Presentation on
Water Loss Management

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Public Works and Infrastructure Development

DEFINITION
Water Loss Management

Water Loss Management is the strategy to reduce:

- Technical losses (where not all water supplied reaches the consumer)
- Financial losses (where not all water reaching the consumer is paid for)

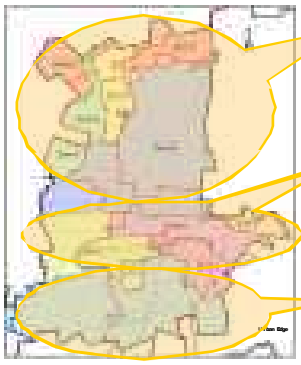
These losses are caused by:

- Real losses (physical loss of water from the systems)
- Apparent losses (non-physical losses due to customer meter inaccuracies, meter estimations, non-metering of water and unauthorized consumption). This is water that is consumed but is not properly measured, accounted or paid for

DEFINITION
Water Conservation & Demand Management

- Water Demand Management refers to strategies that influence the water demand and usage of water in order to meet any of the following objectives:
  Economic efficiency, social development, social equity, sustainability of water supply and services, environmental protection and political acceptability
- Water Conservation is the minimisation of water loss or waste, the care and protection of water resources and the efficient and effective use of water

CoT STATUS QUO



THE NORTH
Several rudimentary household services
Varied densities
Former Cross boundary areas

THE CENTER
Declining CBD
Government Departments
Research and Education facilities
Links to poor, but relatively well serviced townships in east and west

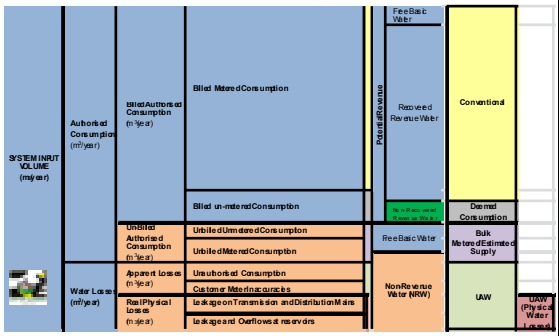
THE SOUTH
Quality municipal services
Growing Economy

CoT STATISTICS

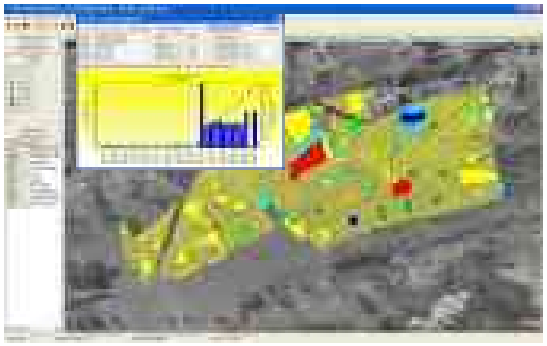
- 8 250 km of bulk and distribution mains
- 137 storage reservoirs with 1 690 Ml storage
- 28 water towers with 10,4 Ml storage
- 360 Control Valves (PRV's, Flow control etc)
- 240 Bulk Management Meters
- 372 000 Consumer connections

CoT Standard Water Balance

Not according to scale



AVERAGE ANNUAL DAILY DEMAND (AADD) OF A STAND



WHAT IS UNACCOUNTED FOR WATER (UAW)?

Unaccounted for Water (or Total Losses) is the difference between the volume of water supplied to the system and the authorised consumption.

It comprises Real and Apparent Losses:

- Real losses (physical leakage) can be valued in terms of the purchase price of water
  = R4.39/kl (RW incl. WRC levy)
- Apparent losses (non-physical losses) can be valued in terms of the selling price of the water
  = R6.71/kl (7 kl to 12 kl)

WHAT IS NON-REVENUE WATER (NRW)?

Non-Revenue water is the difference between the volume of water supplied to the system, and the total billed authorised consumption and additional free basic water component to unmetered indigent households.

It comprises the Unbilled Authorised Consumption, Real and Apparent Losses.

