water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

AMATOLE WATER SUPPLY SYSTEM
RECONCILIATION STRATEGY

STATUS REPORT
2010

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1 PURPOSE OF THE STATUS REPORT

The purpose of this report is to:

a) Provide an overview of progress in the implementation of the Amatole Water Supply System Reconciliation Strategy (the Strategy); and

b) Emphasize the actions required to prevent medium- to long-term water supply constraints to meet the growing water requirement from the Amatole Water Supply System (AWSS).

2 INTRODUCTION

2.1 The Amatole Water Supply System

The AWSS provides water to about 1 million people residing in the catchments of the Buffalo, Nahoon and Upper Kubusi rivers, as well as for some 1000 ha of scheduled irrigation along the upper and middle reaches of the Kubusi River. The communities supplied fall primarily within the Buffalo City, Amahlati and Ngqushwa local municipal areas with East London, King Williams Town, Bhisho and Stutterheim being the main urban centres.

The main storage dams of the AWSS are the Gubu, Wriggleswade, Rooikrantz, Laing and Nahoon dams (owned by the Department of Water Affairs and operated by the Amatola Water Board) and the Maden and Bridledrift dams (owned and operated by the Buffalo City Municipality). The Gubu and Wriggleswade dams are located on the Kubusi River, the Maden, Rooikrantz, Laing and Bridledrift dams on the Buffalo River and the Nahoon Dam on the Nahoon River.

The supply area of the AWSS is the second largest contributor to the Eastern Cape economy after Port Elizabeth and its immediate surrounds, and is the economic hub of the Border-Kei Region. Urban water use within Buffalo City Municipality (BCM) in general and in East London / Mdantsane in particular, represents the largest use of water from the AWSS (84% and 62% respectively).

The growth in water requirement for the area served by the AWSS is driven primarily by the increase in domestic requirement (increased number and level of housing and services provided) and to a lesser extent by industrial growth.

2.2 The Amatole Water Supply System Reconciliation Strategy

The Strategy was completed in March 2008. The key actions and interventions identified to ensure reconciliation of water supply and requirement into the future are as follows:

- Constitute a Strategy Steering Committee, consisting of key stakeholders, to oversee the implementation and maintenance of the Strategy;
- Complete the Wriggleswade - Yellowwoods link to remove system yield constraints;
- Operate the AWSS as an integrated system so as to maximise its yield;
- Implement Water Conservation and Water Demand Management (WC/WDM) measures to reduce water wastage and promote the efficient use of water;
- Investigate schemes to re-use water, with a focus on the water currently being discharged to waste downstream of dams;

- Study new surface water options to augment the yield of the System; and
- Compare all augmentation options and make recommendations to decision makers on the implementation of the preferred ones, as required.

2.3 Implementation of the Strategy

The Amatole System Strategy Steering Committee (ASSSC), comprising of senior representatives of all key stakeholders, was constituted on 24 June 2009 to oversee the implementation and maintenance of the Strategy. Other key interested and affected parties have since been co-opted onto the Committee.

The ASSSC meets twice a year, generally in May and October. It has to date met on the following occasions:

- 24 June 2009;
- 17 November 2009;
- 19 May 2010; and
- 5 October 2010.

An administrative and technical support group comprising of officials of the key stakeholders was formed to assist the ASSSC in all aspects of implementing, monitoring and maintaining the Strategy. The Amatole System Administrative and Technical Support Group (ASATSG) generally meets 6 weeks before and 4 weeks after each ASSSC meeting to prepare for the meetings and to react to instructions given by the ASSSC.

3 SYSTEM YIELDS

The yields available from each of the AWSS dams, as determined in the study to compile the reconciliation strategy, are presented in Table 1.

Table 1: Yields of the individual dams comprising the Amatole Water Supply System

Dam	Yield (million m^3/a)
Maden	0.48
Rrooikrantz	3.70
Laing	18.27
Bridledrift	29.41
Nahoon	8.41
Gubu	2.87
Wriggleswade	31.80
Combined yield of dams	**94.94**

Notes:-

- **Yields are at 98% assurance of supply.**
- **Yields are for individual dams.**
- **EWRs (environmental water requirements) are not included.**
- **Transfer losses from Wriggleswade are not included.**
- **The possible impact of climate change is not included.**

The environmental classifications (ECs) of the respective rivers were determined as part of the Strategy Study. However, due process still needs to be followed before the ECs can be formally

adopted. The impact of implementing the environmental water requirements (EWRs) on the yield from the AWSS could be a reduction of as much as 25 million m^3/a. The phasing in of the EWRs are therefore not taken into account at this stage, but are considered as a scenario for future reconciliation planning.

A study to determine operating rules to maximize the yield possible from the System has been initiated by DWA and completed by the Operating Rules Study Team. The findings of the study indicate that the yield from the System, when optimally operated as an integrated system, remains at about 95 million m^3/a, in that the savings achieved in system operation are offset by transfer losses. Current transfer losses are in the order of 1.9 million m^3/a.

The ASATSG is currently reviewing the system yield, based on the adopted operating rules, using the Water Resources Yield Model, the results of which will be available for the next ASSSC meeting. Current reconciliation planning is therefore based on a system yield figure of 95 million m^3/a.

Investigations undertaken by the Operating Rules Study Team have indicated that previous yield studies may have under-estimated the impact of invasive alien vegetation. However, no detailed information in this regard has been made available to the ASATSG as yet. The impact of invasive alien vegetation in the catchments of the AWSS will be reviewed by the ASATSG when running the Water Resources Yield Model.

The potential impact of Climate Change on the yield from the AWSS has also been investigated by the Operating Rules Study Team at a conceptual level of detail. The findings indicate that the potential long-term impact is not significant to materially impact on the system yield. The potential impact of Climate Change will however continue to be reviewed in terms of this Strategy, as more detailed information becomes available.

4 WATER REQUIREMENTS

4.1 Background

Various future water requirement scenarios have been developed based on current and predicted future population data from various sources, coupled with predictions of progressively increasing levels of water services being provided, as well as current and projected industrial and agricultural water requirements.

The irrigation requirement is currently based on compensation releases and existing rights only, with no provision for future growth.

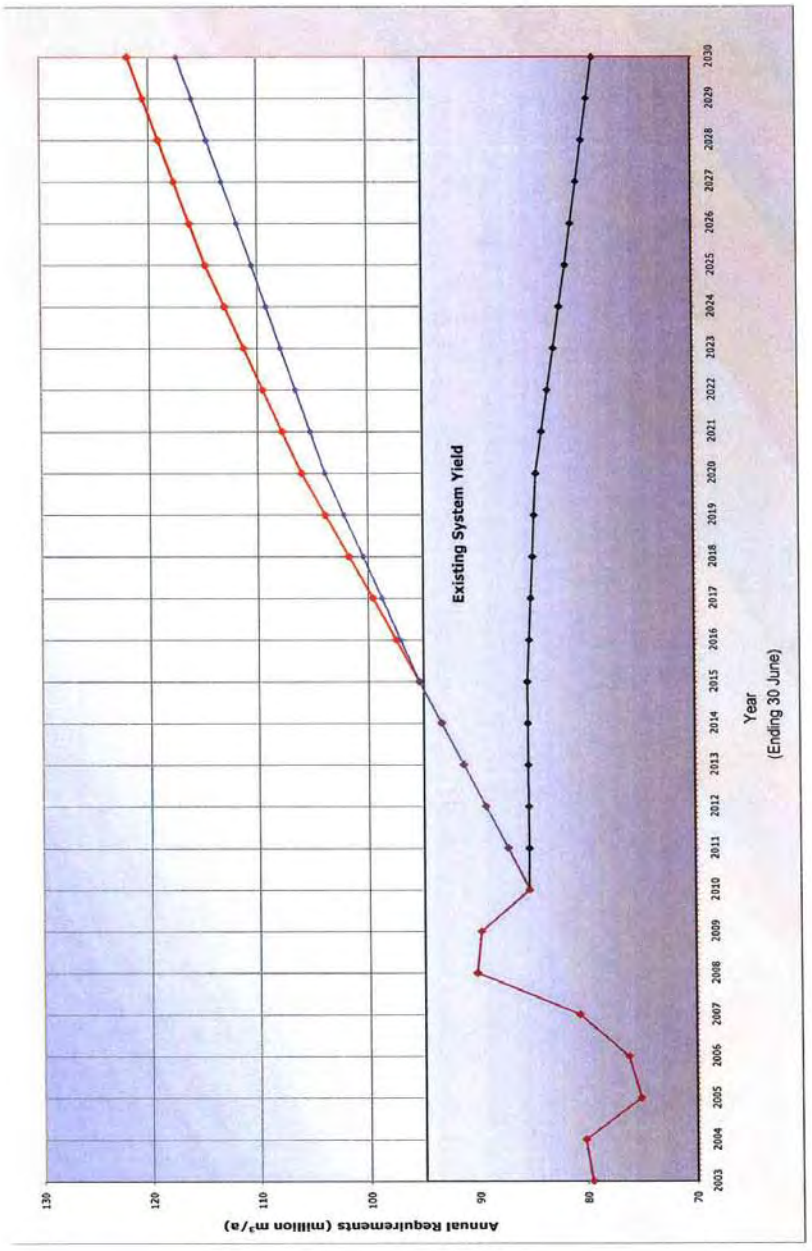
The water requirement scenarios do not include future WC/WDM measures, which are considered interventions that could be implemented to reduce the water requirement.

4.2 Historical Water requirements

The combined domestic, industrial and irrigation historical water requirements from 2003 to 2010 are presented in **Figure 1**, together with the assumed system yield of 95 million m^3/a. The average increase in requirement over this period is about 1% pa.

FIGURE 1

FIGURE 1 : AMATOLE WATER SUPPLY SYSTEM - WATER BALANCE GRAPH



The requirement profile is characterised by:

- The System as a whole:
  - A general increase in requirement between 2003 and 2008;
  - A general decrease in requirement between 2008 and 2010;
  - A general steady decrease in requirement from Bridledrift Dam; and
  - A general steady increase in requirement from the other dams.
- By Sub-systems:
  - Lower Buffalo:
    - 0.4% pa increase in potable water requirement (relatively smooth); and
    - 0.8% pa increase in raw water requirement (highly variable).
  - Upper Buffalo:
    - Nearly a 10% pa increase in both potable and raw water requirements (relatively smooth).

See **Appendix A** for the historical water requirements graphs on the respective dams and sub-systems.

4.3 Projected Water Requirements

BCM is responding to development pressures to the west of East London (West Bank, Kidds Beach and Kaysers Beach) and is implementing infrastructure to feed this area from the AWSS. Therefore, the projected water requirements now include the requirements projected for this increased area, which were previously treated as a scenario in terms of the Strategy.

The Amathole District Municipality have initiated feasibility studies to service the Great Kei Local Municipality area (to the east of East London) from the AWSS, and have indicated that they will submit a license application for a supply from the AWSS in due course. Supply to this area is still being treated as a scenario in terms of the Strategy. It has been determined that it would take at least 6 years to initiate supplies to the Great Kei area, in which case the impact of this supply would only be noted after 2016.

