

**Water Reconciliation Strategy Study  
for the Kwazulu-Natal Coastal  
Metropolitan Areas**

**Second Study Steering Committee  
Meeting**

28 February 2008

**Agenda**

- WELCOME AND INTRODUCTION
- ATTENDANCE AND APOLOGIES
- ACCEPTANCE OF AGENDA
- APPROVAL OF MINUTES
- FUNCTIONING OF STUDY STEERING COMMITTEE
- STAKEHOLDER ENGAGEMENT
- TEA BREAK
- KZN WATER RECONCILIATION STRATEGY (PRESENTATIONS)
- DISCUSSION AND COMMENTS
- STRATEGY STEERING COMMITTEE
- GENERAL
- CLOSURE AND NEXT MEETING DATE
- LUNCH

**Water Reconciliation Strategy Study  
for the Kwazulu-Natal Coastal  
Metropolitan Areas**

**FUNCTIONING OF SSC**

28 February 2008

**Confirmation of Membership**

- Public/information meeting (20 June 07):
  - Sectors identified
  - Nominations received at meeting
- DWAF reviewed i.t.o gaps (sector representation)
- Liaison with relevant organisations
- Further gaps identified at 1<sup>st</sup> SSC meeting
- Liaison with relevant organisations

**Membership**

National Government	DEAT DoA DWAF (Nat and Prov)
Provincial Government	Office of Premier Dept Agriculture & Environmental Affairs Dept Local Govt & Traditional Affairs Dept Economic Development
Local Government	eThekwini Msunduzi uMgungundlovu Ugu iLembe
Research / Universities	University of KZN SA Sugarcane Research Institute
Organised Business and Industry	Dbn Chamber of Commerce & Industry PMB Chamber of Business

**Membership (continue)**

Parastatals	Umgeni Water
NGOs and CBOs	Wildlife and Environmental Society of SA (WESSA) KwaNaLoga Siyanyuka Communications Sakhakuyekubekuhle Catchment Management Fora
Organised Commercial Forestry	Forestry SA (FSA)
Conservancy	Blythedale Conservancy & KZN Wildlife Ezemvelo KZN Wildlife KZN Conservancies Association
Organised Agriculture	South African Sugar Association (SASA) KZN Agricultural Union (KWANALU) Nat African Farmers Union of SA (NAFU)

## Roles and Responsibilities

### Proposed overall responsibility

To give guidance in steering the study by providing advisory support to the study team, identifying problems and / or problem areas in the study as well as sensitive technical and political issues

## Proposed Terms of Reference

- Executive support, guidance and commitment to the direction and outcomes of the study
- Share / facilitate the sharing of information / data where possible
- Facilitate strategic linkages with other projects and stakeholders
- Study reports and provide comments
- Provide strategic advise
- Provide feedback to constituencies
- Act in the interest of the study and promote consensus

## Steering Committee Arrangements

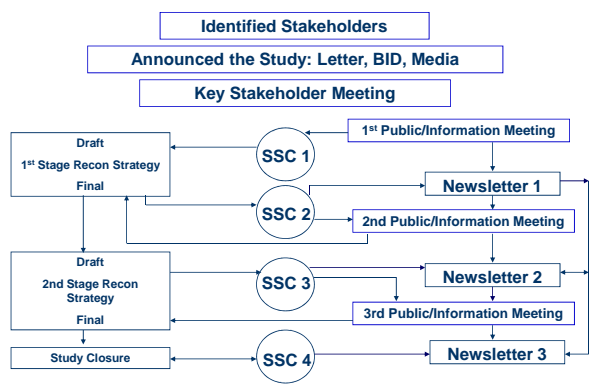
- Voluntary institution
- Stakeholder Engagement Office to provide secretarial support:
  - Recording proceedings
  - Formulate into document and distribution of it
  - Arrange meetings

## SSC

### Preliminary Meeting Dates and Process

- 18 October 07 – first meeting
  - SSC agree on arrangements
  - Study team to give feedback on progress
  - Discussions
- 28 February 08 – present meeting
  - Study team to present 1<sup>st</sup> stage strategy
  - Discussions
- 12 June 08 – next meeting
  - Study team report progress on study
  - Discussions
- 26 February 09
  - Study team present 2<sup>nd</sup> stage strategy
  - Discussions

## Process of Stakeholder Engagement



## Public / Information Meeting

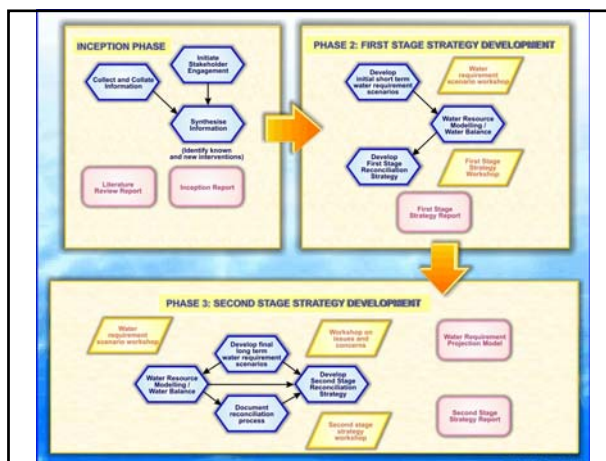
Booking of venue	Finalising
Invitation to stakeholders	3.3.08
Publish advertisements	13/14.3.08
Draft agenda / documents	14.3.08
Reminders to stakeholders	17 & 26.3.08
Dry run	Week 25.3.08
Public meeting	31.3.08

## TEA BREAK

## RECONCILIATION STRATEGY PRESENTATIONS

### Presentation Layout

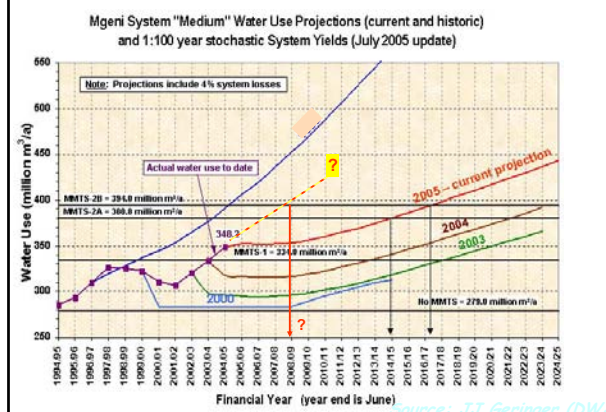
- INTRODUCTION AND OVERVIEW
- PLANNING SCENARIOS WATER REQUIREMENTS AND RETURN FLOWS
- WATER CONSERVATION AND WATER DEMAND MANAGEMENT INTERVENTIONS
- WATER QUALITY MANAGEMENT REQUIREMENTS AND REUSE
- INFRASTRUCTURE OPTION
- ENVIRONMENTAL CONSIDERATIONS
- RESULTS OF SCENARIO ASSESSMENT
- FIRST STAGE RECONCILIATION STRATEGY
- WAY FORWARD



### Scope of work – tasks

- **TASK 1: INCEPTION PHASE**
  - 1.1 Assemble and assimilate available information (Compile Literature Review Report)
  - 1.2 Prepare inception literature review reports
- **TASK 2: FIRST STAGE RECONCILIATION STRATEGY**
  - 1.2 Develop short term water requirement and return flow scenarios
  - 2.2 Assess intervention options
  - 2.3 Develop first stage reconciliation strategy
  - 2.4 Compile first stage reconciliation strategy report
- **TASK 3: SECOND STAGE RECONCILIATION STRATEGY**
  - 3.1 Develop long term water requirement and return flow scenarios
  - 3.2 Assess sequence of intervention options – develop second stage reconciliation strategy
  - 3.3 Document reconciliation process
  - 3.4 Consideration of other issues and concerns
  - 3.5 Compile second stage reconciliation strategy document
- **TASK 4: STAKEHOLDER ENGAGEMENT PROCESS (Public Participation)**
- **TASK 5: STUDY MANAGEMENT**

### What's the Challenge?



## Water Requirement and Return Flow Scenarios



## Population Scenarios

- Three scenarios; high, medium and low were developed.
- Take account of growth prospects in context of regional planning and recent as well as expected development trends.

