

# Feasibility Study Mzimvubu Water Project

Newsletter 1/August 2012

## Activities and Achievements to Date

A detailed feasibility study is underway in the Eastern Cape to investigate a potential site for a multipurpose dam to supply new water capacity for irrigation development, domestic and industrial water requirements, and potentially, hydropower usage, in the Mzimvubu river catchment. The study will include the dam site and dam type selection, the dam sizing and preliminary design and size, cost estimates and regional economics and assessment of water requirements.

The Mzimvubu river catchment is currently one of the most under-utilised water resources in the country and the main aim of the study is to develop a water resource scheme that will maximise benefits to the region by accelerating the social and economic upliftment of the surrounding communities.

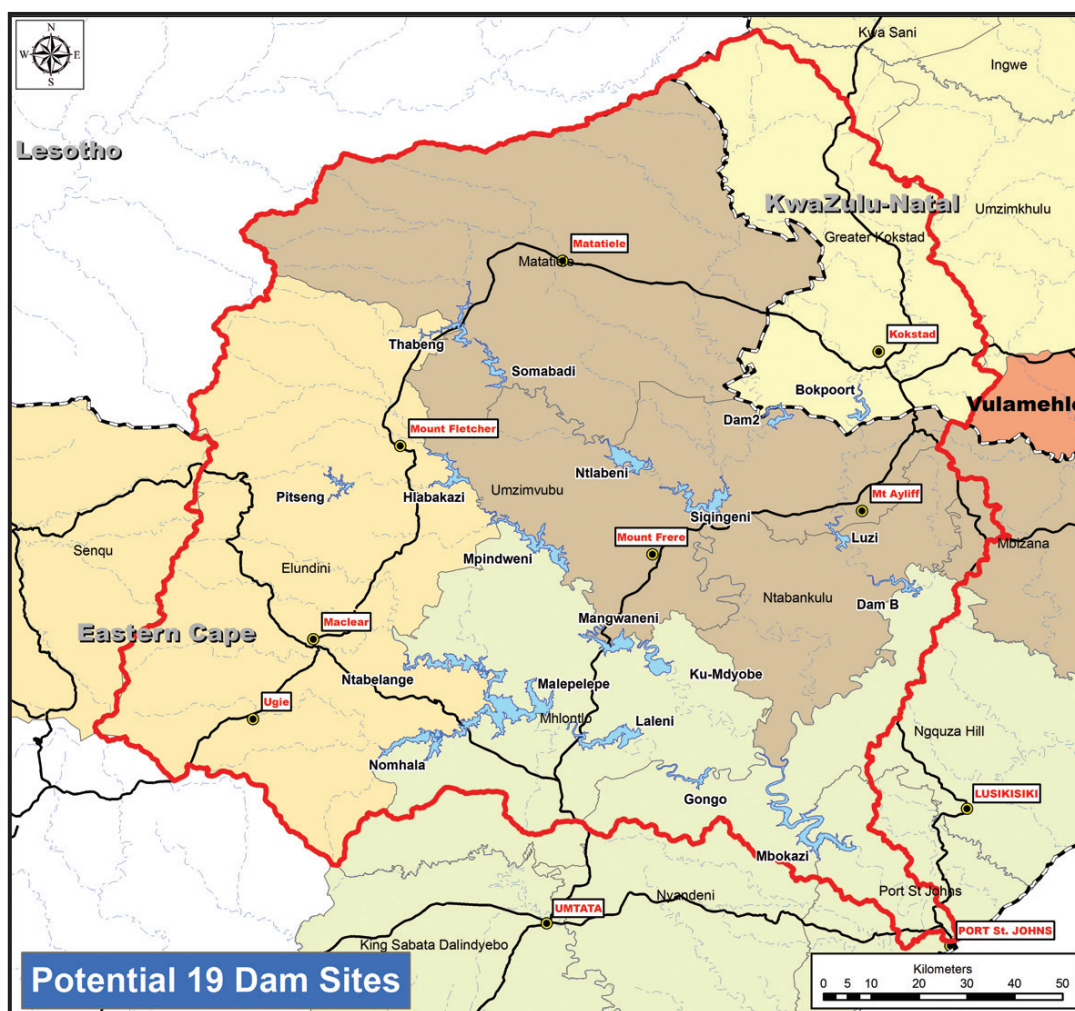
Harnessing the water resources of the Mzimvubu River and its tributary rivers, the only major river system in the country which is still largely unutilised, is considered by the Eastern

Cape Provincial Government as offering one of the best opportunities in the province to achieve such development.