The low water requirement scenario, which includes supplies to the west and east of East London, indicates a decline in water requirement over time due to the predicted impact of HIV/Aids and population migration.

The decrease in water requirement between 2009 and 2010 is as a result of WC/WDM measures implemented by BCM, and specifically those to address losses at its Umzonyana Water Treatment Plant. These savings are deemed to be sustainable, and therefore the projected water requirements have been adjusted accordingly.

The projected water requirements for the AWSS are presented in **Figure 1** of this report.

5 WATER BALANCE

Figure 1 shows the current high and low water requirement scenarios against supply available from the System.

Based on the high water requirement scenario, measures to reduce the requirement or to increase the System yield would have to have been implemented by 2015.

Based on the low water requirement scenario, the System has adequate yield to meet the requirements to 2030, inclusive of supplies to the Great Kei area.

6 RECONCILIATION OPTIONS

The following options to reconcile supply with the projected water requirements from the AWSS are prioritised for implementation in terms of the Strategy:

- Operation of the AWSS as an integrated system so as to maximize System yield;
- Water conservation and water demand management (WC/WDM);
- The re-use of water;
- Stream flow enhancement through the removal of alien vegetation:
- The development of new surface water supplies; and
- Desalination of sea water.

It is also required that water quality concerns be addressed at source, so as to prevent the need to operate the System to address water quality concerns by means of dilution.

The status in implementing the above options is described in more detail in sections 7 to 13 of this report.

7 SYSTEM OPERATION

The responsibility to co-ordinate system operation resides with the Amatole Supply System Operations Co-ordination Committee (ASSOCC), which comprises of the owners and operators of the various dams within the System.

Long-term operating rules for the System have been determined and adopted by the various ASSOCC member institutions.

The normal operating rule entails a maximum release from Wriggleswade Dam into the Yellowwood River of 1.3 m^3/s when Bridledrift Dam reaches 30% of its full supply capacity, which is within the limit recommended to protect the environmentally sensitive reach of the KwaNkwebu River (tributary of the Yellowwood River). As such, this reach of the river is no longer seen as a constraint to maximising the yield from the System.

The need for pedestrian crossings over the Yellowwoods River must however still be decided by ASSOCC and implemented if deemed necessary.

8 WATER CONSERVATION / WATER DEMAND MANAGEMENT

8.1 Buffalo City Municipality

BCM is in the process of formalising a draft WC/WDM strategy. The strategy requires some R18 million/a over a 9 year period to achieve an estimated total savings of 26.2 million m^3/a.

The ASATSG is of the opinion that savings of between 10 and 15 million m^3/a on the 2010 requirement figure of 84 million m^3/a should be readily achievable. This would represent savings of between 12% and 18%.

BCM has already committed funding to projects, which seek to achieve a total saving of 4.7 million m^3 over the next 2 years. The savings and costs of the committed project are presented in Table 2.

Table 2: Preliminary estimates of savings and costs of committed WC/WDM projects

Project	Targeted Saving (million m^3/a)	Unit Reference Value (2010)	Estimated Cost		Time to Implement (years)
			Capital (R Million)	O&M (R Million/a)	
Buffalo River Weir and Pump Station Upgrade	2.48	0.14[1]	4.0	0.02[1,2]	2
Umzoniana WTP upgrade	1.69[3]	0.20[1]	4.0[3]	0.02[1,2]	1
Mdantsane: Replacement of mid-blocks and installation of meters	0.06[3]	2.61[1]	2.0[3]	0.005[1,2]	1
Duncan Village: Replacement of mid-blocks, installation of meters and new ablution blocks	0.73[3]	0.11[1]	1.0[3]	0.003[1,2]	1

Notes:-

1. Excludes cost savings due to a reduction in the losses.
2. Includes additional maintenance costs only.
3. Additional savings and costs only. Costs and savings realised in previous years are excluded.

See **Appendix B1** of this report for the draft WC/WDM implementation plan as well as a list of committed WC/WDM projects.

8.2 Amatola Water

There is limited potential to achieve savings on the infrastructure operated by Amatola Water, which are not enough to impact significantly on reconciliation planning. The focus of Amatola Water is therefore primarily on maintenance, i.e. preventing losses from increasing.

See **Appendix B2** for a report on the current losses on Amatola Water operated infrastructure.

8.3 Amathole District Municipality

There is also only limited opportunity to achieve savings on the infrastructure owned by Amathole District Municipality (ADM). The focus of ADM is therefore primarily on local WC/WDM interventions.

8.4 Kubusi Irrigation Board

There is similarly nominal opportunity to achieve significant savings on the Kubusi Irrigation Board (KIB) operations. The KIB will nevertheless continue promoting water use efficiency among its members.

Metering on KIB infrastructure is however inadequate to effectively measure losses, and the Board needs to effect improvement in this regard.

9 WATER RE-USE

9.1 Background

There are 7 waste water treatment works (WWTW) within the AWSS which currently discharge some 24.0 million m^3/a of effluent to waste directly into the sea or into rivers downstream of dams. All these WWTWs are owned and operated by BCM.

Less than 1% of the effluent discharged from these coastal WWTWs is currently being re-used. This use is primarily for local irrigation of golf courses and for agriculture.

The ASATSG have conducted a “Review of the current knowledge regarding the potential of Water Re-Use to augment supplies to the AWSS”. This report, which was made available to the ASSSC at their meeting of 5 October 2010, evaluated and updated the costing of two water re-use schemes previously identified by others.

A finding of the report is that water re-use schemes evaluated appear to be viable and cost competitive with surface water supply schemes, and it is recommended that BCM undertakes studies to further identify and evaluate potential re-use schemes for possible implementation.

See **Appendix C** of this report for the comparison of the preliminary estimates of yields from and costs of possible re-use and surface water supply schemes.

9.2 Buffalo City Municipality

BCM does not have a re-use strategy in place as yet. BCM is however reported to be planning re-use options simultaneously with the construction of its proposed new regional WWTWs at Reeston and Zwelitsha. No further details in this regard have to date been made available to the ASATSG. It is recommended that BCM develop and implement a Water Re-use Strategy and Implementation Plan.

10 SURFACE WATER SUPPLIES

Department of Water Affairs: Options Analysis (DWA:OA) has to date not initiated any studies to further investigate possible surface water supply options. DWA:OA is awaiting instructions from the ASSSC to proceed in this regard.

The ASATSG is however in the process of undertaking a conceptual review of the Sandile/Binfield Park Dams supply augmentation option. This option was identified in the Strategy as one of the more favourable ones. Results will be available for the next ASSSC meeting.

See **Appendix C** of this report for the preliminary estimates of yields from and costs of possible surface water supply augmentation schemes.

11 STREAMFLOW ENHANCEMENT

Initial findings during the Reconciliation Strategy Study indicated that the potential impact of invasive alien plant (IAP) removal from the catchments of the AWSS would not be significant enough to materially impact on the system yield. Hence, the focus of Working for Water (DWA:WfW) in terms of this Strategy, is purely one of maintenance, i.e. not allowing the situation to worsen.

Recent investigations by the Operating Rules Study Team however indicate that the impact of IAPs may have been under-estimated in the development of the Strategy. This will be reviewed by the ASATSG and be reported on at the next ASSSC meeting.

12 DESALINATION OF SEAWATER

Desalination of seawater was not identified as a preferred reconciliation option in the Strategy Study for the foreseeable future. It has however been accepted that findings of studies being undertaken by other metros will be made available to the ASATSG for review and consideration in the AWSS context, once they become available.

No such information is available as yet, nor has BCM as yet conducted any initial investigations in this regard, i.e. identify potential abstraction location(s), seawater quality assessments or review of distribution layouts.

13 WATER QUALITY

The Strategy requires that the System be operated so as to maximize the yield possible from the system, and that water quality concerns be addressed at the source of the pollution, i.e. water quality concerns will not be addressed by dilution through system releases. Identified water quality interventions include:

- Reduction of saline effluent sources;
- Elimination of sewer leaks;
- Reduction of phosphate loading from point sources, e.g. enhance waste water treatment; and
- Control of diffuse pollution from informal settlements to reduce bacterial loading.

The responsibility of addressing water quality issues resides with ASSOCC, the owners and operators of WWTWs and the local authorities, but is of interest to the ASSSC to the extent to which water quality could impact on reconciliation planning.

BCM is reported to be taking action to address certain water quality concerns in the Upper Buffalo area via the establishment of a regional waste water treatment works at Zwelitsha, with provision for biological nutrient removal. Timeframes for implementation of the WWTW have not been made available to the ASATSG as yet.

BCM is also currently addressing pollution from rural settlements as part of its rural sanitation backlog eradication programme. Details on the role-out of the backlog eradication programme have not been made available to the ASATSG as yet.

Water quality however remains a serious concern in the area and efforts by all responsible parties to address pollution at source need to be enhanced. The DWA in its capacity as regulator also needs to actively monitor the situation and act where required.

14 COMMUNICATION STRATEGY

The adopted Communication Strategy makes provision to communicate issues related to the Strategy and progress with its implementation to the following persons/institutions, via a variety of mechanisms:

- Primary stakeholders/individuals (directly involved in water resources planning);
- Secondary stakeholders/individuals (affected by water planning); and
- General public.

The mechanism used and level of detail provided differs for each targeted group.

A media breakfast was held in East London in June 2010 to officially launch the adoption and implementation of the Strategy. The breakfast and subsequent press release were facilitated by the DWA regional office.

The press release was then followed by the distribution of Newsletter No.1 to primary and secondary stakeholders.

DWA has also made certain documentation available for distribution, including the 2010 Situational Analysis on Integrated Water Resource Planning for South Africa.

It is proposed that Newsletter No.2, focusing on WC/WDM and the effect of the current drought on the System, be distributed prior to the year end.

15 RECONCILIATION PLANNING

The following reconciliation scenarios have been considered to meet the high water requirement scenarios:

- Without EWRs
    - WC/WDM 100% effective and surface water augmentation
    - WC/WDM 50% effective and surface water augmentation
    - WC/WDM 25% effective and surface water augmentation
    - WC/WDM 100% effective and re-use of water
    - WC/WDM 50% effective and re-use of water
    - WC/WDM 25% effective and re-use of water

- With EWRs
    - WC/WDM 100% effective and surface water augmentation

The following reconciliation scenario has been considered to meet the low water requirement scenario:

- With EWRs
    - WC/WDM 100% effective

The graphs of the various reconciliation scenarios are included in **Appendix D** of this report.

The following conclusions can be drawn from the above analysis:

- If WC/WDM interventions are 25% effective:
    - Planning of further WC/WDM interventions needs to start by 2011 with first savings required by 2014;
    - Planning for certain of the surface water supply schemes would have to start by 2011, with first water required by 2017;
    - Planning of new re-use schemes needs to start by 2012 with first water required by 2016.