## Key Findings

- **Key variables for demographic projections**
  - AIDS impact uncertainties
  - land-use & urbanisation
  - political-economic possibilities
- **Low road : political-economic decline. 40% margin below median growth projections for 2030**
- **High road : HIV / ARV Solutions, sustained economic growth. 40% margin above median growth projections for 2030**

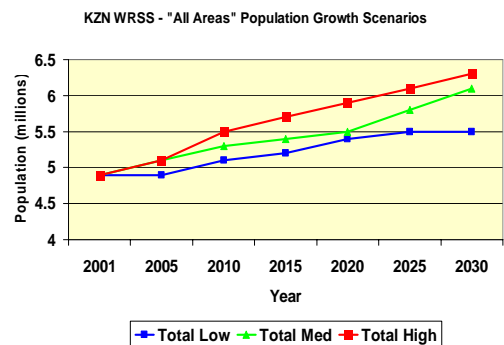
## Key Findings, cont.

- **Overall population growth projections:**
  - 0.7% pa : best estimate
  - 1% pa : High Road
  - 0.4% pa : Low Road
- **Key growth corridors**
  - N2 - Durban-Stanger (best estimate growth rate, North : 1.2% pa)
  - N3 - Durban-Pietemartizburg (best estimate growth rate, West : 0.9% pa)
- **2030 Total Population:**
  - Low Road : 5.6m
  - Best Estimate : 6.0m
  - High Road : 6.5m

## Key Findings, cont.

- **Domestic consumption comprises 60%-65% of supply to Ethekwini Municipality and Msunduzi Municipality**
- **Overall Water demand growth in Ethekwini has been 2.6% pa since 2005**
- **Biggest driver of water demand increases is coming from upgraded service levels and new low income housing, rather than the developed urban sector**

## Population Scenarios



### Dr J McCarthy Population Estimates for Study Area

Year	Total Low (x10 <sup>6</sup> )	Average annual increase for each 5-year period (%)	Total Med (x10 <sup>6</sup> )	Average annual increase for each 5-year period (%)	Total High (x10 <sup>6</sup> )	Average annual increase for each 5-year period (%)
2001	4.9		4.9		4.9	
2005	4.9	0.00%	5.1	1.01%	5.1	1.01%
2010	5.1	0.80%	5.3	0.77%	5.5	1.52%
2015	5.2	0.39%	5.4	0.37%	5.7	0.72%
2020	5.4	0.76%	5.5	0.37%	5.9	0.69%
2025	5.5	0.37%	5.8	1.07%	6.1	0.67%
2030	5.5	0.00%	6.1	1.01%	6.3	0.65%

### Stats SA 2007 Mid-Year Population Estimates for KwaZulu-Natal

Year	KZN Population Estimates	year-on-year growth rate (%)	Average annual growth rate since 2001 (%)
2001	9,429,007		
2002	9,534,696	1.12%	1.12%
2003	9,637,934	1.08%	1.10%
2004	9,738,305	1.04%	1.08%
2005	9,837,158	1.02%	1.07%
2006	9,924,222	0.89%	1.03%
2007	10,014,393	0.91%	1.01%

From Stats SA 2007 Mid-year report

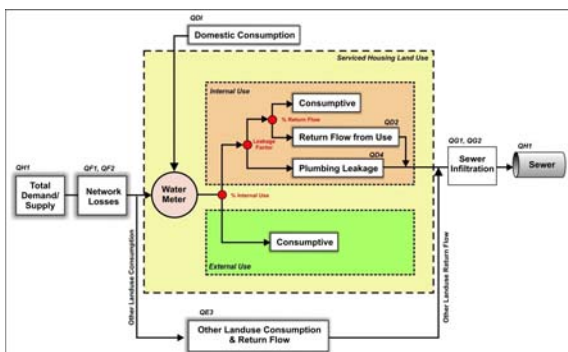
### Comments on Stats SA 2007 Mid-year Estimates

- Stats SA :
  - KZN population growth rates declining fastest nationally
  - Fertility rates declining at 10%pa over 5 years
  - Life expectancy to drop from 47 yrs for period 2001-2006, to 45 years for period 2006-2011
  - Ethekwini had the lowest inter-censual (1996-2001) population of all major SA Metro's

### Comments on Data

- Dr J McCarthy :
  - Inward migration to Ethekwini now being countered by declining rural populations
  - Ethekwini Transport Authority Study : growth rate of 1%pa to 2030
  - Growth rates will be highest in Northern and Western areas of study

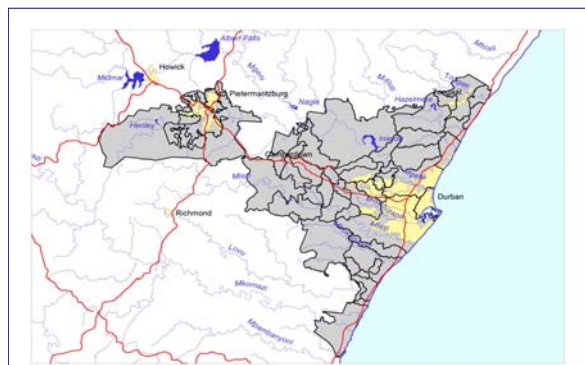
### Demand and Return Flow Model



### Water Requirements and Return Flow Modelling

- Configured model for 53 SDAs
- Split water use into direct and indirect.
- Calibration based on year 2006 data.
- Data integrity good for Ethekwini, poor for Msunduzi

## Map of SDAs



## Key Data in the Model Calibration

Major Sewerage Drainage Area Water Demands :  
Ethekwini & Msunduzi

DA Name	Demand (million m <sup>3</sup> /a)		
	Domestic	Non Domestic	Total
SOUTHERN WORKS	47.68	29.13	76.81
CENTRAL	13.61	17.04	30.65
NORTHERN	26.76	5.49	32.25
KWA MASHU	36.14	4.68	40.82
PHOENIX	21.02	0.26	21.28
*DARVILL	33.54	4.35	37.89

## User Demand Categories

Serviced Housing Category	Description
Category 1	Fully serviced houses on large erven (erven > 500 m <sup>2</sup> )
Category 2	Fully serviced flats, townhouses or cluster homes
Category 3	Fully serviced houses on small erven (erven < 500 m <sup>2</sup> )
Category 4	Small houses, RDP type houses and shanties with water connection, but no or minimal sewage service
Category 5	Informal houses serviced only by communal taps and no water borne sewage
Category 6	No service from any water distribution System
Category 7	Other/Miscellaneous (Includes hostels, military camps, etc.)

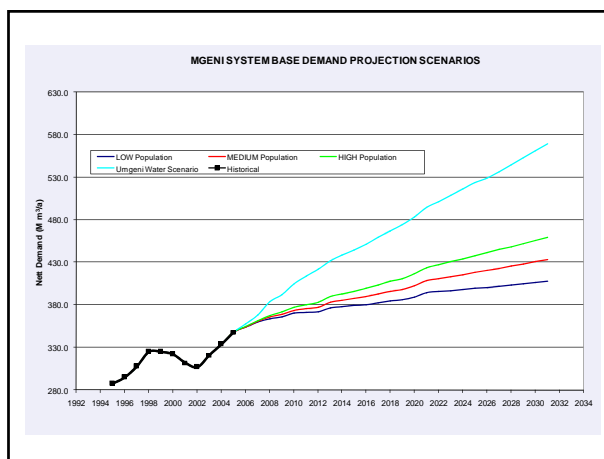
## Key Data in the Model Calibration

Major Sewerage Drainage Area Unit Water Demands :  
Ethekwini & Msunduzi

DA Name	Unit Consumption (l/capita/day)						
	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	CAT 6	CAT 7
SOUTHERN WORKS	225	225	70	50	7	5	50
CENTRAL	320	320	170	80	15	10	80
NORTHERN	300	300	160	70	10	7	70
KWA MASHU	320	320	150	80	15	10	80
PHOENIX	360	360	250	180	150	30	130
*DARVILL	390	390	240	140	55	25	140

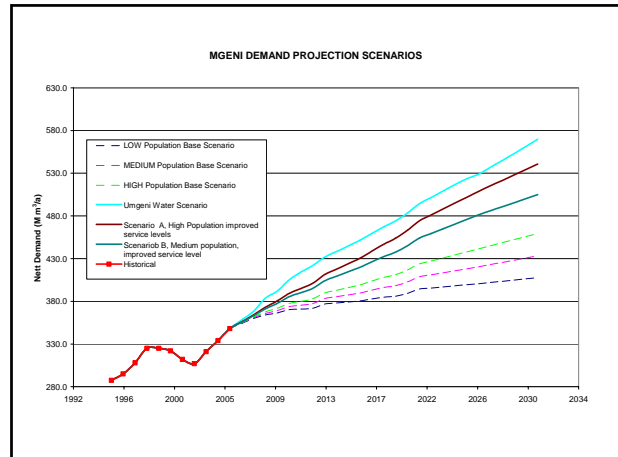
## Water Requirements and Return Flow Scenarios

- **Base Scenarios:**
  - Three population scenarios
  - Portion of population in housing categories remain as in 2006.
  - In-direct use component grown to same ratio as direct use.



