This could be achieved through cost savings in postponing capital infrastructure and savings in operating costs.
The WC/WDM paradigm and the principles proposed in these strategies integrate some of the relevant principles recognised in both the Water Services Act (No. 108 of 1997) and the National Water Act (No. 36 of 1998). The strategies developed are related to existing requirements promulgated through both Acts and in particular the Water Services Act Regulations, Water Services Development Plans and the Water Board Business Plans.

The Municipal Water Services Sectoral WC/WDM strategy is one of five sectoral strategies that have been developed by the Department of Water Affairs and Forestry. The others include:

- Industry, Mining and Power Generation
- Agriculture
- Forestry
- Environment

The integration of all sectoral strategies forms the National Water Conservation and Water Demand Management Strategy. Elements of the overall WC/WDM strategy then form part of the National Water Resource Strategy and is promulgated in the National Water Act.

The development of the sectoral strategies is based on the principles developed in the WC/WDM National Strategy Framework.

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

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

- Water a garden. The objective is to have a nice garden. This can be achieved with indigenous plants, by watering the correct way, by recycling bathroom water and harvesting of rain water. Such measures can reduce the total consumption of the consumer without necessarily affecting the desired objective of having a desirable garden.

It is estimated that in the Municipal Water Services Sector water loss and inefficient usage could be as high as 45%.

Non-Revenue Water and Water Loss:

Definitions:

Non-revenue water (NRW) is water that has been produced and is "lost" through the water supply and distribution system and includes unbilled authorised consumption. Water losses can be real losses (through leaks, sometimes also referred to as physical losses) or apparent losses sometimes also referred to as commercial losses (for example through theft or metering inaccuracies). High levels of NRW are detrimental to the financial viability of water utilities. NRW is typically measured as the volume of water "loss" as a share of net water produced. However, it is sometimes also expressed as the volume of water "lost" per km of water distribution network per day.

NRW is sometimes also referred to as unaccounted-for water (UFW). While the two terms are similar, they are not identical, since non-revenue water includes unbilled authorised consumption (e.g. for fire fighting or, in some countries, for use by municipalities itself) while unaccounted-for water excludes it.
IWA Water Balance – Table 2

Water losses are water that is lost through a water supply and distribution system and can be divided into two main categories:

- **Real losses**, also referred to as physical losses, are actual losses of water from the system and consist of leakage from transmission and distribution mains, leakage and overflows from the water system's storage tanks and leakage from service connections up to and including the meter.
- **Apparent losses**, also referred to as commercial losses, occur when water that should be included as revenue generating water appears as a loss due to unauthorized action or calculation error. Apparent losses consist of unauthorized consumption, customer metering inaccuracies, and systematic data handling errors in the meter reading and billing processes.

In order to fully understand the concepts of Non-Revenue Water and Water Losses the concept of a water balance analysis needs to be understood.

To ensure that all water supply institutions across the world define their water losses in a similar way, the International Water Association (IWA) has developed a standard water balance now utilized abroad and in SA by most municipalities including the MLM. The components of the standard IWA water balance are shown in **Table 2** below.

Table 2: Components of the Standard IWA Water Balance

<table>
<tr><td rowspan="8">System Input Volume</td><td rowspan="3">Authorised Consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed Metered Consumption</td><td rowspan="3">Potential Revenue Water</td><td>Free Basic Water</td></tr>
<tr><td>Billed Unmetered Consumption</td><td>Recovered Revenue</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled Metered Consumption</td><td>Non-Recovered Revenue</td></tr>
<tr><td>Unbilled Unmetered Consumption</td><td colspan="2" rowspan="6">Non Revenue Water</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorised Consumption</td></tr>
<tr><td>Customer Meter Inaccuracies</td></tr>
<tr><td rowspan="3">Real Losses</td><td>leakage on Transmission and Distribution mains</td></tr>
<tr><td>Leakage on Overflows at Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to Point of Customer Meter</td></tr>
</table>

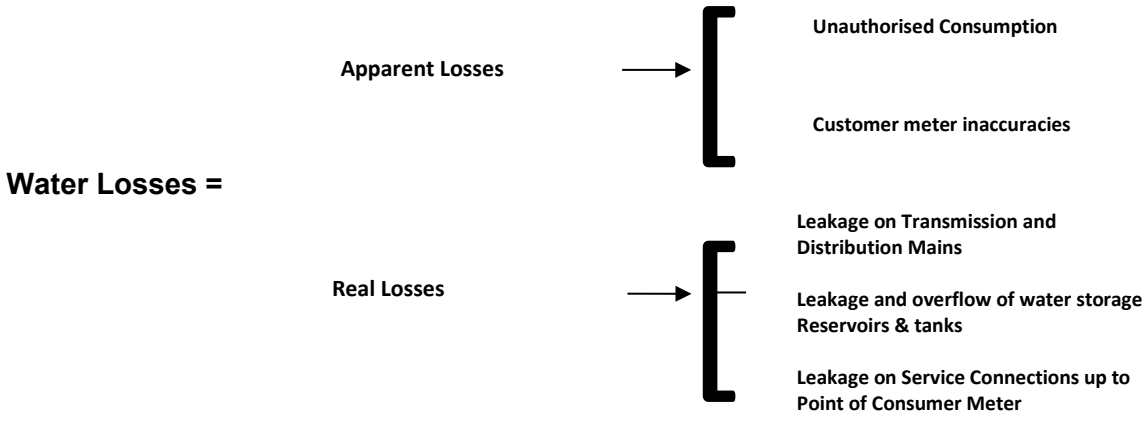
NRW is defined as the volume of water supplied into the water system by the municipality referred to as system input volume, minus the billed authorised consumption. It should be noted that the Standard International Water Association (IWA) is a volumetric water balance and not a financial balance. For purposes of calculating the NRW it is assumed that all billed water is paid for.

In terms of the standard Opex budget process, municipalities will budget for non-recovered revenue as bad debt provision.

With regard to the Water Balance, Non-Revenue Water can also be defined as the total of water losses plus Unbilled Authorised Consumption within a water system.