- If WC/WDM interventions are 50% effective:
    - Planning further WC/WDM interventions needs to start by 2012 with first savings required by 2015 (one year later);

- Planning of new surface water schemes may also need to start by 2011 with first water required by 2018 (one year later); and
- Planning of new re-use schemes needs to start by 2014 with first water required by 2018 (two years later).

- If WC/WDM interventions are 100% effective:
  - Planning further WC/WDM interventions needs to start by 2014 with first savings required by 2017 (three years later);
  - Planning of new surface water schemes needs to start by 2020, with first water required by 2025 (eight years later); and
  - Planning of new re-use schemes needs to start by 2019 with first water required by 2023 (six years later).

A key aspect of the AWSS, given the proximity of the current requirement to the System yield and the flat gradient of the predicted high growth trajectories, is that a small variation in requirements results in a large time differential. This implies that:

- The start dates for projects should in fact be brought forward (i.e. there is a need to reach an earlier state of preparedness, in order to be able to implement projects at short notice); and
- Consideration may need to be given to reducing the assurance of supply (increased likelihood of restrictions) over defined periods, as a reconciliation option, in order to accommodate temporary supply shortfalls.

16 CONCLUSIONS

The following conclusions can be drawn from the above:

- The effective and sustained implementation of WC/WDM interventions is a pre-requisite to ensure reconciliation of supply with future water requirements from the AWSS in that:
  - WC/WDM is the most cost effective intervention; and
  - WC/WDM projects have short lead periods.
- The failure to effectively implement WC/WDM is likely to result in supply shortfalls (increased likelihood of restrictions), in that institutional constraints may prevent alternative schemes from being implemented timeously.

17 RECOMMENDATIONS

In light of the above, it is recommended that:

- Significant effort and intervention be applied to ensure the effective and sustained implementation of WC/WDM projects;
- That the planning of new surface water supply schemes be based on BCM achieving at least 75% of the savings deemed possible by the ASATSG; and
- That re-use interventions be identified to address any potential temporary supply shortfalls.

Given the above, it is further recommended that:

- BCM commence planning further WC/WDM projects at the beginning of 2011 and that these projects seek to achieve at least a minimum average savings of 1.2 million m^3/a per year over an eight year period, starting from 2014.
- BCM develop a water re-use strategy in 2011 and 2012, commence studying re-use schemes as from 2012 where these schemes seek to deliver at least a minimum average additional supply of 2.9 million m^3/a per year over 5 years, starting from 2016.
- A screening workshop be held in 2011 to prioritise the surface water supply schemes DWA: OA should take forward to prefeasibility level studies.
- DWA: OA commence with prefeasibility level studies of likely surface water supply schemes in 2012, and feasibility level studies of the "preferred" option(s) immediately thereafter.

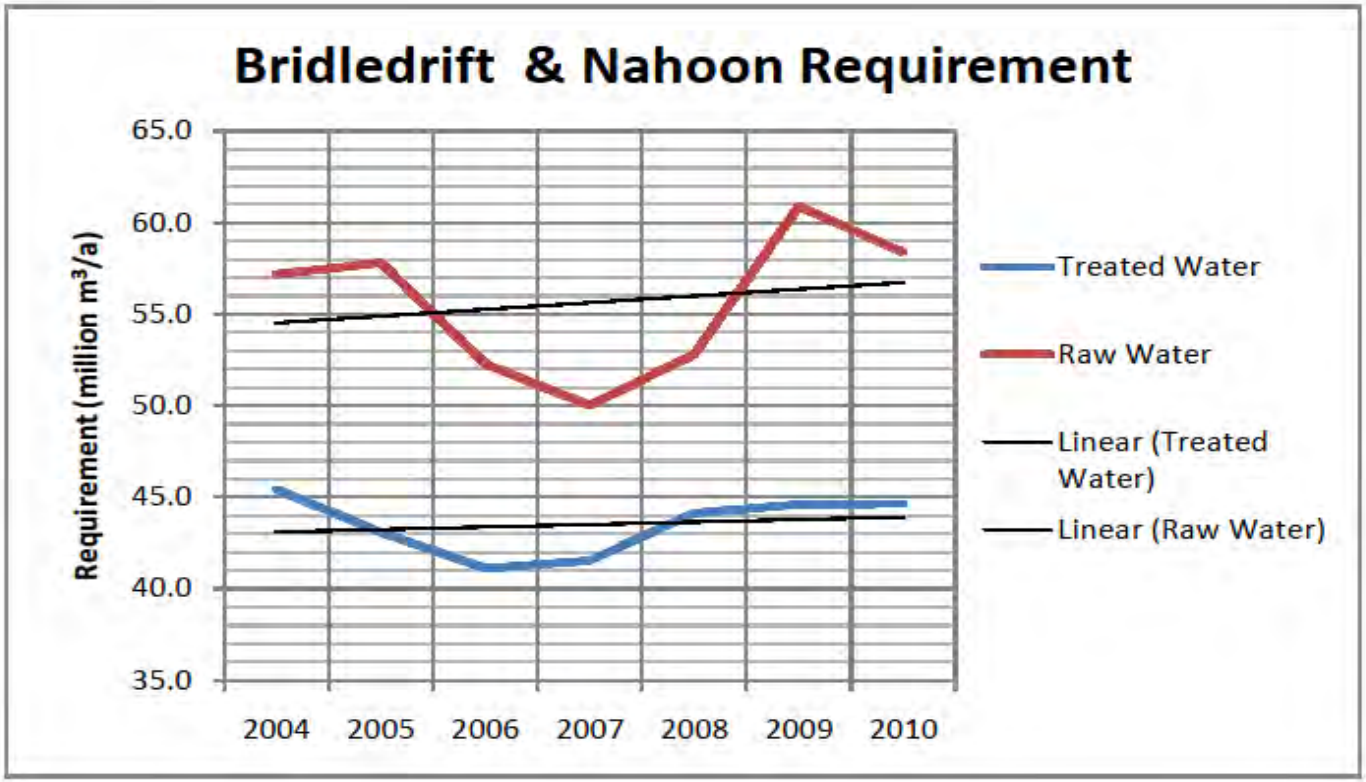
See **Appendix E** of this report for the recommended latest study start dates for the various stakeholders.

