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DEPARTMENT OF WATER AFFAIRS & FORESTRY

The Development of a Reconciliation Strategy for the CROCODILE WEST WATER SUPPLY SYSTEM

Water Requirement and Availability Scenarios for the Lephalale Area

MAY 2008

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THE DEVELOPMENT OF A RECONCILIATION STRATEGY FOR THE CROCODILE WEST WATER SUPPLY SYSTEM

WATER REQUIREMENT AND AVAILABILITY SCENARIOS FOR THE LEPHALALE AREA

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1. INTRODUCTION

The Department of Water Affairs and Forestry (DWAF) initiated a study "*The assessment of water availability in the Crocodile (West) River Catchment by means of water resource related models in support of the planned future licensing process*". This study is hereafter referred to as the *Crocodile West Modelling Study* (CWMS).

Another parallel study was initiated by the Department of Water Affairs and Forestry to develop a reconciliation strategy for the Crocodile (West) River system. This is referred to as the *Crocodile West Reconciliation Strategy* (CWRS). The CWRS focuses on strategies for resolving imbalances between water requirements and water availability based on data gathered for and results from the models set up as part of the CWMS.

The study area covers the Crocodile (West) River catchment, which forms the major part of the Crocodile (West) and Marico WMA, but excludes the Marico River. It extends northwards from the Witwatersrand catchment divide in central Johannesburg (where the Crocodile (West) originates), to the Limpopo River on the northern border of South Africa with Botswana. The Limpopo River is an international river basin shared between South Africa, Botswana, Zimbabwe and Mozambique, originating from the confluence of the Crocodile (West) and Marico Rivers.

The main source of water in the Mokolo River catchment is the Mokolo Dam. The water availability from the Crocodile (West) River catchment as source to supplement the limited water availability of the Mokolo River catchment is addressed in this report.

This report was produced as input into the Crocodile Reconciliation Strategy. The proposed developments of power stations by Eskom and coal to liquid (CTL) plants by SASOL at Lephalale requires water that is beyond the yield of the Mokolo Dam, The Crocodile River was identified as the source for the additional water requirements. It was therefore essential to add the requirements of the Lephalale area to the Reconciliation Study.

2. WATER SITUATION IN THE LEPHALALE AREA

2.1 WATER REQUIREMENTS IN THE LEPHALALE AREA

Eight different scenarios of water requirements for the Lephalale area have been prepared. Several discussions were held between representative of DWAF, Eskom, SASOL, the mines and the Lephalale Municipality. Each of these organisations represented at the meetings has supplied projected water use figures for different possible development scenarios. These water requirements were combined into eight different scenarios.

The existing and projected future water use sectors include Eskom's power stations, mining, SASOL, as well as domestic users. For domestic use the natural growth of the town of Lephalale was provided for plus the additional water requirement that will be the result of the establishment of the various power stations, mines as well as the CTL plants as appropriate for each scenario.

2.1.1 Scenario 1

The water requirements for this scenario are summarised in **Table 1** and include the following users:

- Power stations
    - Matimba using existing technology.
    - Medupi using existing technology (Medupi has received a record of decision on existing technology and it was assumed that if no new power station will be added, no additional cleaning of the emissions will be required).
- Mining
    - Exxaro coal supply for 2 power stations (using existing technology for coal beneficiation).
    - Exxarro to construct a 1 000 MW power station. The water supply to this power station and the coal beneficiation is included in Table 1. This scenario provides for Exxaro's requirements plus for mining coal "optimally".
    - Mining of coal for export and downstream value adding.
- Domestic
    - Current Lephalale town.
    - Provision for additional domestic water for Medupi and Exxaro power stations.
- Construction
    - Water for construction purposes and temporary construction personnel in Lephalale.

2.1.2 Scenario 2

The water requirements for this scenario are summarised in **Table 2** and include the following users:

- Power stations
  - Matimba using existing technology.
  - Medupi using flue gas desulphurisation (FGD) technology, which uses more water (Medupi will be changed from existing to FGD technology).
  - 1 new power station (Lephalale 3) using FGD technology.
- Mining
  - Exxaro coal supply for 3 power stations (using existing technology for coal beneficiation). In this case Exxaro will not build their own power station.
- Domestic
  - Current Lephalale town.
  - Provision for additional domestic water for new power stations (Medupi and Lephalale 3).
- Construction
  - Water for construction purposes and temporary construction personnel in Lephalale.

2.1.3 Scenario 3

The water requirements for this scenario are summarised in **Table 3** and include the following users:

- Power stations
  - Matimba using existing technology.
  - Medupi using FGD technology.
  - 1 new power station (Lephalale 3) using FGD technology.
  - 2 new power stations (Lephalale 4 and Lephalale 5) using fluidised bed combustion (FBC) technology. Note: FBC uses significantly less water than FGD.
- Mining
  - Exxaro coal supply for 5 power stations. Coal beneficiation for FBC power stations also use less water than for others.
- Domestic
  - Current Lephalale town.
  - Provision for 5 power stations townships (Matimba, Medupi and 3 more).
- Construction
  - Water for construction purposes and temporary construction personnel in Lephalale.

2.1.4 Scenario 4

The water requirements for this scenario are summarised in **Table 4** and include the following users:

- Power stations
  - Matimba using existing technology.
  - Medupi using FGD technology.
  - 3 new power stations (Lephalale 3, Lephalale 4 and Lephalale 5) using FGD technology.
- Mining
  - Exxaro coal supply for 5 power stations (using existing technology for coal beneficiation).
- Domestic
  - Current Lephalale town.
  - Provision for 5 power stations townships (Matimba, Medupi and 3 more).
- Construction
  - Water for construction purposes and temporary construction personnel in Lephalale.

2.1.5 Scenario 5

This is the same as Scenario 1 with SASOL's Mafutha 1 and Mafutha 2 included. The water requirements for this scenario are summarised in **Table 5** and include the following users:

- Power stations
  - Matimba using existing technology.
  - Medupi using existing technology.
- Mining
  - Exxaro coal supply for 2 power stations (using existing technology for coal beneficiation).
  - Exxarro to construct a 1 000 MW power station. The water supply to this power station and the coal beneficiation is included in Table 5. This scenario provides for Exxaro's requirements plus for mining coal "optimally".
  - Mining of coal for export and downstream value adding.
- SASOL
  - SASOL Project Mafutha Phase 1.
  - SASOL Project Mafutha Phase 2.