It should be noted that the "Revenue Water" component of the standard IWA water balance has been modified slightly (WRC Report No TT300/07, 2007) for use in South Africa. This change was considered necessary to deal with the free-basic-water allowance which is unique in SA. To the author's knowledge, South Africa is the only country in the world that requires municipalities to make provision for a free-basic water allocation in their budgets.

According to this International Water Balance standard Water Losses can be defined as the following:



The National IWA Water Balance is summarized in **Table 3** below and serves as a benchmarking tool for Municipalities. Most municipalities are sitting with high NRW figures, and are all experiencing the same challenges in lowering NRW.

Table 3: Summarized best estimate SA National IWA Water Balance (2012)

System Input Volume (Total Supply from own & external sources) 100.0%	Authorised Consumptions (Billed metered + Billed Unmetered + Unbilled Metered + Unbilled Unmetered) 68.3%	Billed Authorised (Billed metered + Billed Unmetered (flate) rate + Free Basic Water) 63.3%	Revenue Water (Volume of Water for which an income is received. Assumes all billed water is paid for) 63.3%
		Unbilled Authorised = 5.0%	Non-Revenue Water (Volume of Water for which no income is received) 36.7%
	Water Losses (Real + Apparent Loss) 31.7%	Apparent or Commercial Loss = 6.3%	
		Real or Physical Loss 25.4%	

The NRW figure for South Africa is similar to the estimated world average of 36,6%, but is considered high in comparison to developed countries.

The Formula for calculating NRW is as follows:

$$\%\ \text{NRW} = \frac{System\ Input\ volume - (Billed\ \text{authorized}\ consumption\ \text{which}\ include\ free\ basic\ water)}{SystemInputvolume} \times 100$$

Classification of NRW Percentages:

In accordance with the DWA "National Non-Revenue Water Assessment Report" of July 2010, NRW can be classified into seven categories of performance levels as per **Table 4** below:

Table 4: Classification of NRW Performance levels

Category	NRW	Description
1	< 20%	Very low level of NRW, very good performance
2	20 – 30%	Low level of NRW, good performance
3	30 – 40%	Average level of NRW, average performance
4	40 – 50%	High level of NRW, poor performance
5	> 50%	Very high level of NRW, Very poor performance
6	No data	No data provided by the municipality
7	Dubious data	Data inconsistent, incomplete or seems incorrect

In accordance with Table 4 above, and the NRW figure of 32.4% for MLM contained in Table 6, MLM falls within Category 3: Average level of NRW, **average performance**.

Status Quo

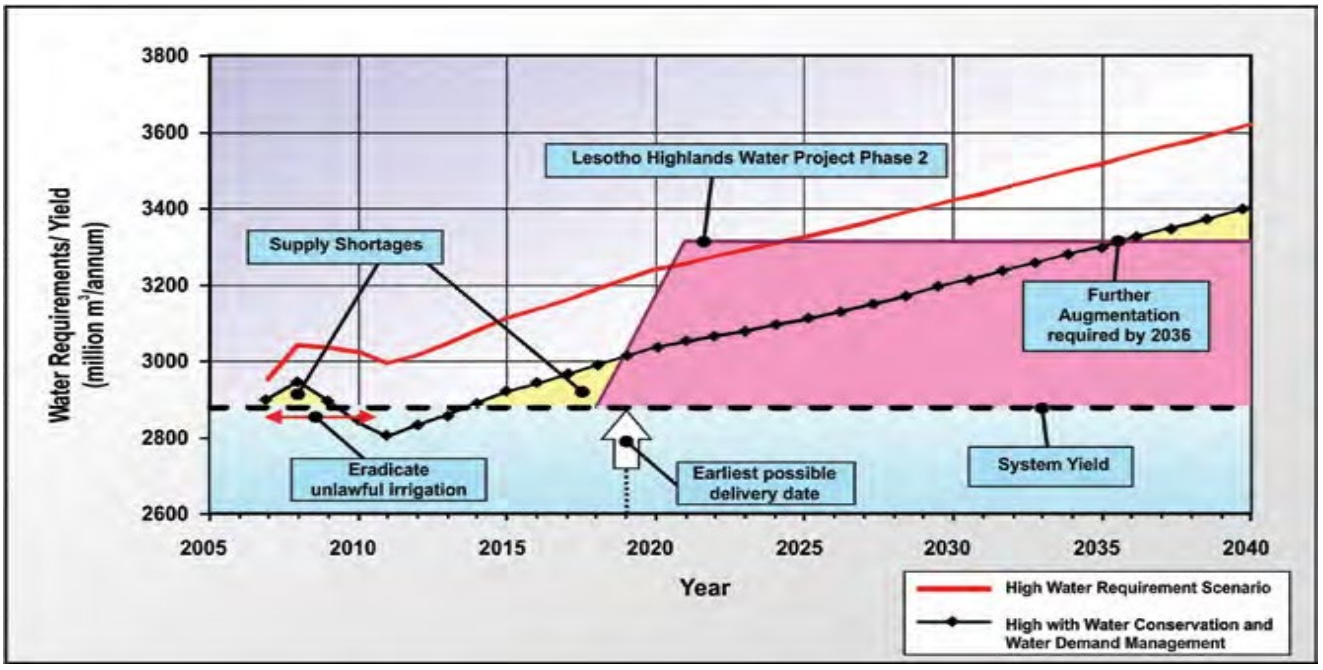
Water Conservation and Demand Management

Regarding Integrated Water Resource Planning for SA, the Department of Water Affairs (DWA) completed the *"Vaal River System Large Bulk Water Supply Reconciliation Strategy Study Investigation Report"* in 2010, with recommendations regarding the future usage of water beyond 2010, and DWA investigated all the resource options, and sought to develop a strategy to ensure that future water supplies to all users of the Vaal River System are maintained. The Vaal River System Reconciliation Strategy identified five core actions to ensure that sufficient water is available to users, including:

- Apply all the necessary resources to eradicate extensive unlawful water use, as a national priority, by 2011.
- Implement Water Conservation and Water Demand Management (WC/WDM) measures to reduce losses and reduce the urban demand by at least 15% by 2014 (DWA Project 15%).
- Undertake a feasibility study into the re-use of water, with the first priority being water from gold mines.
- Implement the Vaal River Integrated Water Quality Management Strategy. This has a focus on salinity, eutrophication, microbiological pollution, and institutional challenges.
- Implement Phase 2 of the Lesotho Highlands Water Project.