In 2007, a special-purpose vehicle (SPV) called AsgiSA-Eastern Cape (Pty) Ltd (AsgiSA-EC) was formed in terms of the Companies Act to initiate planning and to facilitate and drive the Mzimvubu River Basin Water Resources Development.

The five pillars on which the Eastern Cape Provincial Government and AsgiSA-EC propose to model development in the Mzimvubu River Basin are: \*Afforestation \*Irrigation \*Hydropower \*Water transfer \*Tourism.

The Department of Water Affairs (DWA) undertook to investigate the project at a feasibility level of detail. The project commenced in January this year, and is being implemented by the DWA supported by the professional service providers Jeffares & Green, with close cooperation of the Eastern Cape Provincial Government, local government and other role players.



The study is divided into two distinct phases:

Phase 1 will be a screening process to investigate and analyse some 19 potential dam development sites that were identified under previous studies, and to identify and select the three sites which show the most promise in meeting the above requirements in a viable, affordable, sustainable and environmentally acceptable manner.

After investigating these three options in some detail, and once all the relevant stakeholders have agreed upon the finally chosen single development option, this most promising single dam option is

to be taken forward to a detailed level of investigation, in Phase 2 of the study. Phase 1 of the study is due to be completed by November 2012, and Phase 2 no later than April 2014.

## Phase 1: Screening Process – Moving from 19 to 3 dam options

The DWA team has undertaken an extensive collection, collation and analyses of the existing, though preliminary, information on the 19 potential dam sites, using previous studies, current ongoing planning of District Municipalities and other organs of State as their sources.

A Project Steering Committee (PSC) has been formed, made up of key stakeholders and roleplayers, and has met three times to date. A stakeholder forum has also been created and the findings of the investigations and analyses undertaken to

date were presented and discussed at this forum at a meeting held in Mthatha on 27th June.

The stakeholders forum was given a presentation of the analyses undertaken to date and the decision-making process that the DWA team intended to follow, whereby the stakeholders were able to participate hands-on in a consultative and integral decision-making process.

The process started with the 19 potential dam sites shown in blue on the map on page 1. The red line is the study boundary.

## Choosing which are the best dam sites

In order to decide which of the many potential dam sites were the best, a set of decision criteria were developed. The following criteria were chosen by the stakeholders:

- Technical and economic considerations
  - Capital cost
  - Unit reference value (URV) (cost) of water produced\*
  - Accessibility
  - Hydropower potential (capex/MW)
- Environmental and social considerations
  - Potential for irrigated agriculture\*
  - Potential for domestic water supply
  - Environmental impacts\*
  - Job creation\*

\* Key criteria identified against which to evaluate the potential dam sites

The four key criteria highlighted above were considered to be the most important as they had the highest impact on being

able to produce water at the lowest cost, as well as offering the highest potential for job creation, where irrigated agriculture is considered to be an economic driver.

All 19 dams were screened for these criteria using available preliminary information and the stakeholder forum agreed on a system which was colour coded so that the best options could be easier identified. This coding system is shown below:

Colour Rating Index	Low Impact 1 Low Cost High Potential	Medium Impact 2 Medium Cost Medium Potential	High Impact 3 High Cost Low Potential	Very High Impact 4 Very High Cost Very Low Potential
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This system proved a very impartial and robust way of eliminating many of those potential dam sites that were obviously not as viable as the others.