- Domestic
    - Current Lephalale town
    - Provision for additional domestic water for Medupi and Exxaro power stations.
    - Provision for additional domestic water for SASOL's Mafutha 1 and Mafutha 2.
- Construction
    - Water for construction purposes and temporary construction personnel in Lephalale.

2.1.6 Scenario 6

This is the same as Scenario 2 with SASOL's Mafutha 1 and Mafutha 2 included. The water requirements for this scenario are summarised in **Table 6** and include the following different users:

- Power stations
    - Matimba using existing technology.
    - Medupi using FGD technology.
    - 1 new power station (Lephalale 3) using FGD technology.
- Mining
    - Exxaro coal supply for 3 power stations (using existing technology for coal beneficiation).
- SASOL
    - SASOL Project Mafutha Phase 1
    - SASOL Project Mafutha Phase 2
- Domestic
    - Current Lephalale town.
    - Provision for additional domestic water for new power stations (Medupi and Lephalale 3).
    - Provision for additional domestic water for SASOL's Mafutha 1 and Mafutha 2.
- Construction
    - Water for construction purposes and temporary construction personnel in Lephalale.

2.1.7 Scenario 7

This is the same as Scenario 3 with SASOL's Mafutha 1 and Mafutha 2 included. The water requirements for this scenario are summarised in **Table 7** and include the following different users:

- Power stations
  - Matimba using existing technology.
  - Medupi using FGD technology.
  - 1 new power (Lephalale 3) station using FGD technology.
  - 2 new power stations (Lephalale 4 and Lephalale 5) using FBC technology.
- Mining
  - Exxaro coal supply for 5 power stations.
- SASOL
  - SASOL Project Mafutha Phase 1.
  - SASOL Project Mafutha Phase 2.
- Domestic
  - Current Lephalale town.
  - Provision for 5 power stations townships (Matimba, Medupi and 3 more).
  - Provision for additional domestic water for SASOL's Mafutha 1 and Mafutha 2.
- Construction
  - Water for construction purposes and temporary construction personnel in Lephalale.

2.1.8 Scenario 8

This is the same as Scenario 4 with SASOL's Mafutha 1 and Mafutha 2 included. The water requirements for this scenario are summarised in **Table 8** and include the following different users:

- Power stations
  - Matimba using existing technology.
  - Medupi using FGD technology.
  - 3 new power stations (Lephalale 3, Lephalale 4 and Lephalale 5) using FGD technology.
- Mining
  - Exxaro coal supply for 5 power stations (using existing technology for coal beneficiation).
- SASOL
  - SASOL Project Mafutha Phase 1.
  - SASOL Project Mafutha Phase 2.

- Domestic
    - Current Lephalale town.
    - Provision for 5 power stations townships (Matimba, Medupi and 3 more).
    - Provision for additional domestic water for SASOL's Mafutha 1 and Mafutha 2.
- Construction
    - Water for construction purposes and temporary construction personnel in Lephalale.

2.2 WATER AVAILABILITY FROM THE MOKOLO CATCHMENT

The yield available from the Mokolo Dam in the Mokolo catchment at 1:200 recurrence interval (99.5% assurance of supply) is 27.4 million m^3/a.

2.3 WATER BALANCE FOR THE CROCODILE/MOKOLO SYSTEM

The water balance for the Crocodile/Mokolo system was determined for the four scenarios which are addressed in the Crocodile West Reconciliation Strategy: Scenario D: High, Scenario D: Base, Scenario D: Low and Scenario C: High (refer to Chapter 2 of this report).

Table 1: Water requirements for Scenario 1: Matimba power station (existing technology), Medupi power station (existing technology), Exxaro supply coal for two power stations, no SASOL, Lephalale town for two power stations

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station		0.5	0.8	1.0	1.0	3.2	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lephalale 3 Power Station																								
Lephalale 4 Power Station																								
Lephalale 5 Power Station																								
Total	**3.6**	**4.1**	**4.3**	**4.6**	**4.6**	**6.8**	**8.4**	**8.4**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro** (local)							0.7	1.3	3.4	4.4	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lephalale 3																								
Lephalale 4																								
Lephalale 5																								
Other: 1 000 MW power station (Exxaro), export							0.5	0.7	2.9	5.7	8.6	12.9	13.6	14.3	15.0	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
Total	**3.0**	**3.1**	**3.6**	**4.7**	**5.9**	**6.9**	**9.8**	**10.6**	**14.9**	**18.7**	**22.1**	**26.4**	**27.1**	**27.8**	**28.5**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**
SASOL																								
Construction																								
CTL Facility																								
Coal mining and beneficiation																								
Total																								
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3																								
Lephalale 4																								
Lephalale 5																								
Construction		0.6	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0										
Sasol																								
Total	**3.4**	**4.2**	**4.5**	**5.0**	**5.4**	**5.9**	**6.3**	**6.5**	**6.8**	**6.8**	**6.8**	**6.8**	**6.8**	**6.8**	**5.8**	**5.8**	**5.8**	**5.8**	**5.8**	**5.8**	**5.8**	**5.8**	**5.8**	**5.8**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 1	**20.4**	**21.8**	**22.8**	**24.7**	**26.3**	**30.1**	**34.9**	**35.9**	**40.6**	**44.4**	**47.8**	**52.1**	**52.8**	**53.5**	**53.2**	**54.0**	**54.0**	**54.0**	**54.0**	**54.0**	**54.0**	**54.0**	**54.0**	**54.0**
Water available from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.6**	**-4.6**	**-2.7**	**-1.1**	**2.7**	**7.5**	**8.5**	**13.2**	**17.0**	**20.4**	**24.7**	**25.4**	**26.1**	**25.8**	**26.6**	**26.6**	**26.6**	**26.6**	**26.6**	**26.6**	**26.6**	**26.6**	**26.6**

Table 2: Water requirements for Scenario 2: Matimba power station (existing technology), Medupi power station (FGD), 1 new power station (FGD), coal supply to 3 power stations, no SASOL, Lephalale town for 3 power stations

