



**water affairs**

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Department:

Water Affairs

**REPUBLIC OF SOUTH AFRICA**

## **ALGOA WATER SUPPLY SYSTEM RECONCILIATION STRATEGY**

### **Status Report**

**October 2011**

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## 1. INTRODUCTION

### 1.1. BACKGROUND

The Algoa Water Supply System (AWSS) extends from the Kouga River system in the west to the Sundays River system in the east. The AWSS provides water to the Gamtoos Irrigation Board, the Nelson Mandela Bay Municipality (NMBM) and several smaller towns within the Kouga Municipality. The AWSS currently comprises two major dams in the west, several smaller dams and a spring situated near to NMBM, and an inter-basin transfer scheme from the Orange River via the Fish and Sundays rivers to the east.

The figure in Appendix A illustrates the extent of the AWSS.

The Algoa Reconciliation Strategy Study was undertaken by the Department of Water Affairs (DWA), in cooperation with the NMBM and other stakeholders in order to secure a sustainable future water supply for NMBM and the other towns served by the Algoa Water Supply System (AWSS). The purpose of the Reconciliation Strategy is to determine the current water balance situation and to develop various possible future water balance scenarios up to 2035. It further aims to describe the proposed strategy, and the associated actions, responsibilities and timing of such actions that are urgently needed to reconcile the supplies and requirements, to enable additional interventions to be timeously implemented so as to prevent the risk of a water shortage becoming unacceptable. The Strategy offers a system for the continuous monitoring and updating of the Algoa Reconciliation Strategy into the future.

The Strategy was initially completed in early 2010 and was subsequently updated in April 2011 due to emergency interventions planned as a result of the drought, as well as revised Coega IDZ requirements.

### 1.2. PURPOSE OF THIS REPORT

The purpose of this Summary Report is to:

- a) provide a short summary of the Algoa Water Supply System Reconciliation Strategy Study that was completed in 2011, as well as the main recommendations from the study,
- b) give an overview of the progress made in the implementing of the recommendations of the Strategy,
- c) set out the updates to the Strategy, and
- d) list the updated recommendations.

## 2. SUMMARY OF THE 2011 RECONCILIATION STRATEGY STUDY

### 2.1. WATER REQUIREMENTS

The total usage of water from the AWSS in 2009 was 157.8 million m<sup>3</sup>/a. This comprises urban use by NMBM and various small towns, agricultural water use, losses from the Kouga/Loerie canal, and ecological water requirements. The sectoral water use pattern in the AWSS for 2009 was as follows:

NMBM	98.7 million m <sup>3</sup> /a (63% of the total)
Small towns:	4.3 million m <sup>3</sup> /a (3% of the total)
Irrigation	48.5 million m <sup>3</sup> /a (31% of the total)
Canal Losses	4.3 million m <sup>3</sup> /a (3% of the total)
Ecological Water Requirements	2.0 million m <sup>3</sup> /a (1% of the total)
<b>TOTAL</b>	<b>157.8 million m<sup>3</sup>/a</b>

It is important to note that, for water balance calculations, all above-mentioned requirements are based on water supplied at a 1 in 50 year assurance of supply (corresponding to 1 failure in 50 years).

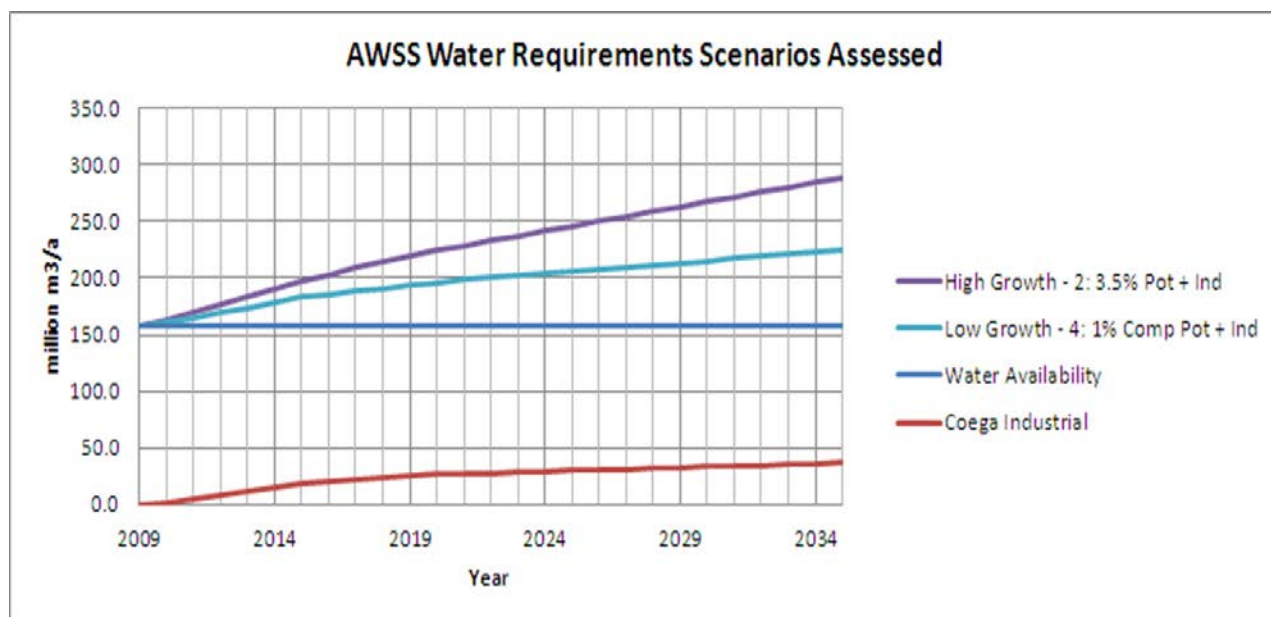
Water for irrigation is supplied at a 91% assurance of supply (approximately 1 failure in 10 years). The full allocation to the Gamtoos Irrigation Board (GIB) is 59.36 million m<sup>3</sup>/a from the Kouga Dam. The combined total usage by agriculture from the AWSS is estimated to be 63.76 million m<sup>3</sup>/a at a 91% year assurance of supply, excluding irrigation usage from the rivers upstream of the dams that form part of the AWSS.

Various future water requirement scenarios were developed, with the primary considerations being population and economic growth. Two future water requirement scenarios were developed for the Algoa Reconciliation Strategy Study, namely a high-growth and a low-growth scenario. These scenarios did not take account of future water conservation and water demand management measures, as these are included as interventions that could be selected to reduce the future water requirement. In the scenario development it has been assumed that irrigation usage, total Kouga-Loerie canal losses and environmental water requirements do not change.

The “High Water Requirement” scenario was based on high economic and high population growth rates which translated to an average water requirement linear growth rate of 3.5% per annum. In this scenario, the potable system requirements grew from 158 million m<sup>3</sup>/a in 2009, to 252 million m<sup>3</sup>/a in 2035. The “Low Water Requirement” scenario was based on low economic and low population growth rates. In this scenario the potable system requirement grew from 158 million m<sup>3</sup>/a in 2009 to 188 million m<sup>3</sup>/a in 2035. This translated to an average compound growth in water requirement of 1.0% per annum. Industrial water requirements for the Coega IDZ grew from 0 million m<sup>3</sup>/a in 2009 to 37 million m<sup>3</sup>/a in 2035.

## 2.2. WATER AVAILABILITY AND BALANCE

The combined yield of the AWSS sources at an assurance of supply of 98% (1:50 year assurance of supply) is 159.4 million m<sup>3</sup>/a. **Figure 1** shows the High and Low Water Requirement scenarios as determined in the Reconciliation Strategy Study, when compared with the 2009 system water yield.



**Figure 1: AWSS water balance**

It has been assumed that the system was just in balance in 2009 and that any increase in use would put the system at risk. The higher the growth in water requirements, the higher the risk would be, especially if large users in the Coega IDZ were to be established within the next five years. It was clear that measures to solve this problem had to be proceeded with immediately on account of the lead times necessary for implementation. In addition, implementing emergency measures to overcome the serious water shortages in the System were necessary because of the severe drought situation.