The potential shortage in the augmentation of water via the Vaal River System is best illustrated via **Graph 1** below. The yellow shaded area of the graph clearly illustrates the expected water shortages between 2014 and 2019, which will be alleviated by the commissioning of the Lesotho Highlands Project Phase 2.

Graph 1: Vaal River System: Water Balance Reconciliation



Based on the above reality, a water conservation and water demand management project has been initiated in Gauteng in order to save 15% of all water used, and all municipalities in Gauteng are involved. The main challenge is funding. The Department's Directorate: Water Use Efficiency and the Gauteng Regional Office have set up a Steering Committee and a Project Management Unit that will drive 'Project 15%'.Even with 'Project 15%' fully effective, the system will experience shortages by the year 2014 and additional augmentation is essential. Recognizing this, the implementation of Phase 2 of the Lesotho Highlands Water Project was approved by Cabinet in December 2008.Nevertheless, the earliest possible delivery from Phase 2 is in 2019.This scheme should provide sufficient water until 2035.The shortages between 2014 and 2019 (yellow-shaded area) could be alleviated through the re-use of water. The re-use strategy includes both the re-use of acid mine drainage and treated sewage effluent with the initial focus on the treatment of mine water. A pre-feasibility study has commenced to assess options for the re-use of effluent.

It was expected from Midvaal to reduce its annual demand since 2008/2009 with 11% taking economic growth into consideration.

Should this be done the annual demand target for Midvaal compared to its actual demand has been as follows:

Table 5: Summary of Rand Water Water Demand targets for Midvaal Local Municipality

Financial Year	Rand Water Target Demand kl/annum	MLM Actual Water Demand kl/annum	% of Targeted Demand above + Below -
2008/2009	10 700 000	10 700 00	-
2009/2010	11 128 000	12 053 000	+8,3%
2010/2011	11 573 000	13 011 000	+12,4%
2011/2012	12 036 000	13 501 000	+12,2%
2012/2013	12 517 000	13 976 000	+11,7%
2013/2014	13 018 000	14 947 000	+14,8%

From the above information it is clear that Midvaal has by far exceeded its water demand target as requested by Rand Water. The water demand for Midvaal over the past five years has increased on average with approximately 7,0% /annum compared to the average economic growth rate of 4% over the same period,

Non-Revenue Water and Water Losses

During 2013 the former Minister of Water Affairs, Edna Molema stated that 1,58 billion cubic meters of water supplied in South Africa each year can be regarded as non-revenue water, which amounts to a financial loss of R7,2 billion per annum. She also stated that a realistic target for non-revenue water of 25% should be achievable over a 10 year period and that this would require an investment of at least R10 billion over this period.

In order to achieve this target, the Department of Water Affairs introduced the “No Drop” incentive based programme, similar to the existing Blue and Green Drop incentive based programmes. The No Drop assessment has been implemented across all municipalities in South Africa from October 2013 and results will be released every 2 years. Results of the first assessment period (2013) will be published in the Blue Drop/No Drop 2014 Report.

This report will provide the public and the water sector with information on water use, water loss and efficiency of water used within a municipality. This new initiative builds on the success of the Blue and Green Drop Certification Programmes, the Department of Water Affairs innovative means of regulation, designed and implemented with the objective of improved water management.

In support of this initiative by the Department of Water Affairs, National Treasury through MFMA Circular No 67 – Municipal Budget Circular for the 2013/2014 MTREF of 12 March 2013, municipalities were reminded that they are required to report on both apparent and real losses as per the Modified International Water Association (IWA) Water Balance for South Africa.

A Summarized MLM IWA Water Balance (June 2014) is reflected in **Table 6** below.

Table 6: Summarized MLM IWA Water Balance (2013/2014)

<table>
<tr><td rowspan="4">System Input Volume

(Total Supply from own & external sources)

100.0%</td><td rowspan="2">Authorised Consumptions

(Billed metered + Billed Unmetered + Unbilled Metered + Unbilled Unmetered)

69,6%</td><td>Billed Authorised

(Billed metered + Billed Unmetered (flate) rate + Free Basic Water)

67,6%</td><td>Revenue Water

(Volume of Water for which an income is received. Assumes all billed water is paid for)

67,6%</td></tr>
<tr><td>Unbilled Authorised = 2,0%</td><td rowspan="3">Non-Revenue Water

(Volume of Water for which no income is received)

32,4%</td></tr>
<tr><td rowspan="2">Water Losses

(Real + Apparent Loss)
30,4%</td><td>Apparent or Commercial Loss 9,2%</td></tr>
<tr><td>Real or Physical Loss

21,2%</td></tr>
</table>

From the Summarized MLM IWA Water Balance (2013/14), the following main conclusion can be made:

- The current MLM NRW is 32,4% which is much lower than the International (36,6%), National (36,7%) and Gauteng (35,7%) average NRW.

The calculated NRW for Midvaal over the past five years is reflected in Table 7 below:

Table 7: Summarised MLM NRW for past five years

Financial Year	Total Water Purchased/Supplied kl	Total Billed Authorised Consumption kl	NRW kl	% NRW
2009/2010	12 053 525	8 630 032	3 423 493	28,4
2010/2011	13 010 916	9 836 252	3 174 664	24,4
2011/2012	13 501 254	9 896 419	3 604 835	26,7
2012/2013	13 975 573	10 169 149	3 806 424	27,2
2013/2014	14 946 866	10 098 777	4 848 089	32,4

From the Summarised MLM NRW for the past five years, the following conclusions can be made:

- The MLM NRW has been fluctuating between 24,4% (lowest – 2010/2011) and 32,4 (highest – 2013/2014)
- The average NRW for the past five years is 27,8%
- That there has been a dramatic increase in NRW for the last financial year, from 27,2% (2012/2013) to 32,4% (2013/2014)

Proposed Plan:

Water Conservation and Demand Management

The first requirement in determining the opportunities of WC/WDM is to develop a water balance and detailed demand analysis regarding water usage per sector within MLM. The water balance has been done as depicted in Table 6 of the report and the demand analyses per sector are depicted in Table 8 of the report.