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station		0.5	0.8	1.0	1.9	7.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Lephalale 3 Power Station				1.2	2.9	8.4	10.8	13.8	13.9	14.1	14.1	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 4 Power Station																								
Lephalale 5 Power Station																								
Total	**3.6**	**4.1**	**4.3**	**5.8**	**8.5**	**19.7**	**26.0**	**29.0**	**29.3**	**29.4**	**29.4**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro**			1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lephalale 3 - coal supplied by Exxaro/other mines			1.1	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 4 - coal supplied by Exxaro/other mines																								
Lephalale 5 - coal supplied by Exxaro/other mines																								
Other: 1 000 MW power station (Exxaro), export																								
Total	**3.0**	**3.1**	**5.7**	**8.0**	**9.7**	**10.7**	**13.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**
SASOL																								
Construction																								
CTL Facility																								
Coal mining and beneficiation																								
Total																								
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3		0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 4																								
Lephalale 5																								
Construction		0.6	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0										
Sasol																								
Total	**3.4**	**4.5**	**5.1**	**6.0**	**6.9**	**7.8**	**8.4**	**8.9**	**9.2**	**9.2**	**9.2**	**9.2**	**9.2**	**9.2**	**8.2**	**8.2**	**8.2**	**8.2**	**8.2**	**8.2**	**8.2**	**8.2**	**8.2**	**8.2**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 2	**20.4**	**22.1**	**25.5**	**30.2**	**35.5**	**48.7**	**58.4**	**63.9**	**64.5**	**64.6**	**64.6**	**63.1**	**63.1**	**63.1**	**62.1**	**62.1**	**62.1**	**62.1**	**62.1**	**62.1**	**62.1**	**62.1**	**62.1**	**62.1**
Water available from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.3**	**-1.9**	**2.8**	**8.1**	**21.3**	**31.0**	**36.5**	**37.1**	**37.2**	**37.2**	**35.7**	**35.7**	**35.7**	**34.7**	**34.7**	**34.7**	**34.7**	**34.7**	**34.7**	**34.7**	**34.7**	**34.7**	**34.7**

Table 3: Water requirements for Scenario 3: Matimba power station (existing technology), Medupi power station (FGD), 1 new power station (FGD), 2 power stations (FBC), coal supply to 5 power stations, Lephalale town for 5 power stations

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station		0.5	0.8	1.0	1.9	7.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Lephalale 3 Power Station				1.2	2.9	8.4	10.8	13.8	13.9	14.1	14.1	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 4 Power Station					0.5	0.8	1.0	2.7	4.6	6.7	7.0	6.2	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Lephalale 5 Power Station										0.5	0.8	2.3	6.4	5.9	6.4	6.5	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Total	**3.6**	**4.1**	**4.3**	**5.8**	**9.0**	**20.5**	**27.0**	**31.7**	**33.9**	**36.6**	**37.1**	**36.4**	**40.6**	**40.1**	**40.6**	**40.7**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro**			1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lephalale 3			1.1	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 4				1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lephalale 5									1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Other: 1 000 MW power station (Exxaro), export																								
Total	**3.0**	**3.1**	**5.7**	**9.0**	**10.7**	**11.7**	**14.6**	**16.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**
SASOL																								
Construction																								
CTL Facility																								
Coal mining and beneficiation																								
Total																								
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3		0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 4			0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4
Lephalale 5									0.3	0.6	1.0	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Construction		0.6	1.0	1.5	1.8	2.1	2.3	2.6	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Sasol																								
Total	**3.4**	**4.5**	**5.7**	**7.1**	**8.7**	**10.4**	**11.6**	**12.6**	**13.6**	**13.9**	**14.3**	**14.3**	**14.8**	**15.2**	**15.4**	**15.7**	**14.8**	**15.2**	**15.4**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 3	**20.4**	**22.1**	**26.1**	**32.3**	**38.8**	**53.0**	**63.6**	**71.3**	**75.5**	**78.5**	**79.4**	**78.7**	**83.4**	**83.3**	**84.0**	**84.4**	**83.3**	**83.7**	**83.9**	**84.2**	**84.2**	**84.2**	**84.2**	**84.2**
Water available from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.3**	**-1.3**	**4.9**	**11.4**	**25.6**	**36.2**	**43.9**	**48.1**	**51.1**	**52.0**	**51.3**	**56.0**	**55.9**	**56.6**	**57.0**	**55.9**	**56.3**	**56.5**	**56.8**	**56.8**	**56.8**	**56.8**	**56.8**

Table 4: Water requirements for Scenario 4: Matimba power station (existing technology), Medupi power station (FGD), 3 new power stations (FGD), coal supply to 5 power stations, Lephalale town for 5 power stations

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station		0.5	0.8	1.0	1.9	7.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Lephalale 3 Power Station				1.2	2.9	8.4	10.8	13.8	13.9	14.1	14.1	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 4 Power Station					0.5	0.8	1.0	5.3	9.3	13.4	13.9	12.4	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 5 Power Station										0.5	0.8	4.6	12.8	11.8	12.8	13.0	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Total	**3.6**	**4.1**	**4.3**	**5.8**	**9.0**	**20.5**	**27.0**	**34.3**	**38.5**	**43.3**	**44.1**	**44.9**	**53.3**	**52.3**	**53.3**	**53.5**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro**			1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lephalale 3			1.1	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 4				1.1	2.3	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 5									1.1	2.3	2.8	2.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other: 1 000 MW power station (Exxaro), export																								
Total	**3.0**	**3.1**	**5.7**	**9.1**	**12.0**	**13.0**	**16.4**	**18.4**	**20.7**	**22.9**	**23.4**	**23.4**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**
SASOL																								
Construction																								
CTL Facility																								
Coal mining and beneficiation																								
Total																								
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3		0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 4			0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4
Lephalale 5									0.3	0.6	1.0	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Construction		0.6	1.0	1.5	1.8	2.1	2.3	2.6	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Sasol																								
Total	**3.4**	**4.5**	**5.7**	**7.1**	**8.7**	**10.4**	**11.6**	**12.6**	**13.6**	**13.9**	**14.3**	**14.3**	**14.8**	**15.2**	**15.4**	**15.7**	**14.8**	**15.2**	**15.4**	**15.7**	**15.7**	**15.7**	**15.7**	**15.7**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 4	**20.4**	**22.1**	**26.1**	**32.4**	**40.1**	**54.3**	**65.4**	**75.7**	**83.2**	**90.5**	**92.2**	**93.0**	**104.1**	**103.5**	**104.7**	**105.2**	**103.9**	**104.3**	**104.5**	**104.8**	**104.8**	**104.8**	**104.8**	**104.8**
Water avaiable from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.3**	**-1.3**	**5.0**	**12.7**	**26.9**	**38.0**	**48.3**	**55.8**	**63.1**	**64.8**	**65.6**	**76.7**	**76.1**	**77.3**	**77.8**	**76.5**	**76.9**	**77.1**	**77.4**	**77.4**	**77.4**	**77.4**	**77.4**

Table 5: Water requirements for Scenario 5: Scenario 1 + SASOL + mine + SASOL township

