Water Indaba

Western Cape Water Security 2020 and beyond

Department of Water and Sanitation Plans and Programme

Presented by:
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Strategic and Emergency Projects

Date: Tuesday 16 May 2017
BACKGROUND
Background

• The ARC Umlindi report of March 2017, *based on the 12-month SPI (Standardised Precipitation Index)*: there are significant parts of the country still experiencing a mild drought, while small pockets of moderate, severe and extreme drought are still found. There is still a large area of severe to extreme drought in parts of the Eastern Cape and severe drought is also still found in the western part of Northern Cape, southern part of Western Cape, northern parts of KZN (this could change with the rain over the weekend of 12 May), and eastern part of Mpumalanga.

• The recent mid-summer rains have made a significant impact, in parts of the summer rainfall areas.

• Despite improvement we will continue to intensify the enforcement of restrictions where necessary to stretch our available water supplies in areas where dams have not recovered.

• This is particularly the case in the Western Cape where dam levels remain low and are declining every week, current dam levels are lower than they were at the same time last year and the lowest they have been in the last 30 years.
Background

• The Western Cape Province is situated largely in a winter rainfall area, which is characterised by wet winters and dry summers. Since the last rainy season, however the western, central to northern parts of the province have received below normal rainfall accompanied with high temperatures, whilst the Southern Cape areas have received normal to above normal rainfall.

• A number of municipalities have already declared or are in the process declaring local disasters for drought during March and April 2017:
  – City of Cape Town (hydrological, March 2017)
  – Knysna, Eden DM (hydrological, March 2017)
  – Bitou, Eden DM (hydrological, in process April 2017)
  – Oudshoorn, Eden DM (Agricultural, March 2017)
  – George, Eden DM (Agricultural, in process April 2017)
  – Witzenberg, Cape Winelands DM (agricultural, March 2017);
SPI Categories

From a water resources management perspective: the most relevant SPI time-step is the 12- and 24-month which are in similar ranges as the response cycles and planning time frames for hydrological/water systems

12-MONTH SPI

- associated with surface water, especially rivers and natural lakes although it can be extended to constructed reservoirs
- rainfall deficit or drought according to this indicator suggest low river levels, which may lead to low dam levels and water shortages.
- the past rainfall season was not enough to end the drought in the summer rainfall regions (eg. parts of MP, KZN and EC) where the indicator shows a rainfall deficit/drought
- according to the indicator, winter rainfall regions are starting their rainfall season with a severe deficit. Whatever rainfall has been received so far has had a minimal impact on the already low river and dam levels
SPI Categories

• **24-MONTH SPI**
  • associated with slow responding water systems such as groundwater
  • the indicator may suggest drought even after good rains because groundwater levels will rise slower than river and dam levels. Caution must be exercised when interpreting the index because it does not take into account soil types and characteristics. It should be used as a pointer to possible flash points at which more focused and detailed assessments must be undertaken.

• **3-MONTH SPI**
  • applicable to rain-fed agricultural systems where rainfall deficits spanning three months causes damage to crops
  • places that according to the April index are experiencing rainfall deficit/drought such as large tracts of the Western Cape and EC may have soil moisture deficits which are impairing plant growth and subsequently crop production, particularly if dependent solely on rainwater without any supplementation with irrigation.
SURFACE WATER RESOURCES: NATIONAL
Combined National Dam Levels Since 1980

National Dams: Water Storage: The Storage for 08 May 2017 since August 1981

08 May 2017: STORAGE = 72.3% FSC

FSC 1 AUG 1980=23113 mcm
FSC 1 AUG 2016=32246 mcm
139% OF 1980 FSC

% of FSC

0 10 20 30 40 50 60 70 80 90 100

Period


15 Nov 1983 34.0%
15 Jan 1991
Sep 1987
Sep 1985
15 Nov 1995 34.4%
15 Dec 1999
2 Jan 2006 56.0%
1 Oct 2007
08 May 2017 72.3%
<table>
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<tr>
<th>Province</th>
<th>FSC in 10^6 m^3</th>
<th>Number of Dams per Province</th>
<th>% of full capacity</th>
<th>09/05/16 Last Year</th>
<th>01/05/17</th>
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<td>≥100%</td>
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<td>214</td>
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SURFACE WATER RESOURCES: WESTERN CAPE
Surface Water Resources