Option	Proposed Dams	Rivers	Yield (Mm <sup>3</sup> /a)	Capital Cost (excl. distribution and access)	URV of Water Produced (R/m <sup>3</sup> )	Accessibility	Hydropower Potential CAPEX/MW	Potential for Irrigated Agriculture	Domestic Water Supply Potential	Environmental Impacts	Job Creation
1	Dam 2	Upper Mzimvubu	3	3	4	2	4	4	4	4	3
2	Siqingeni	Upper Mzimvubu	1	4	2	1	1	4	3	4	4
3	Bokpoort	Mzintlava	4	3	4	2	4	4	3	2	3
4	Luzi	Mzintlava	3	3	3	2	4	4	3	1	3
5	Dam B	Mzintlava	2	4	4	3	3	4	3	1	3
6	Thabeng	Kinira	2	2	2	4	3	1	2	1	1
7	Somabadi	Kinira	2	3	2	4	2	1	2	2	1
8	Ntabeleni	Kinira	1	3	1	2	1	4	2	2	3
9	Pitseng	Tina	4	1	4	4	4	1	3	2	1
10	Hlabakazi	Tina	3	2	2	4	3	4	2	2	3
11	Mpindweni	Tina	2	2	2	2	2	4	2	2	3
12	Mangwaneni	Tina	2	4	3	1	3	4	2	1	4
13	Ku-Mdyobe	Tina	2	4	4	2	3	4	3	1	4
14	Nomhala	Tsitsa (Inxu River)	3	2	3	2	3	2	2	4	2
15	Ntabelanga	Tsitsa	1	1	1	2	1	1	1	2	1
16	Malepelepe	Tsitsa	1	4	1	1	2	4	1	4	3
17	Laleni	Tsitsa	1	4	2	2	1	4	1	4	3
18	Gongo	Tsitsa	2	4	3	3	2	4	3	1	3
19	Mbokazi	Lower Mzimvubu	1	4	1	4	1	4	4	4	3

The less favoured sites can be seen as those with the highest costs per m<sup>3</sup> of water produced, lowest benefits as regards job creation, and highest environmental impacts, as shown in the colour codes **red** and **orange** on the sheet on the left.

The result of the stakeholder forum screening process was that some 12 of the original 19 potential dam options were clearly identified as not meriting further investigation, but the forum concluded that the remaining 7 should be analysed further before deciding upon the “finalist” 3 dam site options which were to be given special attention in this Phase 1 of the study.

The shortlisted 7 dam site options were:

- Thabeng (Kinira River)
- Somabadi (Kinira River)
- Mpindweni (Tina River)
- Nomhala (Inxu/Tsitsa River)
- Ntabelanga (Tsitsa River)
- Laleni (Tsitsa River)
- Mbokazi (Mzimvubu River – lower catchment)

## Consideration of regional development initiatives

The stakeholder forum tasked the DWA team and PSC with the job of undertaking further investigations to ensure that the decision-making took all of the ongoing regional development planning initiatives into consideration, as well as further consultation to be undertaken with Eskom as regards the possible hydropower generation potential of such options.

The DWA team undertook these further investigations which involved reviewing the projects falling under the Integrated Wild Coast Development Programme, which included key projects such as:

- N2 Wild Coast Road and Wild Coast Meander
- Small Town Development (Port St Johns, Nyandeni Precinct, King Sabatha Dalindyebo and Mbizana)
- Agro processing

Given the relatively widespread and, in some cases, distant location of the footprints of these projects when compared with the potential dam sites in the Mzimvubu River Basin, it was confirmed that the dam options in question were not specifically relevant as water sources to the above development initiatives. Where the main Mzimvubu river itself intersects with small portions of these initiatives, it has sufficient reliable flow

to be able to service such initiatives without needing to build an expensive dam and associated infrastructure.