### **2.3. URBAN WATER CONSERVATION/WATER DEMAND MANAGEMENT (WC/WDM)**

NMBM is implementing its WC/WDM Strategy Action Plan, as part of the Drought Emergency Interventions. This intensification of the WC/WDM program is expected to result in overall savings of approximately 15 million m<sup>3</sup>/a. It is important that all actions are continued when the drought is over. This includes:

- Completing the assessment of institutional aspects relating to WC/WDM, and the evaluation of water use data.
- Appointing appropriate staff/professional service providers to expedite implementation of NMBM's existing WC/WDM Action Plan.
- Securing additional resources from the State to assist NMBM, their existing consultants and their contractors to expedite those components of the WC/WDM Action Plan that will provide the most significant savings in as short a time frame as possible, under the Emergency Drought Action Plan and thereafter.
- Biannual aerial infrared surveys of bulk supply pipelines to identify leaks and repair identified leaks.
- Completing the bulk meter installation program and utilising meter data to identify excessive night flows in distribution reticulation, trace and repair leaks.
- Addressing the significant water wastage in schools.
- Address the Private Homes Program and communal standpipes which target high-use private users.
- Address the leakage repair of plumbing at government buildings.
- Address the leakage repair in low-income housing.
- Develop a rainwater harvesting policy and promote the use of rainwater tanks, especially for new developments.
- Prepare a draft policy in support of WC/WDM bylaws, which should inter-alia address penalties for excessive water use, promotion of rain water tanks for especially new houses and buildings and the use of private boreholes etc.
- Review the existing tariff structure, especially the tariff for excessive usage and action measures for such excessive use within defined limits of acceptable use.
- Intensify the public awareness program.
- Implementing a Hot Line for the reporting of leaks and subsequent repair and monitoring.
- Compile and implement a strategic plan for the development of dual systems for the NMBM beach front, golf courses, schools, the university and new developments.
- Evaluate the feasibility of the drafting of a new bylaw that requires the submission of water-wise garden plans for all new developments

The DWA will support NMBM by:

- Significant support with the implementation of their WC/WDM Plan.
- Actively pursuing the implementation of WC/WDM initiatives in other local authorities served by NMBM and the Algoa Water Supply System: Kouga Municipality (Jeffrey's Bay, Cape St Francis, Humansdorp, Hankey and Patensie).

WC/WDM implementation is essential and therefore its implementation during the drought has been afforded the highest priority by NMBM. The drought and the declaration of an emergency have enabled NMBM to intensify their leak detection and repair and plumbing repair programs. Increased sliding-scale tariffs have been introduced, usage patterns are being closely monitored and excessive use is brought to the attention of high users.

## **2.4. IDENTIFICATION OF INTERVENTIONS**

More than sixty potential interventions, which could contribute to meeting the future water requirements of the AWSS, were initially identified from previous and on-going studies, including several newly formulated interventions.

In addition to WC/WDM, the following categories of interventions were identified:

- Increased operational efficiency of the current water supply system;
- Trading of water use authorisations;
- Re-use of water;
- Groundwater schemes;
- Inter-basin transfer schemes;
- Desalination of seawater;
- Desalination of brackish river water; and
- Surface water schemes.

As the implementation of large projects can take up to ten years or more from feasibility study to completion, it is essential that potential future sources of supply be identified and investigated as soon as possible. There are a number of interventions which could be studied and implemented in parallel, if proven feasible. The Reconciliation Strategy Study went through a selection process to identify the most favourable interventions or groups of interventions to meet possible future water requirement scenarios.

All identified interventions were initially evaluated in terms of cost, socio-economic and environmental considerations, to approximate a common base of information. The time required to implement each intervention was considered and a detailed likely implementation programme for each intervention was drafted and reviewed. Public input was then obtained on additional interventions and the potential list of all interventions was amended accordingly.

An Intervention Workshop was held where a representative, multi-stakeholder group took part in the screening process to help eliminate unacceptable interventions or refine/modify proposed interventions.

## **2.5. RECONCILIATION SCENARIOS**

A scenario planning process was used to identify, evaluate and assess alternative groupings and phasing of interventions so as to determine the most appropriate combination of interventions that could be implemented to reconcile water supply and requirement in the AWSS, up to 2035. The objective was not to select one "favourable scenario" but to identify which interventions should be studied further to allow consideration of a range of possible scenarios. This would allow the DWA, the NMBM, and other stakeholders, the maximum amount of flexibility in making informed decisions on which interventions to implement. The outcome of the process was an Action Plan indicating timelines and responsible organisations for the implementation of interventions, and the undertaking of studies and associated supporting tasks.

The interventions which were identified as probably feasible to increase the available supply to the area are listed in **Table 1**. The significant drought experienced in the region and the need to fast-track interventions significantly influenced the interventions recommended for implementation.

**Table 1: Interventions to increase the water resource**

Intervention	Study or Implementation Action
Improved Operation of the Kouga-Loerie System	Implemented in 2009
ORP Nootgedagt Low-Level Scheme	Accelerated design and construction and by provision of budget for early implementation in 2011
Swartkops Drought Emergency seawater desalination plant	Fast tracking of EIA, design and tender processes, dependant on funding approval, for implementation in 2011
Bushy Park Aquifer development	Drought Emergency fast-tracking of the EIA, design and tender process to deliver water in 2011
Re-use of water treated to industrial standards – Coega and Fish Water Flats WWTWs	Feasibility study - for first water by 2021

A range of further studies and supporting actions to be undertaken have been identified as shown in **Table 2**:

**Table 2: Further Studies and supporting Actions to increase the water resource**

Intervention	Study or Action Required
<b>OPERATIONAL EFFICIENCY</b>	
Water use licence application to abstract more water from the Kouga-Loerie system	NMBM to submit water use licence application to DWA
<b>TRADING OF ORANGE RIVER IRRIGATION AUTHORISATIONS</b>	
Water trading – existing entitlements in upper Great Fish River	Pre-feasibility study - 2011
<b>RE-USE OF WATER</b>	
Integrated re-use policies for areas of jurisdiction and determination of the full future potential for effluent re-use	Pre-feasibility study – 2011. Conceptual design of various effluent re-use interventions, and a comprehensive EIA
Re-use of water treated to industrial standards – Coega and Fish Water Flats WWTWs	Feasibility study - 2011
Indirect re-use of water treated to potable standards, from Fish Water Flats and other potential WWTWs	Pre-feasibility study - 2011
Monitoring of wastewater effluent	Establish gauges to monitor flows and quality of WWTW flows for later possible re-use schemes - 2011
<b>GROUNDWATER</b>	
Bushy Park Drought Emergency Aquifer development	Drought Emergency fast-tracking of the EIA, design and tender process to deliver water in 2010
Groundwater schemes at Jeffrey's Arch, Van Stadens, and South-Eastern Coega Fault to supply NMBM or small coastal towns, freeing up water for NMBM	Pre-feasibility study - 2012
Wellfield monitoring	Cap unused artesian boreholes and establish a network of boreholes to monitor groundwater levels in the various aquifers and monitor abstractions - 2011
<b>ORANGE RIVER INTER-BASIN TRANSFER SCHEME</b>	
ORP Nootgedagt Low-Level Scheme	The NMBM have expedited the implementation of the Nootgedagt Low-Level Scheme by accelerating design and

Intervention	Study or Action Required
	construction and by providing budget for early implementation by 2011
Orange River water use evaluation: Potential phasing of the use of Orange River water, synergies with a potential Coega IDZ desalination option and Scheepersvlakte Balancing Dam storage capacity	Pre-feasibility study -2011
Desalination of Sundays River irrigation return flows	<ul style="list-style-type: none"> <li>Utilise the DWA gauge to monitor quantity and quality of the Sundays River WUA return flows – from 2010</li> <li>Thereafter undertake feasibility study</li> </ul>
<b>SEAWATER DESALINATION</b>	
Monitor water quality at the abstraction sites of potential desalination plants	<ul style="list-style-type: none"> <li>From 2011</li> <li>Request Coega Development Corporation and Straits Chemicals to implement a seawater quality monitoring programme</li> </ul>
Coega Industry Desalination Option - purchasing of potable water by NMBM (dependent on the construction of a bulk seawater intake system for the Coega IDZ)	Monitor date on which Straits Chemicals will begin operations or not
Contractual arrangements of a potential future contract between Straits Chemicals and NMBM	Study completed in 2010
Desalination supply for NMBM via a bulk seawater intake system	Pre -feasibility study - 2012
<b>SURFACE WATER</b>	
Validation and Verification of water use in the Kouga/Loerie and Churchill/Impofu systems	From 2012
Kouga/Loerie and Churchill/Impofu systems water availability assessment study (WAAS) including irrigation and urban supplies	Feasibility study – 2013 – following the Validation and Verification Study
Guernakop Dam on the Kouga River, and Raising Kouga Dam on the Kouga River (replacement and raising)	Pre-feasibility study following WAAS study
Implementing the Reserve for existing AWSS dams	Develop a strategy – 2011 to 2012
<b>LAND USE CHANGES</b>	
Invasive Alien Plant clearance in the catchments of the Kromme, Kouga and Bavianskloof rivers	Gamtoos IB is the implementing agent for Working for Water and undertakes ongoing programmes to remove invasive alien plants
<b>CLIMATE CHANGE</b>	
Impact assessment study to determine the expected regional impact of climate change on the AWSS water balance	Pre-feasibility impact assessment study – 2011 to 2012

