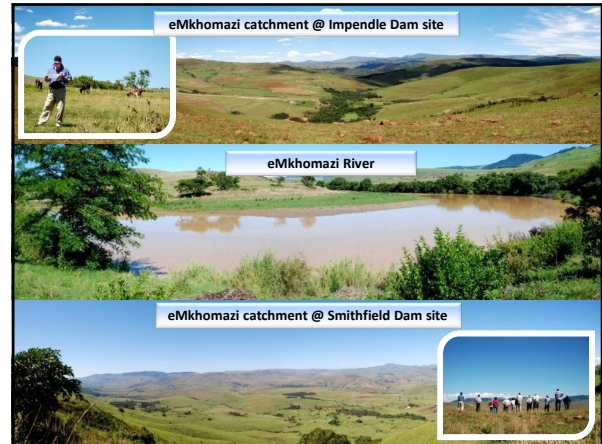


The eMkhomazi Water Project Phase 1: Module 1: Technical Feasibility Study: Raw Water (eMWP1-1/RW)

Project Steering Committee (PSC)
8 November 2012

**Item 8: PRESENTATION AND DISCUSSION ON PROGRESS OF
THE UMWP-1: MODULE 1: TECHNICAL FEASIBILITY STUDY:
RAW WATER**

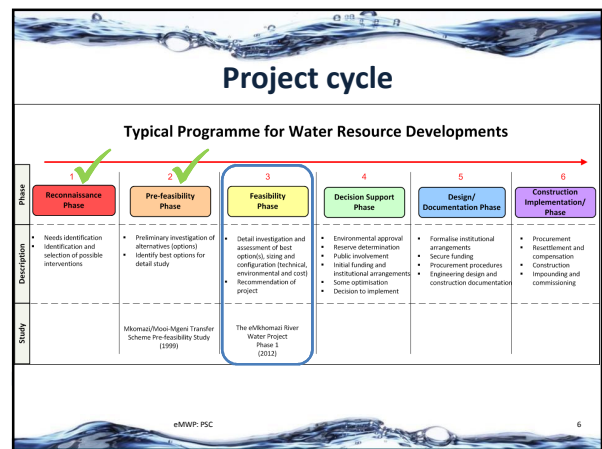
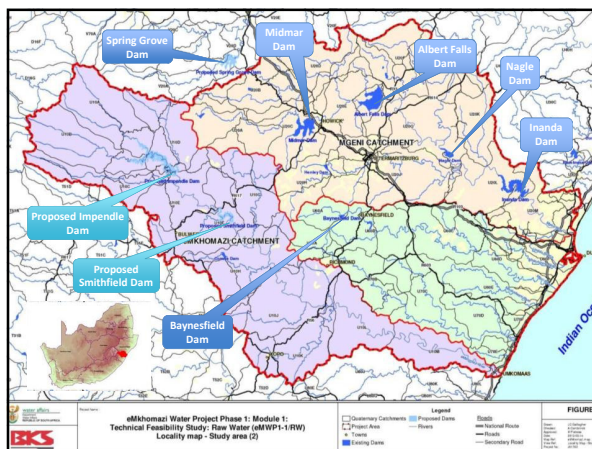
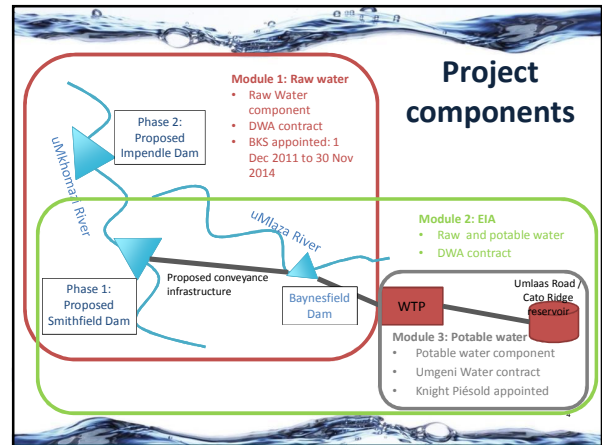


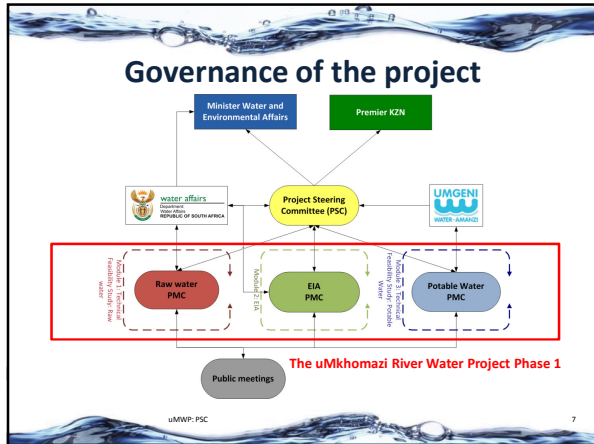
Objective of the study

- Undertake a feasibility study to finalise planning of proposed uMWP at a very **detailed level** so that scheme may be:
 - accurately compared with other possible alternatives
 - ready for implementation (detail design & construction) on completion of study

Project Description:

- Develop Smithfield and Impendle dams with conveyance infrastructure transfer water to a balancing dam in the Baynesfield area. This will supply water to a Water Treatment Plant, from where it is conveyed to a tie-in point with the eThekweni distribution system