The components of the Unbilled Authorised Consumption are:

- Unbilled Metered Consumption
- Unbilled Unmetered Consumption

APPROVAL REGARDING UAW REPORTING

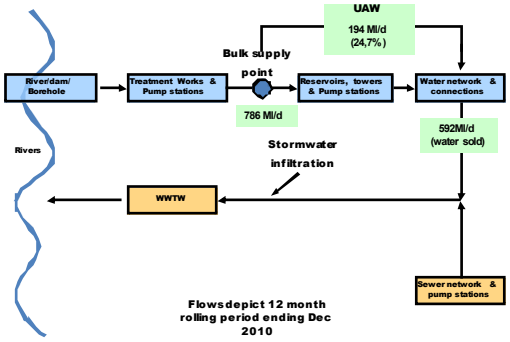
Prior to April 2007, the Finance Department supplied figures which were used for the determination of UAW. However, a report to the City Manager dated 20 April 2007 acknowledged that one of the key problems in using that particular dataset was the inconsistency of the data (i.e. the billed consumption and water purchases) which completely overshadowed any of the technical interventions designed to reduce wastage.

Since the information from Finance was incomplete, the report further recommended that the Water and Sanitation Division would be responsible for reporting on UAW subject thereto that the information from SAP and Swift are made available to the Division on a consistent basis.

DIFFERENCES BETWEEN MEASURING NRW ON RETICULATION AND BULK NETWORKS

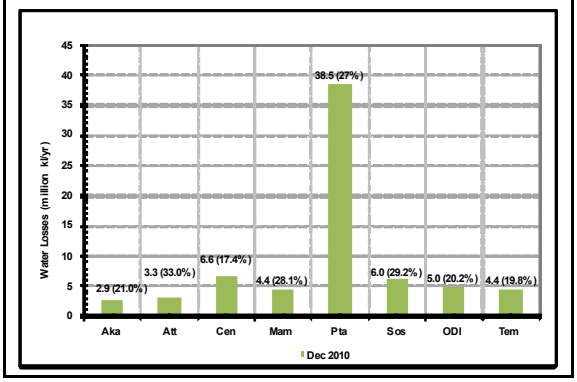
Reticulation Network (CoT)	Bulk Network (RW)
Many illegal Connections	Few illegal Connections
Thousands of accessible points for water theft	Few easy points for water theft
Longer pipe length and thus more potential for bursts (in CoT ±8 250km reticulation pipes excluding connection pipes)	Shorter pipe lengths (Rand Water 3056km)
More connections that need to be metered and where potential leakage can occur (in CoT approx 372 000 connections)	Fewer connections (Rand Water has 1673 connections)
Regular damage to reticulation pipes by other contractors (telecommunications and others)	Few incidents of pipes damaged by contractors.
Generally thinner pipe wall thickness because pipe diameters are smaller and at lower pressure	Thicker wall thickness for pipes
UAW and NRW in RSA typically 25% to 60%	UAW and NRW in RSA typically less than 10%

CoT WATER BALANCE

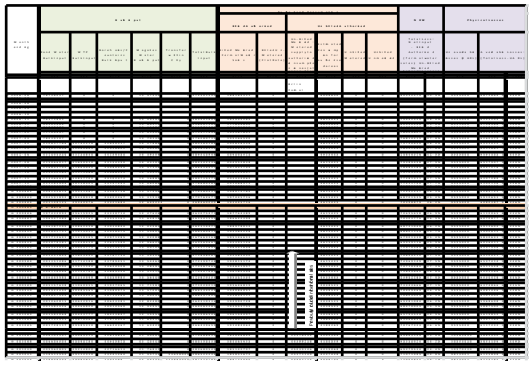


Flows depict 12 month rolling period ending Dec 2010

NRW FOR CoT SUPPLY AREAS



NRW FOR CoT



UNBILLED AUTHORISED CONSUMPTION

BULK METERED / ESTIMATED SUPPLY

There are a number of informal housing developments throughout Tshwane that receive water from the CoT, either via legally installed and metered connection points, fixed water tanks supplied by mobile water tankers or by means of illegal water connections made by the residents of the informal area from adjacent formal housing developments.