The scenario planning process was utilised to *inter alia* assess the following:

- The benefits of implementing WC/WDM;
- NMBM Emergency Interventions;
- Permanent vs. temporary Orange River water allocations;
- Desalination vs. surface water interventions;
- How to meet the Coega IDZ industrial water needs;
- The implications of implementing the ecological Reserve for existing water resources; and
- The implications arising from the possible effects of climate change.



During the scenario planning process various scenarios were considered. Each scenario had a specific objective, which could impact on the possible studies required, as well as the date when the DWA and/or the NMBM should commence the implementation process.

## **2.6. PUBLIC PARTICIPATION DURING THE STUDY**

The Reconciliation Strategy Study was designed to facilitate input from stakeholders and the public. Three newsletters giving feedback on progress with the Study and inviting feedback were distributed to a mailing list of Interested and Affected Parties. In addition, three public meetings were held in the supply area of the AWSS.

## **2.7. RECOMMENDATIONS**

The AWSS Reconciliation Strategy Study which was completed in April 2011 recommended the urgent implementation of the following Emergency Interventions. The responsible organisation identified to undertake the recommendation is shown in brackets.

- a. Urban WC/WDM, comprising a range of measures (NMBM);
- b. Nooitgedagt Low-Level Scheme, using the increased allocation of Orange River water to NMBM (NMBM);
- c. The development of groundwater sources and particularly those close to and easily integrated into the existing infrastructure (NMBM), and
- d. Desalination at the Swartkops estuary should it become necessary to rapidly implement this scheme as an emergency source of supply that would not be affected by drought (NMBM).

The Reconciliation Strategy also recommended that the following study be undertaken as a priority:

- e. Feasibility of re-use of water from the Fishwater Flats and the Coega Wastewater Treatment Plants to supply the Coega IDZ.

The Reconciliation Strategy Action Plan further recommended that studies of the following interventions or combinations thereof should be initiated or that policies with regard to these should be developed:

- Rainwater harvesting;
- Removal of invasive alien plants;
- Re-use of water to non-potable and to potable standards;
- Water trading to replace the allocation of Orange River water that may be phased out;
- Desalination of lower Sundays River irrigation return flows;
- Seawater desalination: the Coega IDZ desalination supply option;
- Desalination of seawater by NMBM;
- Groundwater well-field development;
- Guernakop Dam on the Kouga River; and
- Kouga Dam on the Kouga River – replacement and/or raising.

## **2.8. APPROVAL OF RECONCILIATION STRATEGY STUDY RECOMMENDATIONS**

Following the completion of the Reconciliation Strategy Study, the Strategy, along with its conclusions and recommendations, was presented to various organisations and authorities, including the DWA and the NMBM. The Strategy was accepted in Nov 2010 by the Study Steering Committee, comprising

representatives of DWA, NMBM and other key stakeholders. A submission needs to be made to the DWA MANCO and the Mayoral Committee of the NMBM in order to obtain their support for the Reconciliation Strategy.

### **3. PROGRESS WITH IMPLEMENTATION OF STRATEGY RECOMMENDATIONS**

#### **3.1. ESTABLISHMENT OF THE STRATEGY STEERING COMMITTEE**

One of the recommendations of the Reconciliation Strategy Study was that a Strategy Steering Committee (SSC) should be formed with a clearly defined mandate and scope of work.

The objectives of the SSC are:

- to ensure and monitor implementation of the recommendations of the Algoa Reconciliation Strategy,
- to update the Strategy to ensure that it remains relevant, and
- to ensure that the Strategy, its recommendations and progress with the implementation are appropriately communicated to all stakeholders.

The SSC was constituted with membership from the main users and institutions in the area. See Appendix B for the full list of members as well as the Draft ToR for the Committee in Appendix C.

The following meeting was held:

- Meeting 1: 8 September 2011: The members were given a presentation on the background, conclusions and recommendations of the Reconciliation Strategy Study. The implementation of NMBM Drought Measures was presented as well as progress with NMBM's WC/WDM measures. The Draft Terms of Reference for the SSC, representation on the SSC and appointment of an Administrative and Technical Support Group was briefly discussed by the SSC. Following the meeting, members would comment on the Draft Terms of Reference. The SSC also noted the progress which was made on the implementation of the recommendations contained in the Reconciliation Strategy Study. Two key scenarios were updated and presented.

An Administrative and Technical Support Group (Support Group) is being formed to support the SSC. The Support Group consists of representatives from the Department's National Office (Directorate of National Water Resource Planning and Options Analysis), the DWA Eastern Cape Regional Office, NMBM and the Gamtoos Irrigation Board. The Support Group will meet between the SSC meetings to ensure that the recommendations of the strategy and committee are implemented. Aurecon South Africa (Pty) Ltd was appointed by the DWA in July 2011 to provide administrative and technical support to both the Support Group and the SSC.

#### **3.2. NMBM DROUGHT EMERGENCY WATER SUPPLY STRATEGY**

Severe drought conditions were experienced in the dam catchment areas supplying the NMBM area from 2008 to early 2011. A series of interventions, initiated by the NMBM Water Division, were started with the express intention of alleviating the current drastic water shortage. The NMBM imposed water restrictions in October 2009 and more severe restrictions were imposed on 1 February 2010 in order to minimise the risk of excessive drawdown of the already low water levels in the dams. Subsequent to this, an application for Drought Alleviation funds was made to National Treasury in June 2010.

In view of the relatively long lead times necessary to implement emergency measures NMBM has prepared an Emergency Action Plan to ensure that there will be sufficient water stored in the dams to supply the needs of NMBM and the various coastal towns that it supplies. The Emergency Action Plan entailed:

- Identification of options that could be rapidly implemented in order to further curtail water usage or to augment the supply.
- Screening of these potential options and the development of a short list for implementation together with the authorities responsible for approvals.
- Fast tracking the implementation of the selected options

WC/WDM measures provide the most cost effective means of reducing water demands by minimising losses and wastage, and by so doing delaying the need to construct additional infrastructure, usually at very high capital cost. The purpose of WC/WDM is to permanently reduce water requirements, whereas the emergency restrictions and measures should only be applied for relatively short periods of time when reservoirs are severely drawn down during periods of drought. Additional budget and resources were allocated to NMBM's WC/WDM programme to address screened and prioritised WC/WDM interventions, initially concentrating on those measures that could provide the most effective contributions to the Emergency Action Plan.

NMBM undertook a drought publicity campaign to reduce water use through the media and radio, erection of display boards, preparation and distribution of leaflets, brochures, decals and posters – so-called “in-your-face” media. The importance of political leadership and support for such a campaign is extremely important. It was evident that there is a direct link between awareness and water use levels. Recycled water was promoted for construction where appropriate. The campaign cost R30 million which was expensive, but necessary.

Yield from the Nooitgedagt Scheme was maximised to ensure that the maximum quantity of water was put through the system without compromising water quality. This entailed increasing the plant output from 70 to 90 MI/d. During the drought, the scheme produced up to +/- 93 MI/d. A barge with submersible pumps to access dead storage of up to 9000 MI at Impofu Dam was also ready to be used if needed.