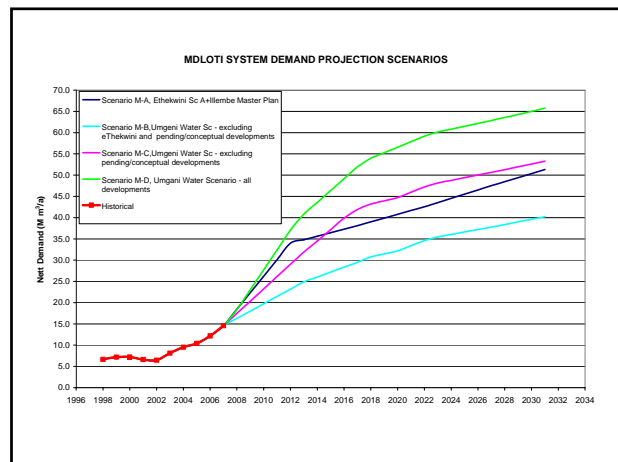
## Water Requirements and Return Flow Scenarios

- **Base Scenario, with improved service levels:**
  - Assume increase in population portion into higher housing service level categories.
  - In-direct water use grown in same proportion as direct.
  - Per capita water use in housing service categories remain unchange.



## Mdloti System Scenarios

- **Mdloti System:**
  - Illembe Master Plan and Scenario A for Ethekwini Portion (Scenario M-A)
  - Umgeni Water Scenario (Scenario M-B)
    - Excluding pending and conceptual future development components.
  - High Mgeni Water Scenario (Scenario M-C)
    - Including pending and conceptual future development components.



## Far North Coast Scenarios

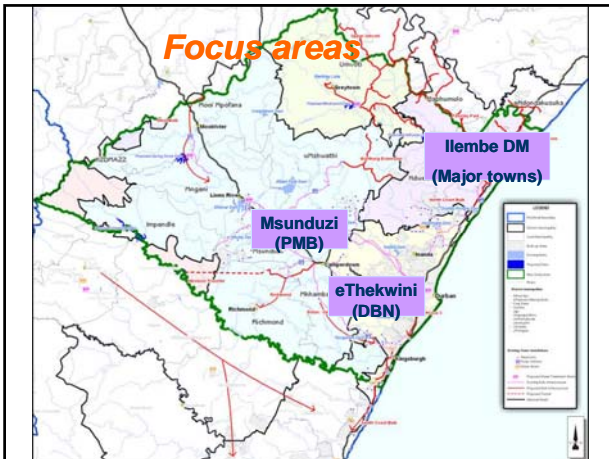
- **Illembe Master Plan (Option 6):**
  - Ngcebo Scheme, supply from Middeldrift on Thukela.
  - Sundumbili and areas north of the Thukela River.

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### Water Reconciliation Strategy Study for the Kwazulu-Natal Coastal Metropolitan Areas

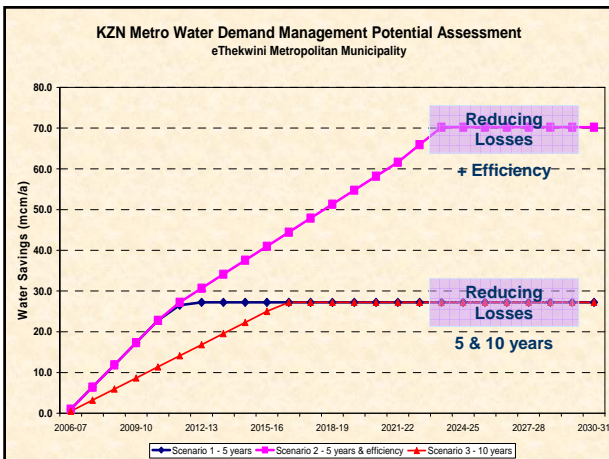
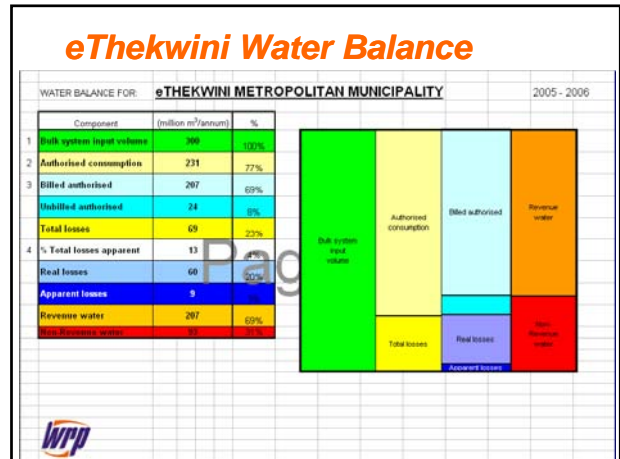
### Urban, Industrial, Mining and Power WC/WDM Potential Assessment

28 February 2008



- ### Scenarios
- Scenario 1**
    - Reduce losses over 5 years and sustain
  - Scenario 2**
    - Reduce losses over 5 years and introduce efficiency after 5 years
  - Scenario 3**
    - Reduce losses over 10 years and sustain

- ### Considerations
- Not all components of non-revenue water will reduce consumption – must be billed and paid for
  - Model does not allow for future losses – assume demand of future developments will be controlled
  - Costs do not include components of maintenance



### eThekweni WC/WDM targets

	Current	Scenario 1 5 years	Scenario 2 5 yrs & eff	Scenario 3 10 years
litres/capita/day	262	240	202	239
m <sup>3</sup> /household/month	31	29	24	29
% Reduction	-	9	23	9
ILI	4.6	2.0	2.0	2.0

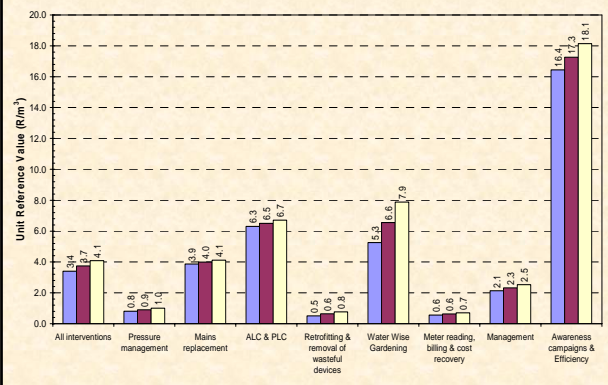
### eThekweni Cost Analysis

NPV * (R million)	Scenario 1 5 years	Scenario 2 5 yrs & eff	Scenario 3 10 years
CAPEX	626.9	669.9	587.9
OPEX	920.2	1 265.2	920.2
TOTAL	1 547.1	1 935.1	1 508.1
SAVINGS (million m <sup>3</sup> )	413.7	875.0	354.3
URV ( R / m <sup>3</sup> )	3.74	2.21	4.26
Reduced payment to Umgeni Water	860.8	1 582.1	745.9
Additional income to eThekweni	808.8	760.4	634.3