The estimated water consumption for each sector within MLM can be summarised as follows: (2013/2014).

Table 8: Water Consumption of the main sectors within MLM for 2013/2014

Sector	Consumption Kl	% Consumption
Households	6 281 440	62.2%
Business & Industry	3 696 152	36.6%
Other (Municipal)	121 185	1.2%
TOTAL	10 098 777	100.0%

The following proposed actions illustrates the opportunities in reducing demand in most water services areas and illustrates the methodology that MLM must undertake in developing its specific demand targets. (Estimates are based on sectoral usage information depicted in Table 8 and on general information obtained from WC/WDM studies in various urban areas.)

Reduction in Non-Revenue Water

It is estimated that by implementing effective distribution management measures the Non-Revenue Water of MLM can be reduced by 62%, which will result in a saving of 12,4% of the total demand over a five year period.

This can be achieved through adequate and proper operating and maintenance measures of the reticulation system. Related activities by MLM can include the following:

- Leak detection and repair
- Pressure management
- Timeous repair of visible and reported leaks
- Pipe replacement / management program
- Cathodic protection of steel pipelines
- Meter management programme
- Illegal connection programme etc.
- Metering of unmetered areas

Reduction in plumbing leaks within domestic consumers

On average it is estimated that by repairing plumbing leaks within domestic consumers the total consumption can be reduced by 7.5% to 25% of the domestic household usage. Plumbing leaks include any leaks past the consumer connection and include, leaks within the connection pipe, leaking taps, leaking toilets and leaking hot water geysers.
Repair of plumbing leaks can be achieved by the following related activities initiated by MLM:

- Leak repair projects in the RDP areas sponsored by the water institutions (re-addressing the plumbing of Council houses)
- Communication, education campaigns and marketing
- Regulations and by-laws
- Negotiations and incentives to developers and builders
- Improved reticulation design and plumbing standards

From the above analysis it is estimated that the total realistic opportunities in reducing water demand in MLM are approximately 20% of the total existing demand. (Reduction in Non-Revenue Water plus reduction in plumbing leaks as well as efficient use of water)

Non-Revenue Water and Water Losses

In analysing the scope by which NRW in MLM can be reduced, it should be borne in mind that the current NRW figure of 32.4% may not be reduced to zero, simply because there are limitations and practicality issues, as well as unavoidable losses (acceptable remaining minimum operating losses common to the water industry).

Unavoidable Annual Real Losses (UARL): Can be defined as the volume of water that can be calculated using the International accepted standard UARL equation and is a function of length of mains, number of service connections and average operating pressure. The UARL for each distribution zone can be calculated as part of the water balance calculation as proposed for each zone.

There is some debate as to what is an economically optimal level of leakage or, speaking more broadly, of NRW. From a financial or economic point of view it is not appropriate to try to reduce NRW to the lowest possible level, because the marginal cost of reducing NRW increases once the cheaper options have been exploited. Once the marginal cost of reducing NRW exceeds the marginal benefits or water savings, an economic optimum has been achieved, which is referred to the optimum cost/benefit ratio.

The World Bank recommends that NRW should be “less than 25%, while the Chilean water regulator SISS has determined a NRW level of 15% as optimal in its model of an efficient water company that is used to benchmark service providers. In England and Wales NRW stands at 19%.

In the United States the American Water Works Association’s (AWWA) Water Loss Control Committee recommended in 2009 that water utilities conduct annual water audits as a standard business practice. AWWA recommends that water utilities should track volumes of apparent and real losses and the annual cost impacts of these losses. Utilities should then seek to control excessive losses to levels that are economic for the water utility. In 1999 the California Urban Water Conservation Council identified a 10 percent benchmark for non-revenue water.

In line with Table 4 of this report, MLM should aspire towards a NRW figure of 20% representing desirable and good performance. The effort required within the SA environment to reduce NRW below 20% may not be regarded as feasible nor cost effective, because of the extensive effort required regarding the outlay of resources (human & financial) to achieve such goal.

It is thus recommended that MLM reduces its NRW from 32, 4% to 20, 0% within five years. A target of 62% reduction from existing levels to the desired level.

The question to be asked is how the 62% reduction in loss could or should be brought about. The proposed breakdown of the NRW reduction is reflected in **Table 9** below.

Table 9: Proportional Breakdown of the NRW Reduction from 32,4% to 20%

Main Categories of NRW	Current %	Description	Analysis of NRW			Descriptions
			Current NRW	Desireable NRW	Targeted Reduction	
Water Losses	30,4%	Real or Physical Loss	21,2%	15,0%	6,2%	* Waterpipe leaks * Erf connection leaks * Leaking meters * Pipe bursts * Overflowing reservoirs * Leaks on properties
		Apparent Loss	9,2%	4,0%	5,2%	* Billing inaccuracies * Interim readings * Under-reading meters * Illegal connections * Unmetered connections
Unbilled Authorised Consumption	2,0%	Unbilled Authorised	2,0%	1,0%	1,0%	Unbilled authorised: * Informal Settlements * Unmetered properties * Parks, sportfields, etc
	32,4%		**32,4%**	**20,0%**	**12,4%**	

As mentioned elsewhere in the report, the task of reducing NRW is not an easy one and poses many challenges to municipalities in this regard due to current inefficiencies and lack of suitably experienced staff. In most cases it is also a known fact from experience gained throughout SA that it will take a number of years to reduce the NRW from 32,4% to 20%. Also the timeframe required to achieve the reduction would be at least five years, provided that the necessary budget allocations and resources are made available, including the outsourcing of work to Service Providers such as Consultants and Contractors and other Specialist Service Providers where required.

During this process sustainability should be created within MLM via training, mentoring and coaching of staff, and via skills transfer.

If a desired time frame of five years is assumed, the reduction in NRW should unfold as reflected in **Table 10** below.