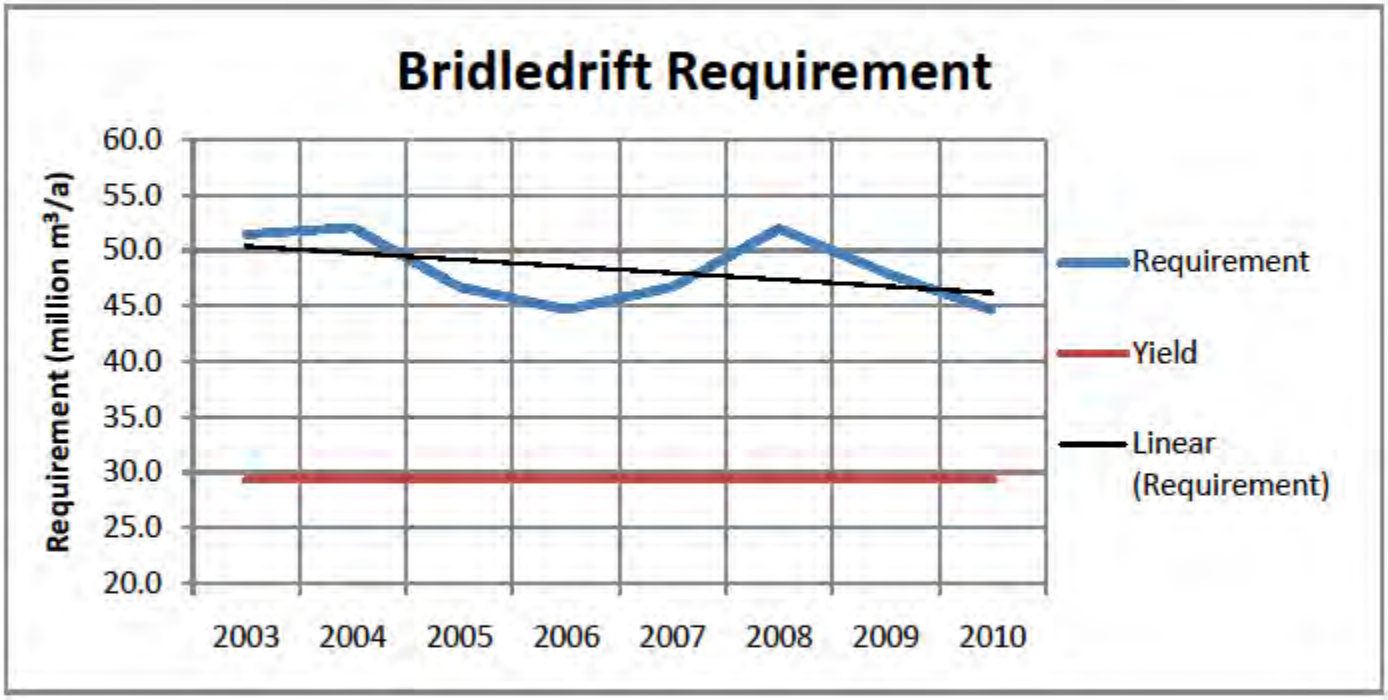
APPENDIX A

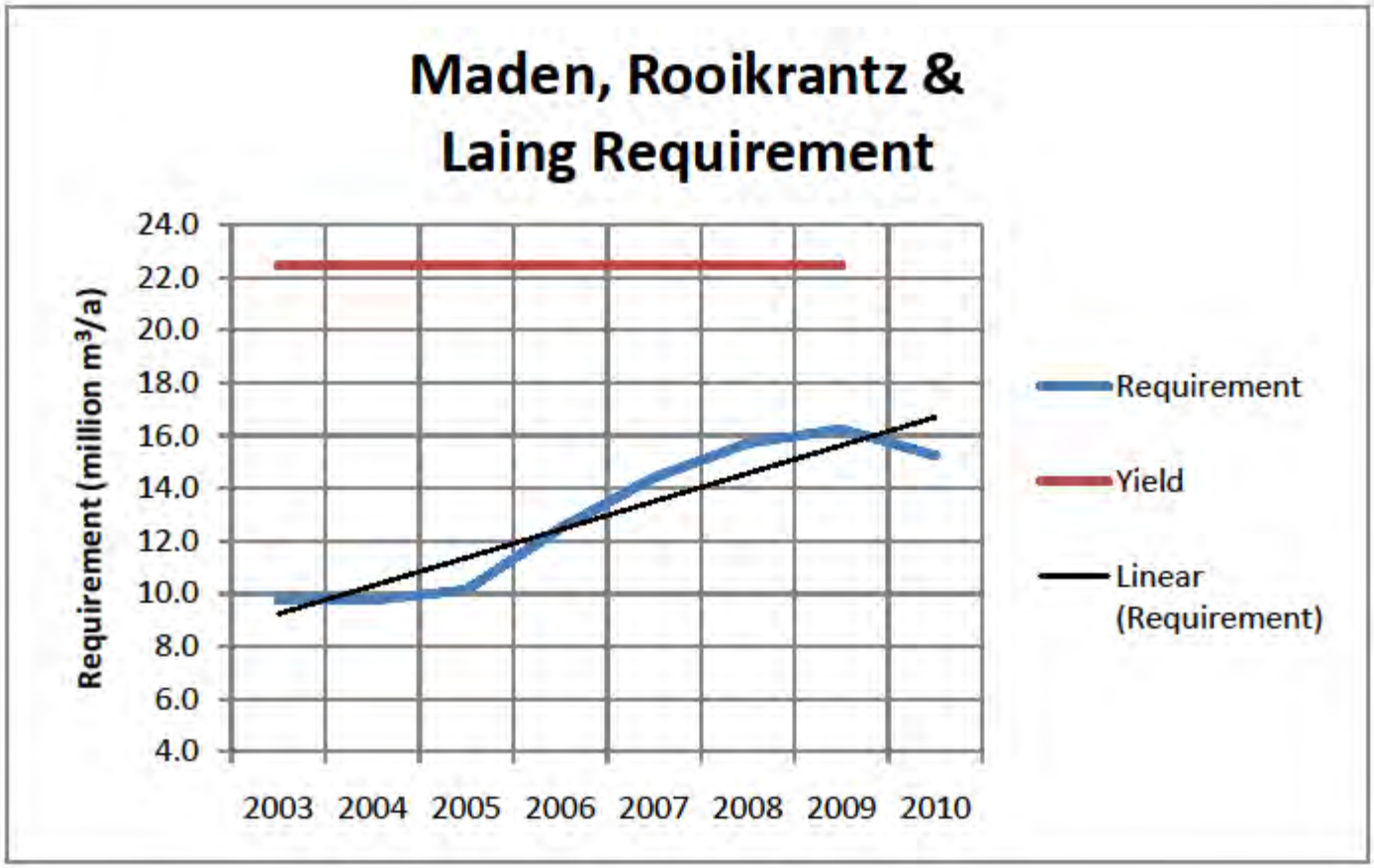
REQUIREMENT GRAPHS FOR THE KEY DAMS

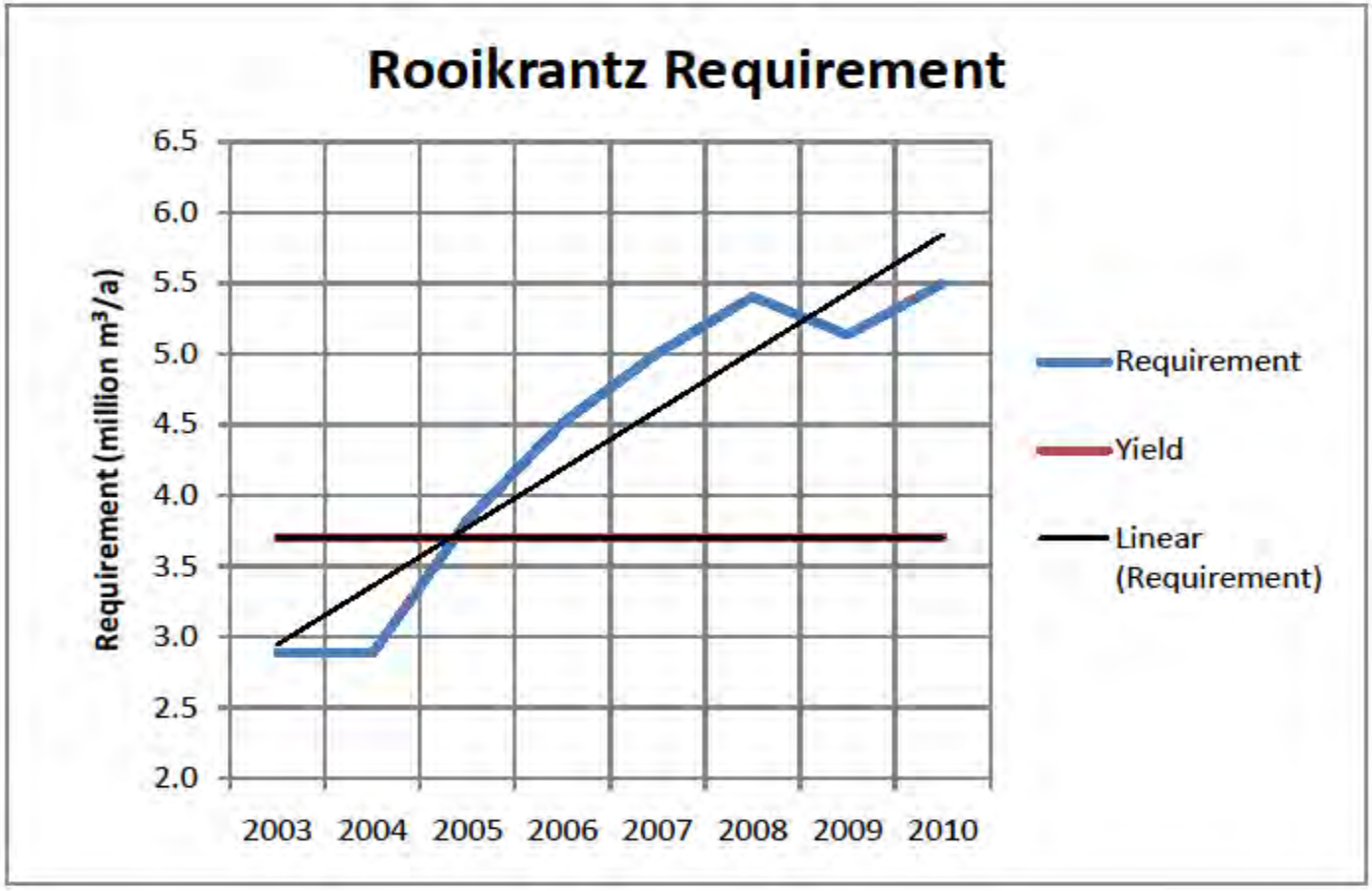
AND

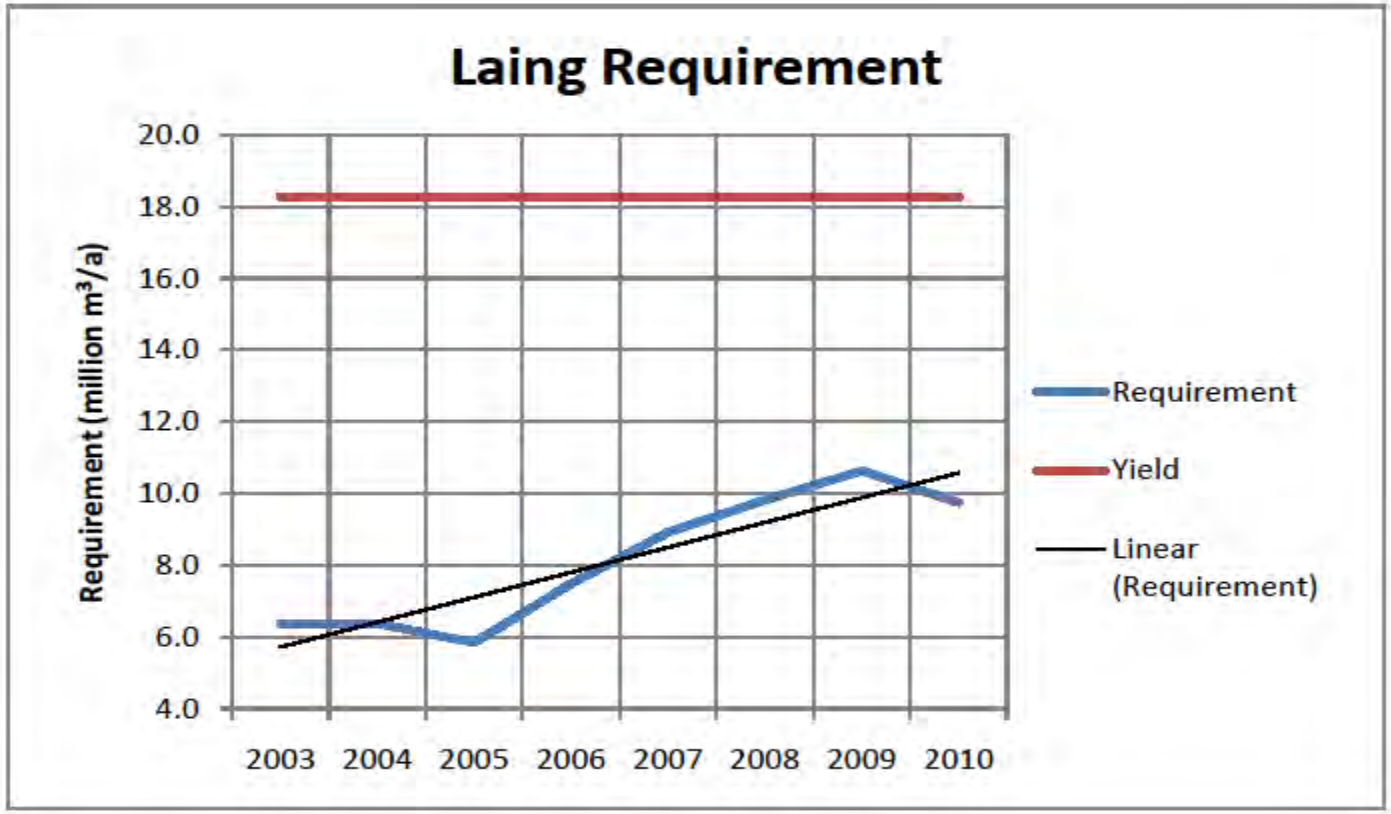
SUB-SYSTEMS OF THE AWSS


Bridledrift & Nahoon Requirement
Requirement (million m³/a)
65.0
60.0
55.0
50.0
45.0
40.0
35.0
2004
2005
2006
2007
2008
2009
2010
Treated Water
Raw Water
Linear (Treated Water)
Linear (Raw Water)


Bridledrift Requirement
Requirement (million m³/a)
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
2003
2004
2005
2006
2007
2008
2009
2010
Requirement
Yield
Linear (Requirement)


Maden, Rooikrantz & Laing Requirement
Requirement (million m³/a)
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2003
2004
2005
2006
2007
2008
2009
2010
Requirement
Yield
Linear (Requirement)


Rooikrantz Requirement
Requirement (million m³/a)
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
2003
2004
2005
2006
2007
2008
2009
2010
Requirement
Yield
Linear (Requirement)


Laing Requirement
Requirement (million m³/a)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2003
2004
2005
2006
2007
2008
2009
2010
Requirement
Yield
Linear (Requirement)