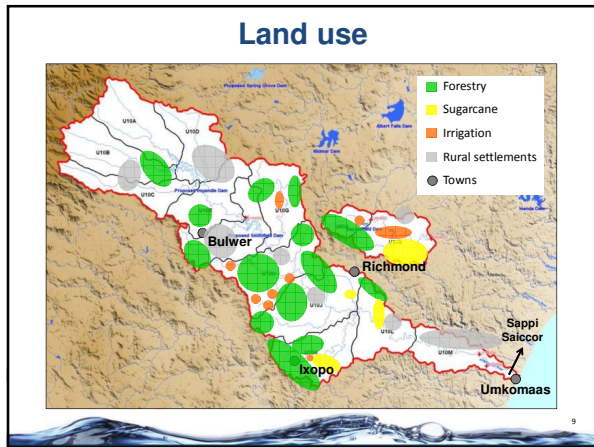




Task 4: Water resources

(Updating of hydrology, water requirements & water availability)

water affairs
Department of Water Affairs
REPUBLIC OF SOUTH AFRICA



uMkhomazi land cover (current)

Description	Area (km ²)	Water use (million m ³ /a)	Water use (mm/a)
Commercial forestry	604	60	99
Dry-land sugarcane	26	2	62
Irrigation	60	38	630
IAPs	44	6	126
Total	735	106	144

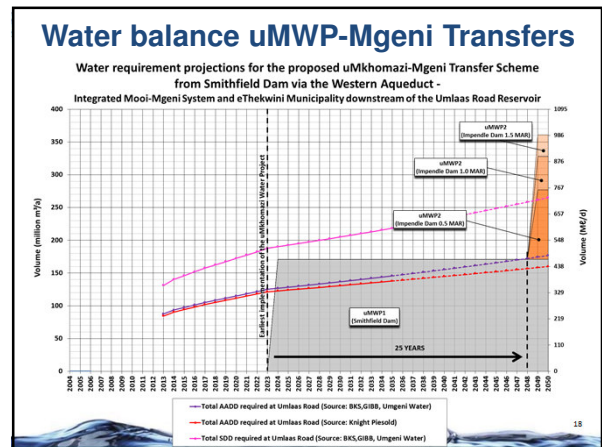
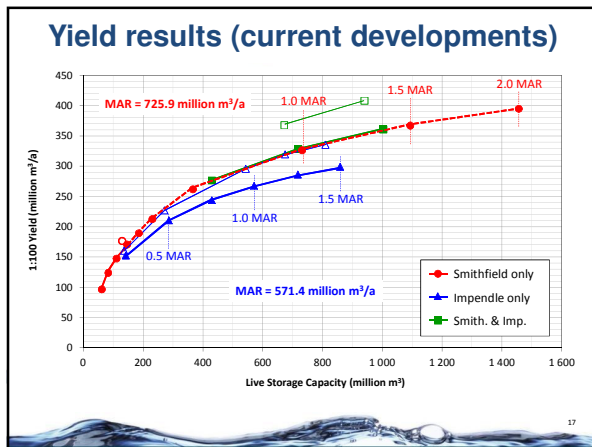
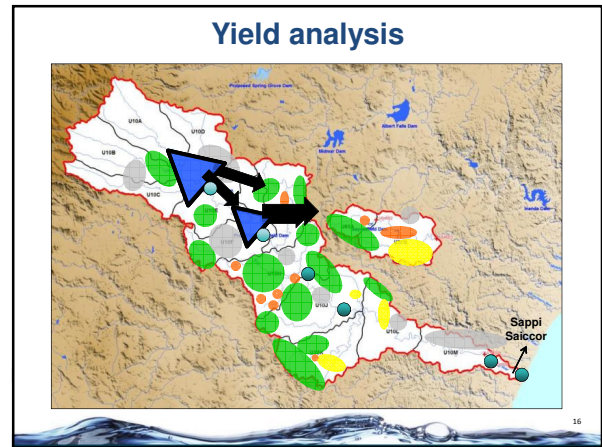
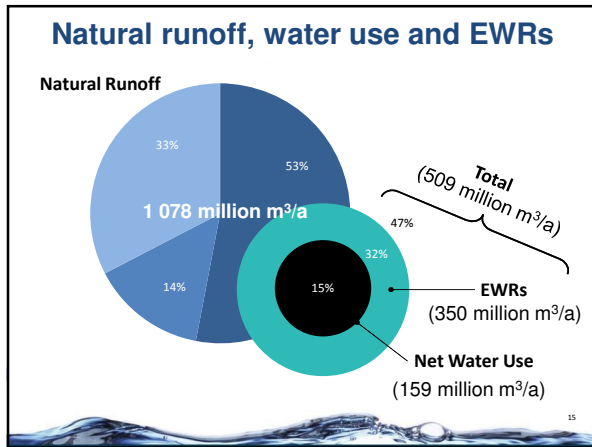
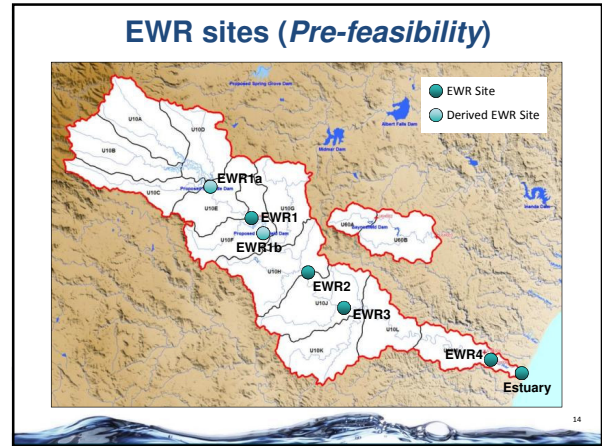
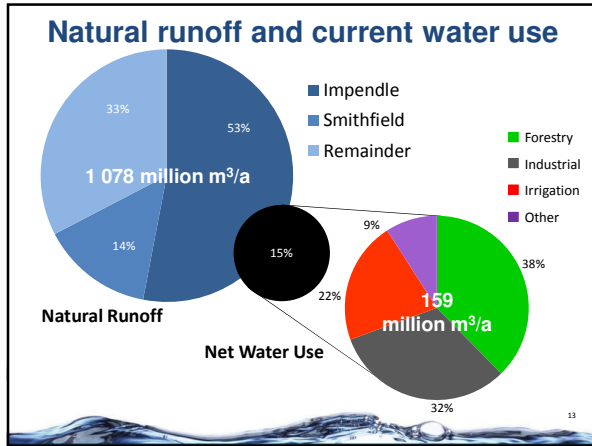
uMkhomazi other (current)