UNBILLED AUTHORISED CONSUMPTION

BULK METERED / ESTIMATED SUPPLY

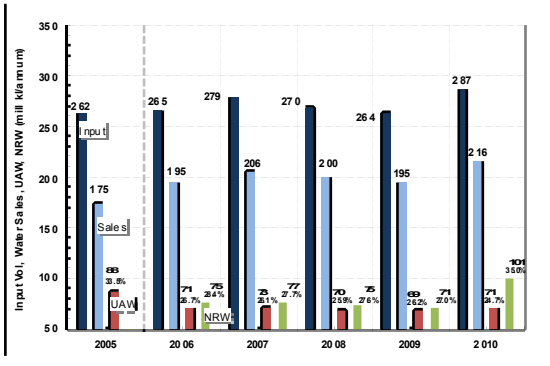
Water entering these areas is measured by:

- Bulk meters at the boundary of discrete areas or,
- Estimating the daily consumption using a base consumption value

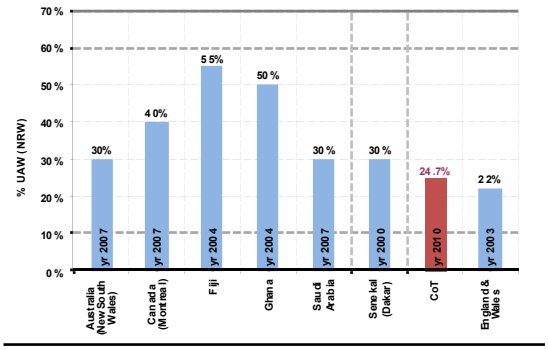
(Base value consumption equal to 10 kl/ha/day conservatively determined from actual measured values obtained from similar developments)

CoT UAW and NRW

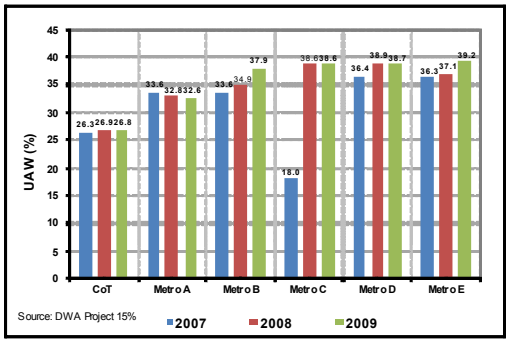
Source: UAW figures from W&S



UAW OF OTHER COUNTRIES



UAW FROM OTHER RSA METROS



Other Metros in no particular order are: Johannesburg, Ekurhuleni, Ethekwini, Nelson Mandela, City of Cape Town

UNAVOIDABLE ANNUAL REAL LOSSES (UARL)

No system can be entirely free from leakage, and every system will have a level of leakage which cannot be reduced any further. In accordance with the International Water Association's guidelines, this minimum level is referred to as the unavoidable level of leakage for any given system.

Leaks will always be present, even if:

- The system is in top physical condition and well maintained
- All reported leaks are repaired quickly and efficiently
- Active leakage control is practiced

Internationally accepted values for UARL (per day) = (18 litre/km*Av. pressure) + (0.8 litre/connection*Av. pressure)

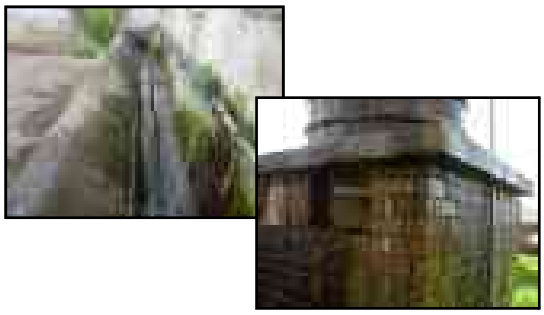
In Tshwane, this results in a reduction in the UAW% of approximately 3,5%, as follows:

Gross UAW for Dec 2010 = 24,7%
Nett UAW for Dec 2010 = 21,3%

CHALLENGES FOR WATER AND SANITATION TO REDUCE LOSSES AND UAW (NRW)

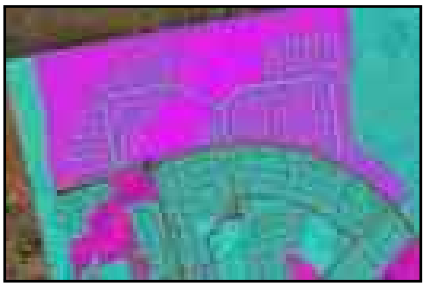
LACK OF MAINTENANCE IN MUNICIPAL BUILDINGS