APPENDIX B

WC/WDM REPORTS FROM STAKEHOLDERS

B1 : Buffalo City Municipality

B2 : Amatola Water

B1: Buffalo City Municipality

3. WATER CONSERVATION AND WATER DEMAND PROJECTS

PROJECT NAME	PROJECT DESCRIPTION	ANTICIPATED SAVINGS	DATE OF ANTICIPATED SAVINGS	BUDGET AVAILABILITY(2010/2011)
Raising Of The Upper Weir And Augmentation Of The Gravity Mains	Installation of 2 x 1200mm gravity bulk water mains from the weir to Buffalo River Pump Station	80% of approximately 8.5 Ml/day of water that is lost at the Buffalo river weir	June 2012 when the project is complete	R4 000 000
Upgrading Of Umzonyana Treatment Works	Reclaimation Of Backwash Water, humus Tank Top Flow And Ground Water Due To Leaks In Water Retaining Structures	13.9 Ml/day or R1 809 244/month R21 710 928/year based on Amatola Water's bulk tariff of R4.276/kl	June 2011 Approximately 11.2 Ml/day of water that was lost to Umzonyana stream is saved.	R4 000 000 (previous year's expenditure-R14 million)
Relocation Of Mid-blocks Water Mains and installation of water meters	Mdantsane NU 1-10	10% of the total demand for Mdantsane (i.e. approximately 4.7Ml/day	June 2011, when all relocated mid-blocks water mains and water meters are functional	R2 000 000 (previous year's expenditure-R3.5 million)

PROJECT NAME	PROJECT DESCRIPTION	ANTICIPATED SAVINGS	DATE OF ANTICIPATED SAVINGS	BUDGET AVAILABILITY(2010/2011)
Reeston	Replacement of water meters, installation of new water meters, repairs on leaking water mains	2 Ml/day	Sustainability of the savings is currently monitored on monthly basis	Previous year's expenditure – R2.1 million
Duncan Village	Relocation of mid-blocks water mains, installation of domestic water meters, installation of bulk water meters, Installation new ablution blocks, replacement of existing standpipes with widget standpipes	10 Ml/day	June 2011 (All water meters and relocated water mains will be commissioned in this financial year).	R1 000 000 (previous year's expenditure-R4 million)
Zwelitsha Water Loss Study	Installation of bulk water meters, Sectorization, water meter audits, water balance, repairs on indigent properties	3.8 Ml/day	Sustainability of the savings is currently monitored on monthly basis	Previous year's expenditure – R1 .9 million

PROJECT NAME	PROJECT DESCRIPTION	ANTICIPATED SAVINGS	DATE OF ANTICIPATED SAVINGS	BUDGET AVAILABILITY(2010/2011)
Top Consumer Audits	Audit each consumer for meter accuracy, water theft, meter reading and billing.	Assuming 20% of the current consumption is not billed, the municipality can through accurate metering and billing generate income on an additional 2.4million m^3/annum	Continuous exercise	Internal Staff
Active Leakage Control	Inspect and repair all meters, control valves, isolating valves, hydrants and air valves. This exercise is restricted to visual inspection and sounding.	Locate and repair unreported bursts and leaks. The average connection leak , leaks at approximately 1.6m^3/h.	Continuous exercise	Internal Staff
Consumer Awareness Campaigns	Distribute literature through inclusion with water bill, schools programmes, Water Week, competitions, articles and advertisements, posters, pamphlets, stickers and sponsorships.	It is estimated that through a long term campaign that at least a half percent of the current annual consumption can be saved i.e. 600 000m^3/annum	Continuous exercise	Internal Staff

Buffalo City Draft WC/WDM Strategy: Summary cost of main projects indicating potential savings in million m³/a

Escalation = 5% | Budget x R 1000 & expected savings | Escalation = 5%

Objective number			Programme	2010/2011 Budget x R 1000	2010/2011 Ml/day	2010/2011 Million m³/a	2011/2012 Budget x R 1000	2011/2012 Ml/day	2011/2012 Million m³/a	2012/2013 Budget x R 1000	2012/2013 Ml/day	2012/2013 Million m³/a
Objective A	Efficient Operation	A.1	Sectorisation				R 689,836		0.1	R 715,166		0.1
		A.2	Zone Metering				R 1,157,516		0.1	R 1,215,090		0.1
		A.3	Water loss monitoring & auditing				R 1,709,217			R 1,794,677		
		A.4	Control valve management				R 191,218		0.0	R 200,779		0.0
		A.5	Pressure management				R 884,040		0.4	R 928,242		0.4
		A.6	Leakage control				R 1,070,640		0.2	R 1,122,670		0.2
Objective B	Water audits, management & control	B.1	Train & appoint water demand management people				R 2,124,442			R 2,230,909		
Objective C	Efficient use & control	C.1	Top consumer audits				R 579,600		0.6	R 608,480		0.6
		C.2	Outlet audits				R 286,744		0.0	R 301,281		0.0
		C.3	Community awareness				R 812,640		0.1	R 853,088		0.1
		C.4	Promote water use efficiency				R 812,640		0.1	R 853,088		0.1
		C.5	Consumer metering				R 7,668,076		1.2	R 8,052,080		1.2
		C.6	Retrofitting & plumbing				R 4,554,522		0.8	R 4,782,247		0.8
Objective D	Reduce future water requirement	D.1	Promote water use of water efficient fittings									
Objective E	Promote WC/WDM within BCM	E.1	Assist line departments to develop and implement WC/WDM BPs									
Objective F	Re-use of water	F.1	Develop re-use strategy and implement projects				R 500,000			R 1,000,000		
Total				0.0	-	-	R 22,069,420	-	3.6	R 23,487,898	-	3.6
Total, cumulative savings, Million m³/a					-	-		-	3.6		-	7.0

No.	2013/2014 Budget x R 1000	2013/2014 Ml/day	2013/2014 Million m³/a	2014/2015 Budget x R 1000	2014/2015 Ml/day	2014/2015 Million m³/a	2015/2016 Budget x R 1000	2015/2016 Ml/day	2015/2016 Million m³/a	2016/2017 Budget x R 1000	2016/2017 Ml/day	2016/2017 Million m³/a
A.1	R 750,630		0.1	R 797,470		0.1	R 837,247		0.1			
A.2	R 1,276,140		0.1	R 1,339,868		0.1	R 1,406,966		0.1			
A.3	R 1,884,411			R 1,978,612								
A.4	R 210,817		0.0	R 221,358		0.0	R 232,426		0.0			
A.5	R 974,654		0.4	R 1,023,386		0.4	R 1,074,556		0.4			
A.6	R 1,180,094		0.2	R 1,240,548		0.2	R 1,310,976		0.2			
B.1	R 2,318,949			R 2,484,482			R 2,508,625					
C.1	R 638,806		0.6	R 670,893		0.6	R 704,377		0.6			
C.2	R 316,441		0.0	R 335,624		0.0	R 352,126		0.0			
C.3	R 895,738		0.1	R 940,526		0.1	R 987,552		0.1	R 1,036,930		0.1
C.4	R 895,738		0.1	R 940,526		0.1	R 987,552		0.1	R 1,036,930		0.1
C.5	R 8,487,129		1.2	R 8,911,485		1.2	R 9,357,069		1.2	R 9,824,912		1.2
C.6	R 4,959,059		0.8	R 5,114,802		0.8	R 4,430,543		0.8	R 4,556,580		0.8
D.1												
E.1												
F.1	R 2,700,000			R 6,968,750			R 14,000,000		2.9	R 15,415,375		2.9
Total	R 25,974,247	-	3.6	R 31,980,482	-	3.5	R 39,714,179	-	6.4	R 41,750,730	-	5.0
Total, cumulative savings		-	10.6		-	14.0		-	20.4		-	25.4

No.	2017/2018 Budget x R 1000	2017/2018 Ml/day	2017/2018 Million m³/a	2018/2019 Budget x R 1000	2018/2019 Ml/day	2018/2019 Million m³/a	2019/2020 Budget x R 1000	2019/2020 Ml/day	2019/2020 Million m³/a	Total		Million m³/a	Saving period beginning	Saving period end	Time to savings
A.1										R 3,137,278	C	0.6	2012	2016	4
A.2										R 5,730,450	C	0.6	2012	2016	4
A.3										R 6,857,222		-	2012	2016	4
A.4										R 880,059	C	0.1	2012	2016	4
A.5										R 4,080,810	C	2.0	2012	2016	4
A.6										R 4,881,300	C	1.0	2012	2016	4
B.1										R 9,518,940		-	2012	2016	4
C.1										R 2,533,551		2.6	2012	2016	4
C.2										R 1,311,275		0.2	2012	2016	4
C.3	R 1,088,777		0.1	R 1,143,216		0.1	R 1,200,376		0.1	R 8,146,203	C	0.6	2012	2020	8
C.4	R 1,088,777		0.1	R 1,143,216		0.1	R 1,200,376		0.1	R 8,146,203	C	0.6	2012	2020	8
C.5	R 10,316,158		1.2	R 10,831,966		1.2	R 11,373,564		1.2	R 77,156,259	C	10.6	2012	2020	8
C.6	R 4,768,897		0.8	R 5,001,547		0.8	R 5,251,640		0.8	R 35,609,628	C	7.6	2012	2020	8
D.1															
E.1															
F.1	R 16,081,143		2.9	R 16,883,200		2.9	R 17,779,400		2.9	R 91,708,012	C	14.6	2014	2020	6
Total	R 43,318,730	-	5.0	R 45,089,145	-	5.0	R 46,766,423	-	5.0	R 237,129,445		40.6			
Total, cumulative savings		-	30.5		-	35.6		-	40.6						

Objective E1.1 only includes treated effluent which is going to replace potable supply

Note that A1.1 and A1.2 will not result in a significant reduction of demand, but can result in a significant increase in financial revenue

NOTES

1 Cells highlighted in yellow are transferred directly to the "Intervention Data Sheet"

2 Column AC refers to capital or operating budget. If the WC/WDM intervention is shown as capital expenditure the expenditure will be capitalised.