Description	Gross requirement (million m ³ /a)	Return flow (million m ³ /a)	New requirement (million m ³ /a)
Urban and rural	4	0	4
Industrial (Sappi Saiccor)	53	3	50
Stock watering	3	0	3
Total	60	3	57

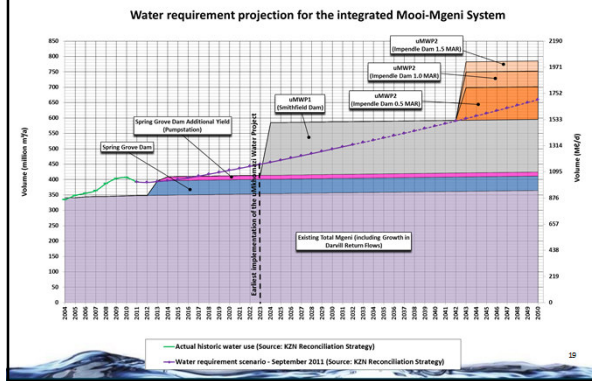
Upper uMlaza land cover (current)

Description	Area (km ²)	Water use (million m ³ /a)	Water use (mm/a)
Commercial forestry	43	5	110
Dry-land sugarcane	3	0	95
Irrigation	1	1	690
IAPs	1	0	131
Total	48	6	121

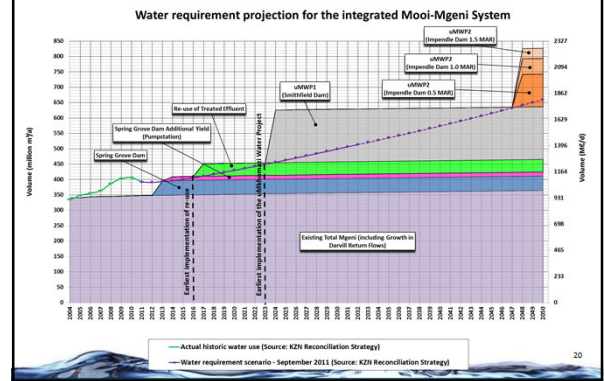
* Baynesfield Dam / U60A



Water balance integrated Mooi-Mgeni



Water balance integrated Mooi-Mgeni



Yield analysis (future developments)

- Projected in-catchment water use
 - SFRs
 - Irrigation
 - Urban & rural
 - Industrial
 - Stock watering
- Projected sedimentation

Projected urban and rural water use*

Development level	From surface water (million m ³ /a)	From groundwater (million m ³ /a)	Total
2001 (Base)	1.73	2.03	3.76
2012	1.78	2.18	3.96
2042 (Low)	1.18	1.91	3.09
2042 (Med)	1.92	2.56	4.48
2042 (High)	2.62	3.16	5.78

* GAADD / Urban-Econ growth factors (Socio-Economic Baseline Report)

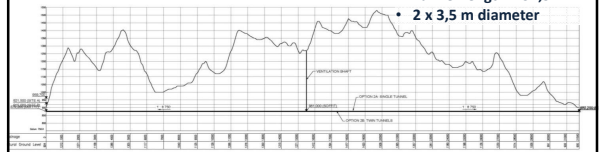
Task 5: Engineering investigation



Task 5.1 progress

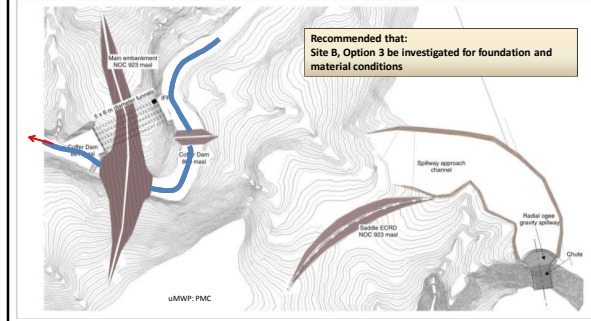
- Report 5.1 Optimization of conveyance System completed