Table 10: Targeted Reduction of NRW over a 5 Year roll-out Period:

Anticipated NRW Reduction over a 5 Year period						
YEAR	0	1	2	3	4	5
	Current	2014/15	2015/16	2016/17	2017/18	2018/19
Targeted Reduction:	0.0%	3,0%	2,7%	2,4%	2,2%	2,1%
NRW Target:	32,4	29,4%	26,7%	24,3%	22,1%	20,0%

The reduction in NRW as well as potential savings is analysed in **Table 11** below.

Table 11: Analysis of NRW Reduction & Potential Savings over a 5 year period:

Analysis of NRW Reduction over a 5 Year period:									
YEAR	FINANCIAL YEAR	Targeted Annual NRW Reduction	Annual NRW Remaining Value	Reduction in NRW					
				Annual Figures	Compounded	Cumulative	Annual Figures	Compounded	Cumulative
		(persentage)	(percentage)	(Kilolitre)	(Kilolitre)	(Kilolitre)	(Rand)	(Rand)	(Rand)
0	2013/14	0,0%	32.4%	n/a		n/a	n/a		n/a
1	2014/15	3,0%	29.4%	456 701	456 701	456 701	R 4 169 223	R 4 169 223	R 4 169 223
2	2015/16	2,7%	26.7%	419 930	876 631	1 333 332	R 3 833 541	R 8 002 764	R 12 171 987
3	2016/17	2,4%	24.3%	382 528	1 259 159	2 592 491	R 3 492 098	R 11 494 862	R 23 666 849
4	2017/18	2,2%	22,1%	360 083	1 619 242	4 211 733	R 3 287 197	R 14 782 059	R 38 448 908
5	2018/19	2,1%	20,0%	353 323	1 972 565	6 184 298	R 3 225 486	R 18 007 545	R 56 456 453
Total Accumulated Savings over the 5 year period:						6 184 298			R 56 456 453

Note: That all financial figures are calculated at current water purchase and sales prices
Saving in Real Losses @ R6,063/kl
Saving in Apparent Losses and Unbilled Authorised portion @ R12,195/kl

From information provided in Table 11 the following conclusions can be made:

- It is obvious that huge savings in water purchases from Rand Water can be brought about by reducing the NRW figure through the implementation of the NRW-Reduction Programmes as outlined in the report.
- The annual savings as reflected in the table above could be partially utilized to fund the WC/WDM Projects as well as the Revenue Enhancement Projects.
- At the end of year five the estimated/projected cumulative reduction in water purchases is 6 184 298 kiloliters for the five years, which is equivalent to R56,4 million.

Proposed Programmes:

WC/WDM is one of the most important functions performed by Municipalities in order to be successful in reducing NRW. Without the proper implementation and functioning of holistic WDM initiatives attending to all aspects relating to water wastage and non-revenue generating serviced properties, and also without involving all the relevant role-players and also without Political and Senior Management buy-in and support, there will be little chance of success in lowering NRW.
It is recommended that the following programmes be initiated and developed in order to implement this plan:

1. Establishment of a WC/WDM Steering Committee

A WC/WDM Steering Committee should be established in order to manage and implement this plan. This is essential to obtain the necessary buy-in from all role players through participative, collective decision making and to monitor the implementation progress. It is recommended that the HOD: Engineering establishes such a Steering Committee in conjunction with the MMC: Engineering Services to promote political buy-in.

2. Calculation and Preparation of Monthly Water Balance

The essential first step in practical management of Non-Revenue Water is to calculate monthly water balances for each distribution area. The International Water Association (IWA) has introduced an international “best Practice” standard approach for water balance calculations as depicted in Table 2 of this report. This approach has also being accepted by South Africa, which included the free basic portion of water as part of Revenue Water, as it is unique for South Africa only.

It is important to prepare a water balance for each distribution area in order to determine its Non-Revenue water. This approach will assist in prioritising budget and projects in addressing Non-Revenue water, especially allowing focus in those areas where the Non-Revenue Water is very high.

It is thus recommended that the HOD: Engineering Services prepare monthly water balances for each water distribution area. This can be done through the existing IMQS system that is managed by GLS Consultants.

3. Accurate and Clear Water Supply and Distribution Plans

In order to efficiently manage a water supply and distribution system, the management and operational staff should have access to accurate and clear water supply plans.

The Engineering Department has been involved in such an exercise in ensuring more accurate plans with the assistance of its Consultants GLS in developing and updating of the Information Management Query System (IMQS) electronic system. The IMQS system is a viewing system of the MLM water supply and distribution system that can be electronically viewed. The system is also linked to a modelling system (WADISO) and financial system (VENUS).

It is important that the IMQS system be updated on an on-going basis as new developments and upgrading of the water network takes place.
The IMQS system can also be of great value in establishing an asset management system for Water Services.

It is recommended that the HOD: Engineering Services ensures that the IMQS system be updated on a continuous basis and that a procedure be developed at the Engineering Department to assure that all new development, replacements and upgrading of the water system be referred to GLS (IMQS) for updating of the IMQS system. Such a procedure is paramount to ensure that any changes to the water system are updated monthly on IMQS.

4. Master Planning of Water System

A Master Plan for a Water System takes into consideration the existing water system and through predictive modelling develops a 20 to 25 year water supply and distribution system. It is a planning tool especially in preparing a long term investment plan, future capacity plan and an upgrading plan.

With regards to Non-Revenue water reduction, the more successful a water service provider is in reducing its Non-Revenue water, the more it can save in terms of provision capacity and capital investment in extending its water system. MLM has engaged GLS Consultants to develop such a long term plan for its 25 distribution network systems. “Computer Model Analysis and Master Planning of Water System-Summary Report, December 2012.”

The project entailed the establishment of computer models for all the water networks in MLM, the linking of these models to the stand and water meter data-base of the Finance Departments financial system, evaluation and master planning of the water networks, and the posting of all information to the IMQS viewer. There is a separate report for each of the 25 distribution zones, addressing both the bulk and the distribution network aspects of each area’s water system. This should then also be linked to each distribution zones water balance.

The existing models are updated regularly by GLS as part of the bureau service they are providing to MLM.