Saulsville Hostels

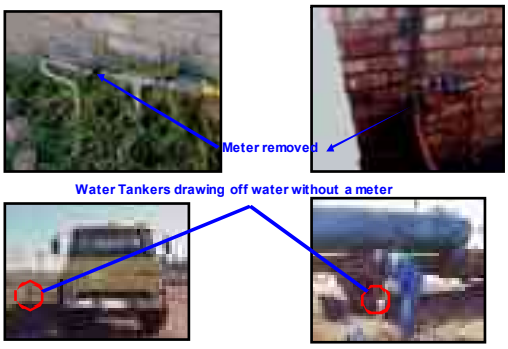


FORMALISED AREAS SERVICES INSTALLED, NO METERS

Soshanguve areas, fully serviced, occupants in houses self connected with no meters (indicated in purple)



ILLEGAL WATER USE



INFORMAL AREAS

Estimated consumption for demarcated area is 885 kl/day

No formal water, multitude of illegal connections, positions unknown
Leakage, damage to roads

INFORMAL AREAS

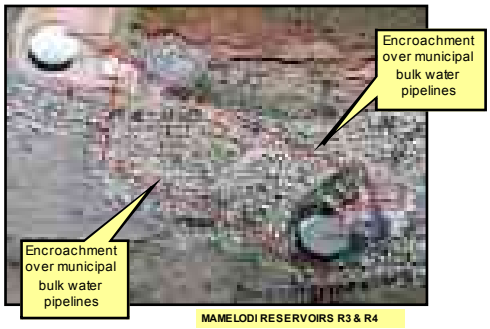
Calculation of estimated consumption:

- Base consumption figures obtained from actual metered consumption values in similar developments (kl/day/Ha)
- Area of informal development determined from 2009 aerial photos, site inspections etc (Ha)
- Base consumption value applied to informal development to obtain estimated consumption volume
- Volume applied in UAW calculation for zone

LEAKING OF UNAUTHORISED NETWORKS

AGGRAVATING CIRCUMSTANCES

Encroachment: Municipal water services



CONSEQUENCES IF NOT RESOLVED

- Increase in water lost in spite of all other efforts with expenditure on action plans
- Increase in un-recovered municipal rates and taxes
- Increase in the number of illegal or unmetered consumers
- Non-sustainability of the CoT water services

WHAT ACTIONS ARE UNDERTAKEN BY WATER AND SANITATION TO REDUCE UAW (NRW)?

CoT WATER LOSS AND DEMAND STRATEGY

Item No.	Description	Max Points	Score
1	Development of Standard Water Balance	4	3
2	Pressurised Supply to all consumers 100% of time	4	4
3	Commercial and Industrial Metering System	4	3
4	Residential Metering System	4	3
5	Effective Bky System including Informative Bky	4	3
6	Network (Leakage) Complaints System	4	3
7	Bky and Metering Complaints System	4	2
8	Asset Register for Water Reticulation System	4	3
9	Asset Management - Capital Works	4	3
10	Asset Management - Operations and Maintenance	4	2
11	Dedicated WDM support	4	3
12	Active Leakage Control	4	2
13	Effective Sectorisation	4	3
14	Effective Bulk Meter Management	4	3
15	Credit Control Bky and Implementation	4	3
16	Pressure Management and Maintenance of Pressure Reducing Valves	4	2
17	As-Built Drawings of Bulk and Reticulation Infrastructure	4	3
18	Schematic Layout of Water Infrastructure	4	4
19	Regulation of Water Fittings	4	1
20	Implementation of By-Laws and National Standards or better	4	3
21	Technical Support to Customers	4	2
22	Removal of Illegal Connections	4	2
23	Community Awareness and Education Programmes	4	2
24	Schools Awareness and Education Programmes	4	2
25	Newspaper & radio articles plus posters and leaflets for distribution	4	1
	Totals	100	65

HIGHLIGHTING OF VARIOUS STRATEGY INITIATIVES

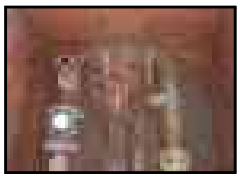
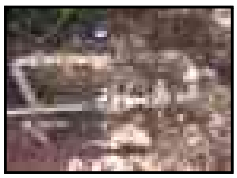
METER AUDITS IN CoT INDUSTRIAL AREAS

- Audit of all connections in industrial areas (large users)
- Locate un-metered connections
- Identify and replace all old, broken, illegible meters
- Ensure all meters are on billing system
- Impact already determined for some areas