- Tunnel length = 32,5 km
- 2 x 3,5 m diameter



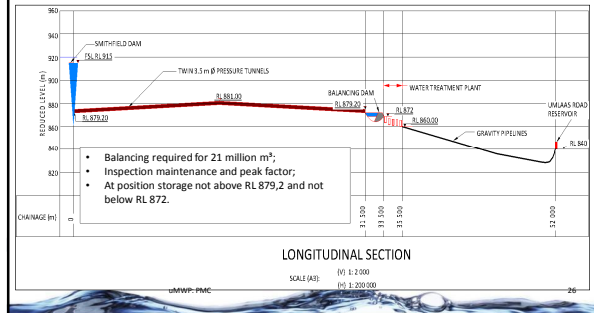
Task 5.2 progress

- Report 5.2 Dam Position completed

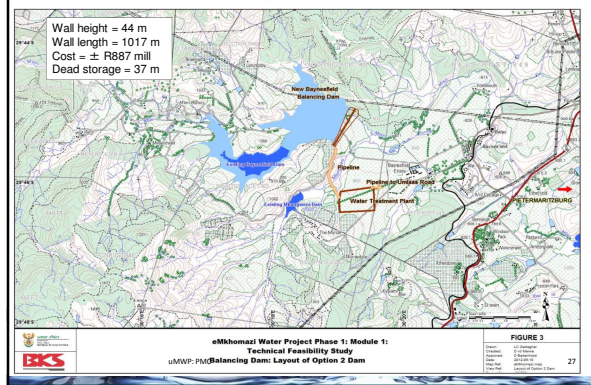


Further optimisation

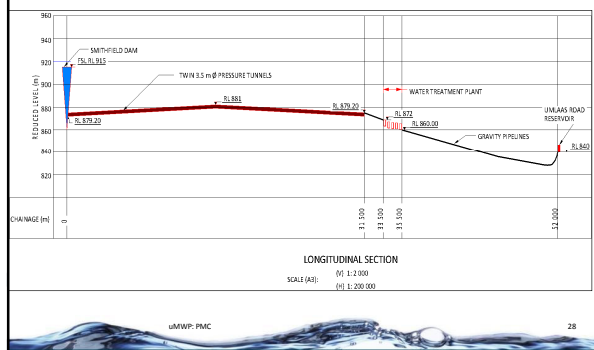
RESULTS OF INVESTIGATION: BALANCING DAM OPTIONS – OPTION 1



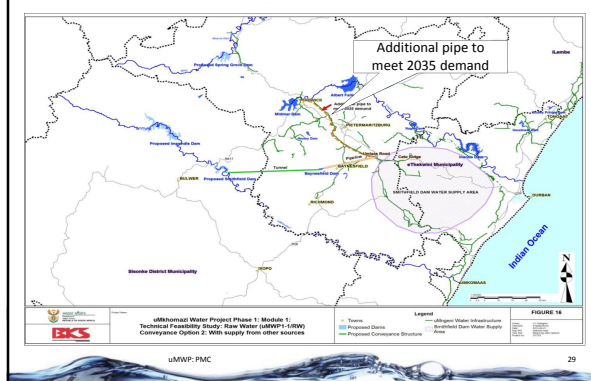
BALANCING DAM OPTIONS – OPTION 1



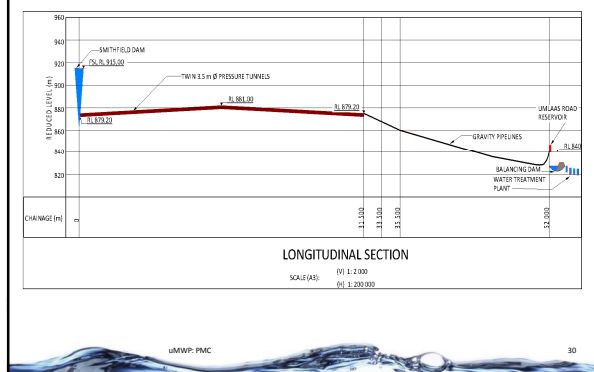
BALANCING DAM OPTIONS – OPTION 2



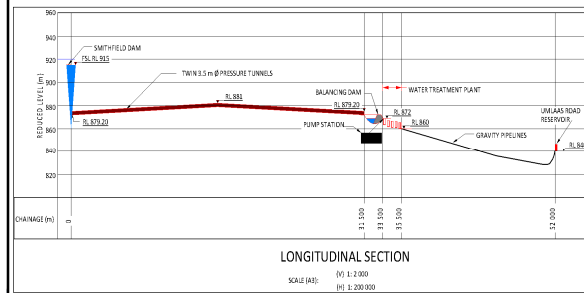
BALANCING DAM OPTIONS – OPTION 2



BALANCING DAM OPTIONS – OPTION 3



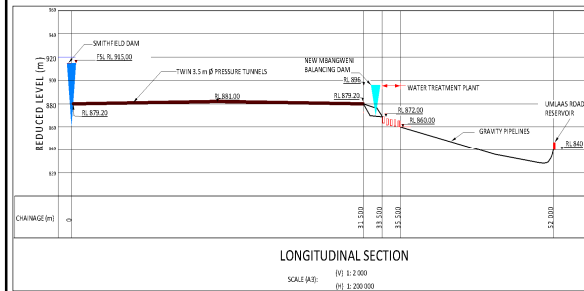
BALANCING DAM OPTIONS – OPTION 4



uMWIP: PMC

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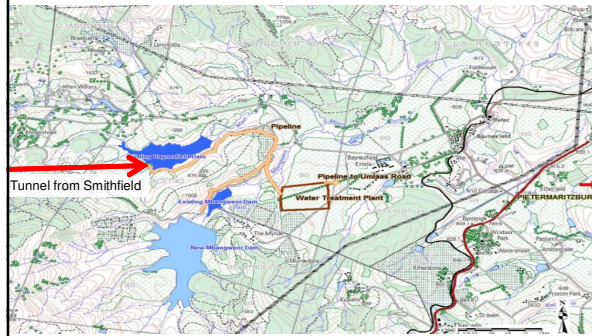
BALANCING DAM OPTIONS – OPTION 5



uMWIP: PMC

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NEW BALANCING DAM OPTION – OPTION 5



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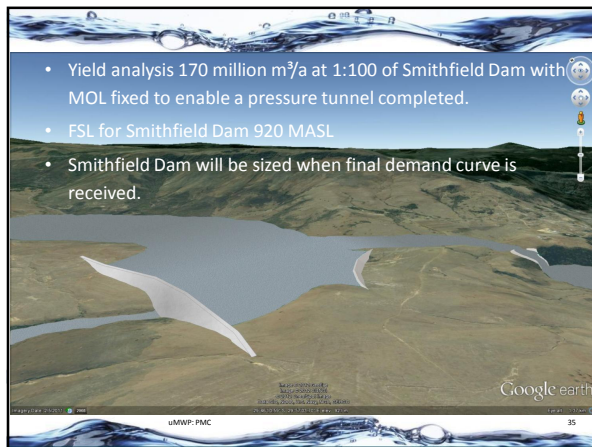
Summary

Options	Comments
1. Large Baynesfield dam	Costly
2. No balancing dam + extra capacity in Mgeni System	
3. Balancing dam & WTP at Umlaas Road	Limited sites for dam & WTP
4. Bayensfield dam + pumping	Expensive + pumping 1:10yrs
5. Mbangweni balancing Dam	

uMWIP: PMC

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- Yield analysis 170 million m³/a at 1:100 of Smithfield Dam with MOL fixed to enable a pressure tunnel completed.
- FSL for Smithfield Dam 920 MASL