Key lessons learnt during the drought were the following:

- Political buy-in and active support is critical.
- All interested and affected parties have to be consulted.
- Drought implementation options should be considered in terms of the long-term Water Management Plan to reduce abortive costs.
- The drought publicity campaign should not summarily be stopped but should continue as part of the WC/WDM Strategy, to remind users of the scarcity of water in their area.
- Earlier implementation of future projects inflates water tariffs.
- New water sources (desalination) had to be considered.
- Empty dams will have a devastating effect on agriculture, business, the Metro and South Africa, and the next round of restrictions would have resulted in more direct job losses.

### 3.3. PROGRESS WITH WC/WDM

The objective of the NMBM WC/WDM Programme is to reduce water use by a minimum of 25 MI/day by undertaking repairs to water leaks on municipal water mains and leaks on properties. This was one of the recommendations of the 2005 NMBM Water Management Plan. Progress is as follows:

Assistance to the Poor (ATTP) **leak repairs** (repairs to private plumbing of poor households): By March 2011 2803 ATTPs used on average more than 30kl/month. To date 11 846 erven have been repaired, with an estimated 26.5MI/day to be saved due to repaired erven. Savings are independently verified by the Management System.

**Schools leak repairs:** 384 Schools within NMBM have been inspected, and a priority school report and recommendations were submitted to NMBM and the Department of Education (DoE). A Memorandum of Agreement was signed by DoE and NMBM to repair leaks at schools. Emergency interventions were undertaken by NMBM at 10 schools for replacement of main water supplies. A budget for school repairs is being finalised by NMBM and DoE, with DoE to transfer R5 million to commence the project. Repairs could start during Oct/Nov.

**Zone Metering:** 168 Zones (districts) were identified, and designs for 31 new installations have been completed. A total of 55 zone meters were replaced.

**Remote Sensing:** A GSM link was installed that transfers data to the WC/WDM system, as well as trial remote sensing installations on zone meters.

**Pressure management:** Two trial installations were identified, but has not commenced due to the drought. A PRV field survey report was completed, and PRVs for repair / replacement was identified. Smart pilot control was investigated for current installations.

**Awareness campaign:** Advertising recommenced in newspapers and radio in May, but has been halted after all the dams filled up. An accounts insert was disseminated in April. A new door-to-door campaign is being planned to remind users to use water wisely.

**Leak detection and repairs:** The implementation team consists of a consultant and two contractors, for leak detection and repair respectively.

**Non-Revenue Water Support structures:** A three-tier approach is used for monitoring, namely project meetings for awarded contracts, the Non-Revenue Water technical team and Finance and Water Service meetings.

**Promoting the use of rainwater tanks:** A municipal bylaw was recently promulgated to promote the use of rainwater tanks. The WC/WDM public awareness campaign recommended increased use of rainwater tanks.

It is important to note that WC/WDM is a long term initiative and gains will not be immediately evident. Adequate funding support is the most critical element.

### 3.4. PROGRESS WITH IMPLEMENTATION OF NMBM DROUGHT PROJECTS

**Improved Operation of the Kouga-Loerie System** to maximise yield was already implemented as part of the Preliminary Reconciliation Strategy in 2009. This additional yield will henceforth be considered as part of the yield of the AWSS.

#### **ORP Nooitgedagt Low-Level Scheme**

An additional allocation of water from the Orange River has been approved by DWA and the environmental impact assessment for the scheme has been approved by the Department of Economic Development and Environmental Affairs (DEDEA). In view of the high cost of infrastructure investment, NMBM have requested DWA to consider making the additional allocation permanent. A total of 9 separate contracts were identified to increase overall plant capacity of Nooitgedagt water treatment works (WTW) from 70 to 160 MI/d. R450 million was approved by National Treasury towards this project. R351 million is still needed to complete the project during the next two financial years. The two pipeline contracts, one electrical contract and Civil Works contract were awarded and have commenced. The outstanding contracts for Reservoir and Pipe Works have

closed and are currently being evaluated. It is estimated that the completion of the WTWs 3rd Module and rehabilitation of the 45 Ml reservoir at Olifantskop will be completed in February 2013.

#### **Swartkops Drought Emergency seawater desalination plant**

A 30 Ml/d reverse osmosis plant to be located at the old Swartkops Power Station at the Swartkops River was identified as the emergency desalination plant. The anticipated total cost of the 30 Ml/d desalination plant, including all associated infrastructure is R450 million excluding a sea outfall (as studies showed that releases could be made via the existing sea outfall). The design of the plant is well advanced and the tender documents have been completed. As the drought is broken, the plant will likely not be constructed in 2011 as planned, and a new location for a bigger desalination plant needs to be investigated instead. Such a plant will need to be in production by 2017/2018, according to the "Reference" Scenario. The cost of such a plant could be R900 million. Funds for the preliminary work need to be made available.

#### **Wellfield development**

Groundwater can provide affordable, dependable supply with minimal management. Private boreholes, municipal boreholes and several potential wellfield sites were investigated, partly based on previous studies undertaken. 6 Production boreholes were sited and a drilling contract is out on tender for the Coega Fault.

#### **Re-use of water treated to industrial standards – Coega and Fish Water Flats WWTWs**

This will be addressed in the NMBM Water Master Plan, following on from the study undertaken to evaluate supply options of the Coega IDZ. Recommendations from the Process Upgrade Study of the Fish Water Flats Wastewater Treatment Works (WWTW) for industrial use recommended that part of the works be converted to a membrane bioreactor (MBR) process. The Loerie Indirect Re-use Scheme was conceptualised during the planning of the implementation of the Fish Water Flats to Coega IDZ industrial water scheme, as it provides the opportunity for 40 Ml/d excess treated water to be conveyed to Loerie Dam for indirect potable reuse. The upgrading of the Fish Water Flats WWTW has been delayed due to NMBM's funding constraints.

### **3.5. PROGRESS WITH OTHER STUDIES AND ACTIVITIES**

In the recommendations of the Reconciliation Strategy Study, a number of interventions were identified as possible future water augmentation schemes that could be implemented after the Nootgedagt Low Level Scheme. In order to ensure that these interventions are available for implementation when required, the DWA and the NMBM were assigned the responsibility of initiating feasibility and/or pre-feasibility level studies into these interventions, or to initiate other supporting activities.

#### **3.5.1 DWA**

##### **Capping of unused artesian boreholes and monitoring of well-field abstractions and groundwater levels**

It has been proposed that, once new production boreholes have been drilled for the Coega Ridge Aquifer in the Motherwell area, they be pumped so that the artesian boreholes are no longer artesian.

##### **Kouga Dam raising in light of DWA dam safety work**

DWA construction activity is planned to start in 2012, to address dam safety issues at Kouga Dam. Liaison is needed with the DWA Dam Safety Directorate to ascertain exactly what will be done and how this could influence the potential raising of the dam.

**Impacts on yields of existing dams through implementation of the ecological Reserve and Climate Change** The Comprehensive Reserve determination recommended that a once-yearly release of 5 million m<sup>3</sup> be made from the Impofu dam for the Kromme estuary. The signed Kromme River Reserve needs to be obtained.

#### **Operating capacity of Darlington Dam**

The required operating level for the Darlington Dam needs to be investigated. The dam safety Office is doing investigations into the stability of the structures. This could potentially involve the removal of gates, depending on the findings. It needs to be ensured that there are no bottlenecks regarding the transfer of additional Orange River water to NMBM. The NMBM has written a letter to DWA to enquire whether any restrictions will be placed on water transferred from the Gariep Dam.

#### **Additional storage in the Scheepersvlakte Balancing Dam and canal**

In addition to potentially increasing the balancing capacity of Scheepersvlakte Balancing Dam, attention must also be given to whether there is a need to increase the supply capacity of the Lower Sundays River Government Water Scheme, i.e. the canal, to cater for the additional allocation to the NMBM, and also for the proposed future development of 3 000 ha of irrigation development for resource-poor farmers. Downtime at the canal is currently not possible as there is no storage for the water available. It is important that an operating risk assessment be done urgently.

#### **Strategies proposed in the All Towns Reconciliation Strategy Study**

There is nothing in the All Towns RSS that will impact directly on the Algoa System as the strategies cover the area not supplied by the AWSS. It would however be worthwhile to find alternative sources for smaller towns like Jeffrey's Bay to reduce water use of such towns from the AWSS. The groundwater initiative under way by NMBM *inter alia* addresses this.