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station using FBC	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station using FBC		0.5	0.8	1.0	1.0	3.2	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lephalale 3 Power Station																								
Lephalale 4 Power Station																								
Lephalale 5 Power Station																								
Total	**3.6**	**4.1**	**4.3**	**4.6**	**4.6**	**6.8**	**8.4**	**8.4**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**	**8.5**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro**							0.7	1.3	3.4	4.4	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lephalale 3																								
Lephalale 4																								
Lephalale 5																								
Other: 1 000 MW power station (Exxaro), export							0.5	0.7	2.9	5.7	8.6	12.9	13.6	14.3	15.0	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
Total	**3.0**	**3.1**	**3.6**	**4.7**	**5.9**	**6.9**	**9.8**	**10.6**	**14.9**	**18.7**	**22.1**	**26.4**	**27.1**	**27.8**	**28.5**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**	**29.3**
SASOL																								
Construction					1.0	3.0	5.0			1.0	3.0	5.0												
CTL Facility								14.0	32.0	32.0	32.0	32.0	46.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Coal mining and beneficiation								1.0	3.0	3.0	3.0	3.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Total					**1.0**	**3.0**	**5.0**	**15.0**	**35.0**	**36.0**	**38.0**	**40.0**	**50.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3																								
Lephalale 4																								
Lephalale 5																								
Construction		0.6	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0										
Sasol								5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total	**3.4**	**4.2**	**4.5**	**5.0**	**5.4**	**5.9**	**6.3**	**11.5**	**11.8**	**11.8**	**11.8**	**11.8**	**16.8**	**16.8**	**15.8**	**15.8**	**15.8**	**15.8**	**15.8**	**15.8**	**15.8**	**15.8**	**15.8**	**15.8**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 5	**20.4**	**21.8**	**22.8**	**24.7**	**27.3**	**33.1**	**39.9**	**55.9**	**80.6**	**85.4**	**90.8**	**97.1**	**112.8**	**133.5**	**133.2**	**134.0**	**134.0**	**134.0**	**134.0**	**134.0**	**134.0**	**134.0**	**134.0**	**134.0**
Water available from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.6**	**-4.6**	**-2.7**	**-0.1**	**5.7**	**12.5**	**28.5**	**53.2**	**58.0**	**63.4**	**69.7**	**85.4**	**106.1**	**105.8**	**106.6**	**106.6**	**106.6**	**106.6**	**106.6**	**106.6**	**106.6**	**106.6**	**106.6**

Table 6: Water requirements for Scenario 6: Scenario 2 + SASOL + mine + SASOL township

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station		0.5	0.8	1.0	1.9	7.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Lephalale 3 Power Station				1.2	2.9	8.4	10.8	13.8	13.9	14.1	14.1	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 4 Power Station																								
Lephalale 5 Power Station																								
Total	**3.6**	**4.1**	**4.3**	**5.8**	**8.5**	**19.7**	**26.0**	**29.0**	**29.3**	**29.4**	**29.4**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro**			1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lephalale 3 - coal supplied by Exxaro/other mines			1.1	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 4 - coal supplied by Exxaro/other mines																								
Lephalale 5 - coal supplied by Exxaro/other mines																								
Other: 1 000 MW power station (Exxaro), export																								
Total	**3.0**	**3.1**	**5.7**	**8.0**	**9.7**	**10.7**	**13.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**	**15.6**
SASOL																								
Construction					1.0	3.0	5.0			1.0	3.0	5.0												
CTL Facility								14.0	32.0	32.0	32.0	32.0	46.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Coal mining and beneficiation								1.0	3.0	3.0	3.0	3.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Total					**1.0**	**3.0**	**5.0**	**15.0**	**35.0**	**36.0**	**38.0**	**40.0**	**50.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3		0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 4																								
Lephalale 5																								
Construction		0.6	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0										
Sasol								5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total	**3.4**	**4.5**	**5.1**	**6.0**	**6.9**	**7.8**	**8.4**	**13.9**	**14.2**	**14.2**	**14.2**	**14.2**	**19.2**	**19.2**	**18.2**	**18.2**	**18.2**	**18.2**	**18.2**	**18.2**	**18.2**	**18.2**	**18.2**	**18.2**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 6	**20.4**	**22.1**	**25.5**	**30.2**	**36.5**	**51.7**	**63.4**	**83.9**	**104.5**	**105.6**	**107.6**	**108.1**	**123.1**	**143.1**	**142.1**	**142.1**	**142.1**	**142.1**	**142.1**	**142.1**	**142.1**	**142.1**	**142.1**	**142.1**
Water available from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.3**	**-1.9**	**2.8**	**9.1**	**24.3**	**36.0**	**56.5**	**77.1**	**78.2**	**80.2**	**80.7**	**95.7**	**115.7**	**114.7**	**114.7**	**114.7**	**114.7**	**114.7**	**114.7**	**114.7**	**114.7**	**114.7**	**114.7**

Table 7: Water requirements for Scenario 7: Scenario 3 + SASOL + mine + SASOL township

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station		0.5	0.8	1.0	1.9	7.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Lephalale 3 Power Station				1.2	2.9	8.4	10.8	13.8	13.9	14.1	14.1	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 4 Power Station					0.5	0.8	1.0	2.7	4.6	6.7	7.0	6.2	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Lephalale 5 Power Station										0.5	0.8	2.3	6.4	5.9	6.4	6.5	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Total	**3.6**	**4.1**	**4.3**	**5.8**	**9.0**	**20.5**	**27.0**	**31.7**	**33.9**	**36.6**	**37.1**	**36.4**	**40.6**	**40.1**	**40.6**	**40.7**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**	**40.5**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro**			1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lephalale 3			1.1	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 4				1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lephalale 5									1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Other: 1 000 MW power station (Exxaro), export																								
Total	**3.0**	**3.1**	**5.7**	**9.0**	**10.7**	**11.7**	**14.6**	**16.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**	**17.6**
SASOL																								
Construction					1.0	3.0	5.0			1.0	3.0	5.0												
CTL Facility								14.0	32.0	32.0	32.0	32.0	46.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Coal mining and beneficiation								1.0	3.0	3.0	3.0	3.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Total					**1.0**	**3.0**	**5.0**	**15.0**	**35.0**	**36.0**	**38.0**	**40.0**	**50.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3		0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 4			0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4
Lephalale 5									0.3	0.6	1.0	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Construction		0.6	1.0	1.5	1.8	2.1	2.3	2.6	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Sasol								5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total	**3.4**	**4.5**	**5.7**	**7.1**	**8.7**	**10.4**	**11.6**	**17.6**	**18.6**	**18.9**	**19.3**	**19.3**	**24.8**	**25.2**	**25.4**	**25.7**	**24.8**	**25.2**	**25.4**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 7	**20.4**	**22.1**	**26.1**	**32.3**	**39.8**	**56.0**	**68.6**	**91.3**	**115.5**	**119.5**	**122.4**	**123.7**	**143.4**	**163.3**	**164.0**	**164.4**	**163.3**	**163.7**	**163.9**	**164.2**	**164.2**	**164.2**	**164.2**	**164.2**
Water available from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.3**	**-1.3**	**4.9**	**12.4**	**28.6**	**41.2**	**63.9**	**88.1**	**92.1**	**95.0**	**96.3**	**116.0**	**135.9**	**136.6**	**137.0**	**135.9**	**136.3**	**136.5**	**136.8**	**136.8**	**136.8**	**136.8**	**136.8**