3 The saving period beginning and saving period end inputs must be made based on the WC/WDM programme at the discretion of the spreadsheet operator

4 The headings highlighted in light blue require input

B2 : Amatola Water

Amatola Water System Losses

Amatole Water Supply System - Scheme Losses (2009/2010)

Scheme	Treatment Losses		Distribution Losses		Total Losses
	million m^3/a	%	million m^3/a	%	million m^3/a
Laing	0.75	8.1	-0.76	-9.0	-0.02
Nahoon	0.46	4.7	0.46	5.0	0.92
Rooikrantz	0.06	10.4	0.06	11.5	0.11
Total	**1.26**		**-0.24**		**1.02**
Sandile	0.13	1.6	0.11	1.4	0.23

APPENDIX C

PRELIMINARY YIELDS AND COSTS OF
POSSIBLE SURFACE WATER SUPPLY SCHEMES
AS WELL AS RE-USE SCHEMES

Preliminary Estimates of Yields from and Costs of the Possible Bulk Water Supply Augmentation Schemes

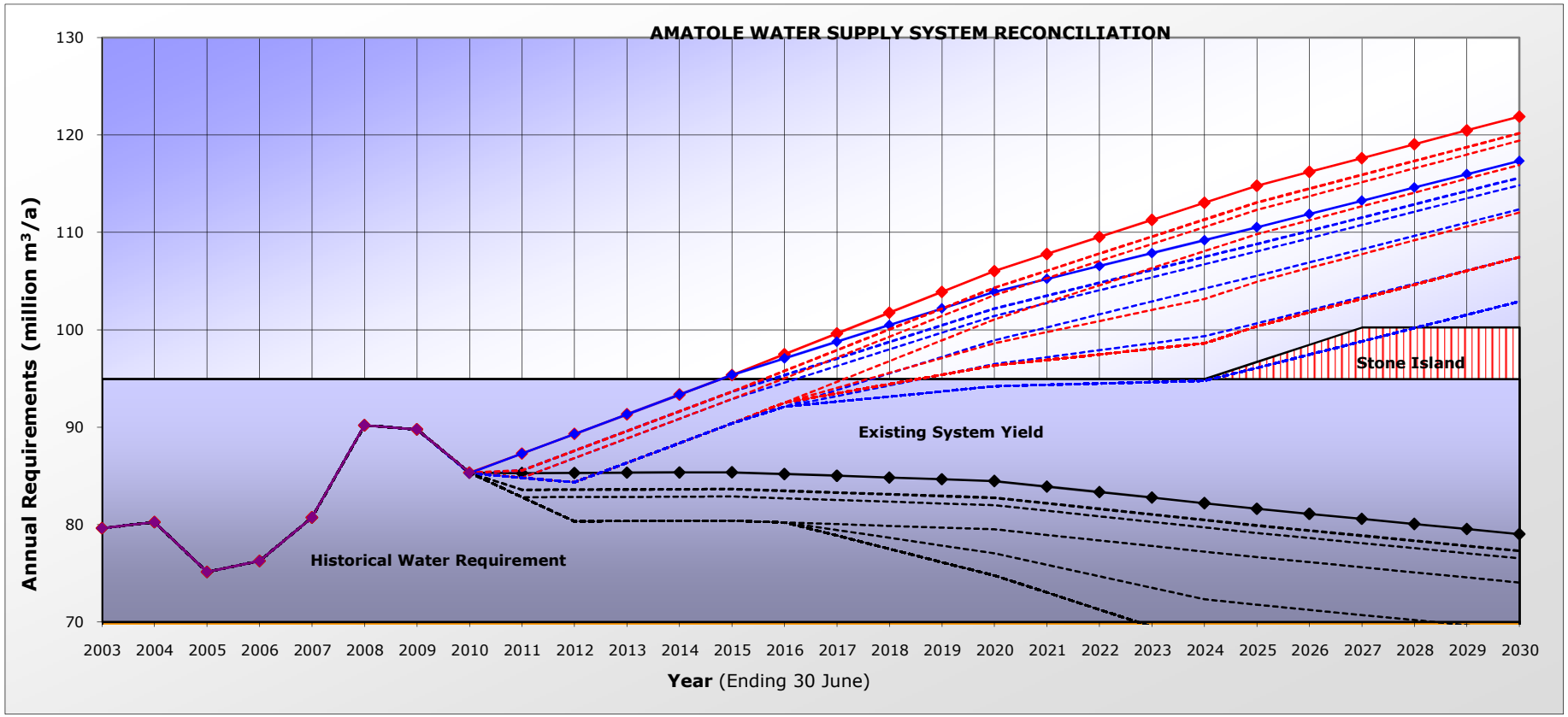
Potential Asset Option	River	Available Yield *	Unit Reference Value – 2006	Estimated Cost 2006		Timeline Years
				Capital	O&M	
		(Mm3/a)	(R/m3)	(R million)	(R million/a)	
Stone Island	Nahoon	5.3	2.8	132	2.5	5
Sandile/Binfield Park	Keiskamma	8.7	3.4	220	8	4
Groothoek/ Waterfall	Gqunube	12.1	3.5	343	8.6	7
Mhalla's Kop	Gqunube	7.9	3.6	235	8.7	7
Wesselshoek	Kwelera	10.9	3.8	343	7.7	7
Matola	Kubusi	15.8	4	490	17.5	10
Ravenswood	Keiskamma	21.3	4.1	607	26.6	10
Thornwood	Keiskamma	29.5	4.4	897	23.9	10
nGutu	Great Kei	55	6.1	1804	74.1	15
Junction (Tyume)	Keiskamma	9	6.3	495	11.6	10
Blackpool (Clachlan)	Thorn	3.4	6.5	210	4.4	10
Fairways	Buffalo	1.1	6.7	75	1	10
North Slope	Toise	2.1	6.8	142	1.6	10
Allandale	Thomas	1.7	8.8	148	1.6	10

APPENDIX D

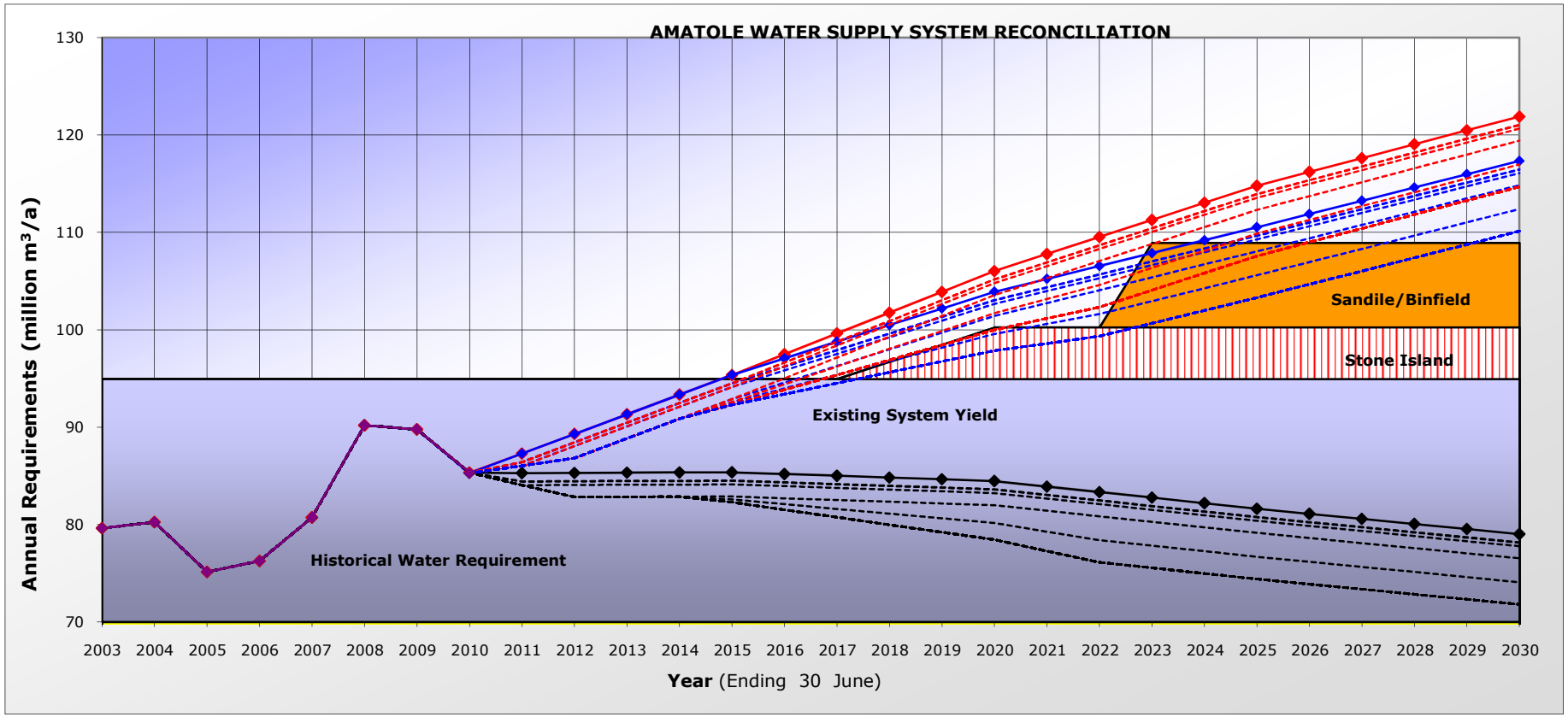
RECONCILIATION SCENARIO

PLANNING GRAPHS

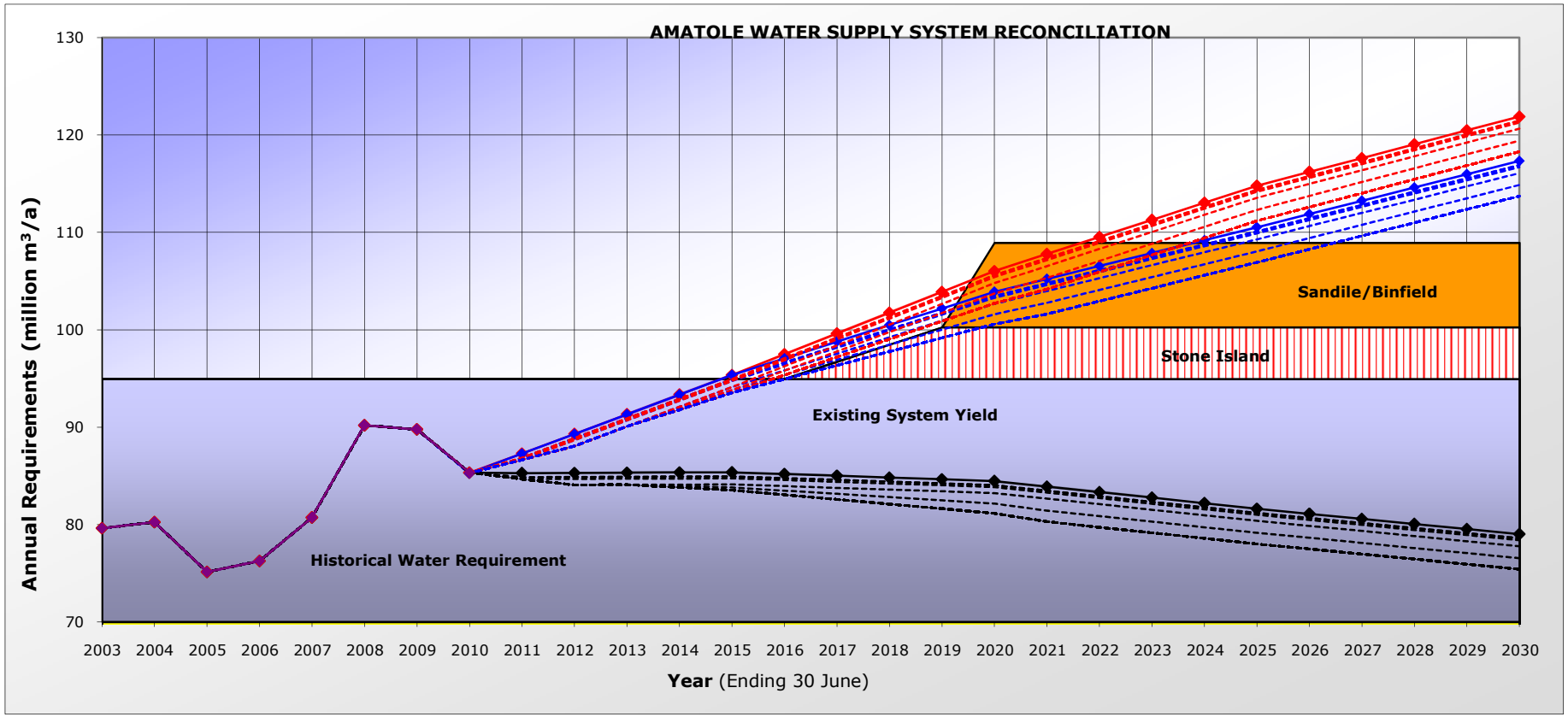
D1: NO EWR, WC/WDM 100% EFFECTIVE, SURFACE WATER