It is recommended that the HOD: Engineering Services ensures that the outcomes and capacity siting from this study be utilized strictly during upgrading and replacement of water infrastructure in MLM and that the master plan be updated at least every two years.

5. War on Leaks

The Department of Water Affairs has encouraged Municipalities to declare War on Leaks. It is estimated that at least 30% of a Municipalities Real Water Losses is contributed by leaking network pipes, pipe bursts, leaking stand connection pipes, leaking reservoirs and overflowing of reservoirs.

It is thus important that Municipal maintenance teams are well equip and alert to immediately address these problems and have such wastage of water addressed within 24 hours or preferably even less.

The Municipality thus should have sufficient motivated maintenance teams available to immediately react on repairing and normalising the situation within 24 hours. Other preventative long term measures will be discussed in more detail hereafter but it is important that there is a back-up service to react immediately on short term challenges such as leaks and pipe burst.

The following aspects should be taken into consideration in preparing a War on Leaks Programme:

- Informed public
- Dedicated, well trained and equipped committed maintenance teams
- Efficient Call Centre and system (allocation, dispatch, reporting and control)
- Good communication between public other role players and Municipality
- Service delivery charter (all leaks, wastage of water systems to be fixed within acceptable time frames)
- Record keeping and analysis of identified problematic areas

It is recommended that the HOD: Engineering Services develops a War on Leaks programme to be developed during the 2014/15 financial year and to be implemented not later than the following financial year.

6. Timeous Leak Detection & Repairs

Not all water leaks are visual and many water leaks cannot be traced easily. The water industry has thus developed technology to trace these non-visible leaks.

There are a number of leak detection tools/instruments to assist in accurately find the source of the leak. The devices used can mainly be divided into two main groups namely:

- Movable leak detection equipment
- Fixed leakage monitoring system

The cost for purchasing operating and maintaining these systems are very costly and dedicated trained staff needs to be employed to perform such investigations. It may be cost effective for large municipalities such as Metros to implement a leak detection section, but it is more cost effective for smaller municipalities such as MLM to outsource such function.

It is recommended that a three year annual contract be prepared and to follow the supply chain process in appointing a service provider to assist the Engineering Department to detect and repair leaks when required.

7. Sectorisation and Zoning of Distribution Areas and Metering of Zones.

Sectorisation of a municipal water distribution is a concept and process whereby the distribution network is divided into smaller supply and distribution areas. This is required in order to separate distribution areas because of the topography (differential pressure) and to assist in identifying areas with the largest water losses and to prioritise projects within a water loss reduction programme.

The International Water Association (IWA) strongly supports the concept of managing water supply networks based on district metred areas (DMA's), using the division of supply networks into manageable sizes for detection and control of leakage.

It is recommended that the HOD, Engineering appoint a specialist Consultant to analyse the MLM water supply and distribution network in order to develop and to assist with the implementation of a sectorisation and zoning plan for the MLM system over the proposed five year period.

8. Asset Management and Water Infrastructure Replacement Programme

It is estimated that replacement value of the MLM's water supply and distribution network is R900 million. Some of the infrastructure has reached its life expectancy and others have even surpassed its life expectancy. One can thus expect that in such cases it will contribute to water losses.

Management principles such as preventative maintenance, retrofitting and upgrading of infrastructure will assist in increasing the life expectancy or at least ensure that a reasonable life expectancy is ensured.

It is recommended that the HOD: Engineering Services develops an Asset Management system and replacement programme that will inform the annual budgeting process. This programme should run parallel with the master planning programme.

It should further develop a preventative maintenance policy, system and programme in order to enhance the life expectancy of its infrastructure. This should also reduce the departments re-active short term time spend on complaints in repairing leaks and burst water pipes.

9. Cathodic Protection of Steel Pipes

Steel pipelines within a water supply distribution system are subjected to corrosion processes, which reduces the life span of such. The life expectancy of such pipes can be extended by cathodic protection methods and technology.

Cathodic Protection is a technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell. A simple method of protection connects protected metal to a more easily corroded "sacrificial metal" to act as the anode. The sacrificial metal then corrodes instead of the protected metal. For structures such as long pipelines, where passive galvanic cathodic protection is not adequate and where stay currents from electric power distribution systems such as power lines and railway lines are present, an external DC electric power source is used on the steel pipeline to neutralise such external enduced stray currents. Stray currents from external sources can have a major negative impact on the life expectancy of a steel pipe line.

It is recommended that the HOD Engineering Services appoints specialist service provider to analyse existing steel pipeline infrastructure and to put processes in place to protect such steel pipelines against corrosion and that such plan be implemented over the five year period.

10. Pressure Management of Water Distribution Zones

Pressure management is a concept whereby the water pressure in a distribution system are controlled to minimise the water pressure to an optimal point in providing water to its customers within acceptable volume and pressure standards.

The South African standard is to have a minimum pressure of 2,4 bar and maximum pressure of 9,0 bar within a system. Water Engineers worldwide has come to the conclusion that the 9,0 bar max limit is far too high in order to obtain acceptable water loss benchmarks and targets. The author is of the opinion that in order to obtain a 20% NRW target the maximum water pressure in a distribution network should be limited to 5,0 bar. The standard should therefore be to manage water pressure between 2,4 – 5,0 bar within a water distribution system.

An intelligent water pressure management system also provides for setting pressure during mid-night and early morning (between 22h00 -05h00) whereby the water pressure is further reduced automatically when the demand has decrease substantially.

The prospect of reducing leak and burst repair and associated costs, and potential for improved asset management, created increased international interest in pressure management. Many hundreds of pressure management schemes have been implemented internationally since 2007. Whenever case studies are presented at conferences or published, the following benefits of pressure management are usually quoted without challenge:

- Reduction of leak flow rates
- Possible reduction of burst frequency of water pipes

- Extension of residual water infrastructure life

In most cases of reported water loss-management programmes implemented, pressure management has made the largest contribution to the reduction of water losses.

It is recommended that the HOD: Engineering Services appoints a specialist service provider to prepare a Pressure Management Plan for the MLM water distribution system to be implemented over the five year period.