Table 8: Water requirements for Scenario 8: Scenario 4 + SASOL + mine + SASOL township

USER	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ESKOM																								
Matimba Power Station	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Medupi Power Station		0.5	0.8	1.0	1.9	7.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Lephalale 3 Power Station				1.2	2.9	8.4	10.8	13.8	13.9	14.1	14.1	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 4 Power Station					0.5	0.8	1.0	5.3	9.3	13.4	13.9	12.4	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Lephalale 5 Power Station										0.5	0.8	4.6	12.8	11.8	12.8	13.0	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Total	**3.6**	**4.1**	**4.3**	**5.8**	**9.0**	**20.5**	**27.0**	**34.3**	**38.5**	**43.3**	**44.1**	**44.9**	**53.3**	**52.3**	**53.3**	**53.5**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**	**53.1**
MINES																								
Matimba - coal supplied by **Exxaro**	3.0	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Medupi - coal supplied by **Exxaro**				1.1	2.3	3.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other mining activities by **Exxaro**			1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lephalale 3			1.1	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 4				1.1	2.3	2.3	2.8	2.8	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lephalale 5									1.1	2.3	2.8	2.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Other: 1 000 MW power station (Exxaro), export																								
Total	**3.0**	**3.1**	**5.7**	**9.1**	**12.0**	**13.0**	**16.4**	**18.4**	**20.7**	**22.9**	**23.4**	**23.4**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**	**25.6**
SASOL																								
Construction					1.0	3.0	5.0			1.0	3.0	5.0												
CTL Facility								14.0	32.0	32.0	32.0	32.0	46.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Coal mining and beneficiation								1.0	3.0	3.0	3.0	3.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Total					**1.0**	**3.0**	**5.0**	**15.0**	**35.0**	**36.0**	**38.0**	**40.0**	**50.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**	**70.0**
LEPHALALE MUNICIPALITY																								
Current	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Medupi		0.2	0.4	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 3		0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Lephalale 4			0.3	0.6	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4
Lephalale 5									0.3	0.6	1.0	1.0	1.5	1.9	2.1	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Construction		0.6	1.0	1.5	1.8	2.1	2.3	2.6	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Sasol								5.0	5.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total	**3.4**	**4.5**	**5.7**	**7.1**	**8.7**	**10.4**	**11.6**	**17.6**	**18.6**	**18.9**	**19.3**	**19.3**	**24.8**	**25.2**	**25.4**	**25.7**	**24.8**	**25.2**	**25.4**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**
IRRIGATION	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**	**10.4**
TOTAL: SCENARIO 8	**20.4**	**22.1**	**26.1**	**32.4**	**41.1**	**57.3**	**70.4**	**95.7**	**123.2**	**131.5**	**135.2**	**138.0**	**164.1**	**183.5**	**184.7**	**185.2**	**183.9**	**184.3**	**184.5**	**184.8**	**184.8**	**184.8**	**184.8**	**184.8**
Water available from Mokolo Dam	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**	**27.4**
Water required from Crocodile/Vaal	**-7.0**	**-5.3**	**-1.3**	**5.0**	**13.7**	**29.9**	**43.0**	**68.3**	**95.8**	**104.1**	**107.8**	**110.6**	**136.7**	**156.1**	**157.3**	**157.8**	**156.5**	**156.9**	**157.1**	**157.4**	**157.4**	**157.4**	**157.4**	**157.4**

Table 9: Summary of water requirements for the Lephalale area for different scenarios

Scenario	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Scenario 1	20.4	21.8	22.8	24.7	26.3	30.1	34.9	35.9	40.6	44.4	47.8	52.1	52.8	53.5	53.2	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0
Scenario 2	20.4	22.1	25.5	30.2	35.5	48.7	58.4	63.9	64.5	64.6	64.6	63.1	63.1	63.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
Scenario 3	20.4	22.1	26.1	32.3	38.8	53.0	63.6	71.3	75.5	78.5	79.4	78.7	83.4	83.3	84.0	84.4	83.3	83.7	83.9	84.2	84.2	84.2	84.2	84.2
Scenario 4	20.4	22.1	26.1	32.4	40.1	54.3	65.4	75.7	83.2	90.5	92.2	93.0	104.1	103.5	104.7	105.2	103.9	104.3	104.5	104.8	104.8	104.8	104.8	104.8
Scenario 5	20.4	21.8	22.8	24.7	27.3	33.1	39.9	55.9	80.6	85.4	90.8	97.1	112.8	133.5	133.2	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0
Scenario 6	20.4	22.1	25.5	30.2	36.5	51.7	63.4	83.9	104.5	105.6	107.6	108.1	123.1	143.1	142.1	142.1	142.1	142.1	142.1	142.1	142.1	142.1	142.1	142.1
Scenario 7	20.4	22.1	26.1	32.3	39.8	56.0	68.6	91.3	115.5	119.5	122.4	123.7	143.4	163.3	164.0	164.4	163.3	163.7	163.9	164.2	164.2	164.2	164.2	164.2
Scenario 8	20.4	22.1	26.1	32.4	41.1	57.3	70.4	95.7	123.2	131.5	135.2	138.0	164.1	183.5	184.7	185.2	183.9	184.3	184.5	184.8	184.8	184.8	184.8	184.8

3. WATER RECONCILIATION IN THE LEPHALALE AREA

The water balance for the four scenarios being reported on is included as **Figure 1** (Scenario D: High), **Figure 2** (Scenario D: Base), **Figure 3** (Scenario D: Low) and **Figure 4** (Scenario C: High).