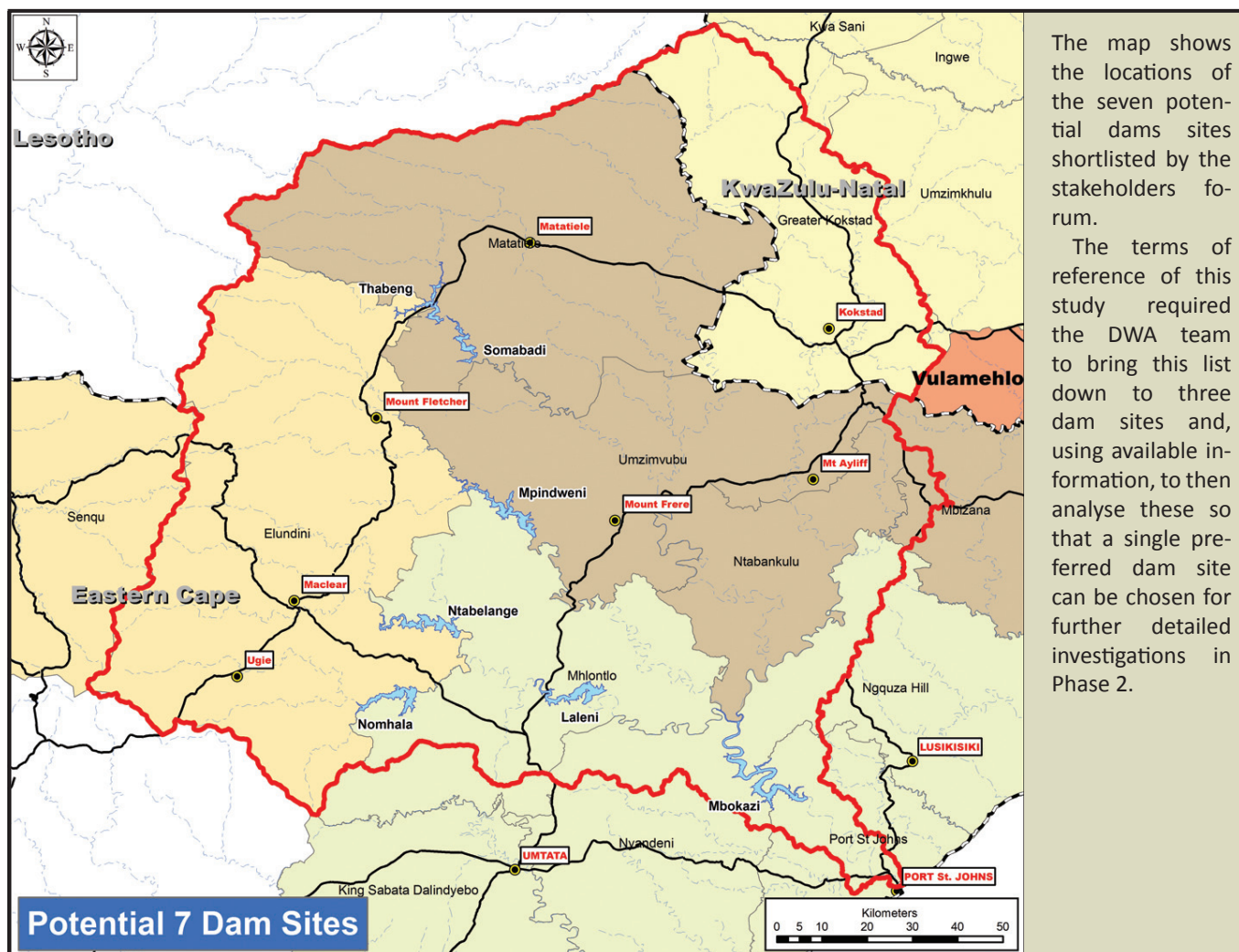
Eskom were also consulted and confirmed that there were several other initiatives being undertaken in the area regarding potential hydropower projects. These range from micro-hydro schemes of less than 5 megawatts, to multi-billion Rand schemes using several dams in tandem to produce up to 150 megawatts of continuous power. These other larger schemes are being dealt with by others under separate initiatives, and do not directly impact on this project other than the fact that this project could in future become part of these other schemes.

These much larger hydro-power schemes would have a much longer period required for implementation and could face significant challenges regarding environmental issues. They will also only provide temporary job creation and very few long-term permanent employment opportunities.

Eskom confirmed that it would be able to consider buying power from the eventual scheme developed under this project provided that it is deemed economically feasible to do so.

This will be considered carefully during Phase 2 of the study.

## Selection of best three dams for further study





## Key criteria critical for making good choices

The seven dam site development options were further ranked using the four key criteria described earlier. This showed the following results (**lowest score = best option**).