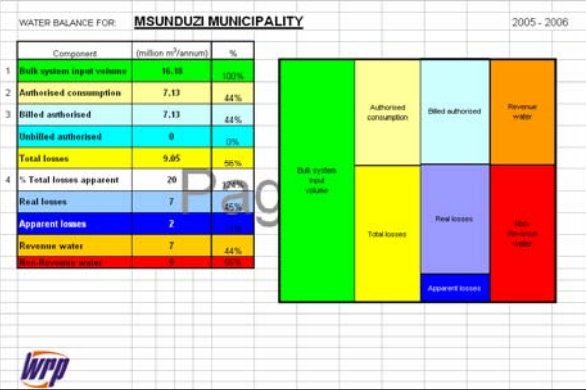
\* NPV - @ 8% over 45 years

### KZN METRO WC/WDM POTENTIAL ASSESSMENT

eThekweni Metro Unit Reference Values - Scenario 1

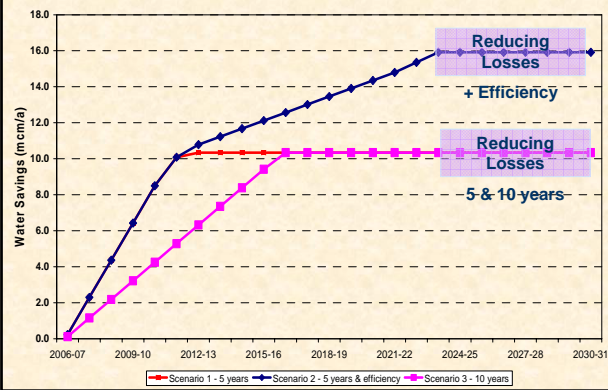


### Msunduzi Water Balance



### KZN Metro Water Demand Management Potential Assessment

The Msunduzi Local Municipality



### Msunduzi WC/WDM targets

KPI	Current	Scenario 1 5 years	Scenario 2 5 yrs & eff	Scenario 3 10 years
litres/capita/day	360	287	249	287
m <sup>3</sup> /property/month	46	37	32	37
% Reduction	-	21	31	21
ILI	9.6	2.0	2.0	2.0

### Msunduzi Cost Analysis

NPV * (R million)	Scenario 1 5 years	Scenario 2 5 yrs & eff	Scenario 3 10 years
CAPEX	101.5	101.5	90.1
OPEX	105.4	150.7	105.4
TOTAL	206.9	252.2	195.4
SAVINGS (million m <sup>3</sup> )	161.8	220.6	144.1
URV ( R / m <sup>3</sup> )	1.28	1.14	1.36
Reduced payment to Umgeni Water	324.6	413.3	271.3
Additional income to eThekweni	348.5	348.5	321.8

\* NPV - @ 8% over 45 years

### Ilembe DM area

KPI	Siza Water	Stanger
litres/ capita/ day	500	206
m <sup>3</sup> / household/ month	43	23
% Non revenue	10%	15%
ILI	< 1	±3

### Industrial, Mining & Power Sectors

- Most major IMP consumers are monitored to international benchmarks and implementing WC/WDM
- Smaller industrial consumers are not closely monitored and have considerable scope for WC/WDM

### Key Constraints

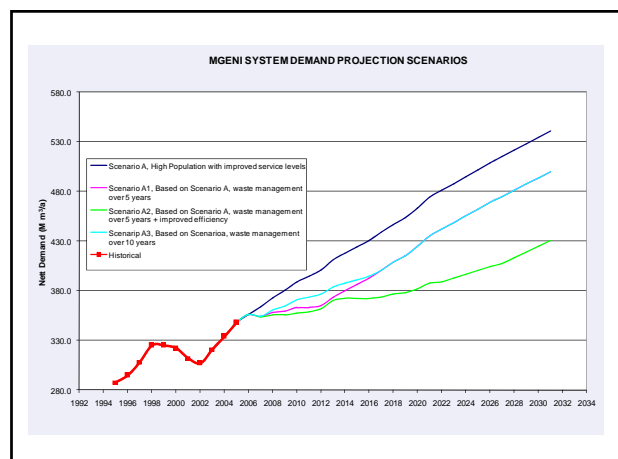
- Human resources
- Technical skills
- Political & technical motivation
- Funding
- Payment for services
- Consumer perceptions

### Summary and Conclusions 1

- WDM can achieve significant savings
- WDM costs are significant and OPEX costs exceed CAPEX costs
- Highest quality fittings should be used in poor areas
- Government should encourage WDM activities – rain water harvesting, low flow plumbing fixtures, etc

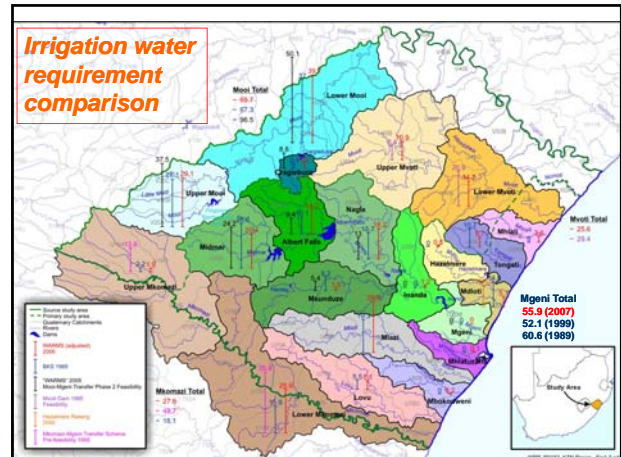
### Summary and Conclusions 2

- Lack of maintenance will result in many systems deteriorating into intermittent supply if action is not taken quickly
- Municipalities should be encouraged to combine technical and financial services into a single unit
- Garden irrigation should be prohibited in all areas where water is not billed based on proper metered consumption



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## IRRIGATION WATER REQUIREMENTS


### WC/WDM in Irrigation Sector

- Department of Agriculture is following a strategy where savings in water use from WC/WDM is made available for expansion within the sector.
- Return flows from Irrigation is utilised by downstream users.
- WC/WDM measures reduce return flows and the nett effect on the system has to be considered when determining the savings.

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## WATER QUALITY MANAGEMENT REQUIREMENTS AND REUSE

(Handouts to be provided)



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## Infrastructure Options



### Water Resource Development Options (1 of 4)

- Cost estimates exclude VAT
- Costs include:
  - engineering fees
  - land acquisition
  - social & environmental work
- Previous estimates have been escalated to Dec 2007 values

## Water Resource Development Options (2 of 4)

- Mooi-Mgeni Transfer Scheme (Spring Grove Dam & pump main):
  - Yield contribution: 60 million m<sup>3</sup>/ annum
  - Capital costs: R 368 million
  - Delivery date: End 2011 (pending RoD)
- Mkomazi-Mgeni augmentation option (Smithfield Dam & bulk infrastructure).
  - Yield contribution: 147 million m<sup>3</sup>/ annum
  - Capital costs: R3 100 million
  - Delivery date: Estm. 2017 (dependant on further studies)
- South Coast Pipeline Phase 1:
  - Capacity: 65 Ml/day AADD ( 24 million m<sup>3</sup>/ annum )
  - Capital costs: R230 million
  - Delivery date: Mid 2008 (under construction)

## Water Resource Development Options (3 of 4)

- Lower Mkomazi River :
  - Studies to determine use as source for South Coast Pipeline
  - Will be guided by results of Mkomazi-Mgeni augmentation feasibility studies
- Raising of Hazelmere Dam:
  - Yield contribution: 14 million m<sup>3</sup>/ annum (2030; 98% assurance)
  - Capital costs: R41 million
  - Delivery date: 2009
- North Coast Pipeline Upgrade:
  - Capacity increase: 78 Ml/day (28.5 million m<sup>3</sup>/ annum )
  - Capital costs: (currently being designed)
  - Delivery date: 2009

## Water Resource Development Options (4 of 4)

- Mvoti River Development Option:
  - Isithundu Dam or Welverdient Dam
  - Isithundu Dam & Mvoti View bulk water supply system:
    - Yield contribution: 34 million m<sup>3</sup> / annum firm (51 million m<sup>3</sup> dam size)
    - 47 million m<sup>3</sup> / annum firm (102 million m<sup>3</sup> dam size)
    - Capital costs: R 838 million (June1996; 51 million m<sup>3</sup> dam)
    - Delivery date: 2017 (pending comparisons with Welverdient Dam and lower Thukela piped supply)
- Lower Thukela supply to North Coast:
  - Capacity: Excess Yield.
  - Capital costs: R 430 million (Mhlathuze Water proposal)
  - Delivery date: 2012 (pending comparisons with iSithundu & Welverdient Dams)
  - Studies required. Seen as interim solution.

## Infrastructure: Further work proposed

- Mgeni area
  - Compare effluent re-use with development of resources
- Northern area
  - Which is most viable: isiThundu Dam, or Welverdient Dam
  - Viability of Lower Thukela supply system?