The point on the above mentioned figures where the lines representing different scenarios of Lephalale water requirement crosses the **Mokolo Dam yield** line gives an indication of when the requirements in the Lephalale area will exceed the water availability. This will give an indication of when new infrastructure, that will be required to supplement the Lephalale area, needs to be in place.

The point on the figures where the lines representing different scenarios of Lephalale water requirement crosses the **Mokolo + Crocodile surplus** line gives an indication of when the requirements in the Lephalale area will exceed the water availability in the Crocodile and Mokolo catchments. This will give an indication of when the available water in the Mokolo and Crocodile catchments will not be enough to supply all the Lephalale requirements. At that date water supply to the Lephalale area needs to be supplemented from the Vaal River system, either directly or though transfers from the Vaal River system to the Crocodile River catchment.

As can be seen from the four figures the yield of Mokolo Dam can supply the growing water requirements in the Lephalale area until 2009. Thereafter the growing water requirements must be met by water transfers from the Crocodile West River catchment to the Lephalale area. If more water than the available water in the Crocodile River catchment is required, it will require interventions within the Crocodile River catchment to reduce the water requirements in the catchment, or to use other sources of water to supplement the projected shortfalls at Lephalale, e.g. water transfers from the Vaal River.

The infrastructure required for the transfer of water from the Crocodile River to the Lephalale area needs to be in place and operational between 2010 and 2013, depending on the water balance in the Crocodile River catchment linked to the water requirement scenario in the Lephalale area.

Other sources of water which could contribute to supplying the expected shortfall include one or a combination of the following possibilities in the Crocodile River catchment:

- Water demand management
- Direct re-use or recycling of effluent
- Indirect re-use of effluent (various potential abstraction points)
- Monitoring, review and enforcement of water use licenses
- Improved water resources management, with negotiated assurance of supply requirements
- Management and allocation of water resources in order to meet user quality requirements
- Trading (re-allocation) of irrigation water

- Development of groundwater (localised small potential)
- Removal of alien vegetation
- Increase transfers from the Vaal River system
- Enforcement of effluent discharge standards (for quality)
- Land use planning, land management and agricultural practices (for quality)
- Treatment or blending of water (for quality)

The raising of the Mokolo Dam has recently been investigated and the results are pending. Indications are that the yield of the dam, if raised by 12 m, could increase by about 17 million m^3/a at 1:200 assurance of supply.

4. CONCLUSIONS

The expected growing water requirements of the Lephalale area can be supplied from own sources until 2009. Water transfers from the Crocodile River catchment to the Lephalale area will then be required to meet the growing water requirements at Lephalale. The projected surpluses in the Crocodile River catchment will have to be supplemented with water from the Vaal River system and need to be in place between 2010 and 2013.

5. RECOMMENDATIONS

The expected planned developments in the Lephalale area could be supplied with water from own sources, supplemented with transferred water from the Crocodile West River catchment and the Vaal River system.

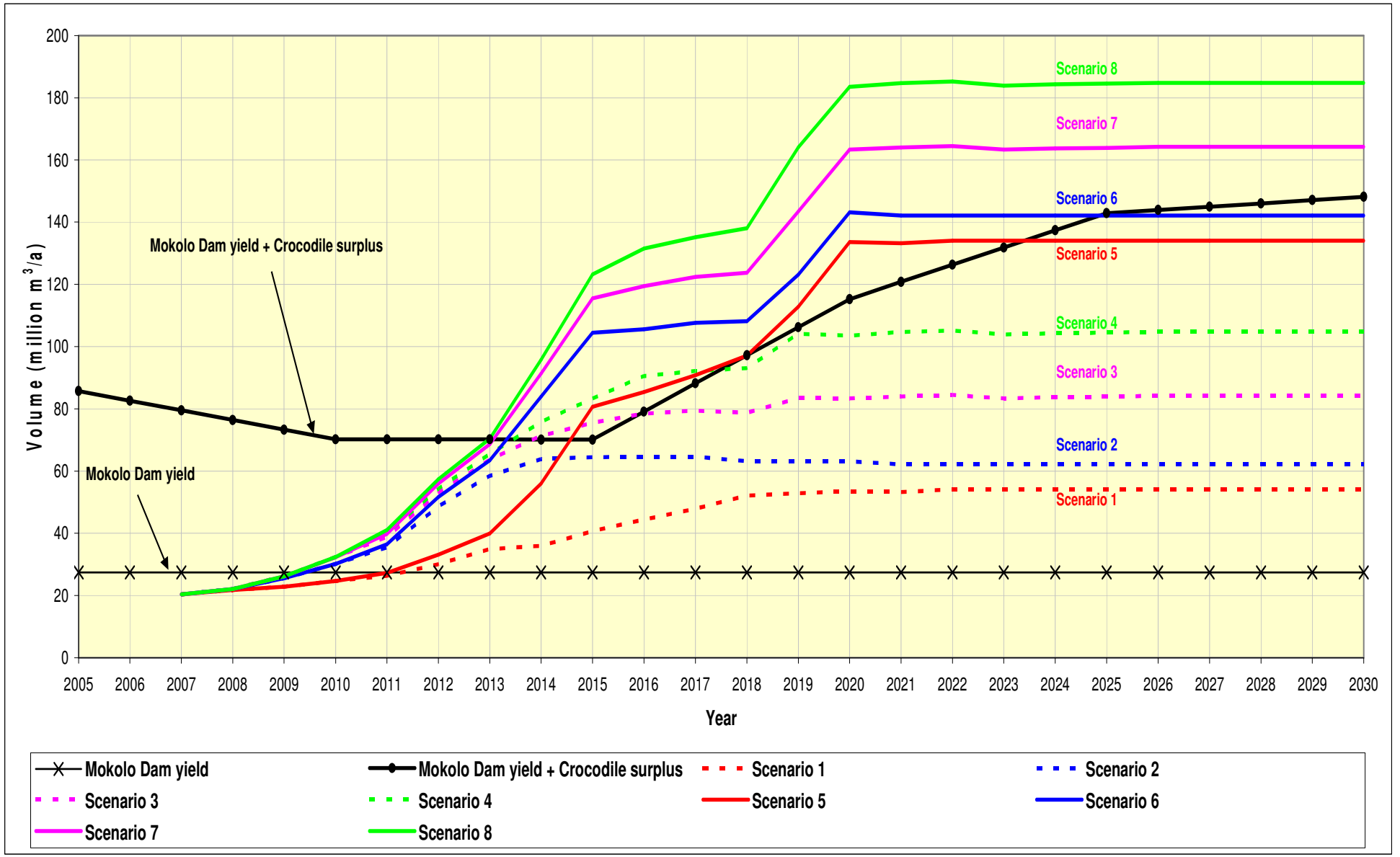
6. REFERENCES

[1] Department of Water Affairs and Forestry (South Africa). 1998. ***Yield Analysis: Terms and procedures.*** DWAF Report Number P0000/001/98. Report by BKS (Pty) Ltd for the Department of Water Affairs and Forestry.