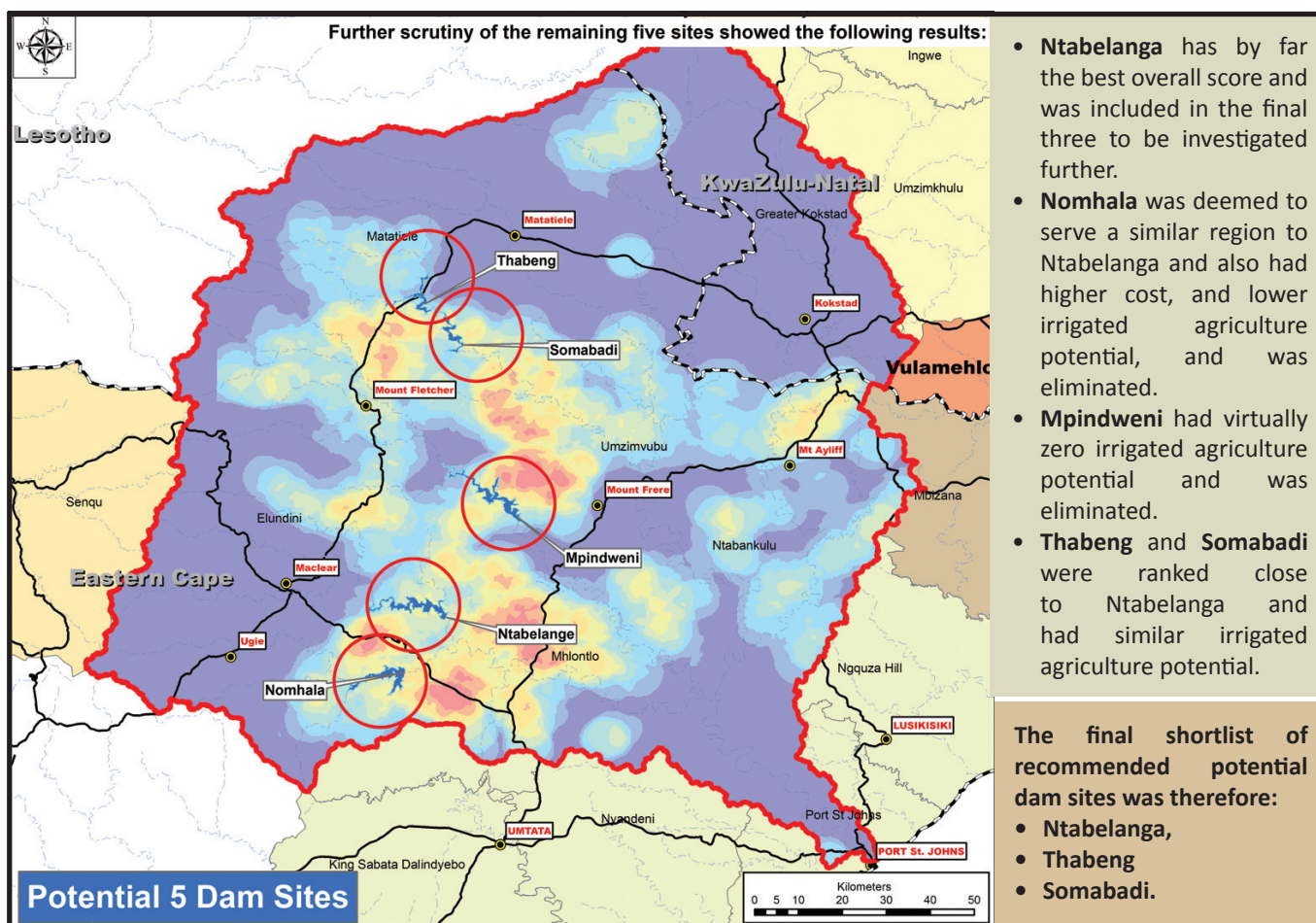
Proposed Dams	Rivers	Yield (Mm <sup>3</sup> /a)	Capital Cost (excl. distribution and access)	URV of Water Produced (R/m <sup>3</sup> )	Accessibility	Hydropower Potential CAPEX/MW	Potential for Irrigated Agriculture	Domestic Water Supply Potential	Environmental Impacts	Job Creation
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Nomhala	Tsitsa (Inxu River)	3	2	3	2	3	2	2	4	2
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Laleni	Tsitsa	1	4	2	2	1	4	1	4	3
Mbokazi	Lower Mzimvubu	1	4	1	4	1	4	4	4	3

The above shows that the worst four dam sites of the seven were Mbokazi, Laleni, Mpindweni and Nomhala.