### **3.5.2 NMBM**

#### **Options to replace Orange River water**

Studies have not yet been initiated for the following options to replace Orange River water in the longer term:

- Desalination of Sundays irrigation return flows.
- Purchase of Orange River water irrigation entitlements.

#### **Coega IDZ Seawater Desalination**

Seawater desalination at the Coega IDZ will be covered in the NMBM Water Master Plan. NMBM will keep abreast of development plans of Straits Chemicals.

#### **Monitoring**

Gauges to monitor flows and quality of WWTW flows for later possible re-use schemes are in place.

The monitoring of seawater quality at potential seawater abstraction points for desalination is being done by NMBM in the Swartkops Estuary.

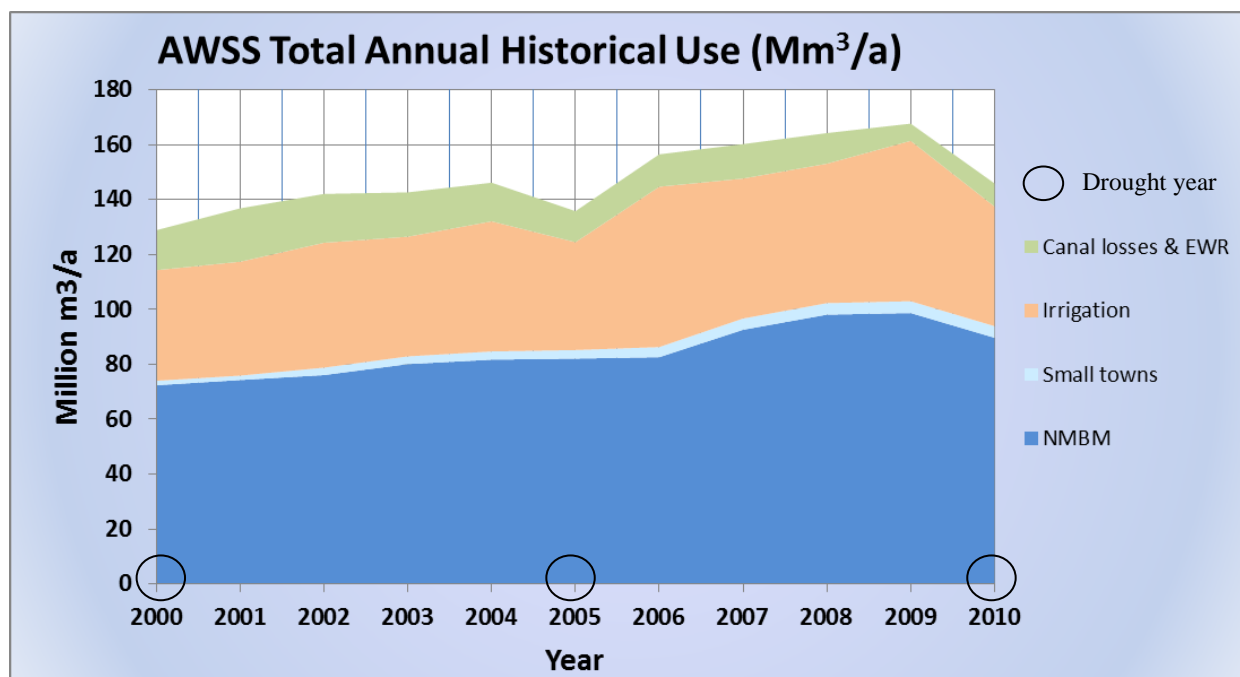
### **3.5.3 Other Municipalities**

Progress with regards to WC/WDM implementation needs to be measured and reported. Municipalities need to plan how to reduce their water requirements and become more efficient. Within the AWSS only the Kouga Municipality will need to be monitored.

## 4. 2009 STRATEGY UPDATE

### 4.1. HISTORICAL WATER REQUIREMENTS

**Figure 2** shows the historical water requirements for the AWSS (calendar years), with the 2010 water requirements added. The influence of the restrictions imposed during the recent drought is evident from the 2009 and 2010 water use. Gamtoos irrigation allocations were restricted by 30%. The graph shows that while water use is inhibited during a drought (drought restriction years shown by circles) through the implementation of water restrictions, the water requirements growth trend has continued after the droughts were broken.



**Figure 2: AWSS historical water use**

A request was made to change the depiction of water use in future from calendar years to 12-month periods starting in July up till June the following year, to correspond with the NMBM and GIB's financial years.

### 4.2. ADJUSTMENTS OF THE STRATEGY

In order to update the scenario planning undertaken as part of the Reconciliation Strategy Study, two 2010 water balance scenarios for potable water use were updated taking account of changed conditions due to the breaking of the drought, accounting mainly for the delay of implementing the Swartkops Desalination Scheme. An updated scenario for earlier implementation of a re-use scheme from the Fish Water Flats WWTW was also developed.

The following two scenarios were updated:

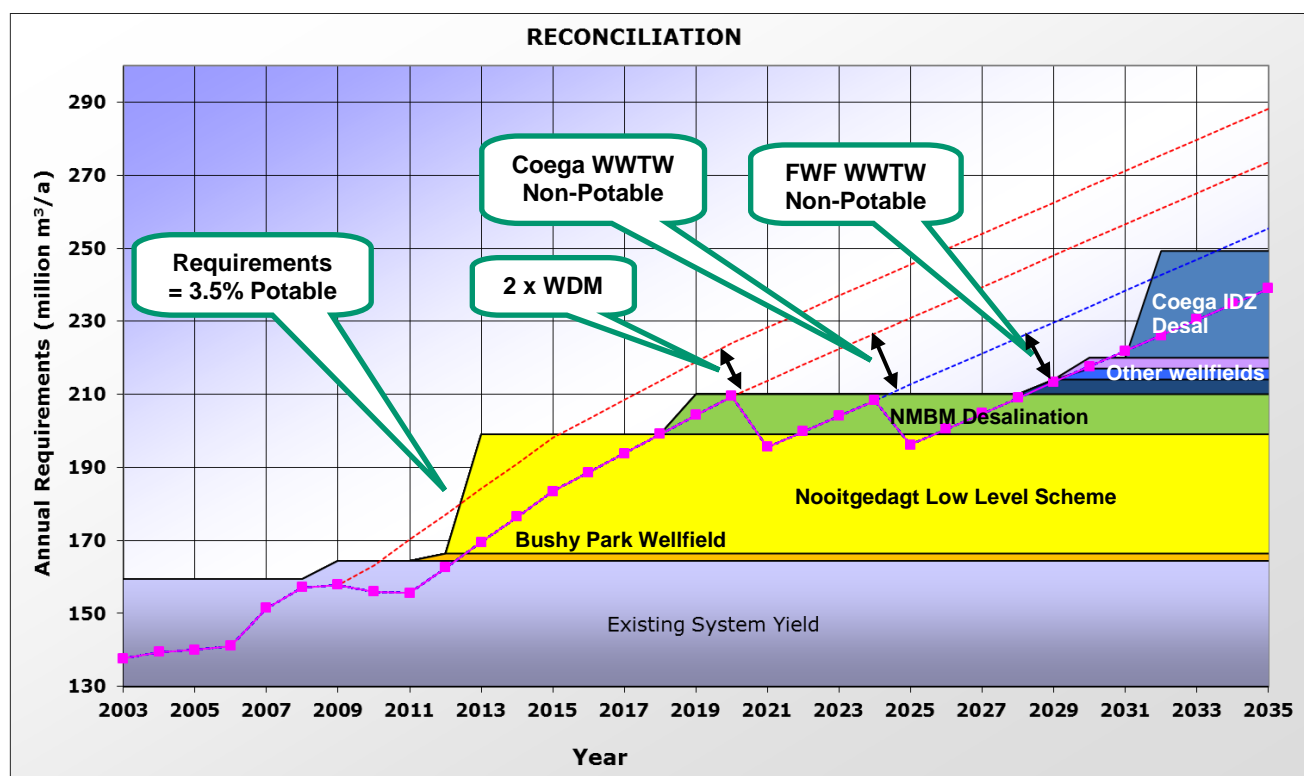
- 1) 2010 (Reference) Scenario 2: "High water requirement", NMBM's Emergency Interventions with a permanent allocation from the Orange River, and in addition Groundwater Abstraction and Coega IDZ Desalination Schemes as well as Non-Potable Water Re-use Schemes at the Coega and Fishwater Flats WWTW to supply NMBM beyond 2035.