• DWS monitors 43 dams in the Western Cape on a weekly basis, 22 of which are in the winter rainfall area and 21 in the transition between the winter and summer rainfall areas. The current status of dam levels in the Western Cape as at 27 February 2017, can be summarized as follows:
  – Overall (43 Dams): 31.8% (last week 33.2% and compared with 38.9% last year);
  – Transition Rainfall Area (21 Dams): 28.3% (last week 26.9% and compared with 53.7% last year);
  – Winter Rainfall Area (22 Dams): 32.3% (last week 34.2% and compared with 36.4% last year);
  – Western Cape System (6 Dams serving City of Cape Town and surrounding towns and irrigators): 32.4% (last week 34% compared with 39.2% last year).

• The situation has deteriorated significantly from last year with a fall in dam levels by 1.4% week on week.

• This should be brought down to a desired fall of less than or equal to 1% (this would give a time horizon of 20 weeks at a minimum should no rain fall in the meantime).
Surface Water Resources

- DWS monitor 43 dams in the Western Cape on a weekly basis, 22 of which are in the winter rainfall area and 21 in the summer rainfall area. The current status of dam levels in the Western Cape as at 8 May 2017, can be summarized as follows:
  - Overall (43 Dams): 20.1% (last week 20.6% and compared with 30.6% last year);
  - Intermediate Rainfall (21 Dams): 22.7% (last week 23.2% and compared with 43.3% last year); Winter Rainfall (22 Dams): 19.6% (last week 20.2% and compared with 28.5% last year);
  - Western Cape System (6 Dams serving City of Cape Town towns up the west coast and Irrigators): 21.7% (last week 22.3% compared with 31.4% last year).

- 10. As can be seen from the abovementioned summary the situation has deteriorated significantly from last year with an average fall in dam levels of 0.9% per month. The current capacity of the dams in the Western Cape is the lowest recorded in the last 30 years.

- This should be brought down to a desired fall of less than or equal to 1% (this would give a time horizon of 20 weeks at a minimum should no rain fall in the meantime).
GROUNDWATER RESOURCES
• DWS is also monitoring groundwater levels and trends, over the past two year period from January 2015 to January 2017, still show a decline.

• In the Western Cape, 63% of the monitoring boreholes have shown a decline during this period. The areas and towns largely dependent on groundwater where the most critical decline in water levels have been observed during the past 24 months include:
  – Beaufort West in the Karoo;
  – Cape Town, Cape Winelands LM and Boland area;
  – The West Coast and adjacent areas to Saldanha; and
  – Further north to areas around Lamberts Bay and Bitterfontein;

• Ground water levels will respond and recover after good rainfalls much slower than our surface water sources (time lag). The rate of recovery will also be influenced by the severity of the current drought conditions and the rain that fall on the surface. Taking into consideration the declining levels, water restrictions will also have to be considered for users who rely on groundwater.
Groundwater Resources

- Natural groundwater levels have dropped to a limited extent in this dry period.
- Localized pressure points are at risk, where extensive groundwater is abstracted.
- Despite the low rainfall there remains significant groundwater in storage across the Province, which could be tapped into for emergency supplies.
- There is potential for groundwater development to improve long term security of municipal supplies.
- This requires well planned detailed investigation to ensure sustainability.
Status of groundwater level trends April 2015- April 2017

LEGEND
- RSA Groundwater Dependant Towns 2013
- Major RSA Cities
- Major RSA Dams
- Major RSA Rivers
- RSA Rainfall Regions
  (A = Winter, B = Year Round, C = Summer)
- International Boundary

Change in Groundwater (GW) Levels [m]
- GW Level Increase > 0.1
- GW Level Stable: -0.1 to 0.1
- GW Level Decrease: > -0.1 to -1.0
- GW Level Decrease: > -1.0

WATER IS LIFE - SANITATION IS DIGNITY
Figure 2: Sequential response and recovery functions of groundwater and surface water to drought. (From: Calow et al., 1997)
WESTERN CAPE WATER SUPPLY SYSTEM (WCWSS)
The Western Cape Water Supply System (WCWSS) consisting of 6 Dams serving City of Cape Town and surrounding towns and irrigators serves more than 3.2 million people in an area which generates approximately 14% of the national GDP and providing water mainly in the Western parts of the Western Cape Province to:

- the City of Cape Town (CCT);
- Certain Overberg, Boland, West Coast and Swartland towns; and,
- Irrigators along the Berg, Eerste and Riviersonderend rivers.

