Development of a Reconciliation Strategy for the Luvuvhu and Letaba Water Supply System

Background Information Document (No. 5): Proposed Reconciliation Strategy for the Luvuvhu and Letaba River System - June 2014

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PURPOSE OF THIS DOCUMENT

This background information document (BID) presents progress made in the study initiated by the Department of Water Affairs (DWA), to develop a Reconciliation Strategy for the Luvuvhu and Letaba Water Supply System.

A reconciliation strategy identifies, prioritises and confirms the interventions required to reconcile the water requirements with the available water resources in a catchment or water system for current and future development scenarios.

Stakeholders are encouraged to participate and communicate their views to the Department on this process by attending Study Steering Committee meetings, corresponding with the public participation office or the technical team at the contact details provided below.

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STUDY PROGRESS

Progress has been made with delivering on the main objective of this study which is to develop a reconciliation strategy for the bulk water resources of the Luvuvhu and Letaba Water Supply System. A preliminary reconciliation strategy has been prepared for the Letaba River System for discussion at the fourth Study Steering Committee (SSC) meeting held on Thursday, 21 November 2013 in Tzaneen. The reconciliation strategy for the Luvuvhu River System will be documented and distributed to the SSC members after the fifth SSC meeting that will take place on 20 June 2014.

The Letaba River System preliminary reconciliation strategy is based on the assessment of the current and projected water balances for the planning horizon up to the year 2040. This considers future growth scenarios of water use mainly in the urban sector, improved assurance of supply in the irrigation sector in the Letaba System as well as what additional water can be made available from the options identified and screened during the second SSC meeting held in April 2013.

A key ingredient in formulating coherent recommendations and action plans is stakeholder involvement. This allows for information sharing from prevailing water resource planning and management processes with the aim of ensuring alignment in thinking and practice.

Comments received from the SSC at the meeting and any new information that may influence the water balance will be incorporated in the proposed reconciliation strategy which will then be distributed for comment. The final strategy is programmed for completion by October 2014 as the main deliverable of the study.

HOW MUCH WATER IS NEEDED?

To determine how much water is needed, information was gathered on the water requirements of the different sectors and the water use Validation Study served as the primary source of historical water use data. **Figure 1** depicts the core study area for which the current water use and future requirements were determined.

Tables 1 summarises the water requirement for the Letaba River System for the user sectors, listing the 2012 water use as well as estimates for the indicated scenarios for the year 2040.

Table 1: Total High and Low growth water requirements (values in million m^3/annum)

Luvuhu and LetabaRiver System			
Sector	Requirement in 2012	Future requirement (2040)	
		High growth	**Low growth**
Irrigation	**138.6**	**158.6**	**158.6**
Urban[(1)]	**116.1**	**234.8**	**205.0**
Mining/Industrial	**4.7**	**4.7**	**4.7**
TOTAL	**259.4**	**398.1**	**368.3**
Sub-Total Letaba	**208.7**	**268.5**	**241.9**
Sub-Total Luvuvhu	**50.7**	**129.6**	**126.4**

Detail information on the water requirement scenarios will be presented at SSC meeting.

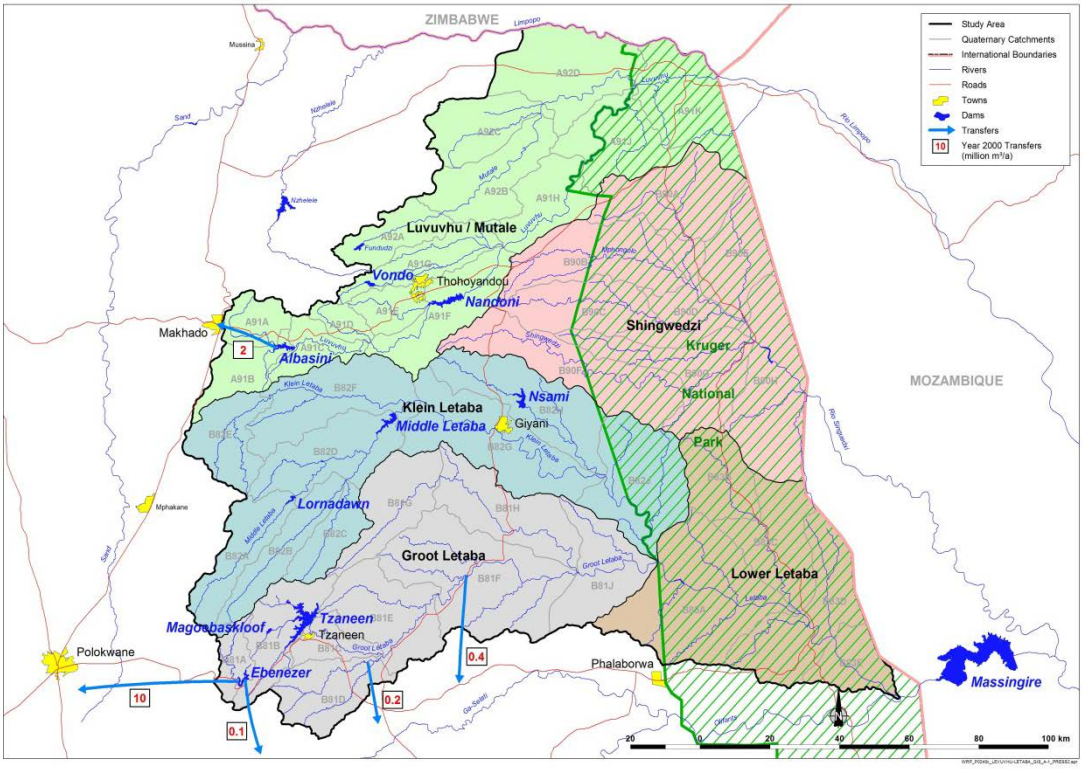

Figure 1: Luvuvhu and Letaba Water Supply System (Study Area)

THE RESERVE

The Reserve is that portion of the natural flow that has to be available in a river or stream in order to sustain the aquatic ecology, and also to provide for basic human needs.