- 2) “Worst-Case” Scenario, 2010 Scenario 7: “High water requirement”, NMBM’s Emergency Interventions with Temporary Orange River Allocation and in addition Groundwater Abstraction, a New Raised Kouga Dam, the Purchase of Irrigation Allocations, the Coega IDZ Desalination Scheme and the Sundays River Desalination Scheme as well as Non-Potable Water Re-use Schemes at Coega and Fishwater Flats WWTW to supply NMBM until 2034, with the release of EWRs from existing dams and the impacts of Climate Change.

Many possible scenarios exist between the 2009 Reference Scenario and the “Worst-Case” Scenario, but if solutions could be found for these two scenarios, all others should be covered. Should the water requirement follow the Low Water Requirement Curve and not the High Water Requirement Curve, the required implementation date of interventions would be delayed and therefore more options for implementation would become available to select from.

#### 4.2.1 Updated 2010 (Reference) Scenario: “High water requirement” for potable supply

The 2010 “Reference” Scenario (**Figure 3**) assumed that NMBM’s Emergency Interventions would be implemented as soon as possible, and that a permanent additional allocation is made from the Orange River. Beyond 2035 further Groundwater Abstraction, a Coega IDZ Desalination Scheme and Non-Potable Water Re-use Schemes at the Coega and Fishwater Flats WWTW will augment the available supply to NMBM.



**Figure 3: Updated 2010 “Reference” Scenario for potable supply**

In the updated 2010 Scenario:

- The yield of the AWSS has been increased with the yield of the *Maximisation of the Kouga/Loerie Scheme*, i.e. with 5 million m<sup>3</sup>/a, from 2009, following the implementation of this scheme.
- The Nooitgedagt Low Level Scheme will be implemented in 2013 instead of in 2011.



- A NMBM Desalination Scheme will be implemented in 2019 after the Bushy Park Wellfield and the Nooitgedagt Low-Level Scheme, and not in 2011 as shown in the original Strategy (referred to as the Swartkops Desalination Scheme).

In **Table 3** the interventions which have been used in Figure 3 are listed.

**Table 3: Updated 2010 “Reference” Scenario interventions**

No	Intervention	Year of First Water or Saving	Yield (million m <sup>3</sup> /a)	Total Lead Time	Study Start Date	Fast-tracked
1	WC/WDM doubled savings	2010	14.6	0	2010	Yes
2	Groundwater Bushy Park	2012	2	2	2010	Yes
3	Nooitgedagt Low Level Scheme	2013	32.7	2	2009	Yes
4	NMBM Desalination	2019	11.0	2	2018	No
5	Industrial effluent to Coega - ex Coega	2021	18.3	6	2015	No
6	Industrial effluent to Coega - ex Fishwater Flats	2025	16.4	6	2019	No
7	Groundwater Van Stadens	2029	4.0	7	2022	Yes
8	Groundwater S-E Coega fault	2030	3	7	2023	Yes
9	Groundwater Jeffreys Arch	2031	3	7	2024	Yes
10	Coega IDZ desalination	2032	29.2	9	2023	No

#### 4.2.2 Updated 2010 “Worst-Case” Scenario for potable supply

The “Worst-Case Scenario” for High-Growth water requirements shows a 15% or 25 million m<sup>3</sup>/a reduction in the yield available from all existing sources of supply including the Orange River due to the implementation of the ecological Reserve on existing schemes. It has been assumed that the ecological Reserves for these schemes will be implemented over 3 years commencing in 2015. It has been assumed that Climate Change would reduce the yields of existing local sources by 10%. This would necessitate the earlier implementation of additional schemes from 2017 onwards as shown in Figure 4.

The potential effect of climate change together with the implementation of the ecological Reserve, compared with the effect of implementing the ecological Reserve only, would necessitate the earlier implementation of the Van Stadens, Coega and Jeffrey’s Arch groundwater abstraction schemes, the Raising of Kouga Dam and the Coega IDZ desalination scheme. The Sundays River desalination scheme and an additional augmentation scheme would also be required.

The sequence of intervention implementation is shown in **Figure 4**.

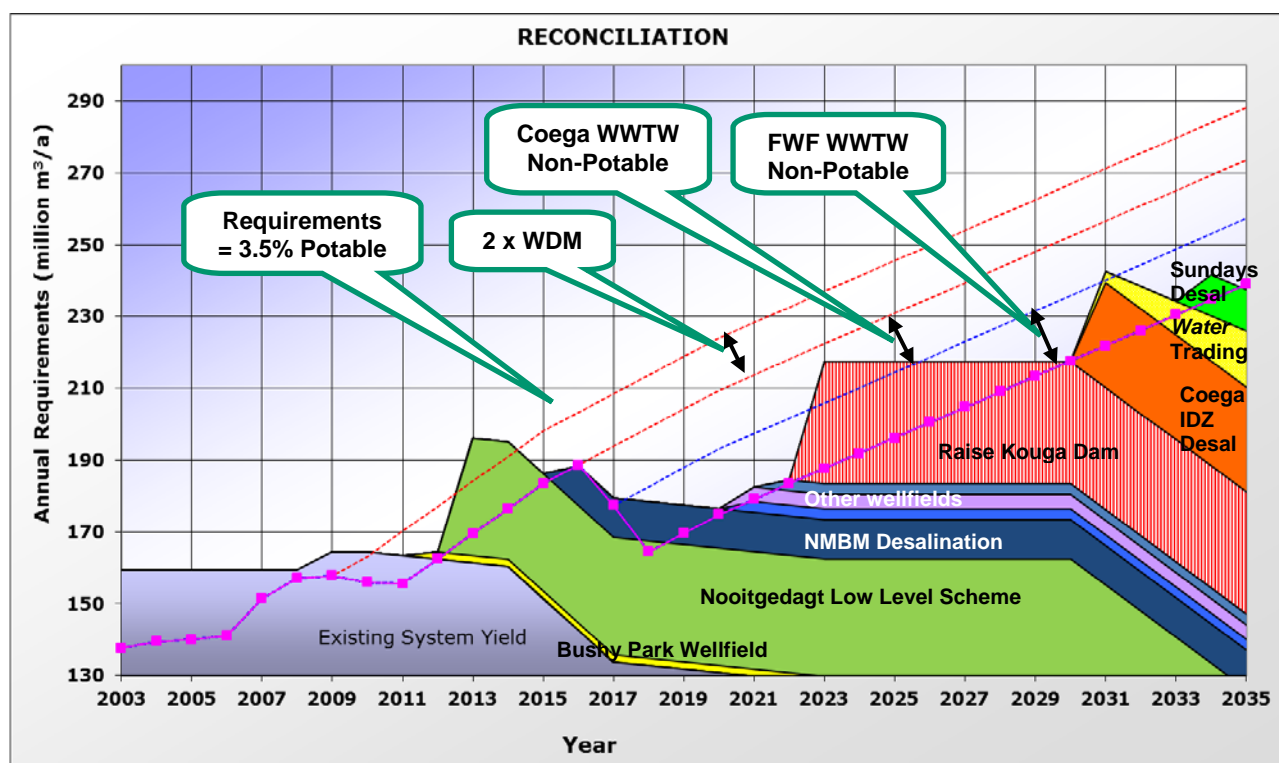


Figure 4: Updated 2010 “Worst-Case” Scenario for potable supply

In the updated 2010 Scenario:

- The yield of the AWSS has been increased with the yield of the *Maximisation of the Kouga/Loerie Scheme*, i.e. with 5 million m<sup>3</sup>/a, from 2009, following the implementation of this scheme.
- The Nooitgedagt Low Level Scheme will be implemented in 2013 instead of in 2011.
- A NMBM Desalination Scheme will be implemented in 2016 after the Bushy Park Wellfield and the Nooitgedagt Low-Level Scheme, and not in 2011 as shown in the original Strategy (referred to as the Swartkops Desalination Scheme).

**Table 4** lists the supply-side interventions which have to be implemented in order to ensure the reconciliation of supply and requirement up to 2030 for the Worst-Case Scenario.