## Environmental Considerations

(Handouts to be provided)

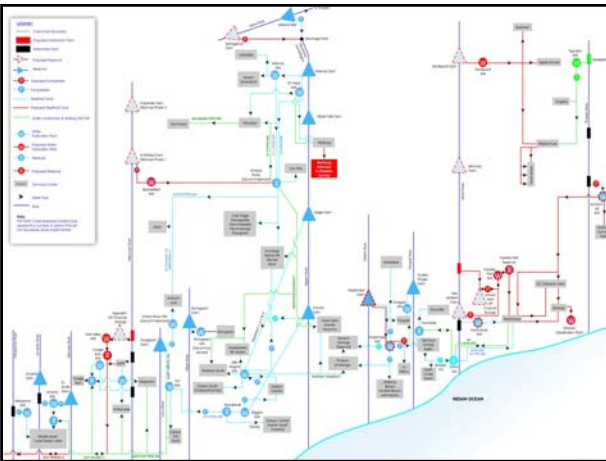
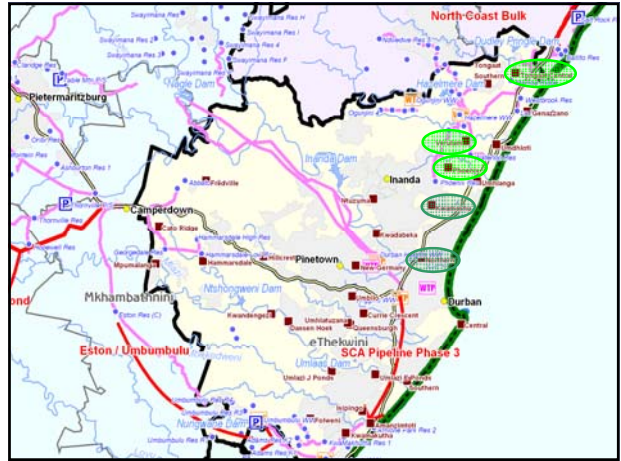
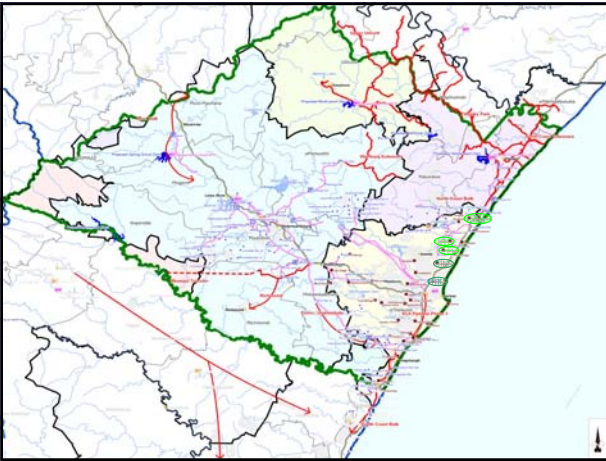
## RESULTS OF SCENARIO ASSESSMENT

## Reconciliation Scenarios

- Projected yield balances, current system yield capability.
- Scenario I:
  - WC/DM Waste management over 5 years.
  - Utilising Thukela Transfer Scheme to support KwaDukuza & Mdloti System
  - Raise Hazelmere Dam
  - Incorporate Water Reuse
  - Incorporate MMTS Phase 2 and Mkomazi Transfer Scheme
- Scenario II:
  - WC/DM waste management over 5 years.
  - Mvoti development to support KwaDukuza. & Mdloti System
  - Raise Hazelmere Dam
  - Incorporate Water Reuse
  - MMTS Phase 2 and Mkomazi Transfer Scheme

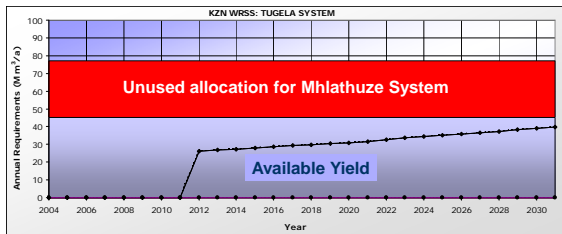
## Reconciliation Scenarios

- Scenario III:
  - WC/DM waste management and improve efficiency
  - Schedule augmentation interventions according to water balance
- Scenario IV:
  - Similar to Scenario I:
  - Treated wastewater from Verulam and Tongaat WWTP used to supply the estuarine water requirements for the Mdloti and Tongati Rivers (Further investigations is necessary to confirm EWR and water balance)



## Existing Yield Scenario

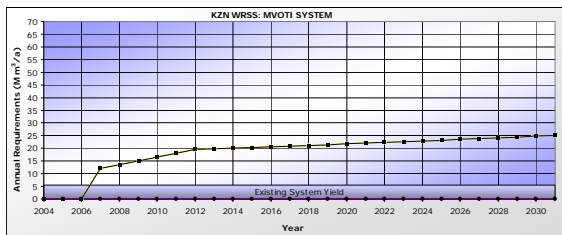
### Tugela System



### Thukela System Water Balance

- Applied the Illembe Master Plan supply Option 6.
- Supply through Ncgebo Scheme and extend supply from Sundumbili to areas north of Thukela River.
- Excess water available if Mhlathuze Water's allocation from Thukela is made available to support KwaDukuza.
- Utilising the Thukela System's excess yield does not require a new storage dam.
- Thukela should be investigated as an alternative to the Mvoti River Development Option.

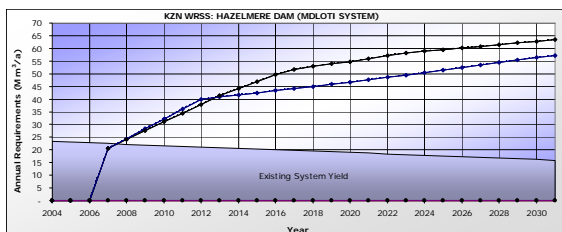
### Mvoti System



### Mvoti System Water Balance

- Current river-runoff yield limited.
- Large deficit in supply – need urgent augmentation.
- Short term: Restrictions and limited support through the proposed North Coast Augmentation Pipeline from Mdloti River System (Hazelmere Dam).
- Mdloti River System water balance also in deficit – require urgent augmentation.

### Mdloti System (Hazelmere)

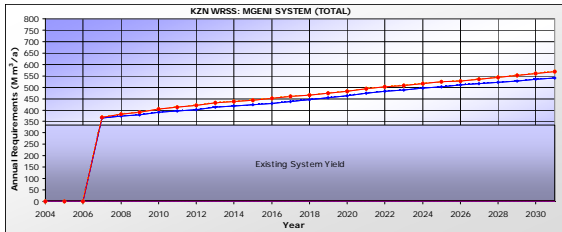


Water Requirement Scenarios:  
**Scenario M-A: Ethekeini Scenario A + Illembe Master Plan**  
**Scenario M-B: Umgeni Water Scenario, excluding pending and conceptual planned developments**

### Mdloti System Water Balance

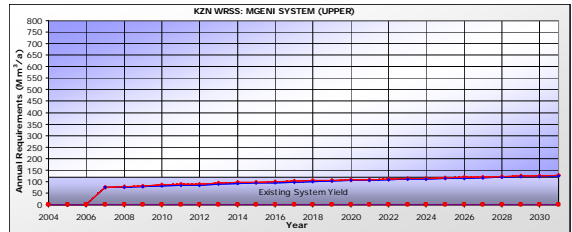
- Deficits in supply from start of period.
- Implement raising of Hazelmere Dam
- Phase the implementation of the EWR.
- Review Irrigation water use from Hazelmere Dam
- Estimated current use 5.8 million m<sup>3</sup>/a (applied in water balance)
- Irrigation allocation 12.6 million m<sup>3</sup>/a – in process of deregistering.