- Smithfield Dam will be sized when final demand curve is received.



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Task 5.3, 5.4 & 5.5 progress (Materials, geotechnical, geomorphologic and seismic investigations)


- Geotechnical and Materials Investigations
 - Scope of Work was defined & submitted to DWA
 - Tender advertised
 - 4 tenders received
 - Tender evaluation done and submitted to DWA
 - Contract should be awarded during this week
 - Environmental issues addressed: WUL & EMPr
 - Programme
 - Seismic to be completed end January 2013
 - 10 week drilling programme after January
- Dam and tunnel type selection will be done during the seismic and drilling phases

uMWIP: PMC

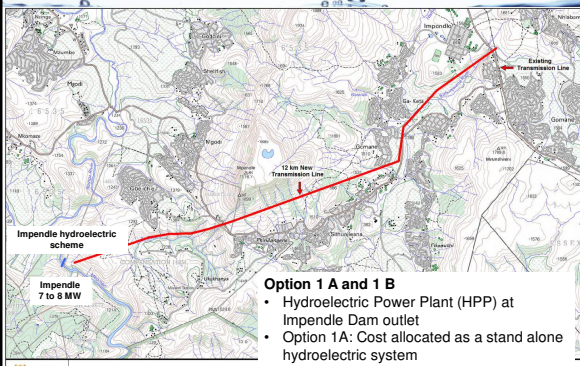
36

Interim Hydroelectric Potential Investigation

- Request from Client
- Three main options investigated



uMWP: PMC 37

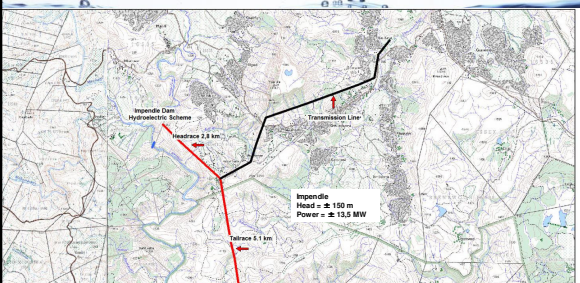


Option 1 A and 1 B

- Hydroelectric Power Plant (HPP) at Impendle Dam outlet
- Option 1A: Cost allocated as a stand alone hydroelectric system
- Option 1B: Dam cost not allocated to project. Dam cost allocated to water supply

uMkhomazi Water Project Phase 1: Module 1
 Technical Feasibility Study: Raw Water (uMWP1-1/RW)
 Option 1A and 1B Layout

uMWP: PMC



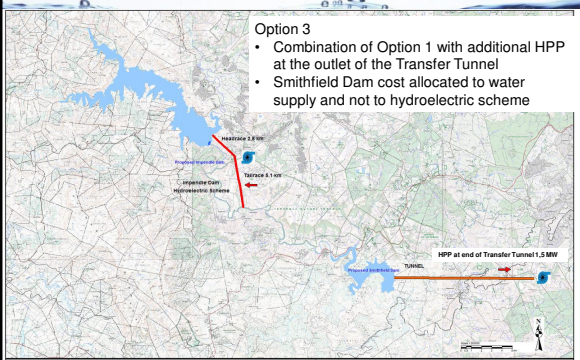
Option 2

- Hydroelectric scheme with a tunnel system to generate maximum head
- HPP still before Smithfield Dam
- Hydroelectric scheme as stand alone. All cost allocated to Hydroelectric scheme