These four dams fare relatively badly when considering the main objectives of social upliftment and job creation opportunities.

Both Mbokazi and Laleni would have very high capital cost, high environmental impact, (Laleni is very close to the Tsitsa Falls heritage site) and very low potential for irrigated

agriculture (especially given that Mbokazi has very difficult access, is away from major population centres, and is in an area of reasonable potential for rain-fed agriculture). It is possible that these two dams might later feature as a part of the much larger hydro-power scheme but this scheme was found less suitable compared to the other sites. Both Mbokazi and Laleni were therefore eliminated as options.



## Conclusions from the investigative and consultative process to date

The shortlisting of three potential dam development sites has been a logical process of elimination based upon the findings of previous studies undertaken on 19 potential dams, but also taking into account further analyses to develop critical decision criteria in consultation with the Stakeholder Forum and members of the Project Steering Committee.

The three dam development sites chosen all have the following characteristics placing them above the other candidates:

- Unit Reference Values of Water Produced at the dam less than Rand 1.00/m<sup>3</sup>
- Ability to supply a regional water supply scheme in an area of need
- Potential for irrigated agriculture of more than 1 200 hectares
- Potential for firm (continuous) hydropower production of ± 2 MW at less than Rand 42 million/MW.

## The way forward

Further studies need to be undertaken on the three recommended dam development options:

1. Ntabelanga, 2. Thabeng, 3. Somabadi.

This selection has been confirmed and the DWA team will now undertake the following on these three options:

- Further stakeholder consultation regarding the three sites
- Land surveys and geotechnical investigations of each site
- Updated hydrology and modelling of yield, flood and hydropower potential
- Water needs assessment
- Conceptual planning of potential for regional water supplies from each dam
- Irrigated agriculture potential assessment and conceptual planning
- Mini-hydropower analyses and further discussions with Eskom to confirm potential
- Further environmental screening of the three options
- Economic analyses for comparative purposes, dam type selection, and optimisation
- Prepare and submit preliminary study report recommending **one site** for further more detailed studies.

## What will Phase 2 comprise?

Once the Stakeholders Forum and PSC have agreed upon the single dam site to be developed, Phase 2 will embark upon all of the necessary detailed engineering, economic, social, and environmental aspects required to be undertaken to produce a viable and sustainable scheme that will maximise the benefits of the new water source to meet the goals of social upliftment and job creation. This will result in delivery of a Final Feasibility Study with Preliminary Designs and Drawings of the scheme as well as detailed cost estimates, cash flows and recommendations for the implementation of the project.

The current intention is that this Phase 2 should be completed by no later than April 2014, and that the implementation of the dam construction and associated infrastructure would be completed (first impoundment of water) by the end of 2018.

## Further information

A summary timeline for the Feasibility Study is as follows:

Study start	January 2012
Phase 1: screening of 19 dam sites down to single option	Completion November 2012
Phase 2: detailed investigations and preliminary design of selected single option	Completion April 2014

<b>Project implementation:</b> not yet finalized.	
Implementation phase – funding, detailed design, tendering, construction, start of impoundment	Target December 2018

### Project Steering Committee meeting dates: (normally held in East London)

PSC Meeting 4	27 Sept 2012
PSC Meeting 5	29 Nov 012
PSC Meeting 6	31 Jan 2013
PSC Meeting 7	25 Apr 2013
PSC Meeting 8	25 Jul 2013
PSC Meeting 9	26 Sept 2013
PSC Meeting 10	28 Nov 2013

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### Documentation and Reports:

Public Documents and Reports published as a part of this project will soon be made available via the DWA website at: [www.dwaf.gov.za](http://www.dwaf.gov.za) under "Projects and Programmes".