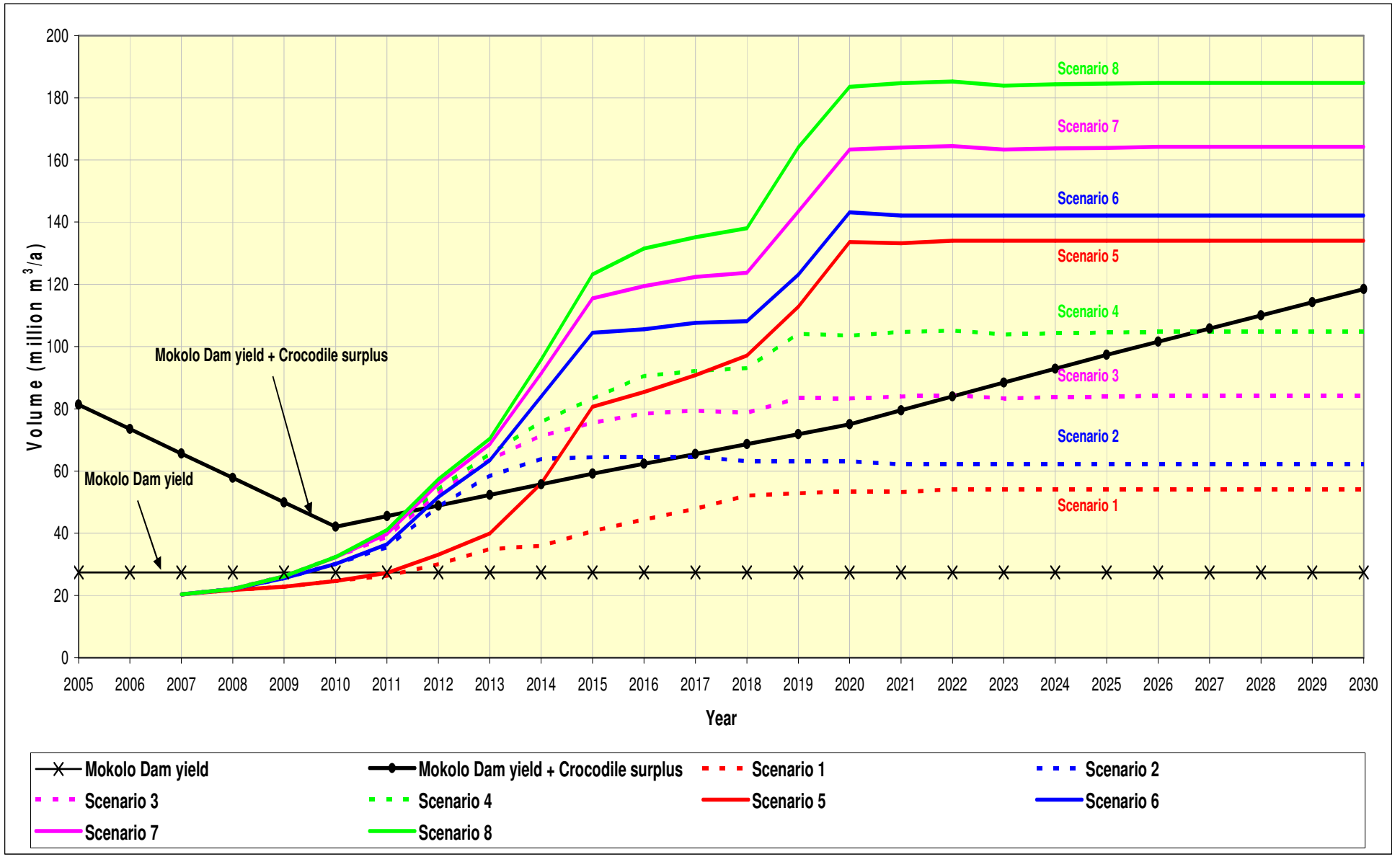
[2] Department of Water Affairs and Forestry (South Africa). 2008. ***Agricultural Assessment***. DWAF Report Number P WMA 03/000/00/2208. Report by Schoeman en Vennote.

[3] Department of Water Affairs and Forestry (South Africa). 2008. ***Crocodile (West) River Catchment: Hydrological Assessment***. DWAF Report Number P WMA 03/000/00/2308. Report by BKS and Arcus Gibb.