Table 4: Updated 2010 “Worst Case” Scenario for potable supply

No	Intervention	Year of First Water or Saving	Yield (million m <sup>3</sup> /a)	Total Lead Time	Study Start Date	Fast-tracked
1	WC/WDM doubled savings	2010	14.6	0	2010	Yes
2	Groundwater Bushy Park	2012	2	2	2010	Yes
3	Nooitgedagt Low Level Scheme	2013	32.7	1	2010	Yes
4	NMBM Desalination	2016	11.0	2	2015	No
5	Industrial effluent to Coega - ex FWF	2017	16.4	6	2012	No
6	Industrial effluent to Coega - ex Coega	2018	18.3	6	2012	No
7	Groundwater Jeffreys Arch	2021	3	7	2014	Yes
8	Groundwater Van Stadens	2021	4.0	7	2014	Yes
9	Groundwater S-E Coega fault	2022	3	7	2015	Yes
10	Kouga Dam replacement and raising	2023	34	10	2012	No
11	Water trading - Upper Fish	2031	15.8	3	2028	No

12	Coega IDZ desalination	2031	29.2	9	2022	No
13	Orange River allocation phasing out	2031	-36.3	0	2031	No
14	Lower Sunday River return flows	2034	11.4	7	2027	No

#### 4.3. IMPLICATIONS HIGHLIGHTED BY THE UPDATED SCENARIO PLANNING

In the updated 2010 “Reference” Scenario for potable supply, it is evident that implementation of the Nooitgedagt Low- Level Scheme should proceed as planned. Allowance has been made for a groundwater intervention to be implemented (it would not necessarily be the Bushy Park Scheme as originally thought) as soon as possible. It is essential that the WC/WDM campaign should not lose steam now that the drought is broken but should proceed as planned and receive the necessary high-level support and funding from NMBM. The next scheme to be implemented (Swartkops Desalination Scheme) would then require delivery of first water by 2019. This allows time for a refined desalination scheme to be evaluated and implemented.

In the updated 2010 “Worst-Case” Scenario for potable supply, implementation of the next scheme to be implemented (Swartkops Desalination Scheme) requires delivery of first water by 2016. This presents a much tighter timeframe for a refined desalination scheme to be evaluated and implemented and fast-tracking of the study may still be required. Proceeding forthwith with more detailed evaluation and drilling of test boreholes for the more feasible groundwater schemes are advised for this scenario. It would also be necessary to bring the implementation of the potential re-use schemes forward by several years.

## 5. KEY MESSAGES

The following key messages can be taken from the comparison of water supply and requirement and the scenario planning undertaken for the September 2011 Strategy Steering Committee meeting:

### **Message 1: Concerns about assurance of supply of the AWWSS**

Concerns about the accuracy of the assurance of supply values provided from the system modelling should be addressed, in light of the regular restrictions needed for the AWWSS. The risk of planning according to system yields that are outdated could be significant.

### **Message 2: Successful implementation of WC/WDM is critical**

Now that the drought has been broken it is essential that political and funding support for the NMBM WC/WDM continues at the same level, especially in terms of awareness creation. The difference between drought measures and WC/WDM measures must be made clear. Measuring and reporting of the results obtained remains important. WC/WDM at smaller towns must also be implemented, measured and reported.

### **Message 3: Re-use of water is an important intervention**

This option will be implemented to provide industrial quality water to Coega IDZ in future, although uncertainty about their future requirements and implementation timing remains. The acceptability of the use of surplus potable water for industrial supply, and the expectations of DEDEA in terms of the timing of re-use should be clarified.

### **Message 4: The Nooitgedagt Low Level Scheme must be completed**

Construction of the scheme is underway. Outstanding funding requirements to complete the project during the next two financial years must be sourced by NMBM. Conditions around the Orange River water allocation to NMBM and measures if the additional allocation remains temporary needs to be further addressed. Potential operating bottlenecks for delivery needs to be evaluated.

**Message 5: Groundwater is a good back-up option**

Investigations into groundwater availability should continue at the most promising sites, and test boreholes should be drilled to establish potential yields. This will provide an option for quick implementation when needed.

**Message 6: The feasibility of seawater desalination should be investigated further**

It is important to study desalination further in detail. Desalination is seen as the ultimate future augmentation solution for the area.

**Message 7: A larger dam on the Kouga River needs urgent attention**

In light of the planned dam safety construction work at Kouga Dam, this option needs urgent attention.

**Message 8: Choice of intervention will be dependent on growth in water requirement**

If the actual growth in water requirements is lower than the high water requirement curve, it will be possible to delay implementation of interventions after the Nooitgedagt Low-Level Scheme is completed. If however the water requirements keep on growing at the current rate, it is important to continue with feasibility studies of the recommended range of interventions. As a result of the recent drought and water restrictions imposed, adjustments due to updated water requirements cannot be made.

**Message 9: Monitoring is very important**

It is important to implement a system to monitor desalination intake seawater quality, potential indicators for climate change and to monitor the NMBM's success in implementing their WC/WDM Strategy measures.

## 6. RECOMMENDATIONS

The following recommendations follow from the assessment of the current water requirements and updated scenario planning:

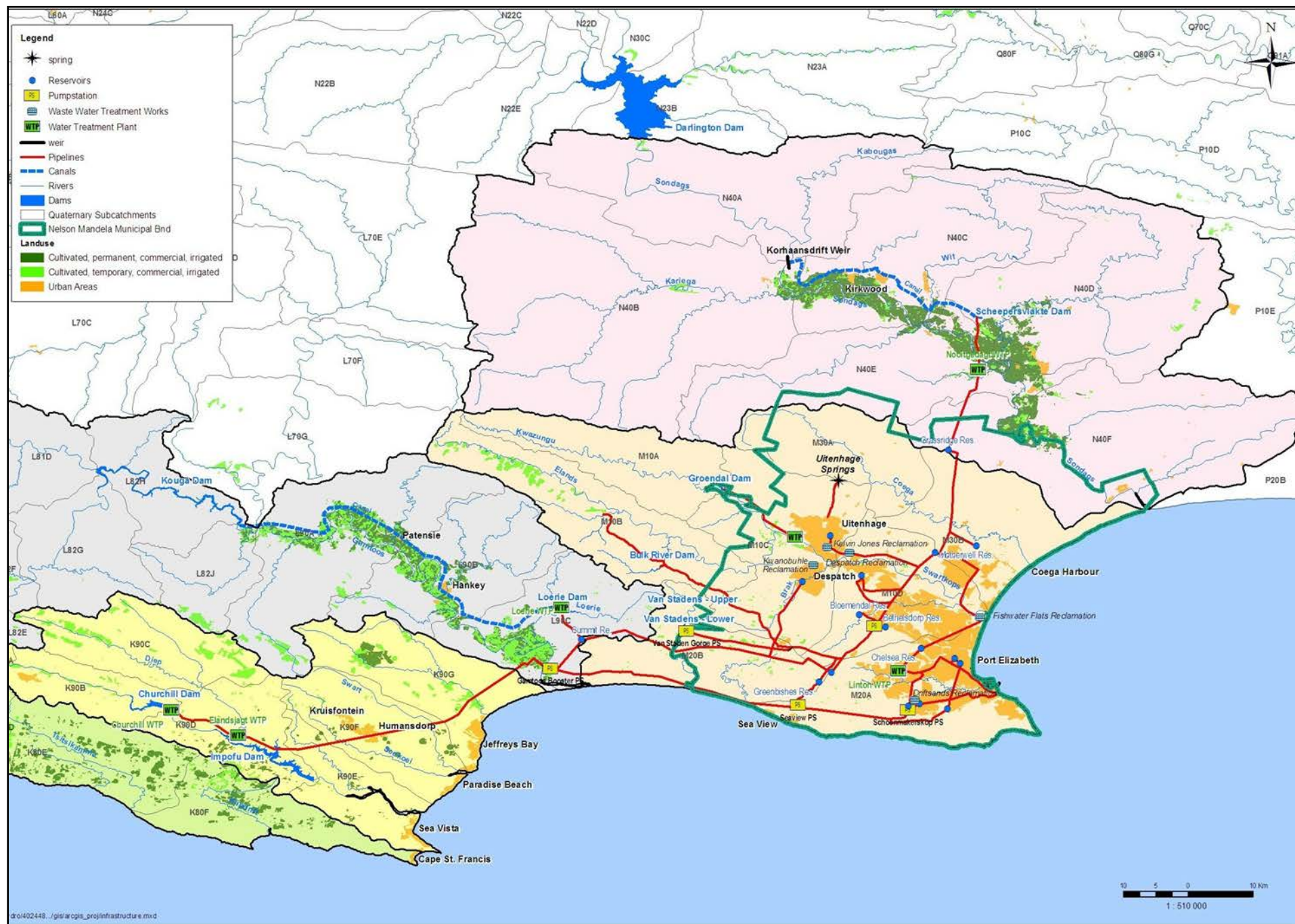
- 1) Approval for the Algoa Reconciliation Strategy should be obtained from DWA MANCO and the Mayoral Committee of the NMBM.
- 2) Additional yield from the Kouga-Loerie System due to improved operation will in future be included in the AWSS yield. NMBM should submit a water use licence application to DWA for the additional water use.
- 3) DWA should initiate Kouga/Loerie and Churchill/Impofu systems Verification and Validation Study followed by a Water Availability Assessment Study (WAAS) including irrigation and urban supplies, to address uncertainty regarding the hydrology and assurance of supply. Relevant findings from the Algoa Bridging Study should be incorporated.
- 4) The NMBM must continue with the implementation of their WC/WDM strategy.
- 5) NMBM should source outstanding funding and complete the implementation of the Nooitgedagt Low-Level Scheme. NMBM should further discussions with DWA regarding their request to make the additional Orange River water allocation permanent. Until this is finalised, investigations on water trading and desalination of Sundays River return flows are on hold.
- 6) DWA should ensure that there are no bottlenecks regarding the transfer of additional Orange River water to NMBM. DWA should initiate an investigation into the required operating level for Darlington Dam and potentially increasing the balancing and supply capacity of the Lower Sundays River Government Water Scheme, addressing the operating risk assessment.
- 7) NMBM should continue groundwater studies, particularly those close to and easily integrated into the existing infrastructure, to determine potential yields.
- 8) NMBM should continue evaluating re-use alternatives for supplying industrial requirements of the Coega IDZ and the study on water re-use and implementation from the Fish Water Flats WWTW. Scenarios for earlier potential implementation of re-use schemes should be developed.
- 9) The newly-formulated intervention – Potable re-use from the Fish Water Flats WWTW via Loerie Dam, should be incorporated into future scenario planning.