Impendle Head = ± 150 m
 Power = ± 13.5 MW

uMkhomazi Water Project Phase 1: Module 1
 Technical Feasibility Study: Raw Water (uMWP1-1/RW)
 Option 2 Layout

uMWP: PMC



Option 3

- Combination of Option 1 with additional HPP at the outlet of the Transfer Tunnel
- Smithfield Dam cost allocated to water supply and not to hydroelectric scheme


HPP at end of Transfer Tunnel 1.5 MW

uMkhomazi Water Project Phase 1: Module 1
 Technical Feasibility Study: Raw Water (uMWP1-1/RW)
 Option 3: Impendle Dam and Smithfield Transfer System

uMWP: PMC

Interim Net Present Values

Option	1A	1B	2	3 (Tunnel)	2 & 3
At a 7,7% rate	-396 465	22 218	-447 595	57 135	-390 460
At a 3,7% rate	91 224	397 977	370 331	144 700	515 030



uMWP: PMC 41

Interim Hydroelectric Potential Investigation

Conclusions

- More accurate yield and power generation head figures available after feasibility stage.
- Hydropower seems viable if dam is constructed for the supply of water and the cost not added to the capital cost for hydropower generation (Options 1B and 3).
- Determination of the hydropower potential for Option 3, forms part of the current, Module 1, Technical Feasibility study and the viability of this option will be investigated further.

uMWP: PMC 42

Interim Hydroelectric Potential Investigation

Recommendations

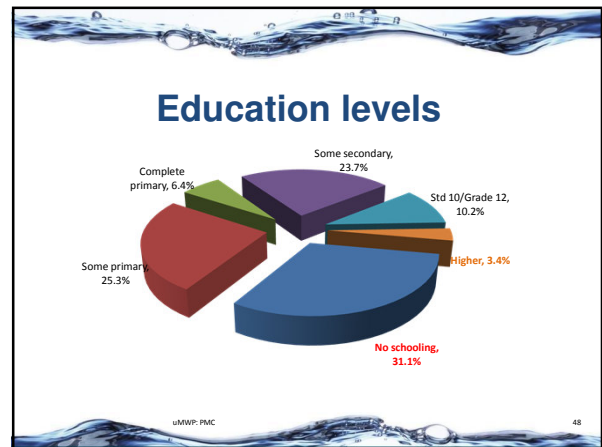
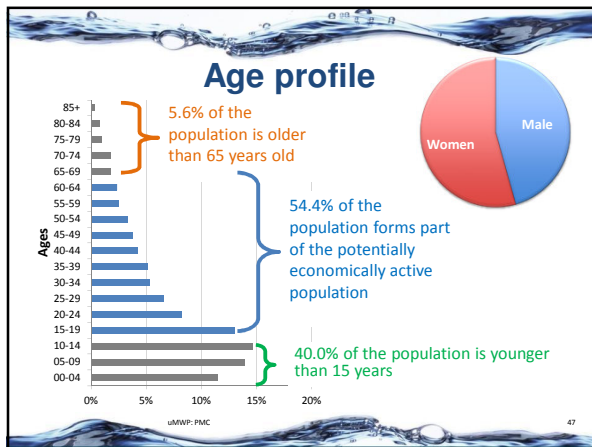
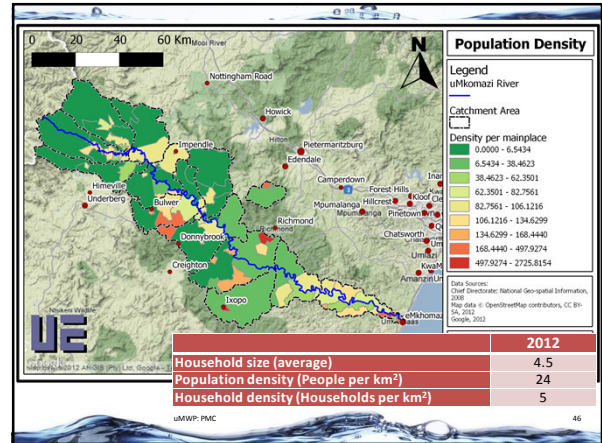
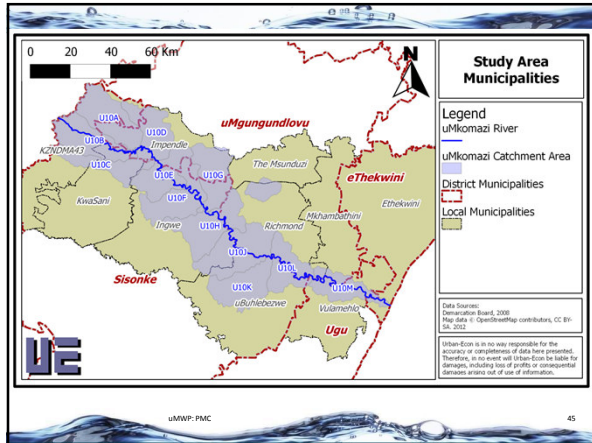
- The selling price of electricity should be confirmed and a more detailed sensitivity analysis should be completed
- Options 1A, 1B and 2 should be investigated up to pre-feasibility stage in to determine the capital cost in more detail (specially Hydro-mechanical costs). (Option 3 will be investigated through the current project)
- Necessity for electricity and strategic importance for renewable energy could outweigh any negative NPVs
 - To approach ESKOM to highlighted generation potential