Key sources of water are the Berg and Breede rivers and their tributaries - now all heavily utilised. Additional smaller coastal rivers include the Eerste, Steenbras and Palmiet rivers and there is some groundwater, with the Table Mountain Group Aquifer potentially very significant. Proximity to the sea allows for desalination.
INTERVENTION THROUGH WATER RESTRICTIONS
Intervention by Water restrictions

• Water Restrictions are used on systems facing deficits to prolong the water supply during periods of water shortage.
• Restrictions are applied to stop supplying less critical uses in order to avoid emptying the water resource completely.
• For urban use, critical use include water for the house, unlike gardening, swimming etc.
• Restrictions are gazetted by the Minister (or as delegated) and if implemented, lasts until the drought is broken.
Intervention by Water restrictions

• The determination of the level of restrictions to be applied is done through Stakeholder Operating Forums (SOFs) where all stakeholders are consulted on the condition of the system. In the case of the WCWSS, following engagement with the SOF (8 March 2016 and 16 November 2016) the following restrictions have been agreed to:
  – Government Gazette 40279 (16 September 2016), 20% for domestic and industrial users and 20% for agricultural use (restrictions were effectively in place from 1 June 2016 despite the late publication of the Gazette);
  – On 16 November 2016, agreed to increase the restriction on agricultural use to 30%;

• The long-term view is that based on the current operating rule for restrictions (20% domestic and industry and 30% for agriculture) the system would only be violated in Nov 2022 with normal rainfall (the next augmentation must be complete by this date),

• This assumes however that all users will implement restrictions as required,

• Currently we are tracking outside of the recommended utilization so the system could be violated at an earlier date resulting in potentially even harsher restrictions in 2018,

• A further system re-run will be conducted in November 2017.
AUGMENTATION OPTIONS TO MEET FUTURE NEEDS
Water Reconciliation Scenarios

- Water Requirement Scenarios (2009 reference scenario);
  - Growth of domestic water requirements
  - Growth of agricultural consumption / capped allocation
  - Industrial development Saldanha Bay
  - Success of WC/WDM

- Available System Yield
  - Impact of climate change
  - Implementation of the Reserve

- Lead-times of available interventions

- The next slide shows:
  - the current system yield (582 million m3/a), actual and adjusted water use (i.e. with capped agricultural use)
  - the expected growth in water requirements until 2040, given the high growth and low growth scenarios, based on the updated WC/WDM Strategy.
Water Requirements and Availability

• System currently in surplus due to the completion of the Berg River Dam (2006/07) (under normal rainfall conditions);
• Without the successful implementation of the WC/WDM measures (per the City’s WDM Strategy) and with high growth in water requirements, this surplus would only be adequate to 2017 (projected);
• The City has invested heavily in implementing WC/WDM measures and it is already showing significant results;
• The consequent lower growth in water requirements being experienced, stretches the date to at least 2020/22 before the next augmentation scheme needs to come on line (under normal rainfall conditions);
• This lower growth water requirement has critical implications for the implementation of any capital-intensive new augmentation scheme option (cost sharing and off-take agreements).
Water Reconciliation Scenarios
Augmentation Options To Meet Future Needs

DWS: pre-feasibility assessments on the following 6 projects:

- *Augmentation of Voëlvlei Dam from Berg River catchment* (winter flow) downstream of the Berg River Dam. (Preferred option, preliminary designs done (EIA started in November 2015), but may only be ready by 2021 (construction to commence in 2019).
- *Michell’s Pass diversion weir* (upper Breede) to augment Voëlvlei Dam.
- *Raising the structure of the Lower Steenbras Dam*
- *Building a new dam in the Molenaars River* (Worcester side of the Huguenot Tunnel)
- *Raising of Voëlvlei Dam*
Augmentation Options To Meet Future Needs