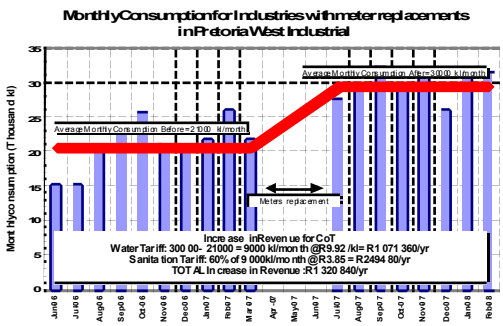
METER AUDITS IN CoT INDUSTRIAL AREAS

Industrial / Commercial Area	Number of Connections audited	Un-metered connections	Replace meter (Illegible, broken, stolen or erratic)		Repair Leak at meter
			Main Meter	Sub-meter of combination meter	
Rosslyn North	138	7	28	11	4
Rosslyn South	236	3	6	6	4
Pretoria Industrial	144	7	1	19	4
Pretoria West Light Industrial	355	52	9	24	5
Waltloo & Silvertonadale	550	28	54	18	8
Koedoespoort	93	0	7	1	1
Hermanstad	189	11	9	1	0
Rooihuiskraal	90	1	5	0	0
Hennopspark	168	2	14	2	0
Sunderland Ridge	169	0	6	3	4
Lyttelton Manor	52	0	1	4	0
Pretoria North	253	15	11	0	3
Total	2437	126	151	89	33

METER AUDITS IN INDUSTRIAL AREAS
Un-metered connections located during audits

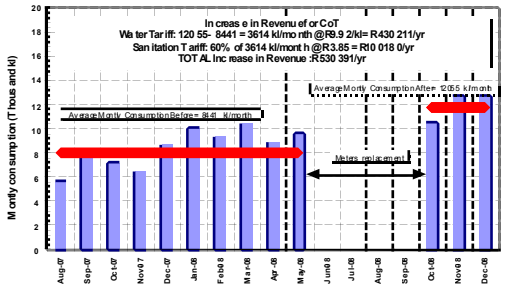



METER AUDITS IN INDUSTRIAL AREAS
Pretoria Industrial intervention results



METER AUDITS IN INDUSTRIAL AREAS
Waltloo and Silverton intervention results

Monthly Consumption for Industries with meter replacements in Waltloo & Silverton Industrial



METER AUDITS IN INDUSTRIAL AREAS
Impact of audits and meter replacements

Area	No. of Conn	Increase in Metered Consumption (kl/yr)	Cost (R)	Water Tariff: Increase in Revenue (R/yr)	Sanitation Tariff: Increase in Revenue (R/yr)	Total Increase in revenue (R/yr)	Return Period (Months)
Rosslyn North	138	60 000	R 338 541	595 200	138 600	733 800	6
Rosslyn South	236	36 000	R 438 238	357 120	83 160	440 280	12
Pretoria Indus	144	108 000	R 455 897	1 071 360	249 480	1 320 840	4
Waltloo, Silverton-dale	550	43 368	R 800 000	430 211	100 180	530 391	18
Total	1 068	247 368	2 032 676	2 453 891	571 420	3 025 311	8

Water Tariff Used: R9.92/kl
Sanitation Tariff Used: 60% of increase in metered consumption @R3.85/kl

ROAD ISLAND METER AUDITS

- Audit of all connections for irrigated road islands
- Locate unmetered connections
- Identify and replace all old, broken, illegible meters
- Ensure all meters are on billing system
- Impact to be determined

ROAD ISLAND METER AUDITS
'Irrigation' at Road Islands

ROAD ISLAND METER AUDITS
Un-metered Connections Located

ROAD ISLAND METER AUDITS

Parks Regions	Depot Names	Number of Connections audited	Un-metered connections	Replace meter (Illegible, broken, stolen or erratic)
Eastern Region	Pretorius Park	30	0	13
	Silverton	34	1	12
	Moregbed	20	1	5
Sub-Total		54	2	30
Southern Region	Die Grasdak: Centurion	25	1	3
Sub-Total		25	1	3
Central West Region	Princess Park	36	0	13
	Kwagga Road	8	0	1
	Mayville	37	0	7
	Lofbus	12	0	2
Sub-Total		93	0	23
North West Region	Klerksoord and Akasia	43	1	2
	Soshanguve	14	0	4
Sub-Total				
North East Region	Mayville	34	2	4
Sub-Total		91	3	10
Total		293	7	66