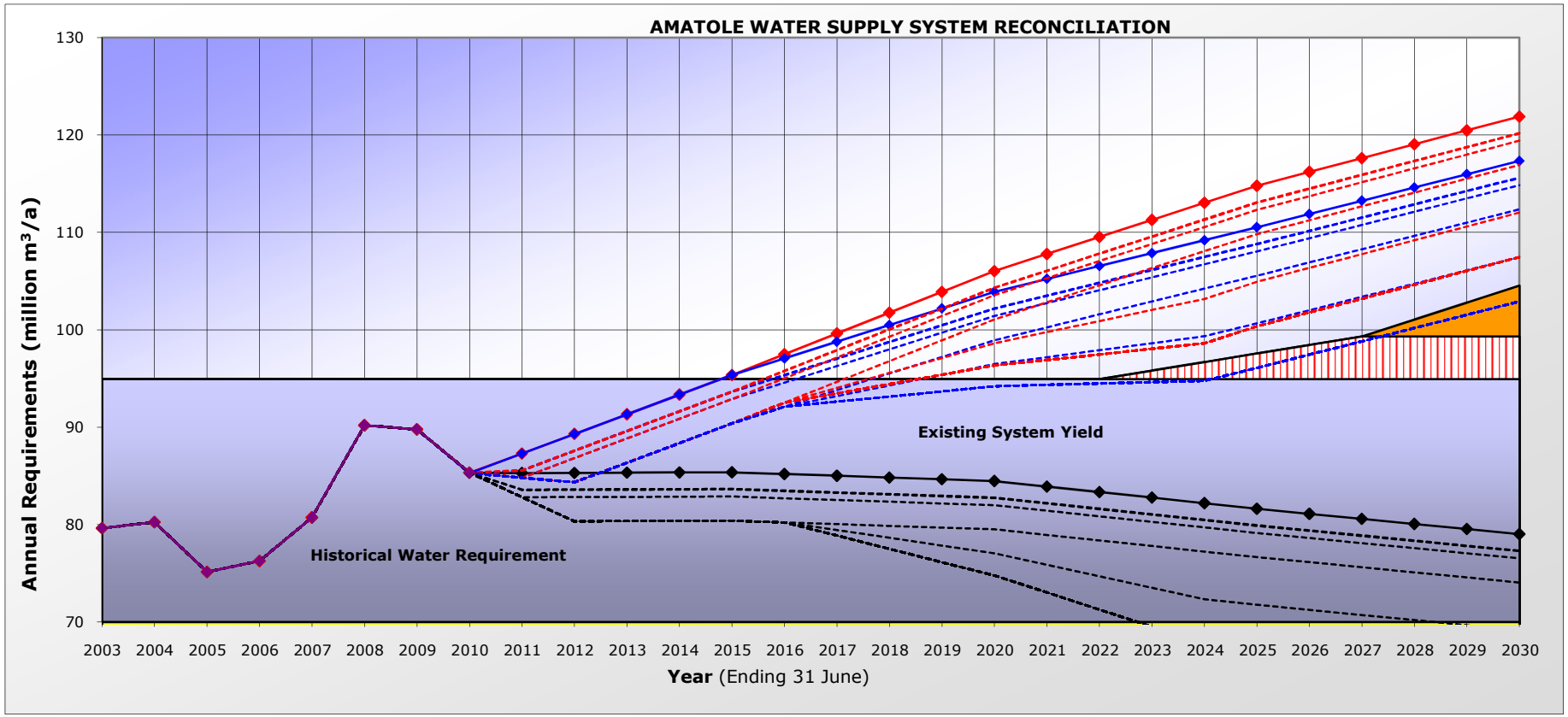
D2: NO EWR WC/WDM 50% EFFECTIVE, SURFACE WATER



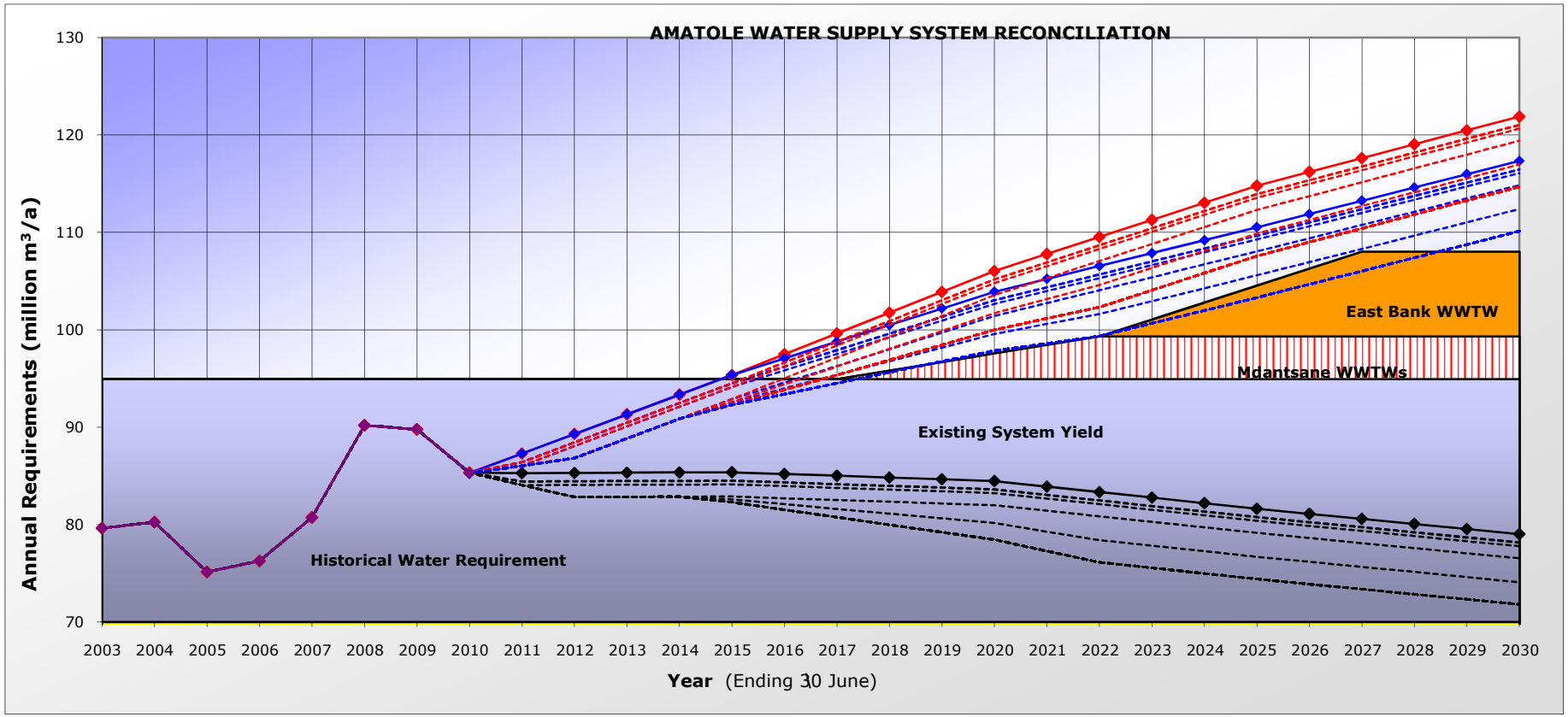
D3: NO EWR, WC/WDM 25% EFFECTIVE, SURFACE WATER



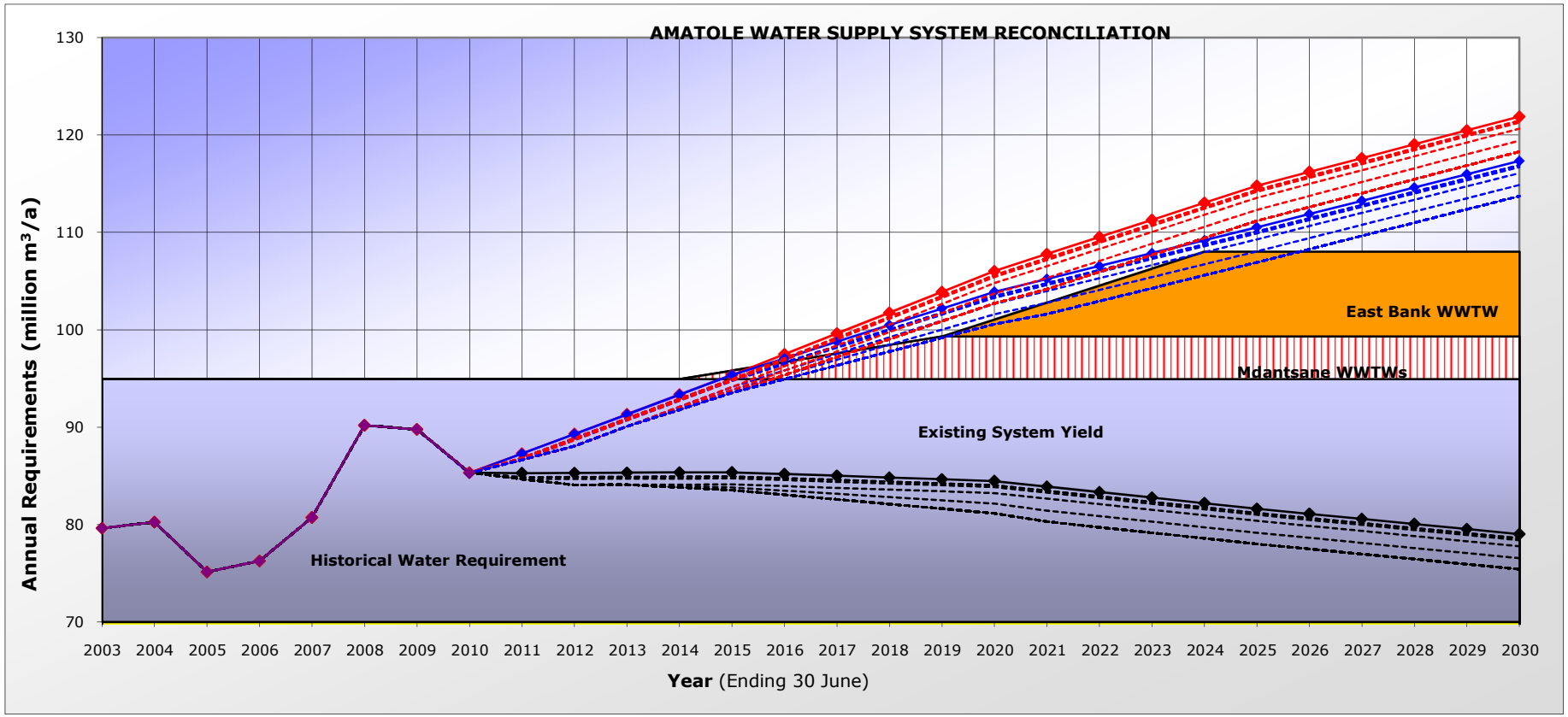
D4: NO EWR, WC/WDM 100% EFFECTIVE, RE-USE