### Mgeni System (Total)



**Water Requirement Scenarios:**  
**Scenario A: No further WC/WDM measures**  
**Scenario A1: Scenario A with waste management over 5 years**

### Mgeni System (Upper)



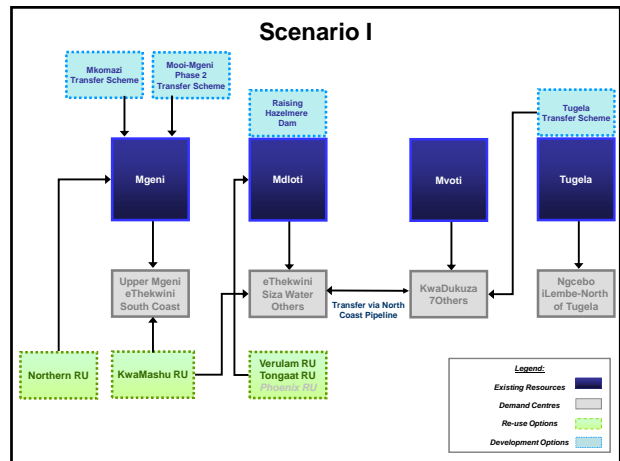
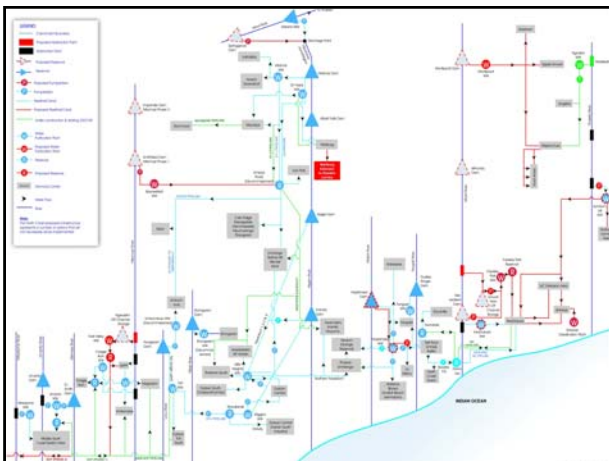
**Water Requirement Scenarios:**  
**Scenario A: No further WC/WDM measures**  
**Scenario A1: Scenario A with waste management over 5 years**

### Mgeni System Water Balance

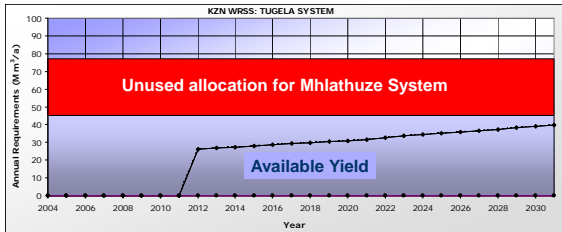
- Deficits from 2008 onwards.
- Upper Mgeni River System require augmentation by 2028.

### Reconciliation Scenario I

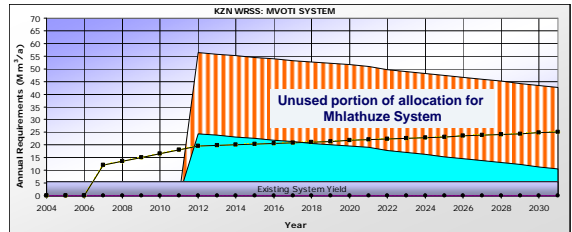
- WC/DM waste management over five years.
- Thukela Transfer Scheme to support KwaDukuza & Mdloti System
- Raise Hazelmore Dam
- Water Reuse
- MMTS Phase 2 and Mkomazi Transfer schemes
- Scenario Ia: Partial utilisation of the Thukela excess
- Scenario Ib: Full utilisation of the Thukela excess



**Scenario I: Tugela System**



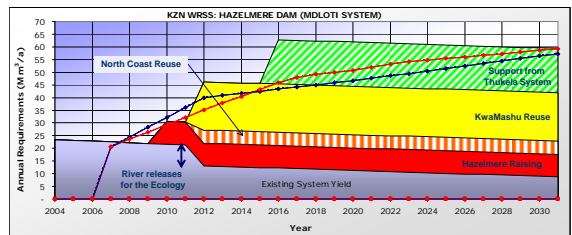
**Scenario I: Mvoti System**



**Mvoti System Water Balance (Reconciliation Scenario I)**

- Short term deficit in supply up to the year 2012 – when the Thukela option can deliver water.
- Maximise utilisation of local resources over the short term.
- Short term: Support from Mdloti System, via the proposed North Coast Pipeline, during emergency drought situations.
- Utilizing Mhlathuze Water's Allocation provides sufficient yield to support the water requirement beyond 2030.

**Scenario I: Mdloti System (Hazelmere)**

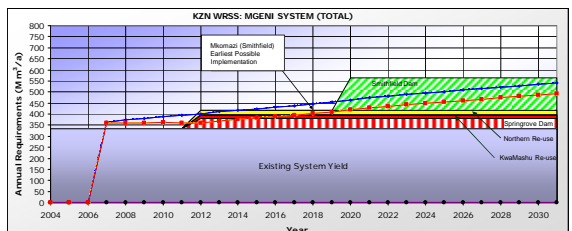


**Water Requirement Scenarios:**  
**Scenario M-A: Etsekwini Scenario A + Illebebe Master Plan**  
**Scenario M-B: Umgeni Water Scenario, excluding pending and conceptual planned developments**

**Mdloti System Water Balance (Reconciliation Scenario I)**

- Short term deficit in supply.
- Augmentation options:
  - Raising of Hazelmere Dam.
  - Reuse of water from Verulam and Tongaat – water supplied into Hazelmere Dam
  - Direct reuse from KwaMashu WWTW
  - Support from Tugela via North Coast Pipeline.

**Scenario I: Mgeni System (Total)**



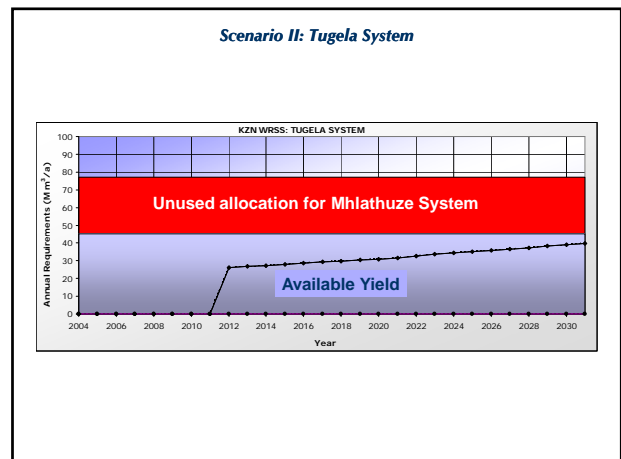
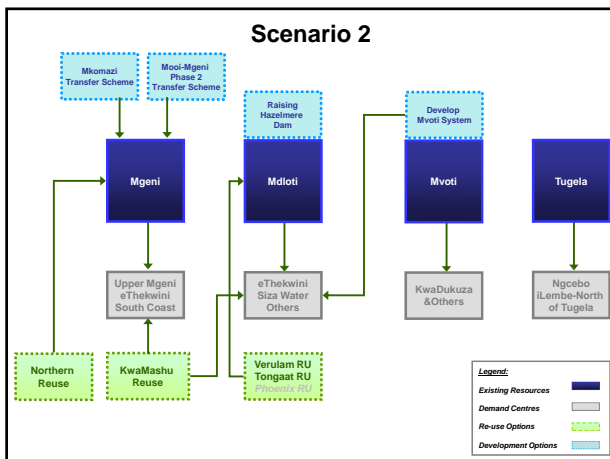
**Water Requirement Scenarios:**  
**Scenario A: No further WC/WDM measures**  
**Scenario A1: Scenario A with waste management over 5 years**

## Mgeni System Water Balance (Reconciliation Scenario I)

- Short term deficit in supply.
- Maximize utilisation of local resources in the South Coast Area over the short term.
- Interventions:
  - WC/WDM, Scenario A1, waste management over five year period.
  - Mooi-Mgeni Transfer Scheme Phase 2
  - Reuse from KwaMashu and Northern WWTW.
  - Mkomazi Transfer Scheme.
- Further possible interventions:
  - Trading of Irrigation Water Rights (+50 mcm/a – Mgeni System)