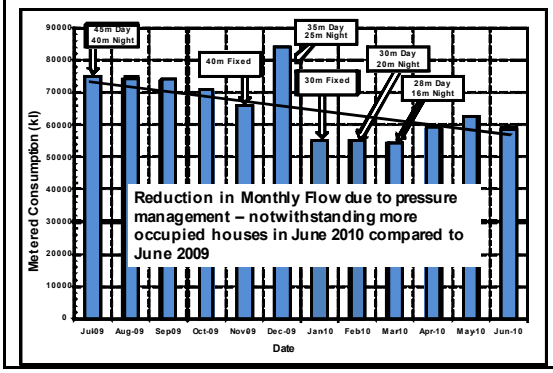
PRESSURE MANAGEMENT (NELMAPIUS EXT 8)

- No consumer meters installed in Nelmapius X8 (high leakage)
- Special pressure reducing valve (PRV) fitted to handle high pressure reduction ratio
- Electronic Time Modulated Controller fitted onto PRV to reduce pressure further during night

CONCEPT OF PRESSURE MANAGEMENT

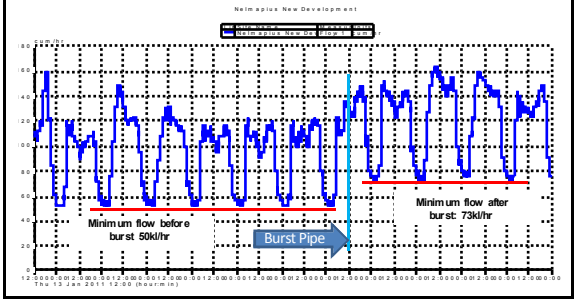
PRV AND CONTROLLER INSTALLATION IN CoT

PRESSURE MANAGEMENT (NELLMAPIUS EXT 8)



NELLMAPIUS Ext 6,7,8: BURST PIPE

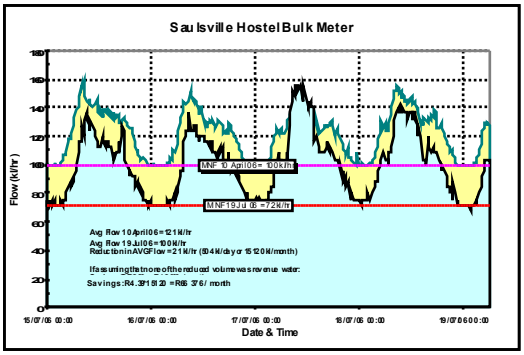
- Picked up through remote GSM measurement of flow and pressures at selected points throughout CoT reticulation network
- No payment in Nelmapius Ext 6,7,8 and therefore unlikely that residents would have reported leak.



NELLMAPIUS Ext 6,7,8 BURST PIPE

Burst pipe, leaking at 23kl/hr was repaired by O&M staff. If burst was not picked up through remote measurement it could have leaked :
In 1 month: 16 000kl/m @R4.39 = R73 000/m
In 1 year: 200 000kl/yr @R4.39 = R880 000/yr

PRESSURE MANAGEMENT
Temporary intervention at Saulsville Hostel

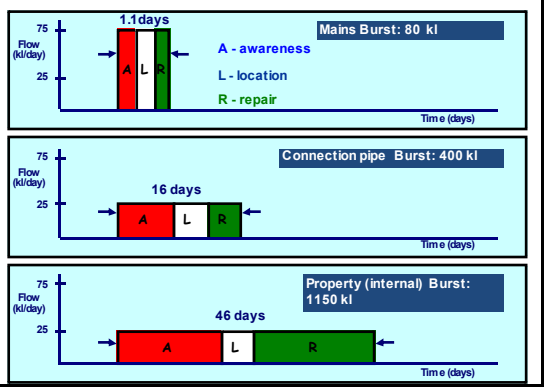


MAINTENANCE OF RETICULATION SYSTEM & METERS: 2010

- 32 760 bursts/leaks repaired
- 59 027 water meters replaced
- 183 km length of mains replaced

(values excluding ODI and Temba)