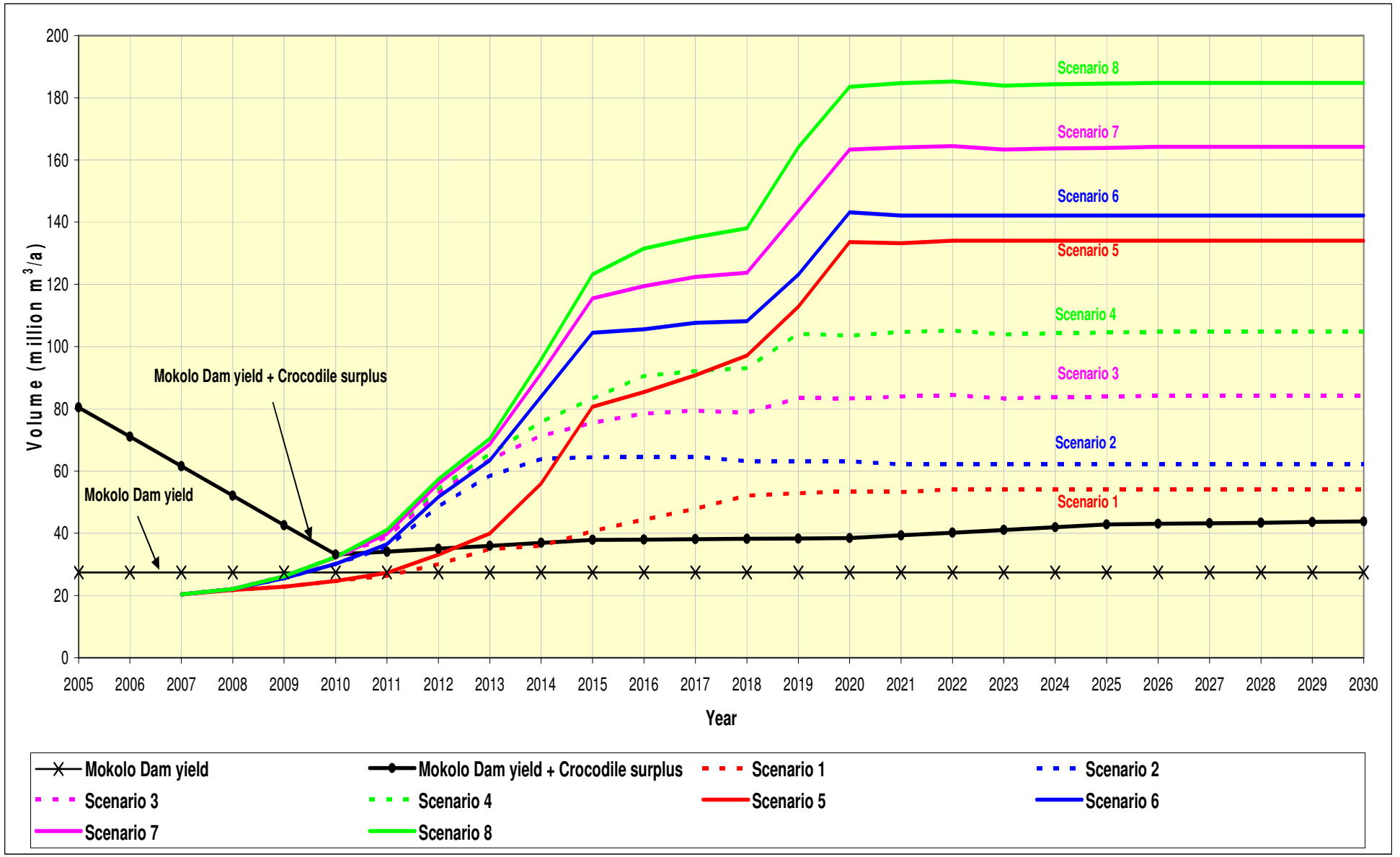
[4] Department of Water Affairs and Forestry (South Africa). 2008. ***Groundwater Assessment***. DWAF Report Number P WMA 03/000/00/2408. Report by AGES.



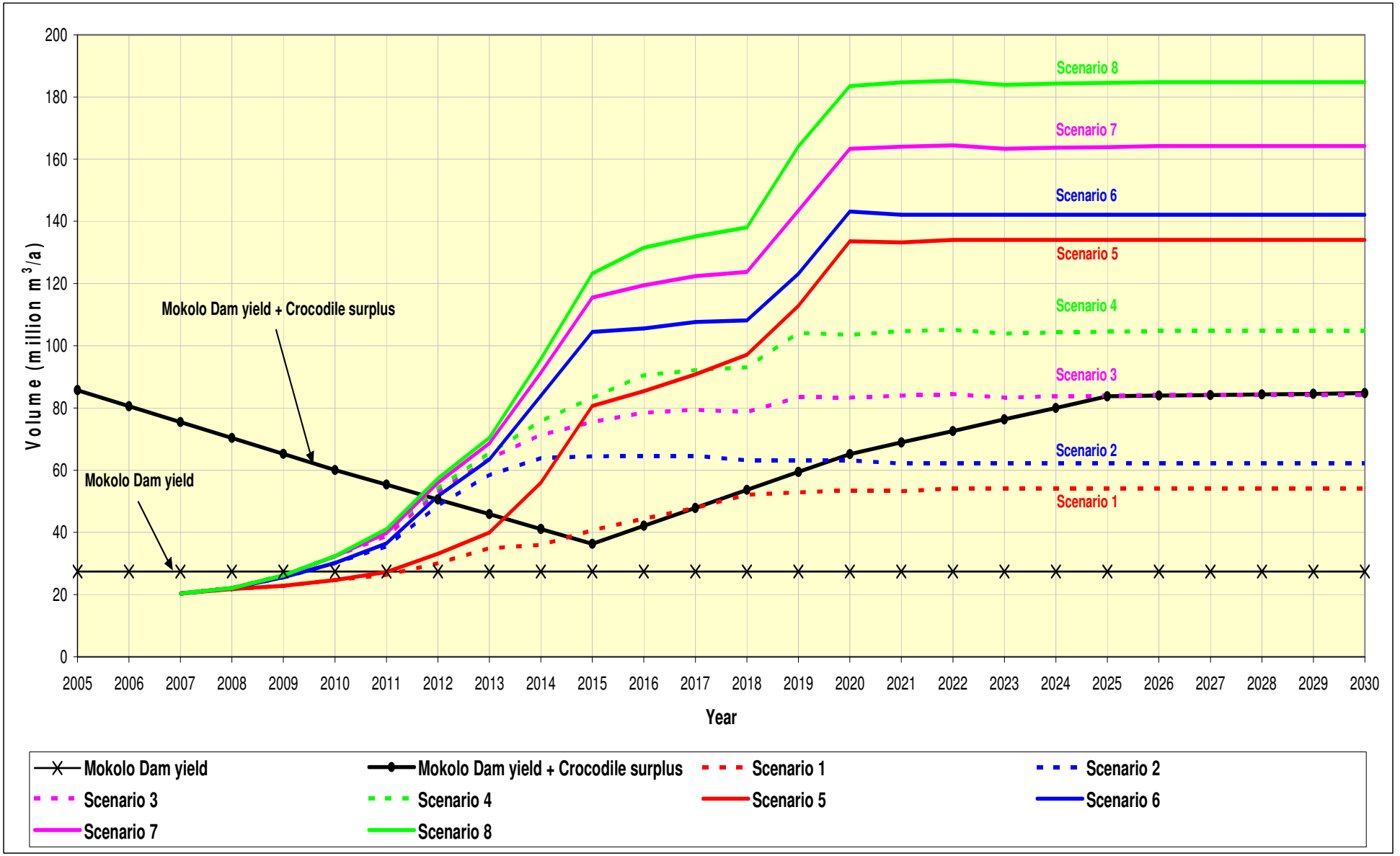
Water balance at Lephalale for Scenario D: High **Figure 1**



Water balance at Lephalale for Scenario D: Base **Figure 2**



Water balance at Lephalale for Scenario D: Low **Figure 3**



Water balance at Lephalale for Scenario C: High **Figure 4**