11. Meter Management Plan

The Water Service of a municipality has the responsibility to generate income from the water produced/purchased and distributed to its customers in terms of the Municipal Systems Act and Municipal Finance Management Act.

In order to meet the legislative requirement the Engineering and Finance Departments are responsible for the accurate metering, billing and revenue collection system.

The Water Services Division of a Municipality therefore needs to install and maintain water meters with the objective to do such as accurate as possible.

Unfortunately municipalities do not achieve this objective because of so called apparent losses as defined in the standard IWA water balance, Table 2 of this report.

These losses can be divided into two main categories namely:

- Unauthorised consumption
    - Unauthorised and illegal connection
- Customer Meter Inaccuracies
    - Old meters – inaccurate
    - Wrong sizing of meters
    - Wrong meter readings
    - Connections not metered
    - Connections metered but meters not visible
    - Connection metered but not read and billed

It is estimated that 9,2% of MLM water purchase for the 2013/14 financial year has contributed to apparent water losses. It is estimated that 929 087kl of water is lossed annually through apparent losses which amounts to approximately R11,3 million per annum calculated at the average retail price.

It is recommended that the HOD: Engineering Services prepare a meter management plan, which should at least include the following and be implemented over the five year period:

- Meter replacement policy and programme
- Plan to meter unmetered areas
- Plan to meter informal settlements
- Procedure for the correct sizing of meters for customers other than residential1 stands/consumers
- Audit plan of all meter installations larger than 15mm
- Accurate metering of Council Property

12. Indigent Leak Repair Programme and Retro Fitting of Toilet Plumbing

A preliminary desk top study revealed that indigents are consuming on average more than 40kl per month per household. There are some households that even consume more than 200kl/month. It was found that most of the consumption was wasted into the sewer system, because of malfunctioning toilet systems.

These consumers are expected to make use of the 6kl/month free basic water supply, but exceed this by far.

It is recommended that approval be obtained from Council that the Engineering Services Department be authorised to repair leaks and retrofitting of toilet plumbing together with education of such at indigent households and other households where specific conditions apply.

That an annual budget for this intervention be made available.

13. Telemetry of Water Supply and Distribution Systems

Telemetery can be defined as a system whereby important information such as reservoir water levels, pressures, flows, pump activation is conveyed over a distance to an information/control desk in order to have accurate information on the functioning and performance of a water supply and distribution network.

Midvaal is a very large area and water infrastructure are spread over this area. With the limited water staff it is very difficult to manage and operate the water distribution network without an efficient telemetry system. A lot of water is lost because of overflowing reservoirs and burst pipes, because of limited information and inadequate control management systems.

It is recommended that the HOD: Engineering Services appoints a specialist in advising on a cost effective telemetry system for the water supply and distribution system of MLM for implementation during the five year period.

14. **Valve Audit, Replacement, Marking and Numbering as well as Plan Updating**.

The installation and maintenance of valves within a water supply and distribution system is crucial for the efficient management of such a system. In the past it was common to install anti-clock wise closing valves. Later-on same municipalities converted to clockwise closing valves. Unfortunately especially with the demarcation of Local Government and changing of boundaries, most municipalities have ended up with systems where both anti-clockwise and clockwise valves are present in their water systems. Should these valves not be marked clearly, operations and maintenance staff open valves with the understanding that they are closing valves and vise-versa. This obviously can cause havoc in the operations and maintenance of water systems. Many water systems capacity has reduced drastically because of this confusion, whereby many system valves are closed that should be open and vise-versa.

It is therefore important that the HOD: Engineering Services initiate a valve audit programme in identifying valves, their direction of closing, condition and position. Such information be updated on plans and the asset management system.

15. Consumer Data Base Audit

It is estimated that unbilled authorised water consumption makes up 2,0% of the MLM Non-Revenue Water.

In most cases this is caused by the anomaly between the actual meter information of the meter/s installed on a property and the information on the Venus billing system. This anomaly also causes inaccurate billing and consumer dissatisfaction.

It is recommended that the HOD: Engineering Services and the Chief Financial Officer initiate a meter data base and site audit as explained above and that such audit be executed within the first two years of the five year programme.

16. Organisation and Human Resource Plan

In evaluating the requirements for the efficient management of the MLM water supply and distribution system as well as what is required to reduce the MLM Non-Revenue Water from 32,4% to 20% over a

5 year period, it is obvious that the existing water services structure and skills available, the Engineering Services Department will not be able to achieve such.

It is thus recommended that the HOD: Engineering Services conducts a detail analysis with regards to existing capacity and skills available versus the capacity and skills required to meet these targets (Gap Analysis).

That the proposals be quantified compared to possible savings in projected non-revenue reduction as well as affordability for MLM.

Should this be achievable, a comprehensive detail plan for each intervention/programme can then be prepared for implementation, which will include a more detailed annual budget/financial plan.

Financial Implications and Budget

The total estimated cost for implementation of this plan over the 5 year period amounts to R64 730 000 as per summary: **Table 13 – 5 Year Non-Revenue Water Reduction Plan Budget.** The total amount is split between Opex and Capex,