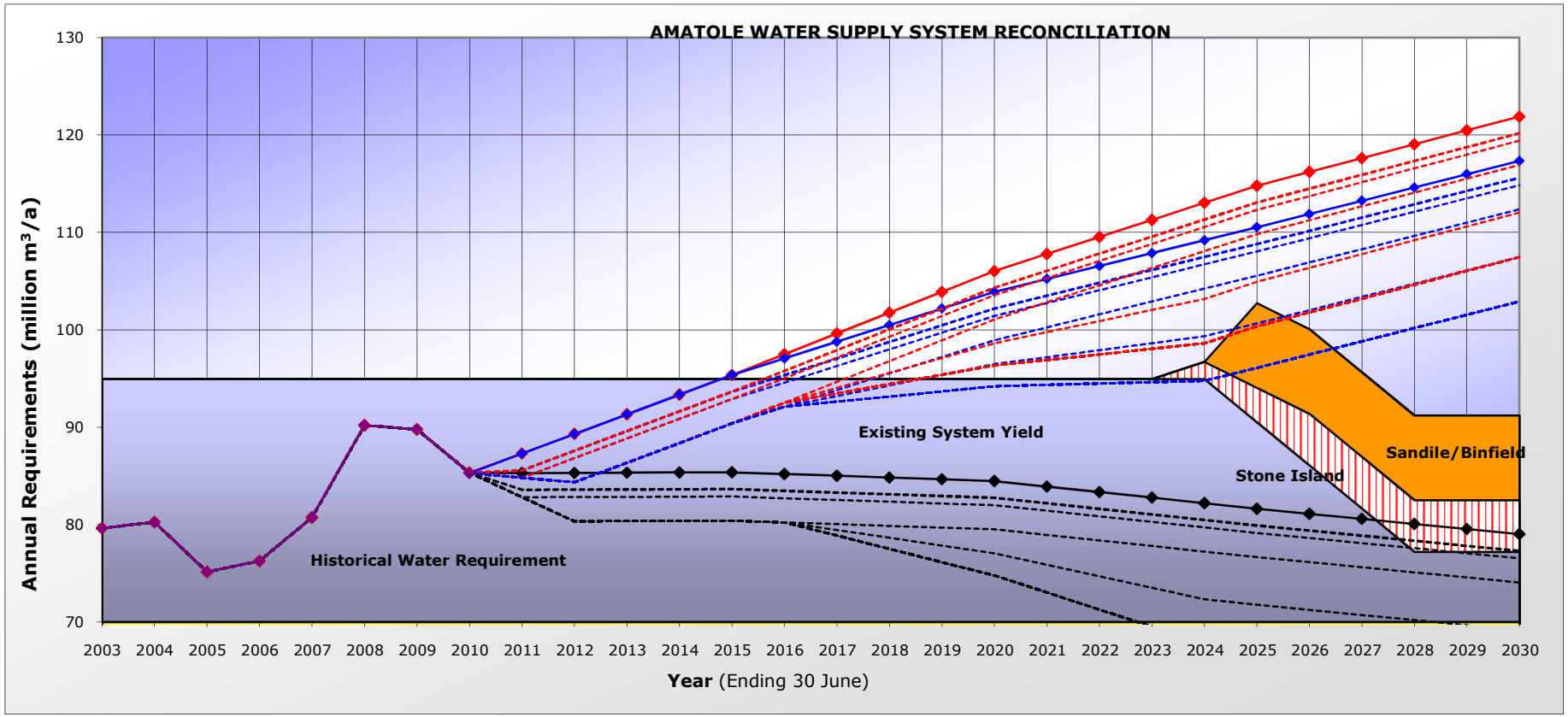
D5: NO EWR, WC/WDM 50% EFFECTIVE, RE-USE



D6: NO EWR, WC/WDM 25% EFFECTIVE, RE-USE

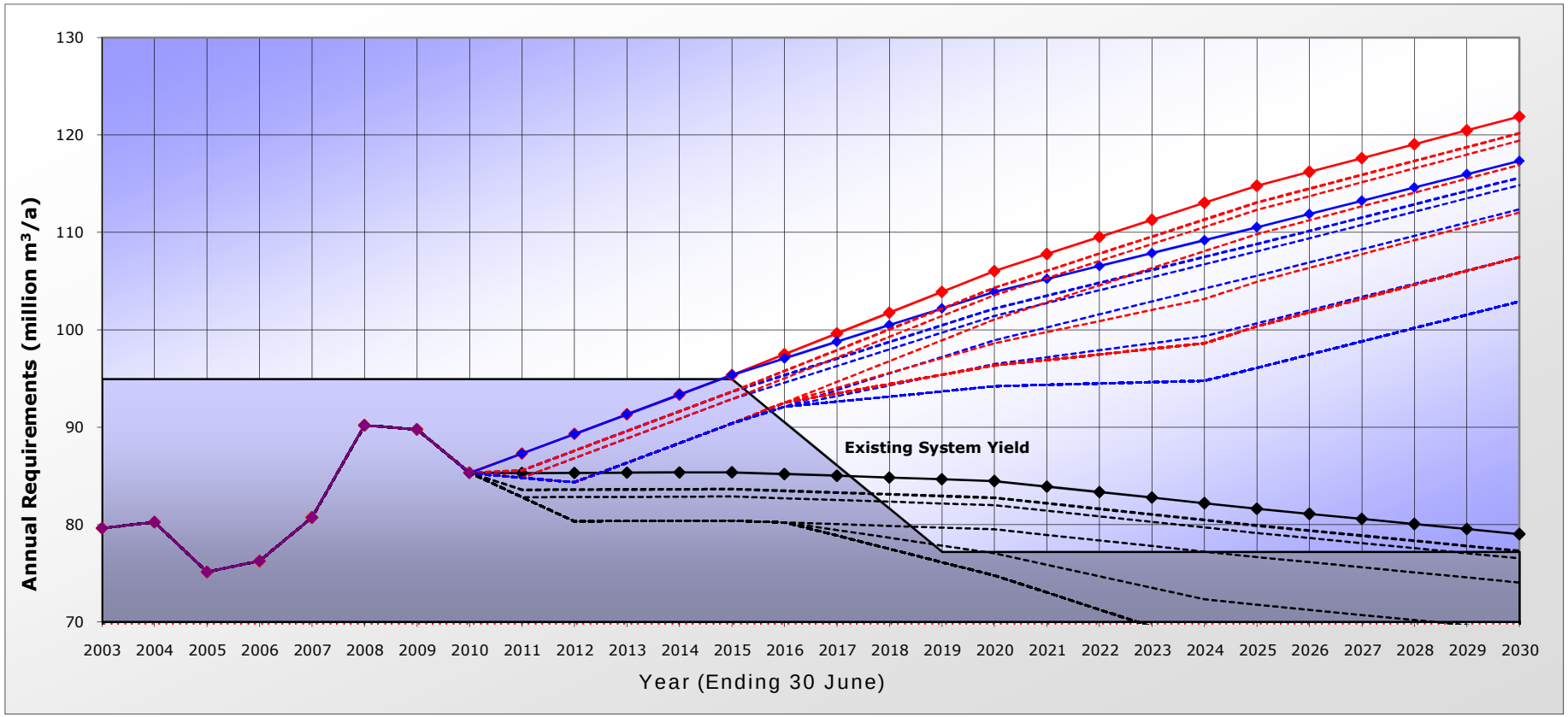


D7: WITH EWR, WC/WDM 100% EFFECTIVE, SURFACE WATER



Historical Water Requirement

D8: WITH EWR, WC/WDM 100% EFFECTIVE; LOW WATER REQUIREMENT SCENARIO



APPENDIX E

RECOMMENDED LATEST STUDY START DATES

Department of Water Affairs: Options Analysis

2011: Latest Study Start Date			
Category	*Intervention/Asset*	*Implement Period (years)*	*Estimated Yield (Million m^3/a)*
SWA	*Possible transfer of water from the Sandile and Binfield Park dams (in tributaries of the Keiskamma River) to the Buffalo River*	*4*	*8.7*
SWA	*Potential dam in the Nahoon River at Stone Island Farm*	*5*	*5.3*
SWA	*Potential dam in the Gqunube River at Groothoek/Waterfall*	*7*	*12.1*
SWA	*Potential dam in the Kwelera River Wesselshoek*	*7*	*10.9*

2012: Latest Study Start Date			
Category	**Intervention/Asset**	**Implement Period (years)**	**Estimated Yield (Million m^3/a)**
SWA	Potential dam in the Keiskamma River at Ravenswood Farm	10	21.3
SWA	Potential dam in the Keiskamma River at Thornwood Farm	10	29.5

Buffalo City Municipality: Water Conservation & Water Demand Management

2011: Latest Study Start Date			
Category	***Intervention/Asset***	***Implement Period (years)***	***Estimated Savings (Million m^3/a)***
WDM	*Reduction potable water losses in the Upper & Middle Buffalo*	*2.5*	*4.9*
WDM	*Reduction potable water losses in the Lower Buffalo*	*2.5*	*4.6*

Notes:

1. **The above represent programmes rather than projects**
2. **It is required that projects of at least 1.2 million m^3/a are required to be planned and implemented over the next 8 years.**

Buffalo City Municipality: Water Re-Use

2011: Latest Study Start Date			
Category	***Intervention/Asset***	***Implement Period (years)***	***Estimated Yield (Million m^3/a)***
RU	*Develop a Re-use Strategy*	*N/A*	*N/A*

2012: Latest Study Start Date			
Category	**Intervention/Asset**	**Implement Period (years)**	**Estimated Yield (Million m^3/a)**
RU	Projects to re-use water from Mdantsane East & West WWTWs	4	4.4
RU	Projects to re-use water from East Bank WWTW	4	8.7
RU	Projects to re-use water from Gonubie WWTW	4	1.1

Notes:

1. **The above represent programmes rather than projects**
2. **It is required that projects that deliver additional yields of at least 2.9 million m^3/a per year be planned and implemented over a 5 year period, with first yield required as from 2016.**