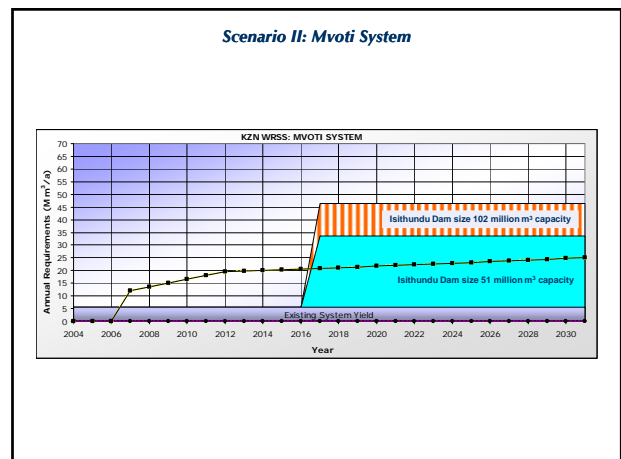
## Reconciliation Scenarios

- Projected yield balances, current system yield capability.
- Scenario I:
  - WC/DM Waste management over 5 years.
  - Fully utilise Thukela Transfer Scheme to support KwaDukuza & Mdloti System
  - Raise Hazelmere Dam
  - Water Reuse
  - MMTS Phase 2 and Mkomazi Transfer Scheme
- Scenario II:
  - WC/DM Waste management over 5 years.
  - Mvoti River development to support KwaDukuza & Mdloti System.
  - Raise Hazelmere Dam
  - Incorporate Water Reuse
  - MMTS Phase 2 and Mkomazi Transfer Scheme



## Thukela System Water Balance (Reconciliation Scenario II)

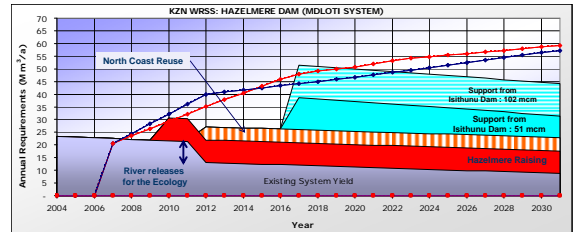
- Applied the Illembé Master Plan supply Option 6.
- Supply through Ngebo Scheme and extend supply from Sundumbili to areas north of Thukela River.
- Assume Mhlathuze Water requires their allocation from the Thukela System – no support possible to Kwa Dukuza from the Thukela.



## Mvoti System Water Balance (Reconciliation Scenario II)

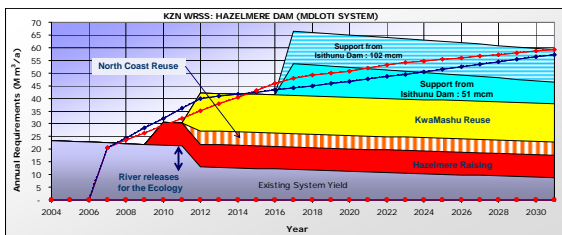
- Current river-runoff yield limited.
- Large deficit in supply until the Mvoti System Development can be implemented.
- Short term: Restrictions and limited supply through proposed North Coast Augmentation Pipeline supported from Mdloti River System (Hazelmere Dam).
- Support the Mdloti River System from Mvoti System Development over the long term – reverse flow through the North Coast Pipeline.

## Scenario II: Mdloti System (Mvoti Support)



**Water Requirement Scenarios:**  
**Scenario M-A: Ethekweni Scenario A + Ilembe Master Plan**  
**Scenario M-B: Umgeni Water Scenario, excluding pending and conceptual planned developments**

## Scenario II: Mdloti System (Mvoti + KwaMashu Support)

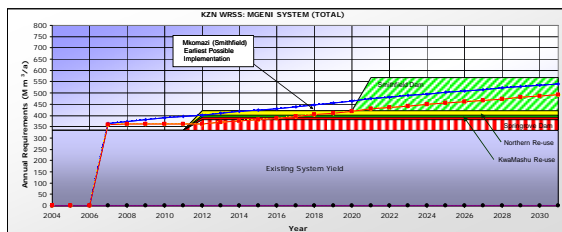


**Water Requirement Scenarios:**  
**Scenario M-A: Ethekweni Scenario A + Ilembe Master Plan**  
**Scenario M-B: Umgeni Water Scenario, excluding pending and conceptual planned developments**

## Mdloti System Water Balance (Reconciliation Scenario II)

- Augmentation options:
  - Raising of Hazelmere Dam.
  - Reuse of water from Verulam, Tongaat – water supplied into Hazelmere Dam.
  - Phased implementation of the Ecological Water Requirements.
  - Transfer from the Mvoti System Development to support long term water use.
  - Deficit over medium term, could be supported from reuse (as reflected in alternative balance).

## Scenario 2: Mgeni System (Total)



**Water Requirement Scenarios:**  
**Scenario A: No further WC/WDM measures**  
**Scenario A1: Scenario A with waste management over 5 years**

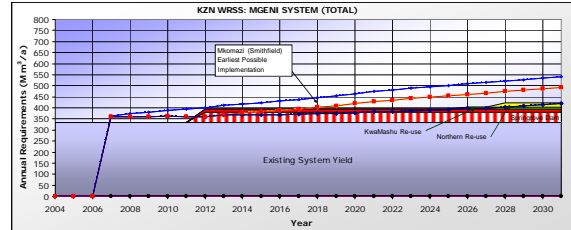
## Mgeni System Water Balance (Reconciliation Scenario II)

- Short term deficit in supply.
- Maximize utilisation of local resources over the short term.
- Interventions:
  - WC/WDM, Scenario A1, waste management over five year period.
  - Mooi-Mgeni Transfer Scheme Phase 2
  - Reuse from Northern and KwaMashu WWTWs.
  - Mkomazi Transfer Scheme.

## Mgeni System Water Balance (Reconciliation Scenario III)

- WC/WDM, Scenario A2, waste management over five year period and improve efficiency.
- Augmentation from the Thukela System.

## SCENARIO III: Mgeni System (Total)

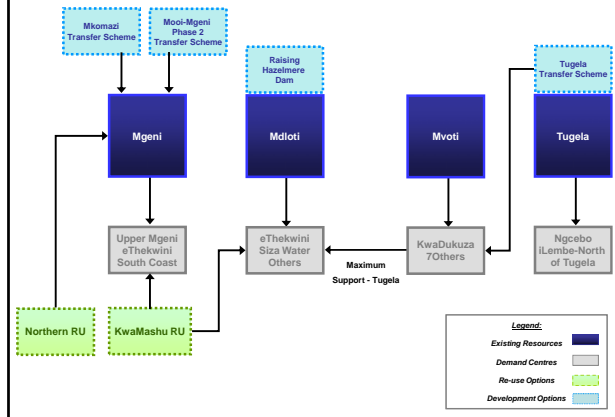


Water Requirement Scenarios:  
**Scenario A: No further WC/WDM measures**  
**Scenario A1: Scenario A with waste management over 5 years**  
**Scenario A2: Scenario A with waste management over 5 years and efficiency**

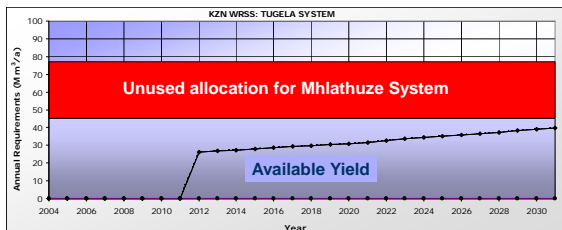
## Reconciliation Scenario IV

- Same as Scenario 1, Verulam and Tongaat WWTP is used to supply the estuarine water requirements for the Mdloti and Tongati Rivers
- Note: Further investigations is necessary to confirm water balance.