Opex = R22 230 000
Capex = R42 500 000

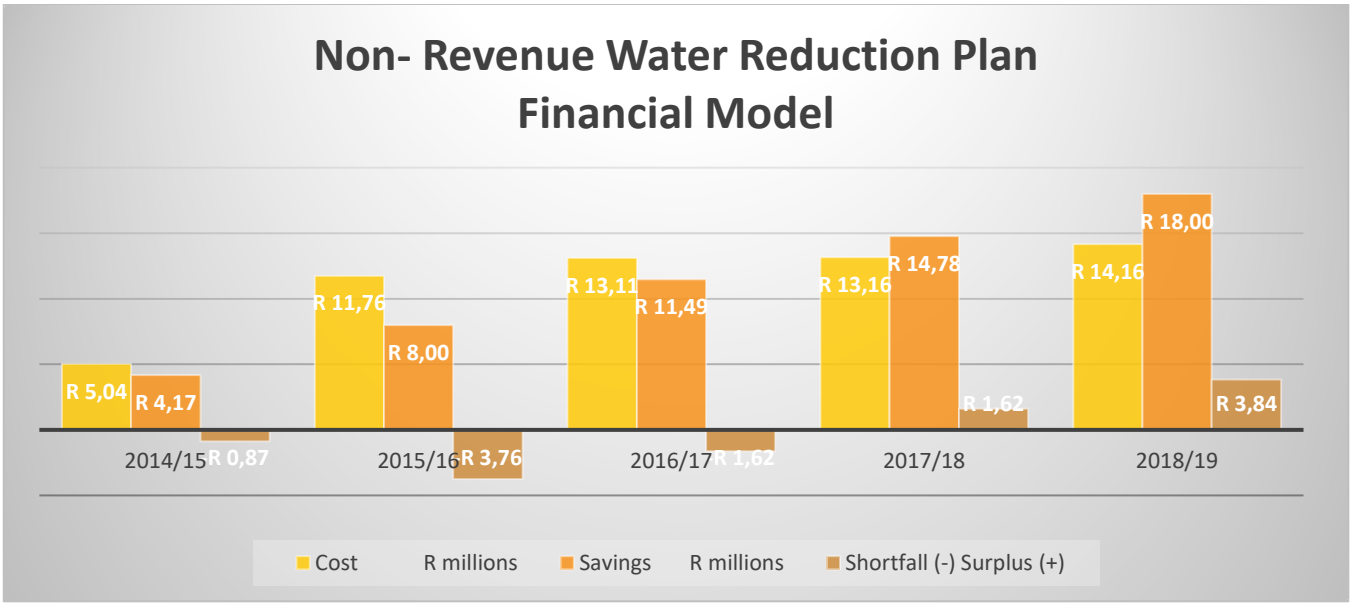
Existing budget amounts of R2 500 000 (Opex) and R5 000 000 (Capex) have to be deducted from the above required amounts, because these amounts have already been provided in existing budgets. Thus the additional amounts to be budgeted and to be provided for over the 5 year period is:

Opex = R19 730 000 (average R3 946 000 per annum)
Capex = R37 500 000 (average R7 500 000 per annum)

The total additional budget required over the 5 year period is R57 230 000, which is estimated to be approximately the same as the estimated saving of R56 456 453 as depicted in table 11.

Graph 2 depicts the financial model..

Graph 2: Non-Revenue Water Reduction Plan – Financial Model



By deducting the additional cost to implement the plan from the potential savings by decreasing the Non-Revenue Water, the shortfall (-) or surplus (+) for each year, is as follows:

Table 12: Financial Model – Cash Flow Shortfall or Surplus

Financial Year	Additional Cost R'millions	Potential Saving R'millions	Shortfall(-) Surplus(+) R'millions
2014/15	5,04	4,17	-0,87
2015/16	11,76	8,00	-3,76
2016/17	13,11	11,49	-1,62
2017/18	13,16	14,78	+1,62
2018/19	14,16	18,00	+3,84

It can be concluded that as from the fourth financial year (2017/18) the project will be self-funding.

It is also very important to note that very limited funding has been provided in the past on the capital budget for the replacement of absolute water infrastructure. The proposed budget includes a substantial amount for the replacement of infrastructure that has reached its life expectancy (40% of total budget provided as indicated in table 13).

The budgeted amounts for implementing the identified programmes are estimated and will have to be updated as soon as recommended investigations have been concluded. A more accurate estimate of the required budget should be provided within a year when investigations have been completed and some programme implementation has been initiated.

It is recommended that the proposed Non-Revenue Water Reduction Plan be implemented, that the additional Opex and Capex amounts be provided in the following 5 year budget programme and that a six monthly progress report be submitted to the Mayoral Committee.

Table 13: 5 Year Non-Revenue Water Reduction Plan Budget

Programme	Estimated Annual Budget					Total	Budget Allocation
	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019		
Calculation and Preparation of Monthly Water Balance	R100 000	R140 000	R150 000	R160 000	R170 000	R720 000	Opex
Accurate and Clear Water Supply & Distribution Plans	-	R50 000	R60 000	R70 000	R80 000	R260 000	Opex
Master Planning of Water System	R240 000	R250 000	R260 000	R270 000	R280 000	R1 300 000	Opex
War on Leaks	R300 000	R320 000	R340 000	R360 000	R380 000	R1 700 000	Opex
Leak Detection & Repairs	R500 000	R550 000	R600 000	R650 000	R700 000	R3 000 000	Opex
Sectorisation and zoning of distribution areas and							Opex

metering of zones	R200 000	R500 000	R550 000	R600 000	R650 000	R2 500 000	and Capex
Asset Management and Water Infrastructure Replacement Programme	R 4 400 000	R5 000 000	R5 500 000	R6 000 000	R6 500 000	R27 400 000	Capex
Cathodic Protection of Steel Pipes	0	R800 000	R700 000	R800 000	R900 000	R3 200 000	Capex
Pressure Management of Water Distribution Zones	R200 000	R500 000	R600 000	R700 000	R800 000	R2 800 000	Opex and Capex
Meter Management Plan	R500 000	R800 000	R900 000	R1 000 000	R1 100 000	R4 300 000	Capex
Indigent Leak Repair Programme and retro fitting of toilet plumbing	R100 000	R150 000	R200 000	R200 000	R200 000	R850 000	Opex
Telemetry of water Supply and Distribution System	-	R500 000	R500 000	R600 000	R600 000	R2 200 000	Opex and Capex
Valve Audit, Replacement and Numbering as well as plan update	-	R200 000	R250 000	R250 000	R300 000	R1 000 000	Opex & Capex
Consumer Database Audit	-	R500 000	R1 000 000	-	-	R1 500 000	Opex
Organisation and Human Resource Plan	-	R3 000 000	R3 000 000	R3 000 000	R3 000 000	R12 000 000	Opex
TOTAL	R6 540 000	R13 260 000	R14 610 000	R14 660 000	R15 660 000	R64 730 000	

Note: That the budget has been determined at current cost. Where budget allocation refers to both Opex and Capex, the Opex portion will be for specialist (consultants) costs to do investigations, to prepare an implementation plan and to assist with the preparation of bid documents where required.