Cape Metro: Implementation of the flowing projects:

- More intensive Water Conservation and Water Demand Management implementation of measures
- Desalination of seawater (working with ESKOM on utilising Koeberg’s marine intake works)
- Development of groundwater (deep drilling would be expensive around Theewaterskloof and Wemmershoek dams, quality problems to do large scale development of the Cape Flats Aquifer, but small scale projects being implemented by the CCT)
- Re-use of waste water (challenges to be resolved in taking this up into the water supply systems, needs significant pumping to one of the large storage dams to dilute with fresh water after final purification. Need to resolve concerns about dealing with suspected toxins, hormones, oil, heavy metals)
WESTERN CAPE WATER SUPPLY SYSTEM

PROJECT DESCRIPTION
First Phase augmentation of the Voelvlei Dam involving pumped abstraction of winter water from the Berg River to improve yield of the dam. Augmentation relies on utilisation of existing storage capacity in the Voelvlei Dam and on the existing capacity of pipeline from the dam.

STATUS
Technical Feasibility Study completed. EIA in progress.

PROVINCE: Western Cape

JOBS IMPACT
Opportunities for job creation will be investigated during the EIA Study

PROJECTED COST TO COMPLETION
R 500 million escalated to 2019

PROJECT SCOPE
- Low level weir on the Berg River;
- Pump station to divert water from the river;
- Pipeline from low level weir to Voelvlei Dam;
- Upgraded Voelvlei Dam outlet structure;
- Associated infrastructure.

IMPLEMENTATION PROGRAMME
- Environmental Authorization end 2017;
- RID scheduled for 2017/18;
- Detailed design complete end 2018;
- Construction commence end 2019 (construction could start as early as 2018 as an emergency scheme);

PROGRESS
Compilation of EIA report is underway.

CONNECTED ISSUES
Upgrading of pipeline from water treatment works by City of Cape Town in a later phase.

FUTURE DECISIONS REQUIRED
- Environmental authorisation
- Ministerial approval in terms of Sec 109 of NWA and publication of Gazette Notice i.t.o Sec 110
- Funding arrangements.
Short term mitigation measures

- Water conservation and water demand management (Leak detection and repair and pressure reduction);
- Bring dysfunctional infrastructure back into operation (e.g., desalination plants which are not fully functional);
- Surface water resource management (Optimised operation of Systems, balanced draw down of dams serving CoCT);
- Managing and use of groundwater resources (drilling and equipping new boreholes);
- Eradication of invading alien plants/catchment care (WfW programme by DEA);
- Eradication of illegal water use;
- Development of surface water resources (complete the raising of the Clanwilliam Dam) and Water Transfers (winter transfer from the Berg into Voelvlei dam);
- Rainwater harvesting (provision of tanks in selected areas);
- Provision of static storage tanks at strategic locations and the carting of water by tanker (extreme cases only, unsustainable).
- Municipalities must accelerate completion of Grant funded projects.
Short term mitigation measures

- In order to utilise the last 10% of available water in the main storage dams, DWS Construction will commence with the cleaning of channels in the dam basins from 03 June 2017:
  - Voelvlei Dam: The feeder channel towards Swartland WTW outlet requires some cleaning and excavation which can only be done when the water is low enough, completed all the surveys and determined the resources required to do the work.
  - Theewaterskloof Dam: We have surveyed the feeder channel to the Charmaine tunnel surveyed and confirmed with echo sounding, some dredging/excavation required in the channel to go down to 4% level, a small coffer wall will be built just above Draaiberg bridge to pump water from the main body of water inside the dam basin back to the feeder canal.

- All Municipalities to intensify implementation of their Water Conservation and Water Demand Management programmes which must include leak detection and leak repairs and consider the installation of flow restrictors;

- Agricultural Sector to intensify the application of restrictions across all water intensive agricultural activities;

- Closely monitor the achievement of targets by water users, assess impact of mitigation measures and interventions (take corrective action where necessary);
THANK YOU!