- 10) NMBM should continue with or update the feasibility study on seawater desalination, and keep abreast of development plans at the Coega IDZ and a potential associated desalination plant;
- 11) The potential raising of Kouga Dam must be urgently clarified, in light of the planned dam safety construction work.
- 12) Clearing of invasive alien plants in the catchments of AWSS dams by the Gamtoos IB should and will continue.
- 13) DWA should initiate a study to develop a strategy for the implementation of the Reserve for existing AWSS dams.
- 14) DWA should initiate an impact assessment study to determine the expected regional impact of climate change on the AWSS water balance.
- 15) A monitoring system should be put in place to be able to quantify and measure the success of the WC/WDM interventions which are being implemented. DWA should be responsible for monitoring water availability and the NMBM should be responsible for monitoring the success of WC/WDM. DWA will monitor quantity and quality of the Sundays River WUA return flows. NBMM should monitor water quality in the Swartkops River, and monitoring at other potential desalination plant intakes should also be addressed.
- 16) The high water requirement scenario will still be used as basis for future scenario planning. Water requirements must be monitored and the projected water requirement curves should be updated if the current assumptions used are deemed to be no longer valid. In light of the uncertainty of growth in requirements due to the recent restrictions, future water requirement curves will be projected from the last annual water use available.
- 17) The Algoa Water Supply System Reconciliation Strategy should be re-assessed in March 2012 and adjusted if required.

## **Appendix A**

### EXTENT OF THE AWSS





## **Appendix B**

### **REPRESENTATION ON THE STRATEGY STEERING COMMITTEE**



# REPRESENTATION ON STRATEGY COMMITTEES

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## **Appendix C**

### **DRAFT TERMS OF REFERENCE OF THE STRATEGY STEERING COMMITTEE**

# Algoa Water Supply System: Reconciliation Strategy Steering Committee

## DRAFT TERMS OF REFERENCE

### 1. Introduction/Preamble

In 2010 the Department of Water Affairs (DWA) and the Nelson Mandela Bay Municipality (NMBM), developed a Strategy to ensure the on-going reconciliation of supply and requirement from the Algoa Water Supply System (AWSS). One of the recommendations of the Strategy Study was that a Strategy Steering Committee be formed with a clearly defined mandate and scope of work. The primary function of the Strategy Steering Committee will be to ensure the implementation of the strategy and to make recommendations, on an annual basis, on long-term planning activities required to ensure on-going reconciliation of requirement and available supply to the AWSS area.

A number of organisations currently own, operate and receive water from the AWSS. The main role-players to date have been the DWA, the NMBM and the Gamtoos Irrigation Board. Although these organisations will continue to play a significant role in future decisions, other organisations need a forum to ensure that their requirements can be clearly conveyed, that they can make contributions when needed, and that they remain continuously informed about the development and decisions regarding the WCWSS. Organisations represented on the Steering Committee must ensure that recommendations made in the Strategy document are implemented and assume a collective responsibility for ensuring the on-going reconciliation of supply and requirement.

### 2. Objectives

The objectives of the Strategy Steering Committee are:

- To ensure implementation of the recommendations of the Algoa Reconciliation Strategy.
- To update the Strategy to ensure that it is relevant.
- To ensure that the Strategy and its recommendations are appropriately communicated.

#### 2.1. Implementation of Strategy Recommendations

- Monitor the implementation of the recommendations contained in the Algoa Reconciliation Strategy Study.
- Monitor the progress and compliance with set targets and objectives, e.g.
  - Target dates for initiating and completing studies
  - Water Conservation and Demand Management
  - Implementation of other interventions
- Assess the implications of deviations.
- Make recommendations on mitigation measures and adjustments to ensure the on-going reconciliation of supply and requirements.

#### 2.2. Updating of the Strategy

- Review / update and revise the Algoa Reconciliation Strategy.
- Monitor and update water requirements on an annual basis.
- Reassess the available resources and the existing system yield.
- Undertake an annual reconciliation of supply and requirements.
- Update the Scenario Planning Process to cater for changes in water requirements, yield and potential delays in the implementation of selected interventions.
- Finalise the process for the Selection of Interventions for implementation
- Make recommendations to DWA, the NMBM, Gamtoos Irrigation Board (IB) and other Water Services Authorities on the need for further studies required to update the water requirements and system yield, as well as on the need to implement interventions.

### **2.3. Communication**

- Communicate annually, and as and when required, progress on the implementation of the recommendations of the Algoa Reconciliation Strategy Study to the following Authorities and Stakeholders:
  - DWA,
  - NMBM,
  - Water Services Authorities,
  - Eastern Cape Provincial Government,
  - Organised Agriculture, and
  - Environmental NGOs.
- Communicate progress on the implementation of the recommendations of the Algoa Reconciliation Strategy Study to the general public.
- Liaise with Departments involved in producing National and Provincial Strategies and provide input into Provincial Strategies.
- Brief relevant municipalities, Irrigation Boards and Water User Associations on imminent decisions.
- Inform politicians of press releases relating to the reconciliation of supply and requirement.
- Liaise with the Operations Committee as required.
- Provide information for the DWA and NMBM websites.

### **3. Reporting**

The Algoa Reconciliation Strategy Steering Committee is a steering committee formed to ensure the on-going reconciliation of water supply and requirement. Whilst the committee comprises of representatives from national government, provincial government, local government, the CMAs, IBs and WUAs, the meetings will be facilitated and chaired by DWA: Integrated Water Resource Planning.

### **4. Administrative and Technical Support Group**

An Administrative and Technical Support Group will be appointed to support the Strategy Steering Committee. The Support Group will provide administrative, scientific and technical support. This support will be facilitated through DWA: National Water Resource Planning.

### **5. Strategy Steering Committee Meetings**

It is envisaged that 2 meetings will be held, at six monthly intervals, each year

- Meeting 1 (March):
  - To consider / review progress with implementation
  - To deal with communications
- Meeting 2 (September):
  - To consider / review progress with implementation
  - To update the WC Reconciliation Strategy
  - To deal with communications