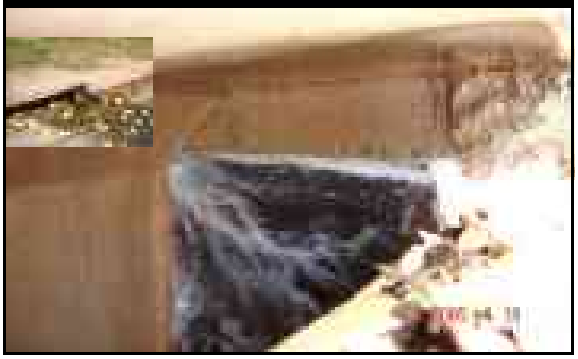
DIFFERENCE IN LEAKAGE VOLUMES



40 m^3/hr for 6 hours = 240 m^3 at R5/m^3 = ± R1200

200 m^3/hr for 3 hours = 600 m^3 at R5/m^3 = ± R3 000

0.5 m^3/hr for 3 years = 13 140 m^3 at R5/m^3 = ± R65 000



SUMMARY OF WDM INTERVENTIONS BY CoT OVER LAST FEW YEARS

- Preparing detailed monthly water balance (very few municipalities in RSA prepare regular water balances)
- Meter Audits in 15 Industrial Areas (2427 connections audited) 126 unmetered connections located, 240 existing meters required replacement. Results determined for 4 of 15 areas to date. Increase in Revenue for CoT for 4 areas = R3mil/yr.
- Meter Audits for all irrigated road islands (293 connections): 7 unmetered connections located, 66 meters require replacement. Impact to be determined by mid 2011.

SUMMARY OF WDM INTERVENTIONS BY CoT OVER LAST FEW YEARS

- 2179 domestic meters installed for unmetered houses in Mamelodi and Soshanguve in 2009. If a low consumption of 15kl per property per month assumed then additional metered consumption of 292 220kl/yr @ R6.71 = additional income of R2.6 mil/yr.
- 115 bursts/leaks repaired per day
- 144 water meters replaced per day
- 500m length of mains replaced per day

SUMMARY OF WDM INTERVENTIONS BY CoT OVER LAST FEW YEARS

- 582 illegal connections found and removed/legalised in 2009/10 (this excludes un-metered connections located in industrial areas)
- 50 School's workshops held in 2009/10 to promote water conservation
- 47 Community workshops held in 2009/10 to promote water conservation

SUMMARY OF WDM INTERVENTIONS BY CoT OVER LAST FEW YEARS

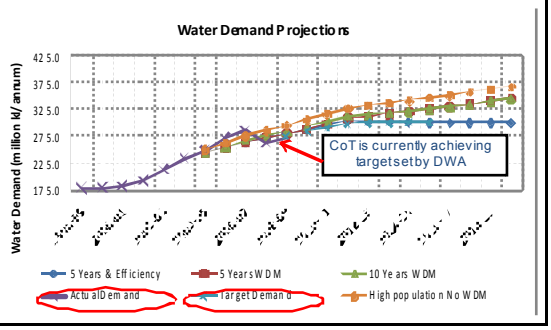
Pressure Management initiatives (excluding annual servicing of all pressure reducing valves)

Pressure management Area	Savings kl/yr	Savings in R/yr (Based on R4.39/kl)
Mamelodi Ext 11	20 000	87 000
Nelmapius Ext 3,4	365 000	1 602 000
Nelmapius Ext 8	230 000	1 009 000
Valhalla	52 000	228 000
Lotus Garden	100 000	439 000

ACHIEVEMENTS OF CoT REGARDING WATER LOSS REDUCTION

- First prize in DWA national Water Demand Management Sector Awards in 2009.
- Over the last three years CoT has managed to reduce the water demand and water losses consistently
- According to DWA Project 15% , the CoT has the lowest percentage UAW of all Metros in the RSA
- CoT is one of the few Municipalities/Metros that is currently closest to achieving the required water demand targets set by DWA for project 15%

DWA PROJECT 15% WATER DEMAND TARGET FOR CoT (PROJECT AIMED AT REDUCING WATER DEMAND BY 15%)



THE WAY FORWARD

Increased funding to implement more initiatives to reduce UAW (NRW) and to sustain the initiatives that are already undertaken:

- R 100 million p.a. required to replace AC pipes over 10 years,
- R 4,5 million p.a. for new PRV installations
- Install 55 000 WMD's over 5 years at R 12,6 million p.a.
- Initiate programmes to repair / retrofit customer internal water systems and cisterns at R5 million p.a.
- Formalisation of 20 000 un-proclaimed erven in new townships and installing water meters over 2 years at R10 million p.a.
- Improve reaction time for repairing water leaks

Thank You