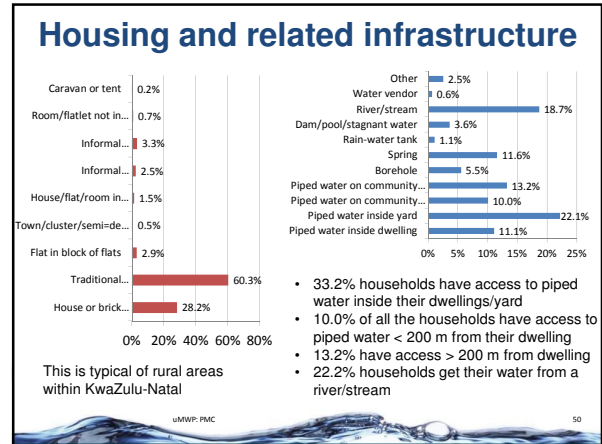
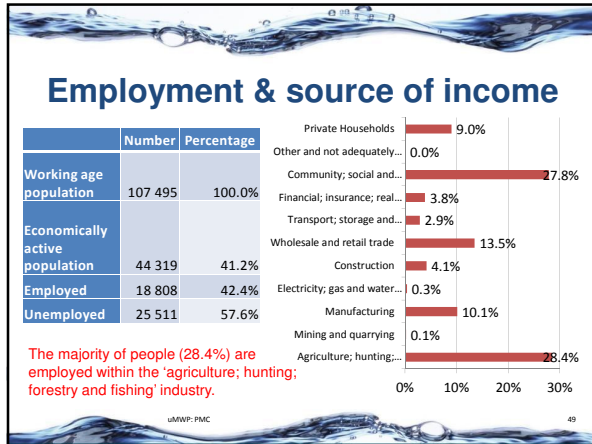
uMWP: PMC

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Baseline Study

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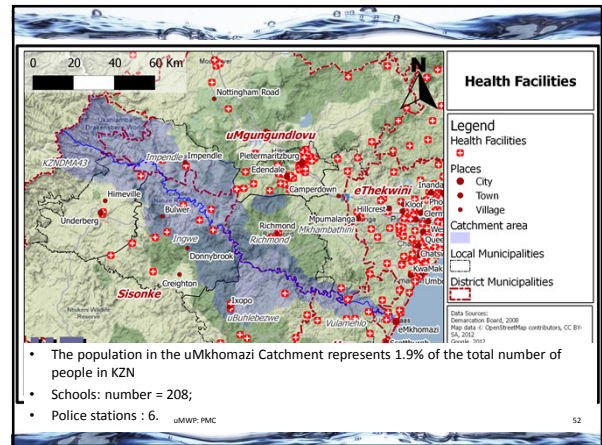




Property values for typical sites

Underberg				
Vacant Land	House/Townhouse	Farm	Commercial	
R 448 283	R 1 267 000	R 3 862 083	R 2 096 000	
Impindle Municipality				
Vacant Land	House/Townhouse	Farm	Commercial	
-	R 311 733	R 4 547 273	R 206 000	
Creighton & Ixopo				
Vacant Land	House/Townhouse	Farm	Commercial	
R 156 333	-	R 3 666 667	-	
Richmond				
Vacant Land	House/Townhouse	Farm	Commercial	
-	R 728 750	R 5 292 143	R 2 350 000	