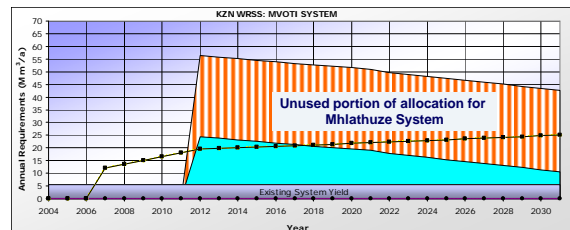
## Scenario IV



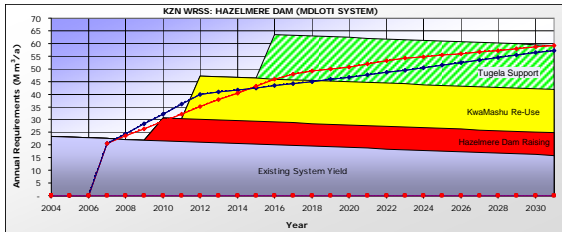
## Scenario IV: Tugela System



## Scenario IV: Mvoti System

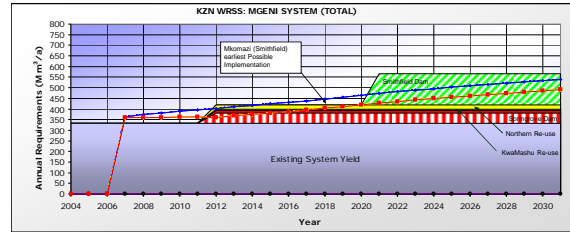


**Scenario IV: Mdloti System (Hazelmere)**



**Water Requirement Scenarios:**  
**Scenario M-A: Ethekeini Scenario A + Illemba Master Plan**  
**Scenario M-B: Umgeni Water Scenario, excluding pending and conceptual planned developments**

**Scenario IV: Mgeni System (Total)**



**Water Requirement Scenarios:**  
**Scenario A: No further WC/WDM measures**  
**Scenario A1: Scenario A with waste management over 5 years**

**URV's for Augmentation Options and Scenarios**

Augmentation Option	URV-6% (R/m³)	URV-8% (R/m³)	URV-10% (R/m³)
<b>Mgeni Supply Area</b>			
Desalination	11.54	13.17	15.05
Smithfield Dam and conveyance system	2.76	3.93	5.39
Springrove Dam and conveyance system	0.63	0.84	1.09
Northern WWTP Re-use and conveyance system to Inanda Dam	1.20	1.42	1.67
KwaMashu WWTP Re-use and conveyance system to Inanda Dam	1.35	1.63	1.93
WC/WDM, Scenario 1 waste management	3.71	4.05	4.39

**URV's for Augmentation Options and Scenarios**

Augmentation Option	URV-6% (R/m³)	URV-8% (R/m³)	URV-10% (R/m³)
<b>Northern Supply Area</b>			
Isithundu Dam and conveyance infrastructure	2.05	2.59	3.19
Lower Tugela Scheme	1.35	1.65	1.97
KwaMashu WWTP Re-use and conveyance infrastructure to Hazelmere Dam	0.85	1.01	1.18
North Coast WWTP's Re-use (Tongaat, Verulam) and conveyance infrastructure to Hazelmere Dam	0.86	1.03	1.20

**URV's for Augmentation Options and Scenarios**

Scenarios	URV 6% (R/m³)	URV 8% (R/m³)	URV 10% (R/m³)
Scenario I	1.60	2.02	2.45
Scenario II	1.74	2.18	2.66

**Other aspects that could influence the reconciliation scenarios**

- Water use rights trading.
- Implementation of the Reserve in the Mgeni River System (see information in further slides).
- Rainwater harvesting in the urban areas.
- Climate Change:
  - Incorporate results from the Mgeni Water Study when it is available.

## **Mgeni System (River Release Scenarios)**

Location	Natural Flow (MAR)	Compensation flows #	EWR Scenario * (Class C)
Midmar Dam	201.7	28.4	47 (23.4%)
Nagle Dam	472.8	22.4	153 (32.3%)
Inanda Dam	629.7	47.3	216 (34.2%)

Notes: Values are given in million m<sup>3</sup>/annum.  
 # Applied in water balances scenarios.  
 \* Low confidence EWR Scenario, for indicative yield estimates.  
 () Values in brackets indicate % of MAR

## **Mgeni System (Indicative Yield Estimates)**

Subsystem	Historical Firm Yields (million m <sup>3</sup> /a)		Differences
	Compensation release scenario	EWR Scenario	
Midmar Dam	177	149	28
Nagle Dam	284	162	122
Inanda Dam	384	210	174

Notes: Yields for the development scenario including MMTS Phase 2.

## **Water available for the ecology downstream of Inanda Dam**

Location	Flows (Mm <sup>3</sup> /a)					
	2006	2011	2016	2021	2026	2031
WWTW RF's	50.8	49.4	52.7	57.5	61.5	65.0
Smithfield Dam* (Surplus Yield)	0.0	0.0	0.0	135.5	103.1	73.5
<b>Total</b>	<b>50.8</b>	<b>49.4</b>	<b>52.7</b>	<b>193.0</b>	<b>164.6</b>	<b>138.5</b>

\*Scenario I

## **Reconciliation Strategy (Current Perspective)**

[ 1 of 3 ]

- Management the short term deficit situation through early drought restrictions.
- Implement WC/DM waste management measures.
- Implement the Mooi-Mgeni Transfer Scheme.
- Implement the raising of Hazelmere Dam.
- Implement the North Coast Pipeline for short term support to KwaDukuza and long term support to the Mloti System (bi-directional pipeline).
- Commission a feasibility study of the Thukela and Mvoti systems for supply to the Northern Areas.

## **Reconciliation Strategy (Current Perspective)**

[ 2 of 3 ]

- Commission a feasibility study for water reuse options for supply to the North Coast and Mgeni River System (consider current and future wastewater sources).
- Proceed with the Feasibility Study of the Mkomazi River Transfer Scheme.
- Commission a feasibility study to confirm efficiency improvements – represented by Scenario A2.

## **Reconciliation Strategy (Current Perspective)**

[ 3 of 3 ]

- Asses revised release rules from Inanda Dam to benefit the ecology.
- Undertake preparatory investigations of the water reuse options.
- Undertake a Water Use Validation study in the Mooi River Catchment.

### Schedule of deliverables

DELIVERABLE	STATUS	PSC REVIEW/ COMMENT	FINAL
Urban water requirements and return flows	Draft	To be circulated to PSC for comment: March 2008	To be issued in May 2008
Potential savings through WC/WDM	Draft	To be circulated to PSC for comment: March 2008	To be issued in May 2008
Water Resource Development Options	Draft	To be circulated to PSC for comment: March 2008	To be issued in May 2008
1 <sup>st</sup> Stage Reconciliation Strategy.	Draft	To be circulated to PSC for comment: March 2008	To be issued in June 2008

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REPUBLIC OF SOUTH AFRICA

## STRATEGY STEERING COMMITTEE



### Objectives

- To ensure that the scenario assumptions are monitored against actual data and that the strategy be updated accordingly;
- To monitor and co-ordinate the implementation of the interventions and related actions proposed in the strategy. (Include quantity and quality related measures);
- To recommend planning activities that will ensure reconciliation of requirements and available supply in the Vaal River System supply area;
- To identify water quality related planning activities that are necessary to improve and sustain the water quality in the Vaal River System.

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### Proposed Functions of the SSC (1 of 3)

Strategy Steering Committee Functions	Water resource management area
Monitor water requirements and return flows against the scenarios and recommend when updating of the scenarios are required.	Water Services.
Monitor water quality at key locations in the system and recommend revisions to water quality management plan.	Water Quality Management.
Review the projected water balance of the system annually and recommend updates to the strategy.  Particular events or activities that will require review of the strategy: <ul style="list-style-type: none"> <li>• Results from the Comprehensive Reserve Determination Study.</li> <li>• Outcome of the water use Validation Study.</li> </ul>	Integrated Water Resource Management.
Review the date when the decision should be taken to proceed with the implementation of an infrastructural augmentation scheme and advise DWAF accordingly.	Integrated Water Resource Management

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### Proposed Functions of the SSC (2 of 3)

Strategy Steering Committee Functions	Water resource management area
Track Water Conservation and Demand Management Measure Implementation.	Water Use Efficiency.
Liaise with provincial and local departments involved in development planning for alignment of strategies.	Development Planning and Scenario Alignment.

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### Proposed Functions of the SSC (3 of 3)

Strategy Steering Committee Functions	Water resource management area
Dissemination of information: <ul style="list-style-type: none"> <li>• Establish annual liaison with the municipalities for information exchange.</li> <li>• Communicate reconciliation strategy information to political decision makers.</li> <li>• Liaison with system Operational Forum.</li> <li>• Present strategy to managers of institutions.</li> <li>• Provide information for DWAF and other institution websites.</li> <li>• Liaison with Water Forums.</li> </ul>	Stakeholder Engagement.
Establish supporting workgroups to fulfil administration and technical functions to the Strategy Steering Committee.	Institutional Support

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