uMWP: PMC 51



Task 3: Project Management

3.3 Information Management - Website

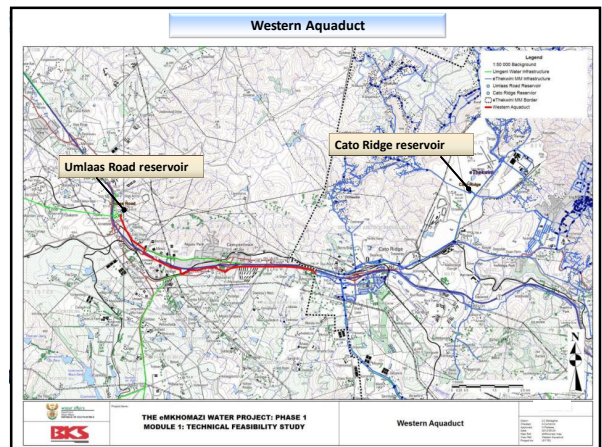
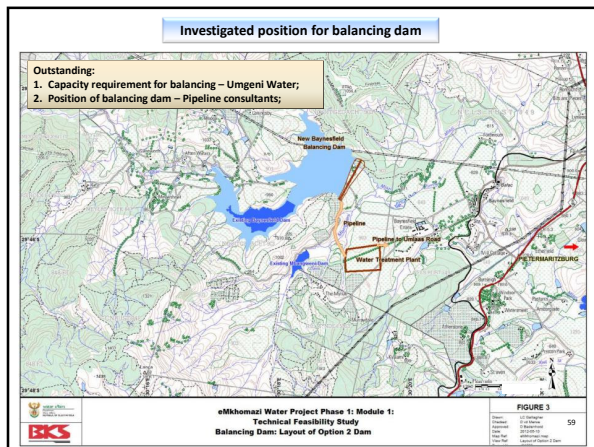
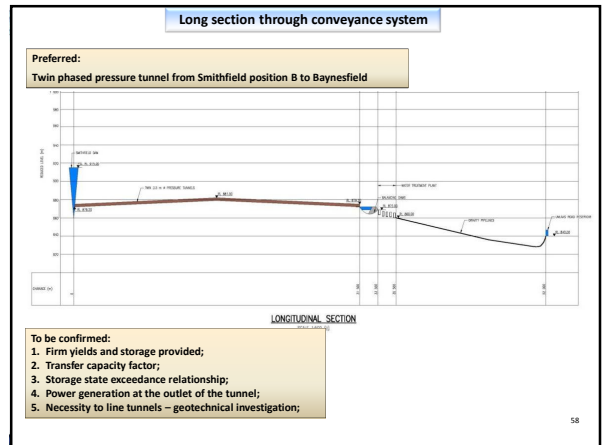
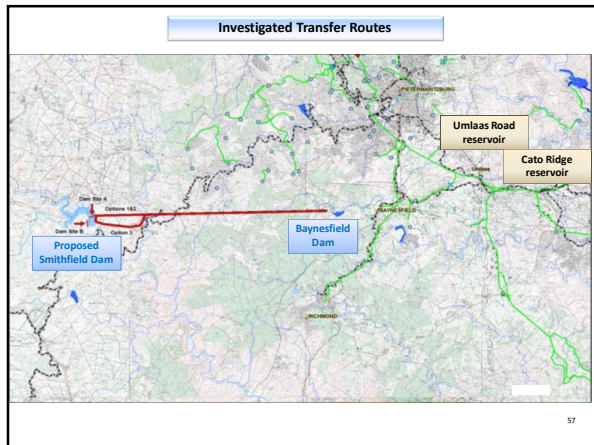
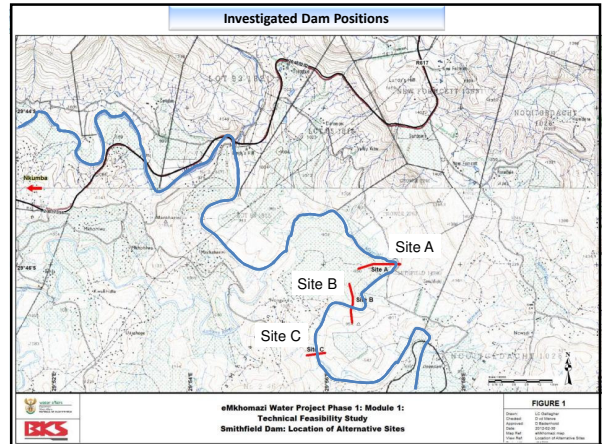
<http://www.dwa.gov.za/Projects/uMkhomazi/default.aspx>

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Discussion

water affairs
Department of Water Affairs
REPUBLIC OF SOUTH AFRICA

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5.3 Materials investigation

5.4 Geomorphologic and seismic investigation

5.5 Geotechnical investigation

- The Study Team plans the following three tenders for geotechnical investigations:
 - ✓ (1) Geotechnical investigation (trenching, seismic and drilling) on **the alignment of the conveyance system**
 - ✓ (2) Geotechnical investigation (trenching, seismic and drilling) on **the position of Smithfield Dam**
 - ✓ (3) Geotechnical investigation (trenching, seismic and drilling) at the **Baynesfield Dam / other balancing dam site**
- Commenced with draft tender documents for (1)

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Task 3: Project Management

3.4 Risk assessment – Pragmatic high-level risk assessment

Ref	Issue	Impact	Likelihood	Rating
Study level assessment				
PM1	Delay in the potable water feasibility study	5	4	20
PM2	Project completion delay	5	3	15
PM3	Sub-consultants delay	5	2	10
PM4	Quality of deliverables	5	2	10
PM5	Loss of key staff on the project	4	3	12
PM6	DWA decision making	4	4	16
Fin2	Feasibility study task budgets inadequate	4	3	12
Tech1	Assessment of alternatives	5	5	25
PP1	Non-involvement of key stakeholders	4	4	16
Env1	Delay in the completion of the EIA	3	3	9

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Task 3: Project Management

3.4 Risk assessment – Pragmatic high-level risk assessment

Ref	Issue	Impact	Likelihood	Rating
Env3	EIA appointment and programme	3	3	9
Env4	DEA processes and requirements	4	4	16
WR1	Reserve determination	4	4	16
Tech2	Non-agreement on water requirement projection to be supplied from Smithfield Dam in future	4	4	16
Implementation level assessment				
Imp1	Approval of the project for implementation	5	4	20
Imp2	Funding for the project	5	4	20
Imp3	Procurement of service providers	5	4	20
Imp4	Environmental aspects	5	4	20
Imp5	Integration of the raw water and potable water contracts	5	4	20
Imp6	EKSOM HV as well as MV voltage lines running through the impoundment area of Smithfield Dam	5	4	20
Imp7	Availability of electricity and other services to the Smithfield Dam site	4	4	16