The work carried out in the Letaba Classification Study consolidated the Ecological Water Requirement (EWR) scenarios for application in the water balances assessment of this study.

EWR scenarios were formulated to reflect the implication on the available yield as shown later in the document and further details will be presented at SSC meeting.

SURFACE AND GROUNDWATER

The surface water hydrology, also accounting for groundwater-surface water interaction, was updated for the Study Area. Yield analyses were undertaken based on the revised hydrology for all major dams and relevant sub-systems. **Table 2** provides a summary of the yield results for the existing infrastructure, indicating the high assurance yield (1 in 50 year or 98% assurance) and low assurance yield (1 in 20 year or 95% assurance) mainly used for irrigation purposes. A confidence rating of the yield results reflects the "accuracy" level of the yield estimates.

Groundwater use and availability were assessed and although there are areas where the use exceeds the exploitable groundwater potential, there still remain areas where further groundwater abstractions are possible.

Table 2: Letaba River System yield results

System / dam	Yieldsfor different assurances (million m^3/annum)			Confidence Rating of yield estimates
	98%	95%	Groundwater	
Ebenezer Dap Naude system	40.5	43.8-	-	High
Hans Merensky	4.84	5.2	-	Medium
Magoebaskloof / Vergelegen	12.9	14.71	-	Medium
Tzaneen	60.0	51.7	1.0	High
Thabina	3.7	4.1	1.4	Medium
Modjadji	3.8	4.4		Medium
Thapane	1.4	1.6		Medium
Middel Letaba/ Nsami system	24.3	31.0	7.2	High

Note: Groundwater yield reflects the current domestic use in the supply areas.

The yield analysis methodology applied to determine the yield results given in **Tables 2& 3** will be presented at the SSC meeting.

Table 3: Luvuvhu/ Mutale River System yield results

System / dam	Yieldsfor different assurances (million m^3/annum)			Confidence Rating of yield estimates
	98%	95%	Groundwater	
Albasini	2.5	3.7-	3.6-	High
Vondo	21.9	25.0	0.6	High
Nandoni	70.0	83.0		High
Damani	5.3	5.7	0.4	Medium
Tshakhuma	1.5	1.8	0	Medium
Proposed Paswane	55.0	64.5		High
Proposed Xikundu	62.5	71.5		High
Proposed Rambuda	16.7	18.7		Medium
Proposed Tswera	62.1	69.4		Medium
Damani	5.3	5.7	-	Medium

At the Screening Workshop held in April 2012, intervention options were identified for consideration in the study as measures to reconcile the water requirement and availability. These consisted of options to reduce the water requirements as well as those that increase the water supply.

The identified options are listed below for the indicated catchment areas:

Options applicable to all Areas:

- Water Conservation & Water Demand Management
- Development of groundwater resources

Groot Letaba Catchment Options:

- Raising of Tzaneen Dam.
- Construction of Nwamitwa Dam.
- Bulk Water Supply Infrastructure to distribute water from Nwamitwa Dam.
- Artificial recharge at Mulele on the Molototsi River.
- Groundwater regional scheme in conjunction with surface scheme.

Note: Further details on the Groot Letaba Water Development Project are provided in the following section:

Middel and Klein Letaba Catchment Options:

- Replacement of MiddelLetaba canal with pipeline – reduce canal losses.
- Transfer Scheme from Nandoni Dam.
- Construction of new dam on Klein Letaba River:
  - Majosi Dam, or
  - Crystalfontein Dam

Luvuvhu/Mutale and Shingwedzi Catchment Options:

- Transfer water from Luvuvhu to Shingwedzi
- Reconsider Makhado water supply combination using Albasini, Nandoni and smaller water resource schemes
- Raising Vondo Dam.
- Mid Dzindi possible dam
- Latonyanda possible dam
- Paswane possible dam
- Xikundu possible dam
- Possible new dams on Mutale (Rambuda, Tswera &Thengwe)

These options were applied in the projected water balances to determine if reconciliation is possible for the period up to 2040.

Groot Letaba Water Development Project

The Minister approved implementation of the Groot Letaba Water Development Project (GLeWaP) and a Notice in accordance with Section 110 of the NWA declaring the Minister's intent to implement the GLeWaP was gazetted on 21 December 2012. The GLeWaP is a major initiative by the Department of Water Affairs (DWA) in support of the social and economic development strategy for the Limpopo Province. The purpose of the project is:

- To meet the projected growing primary water requirements to a 20 year planning horizon at an acceptable assurance of supply in parts of the Mopani District Municipality, and specifically the Greater Tzaneen and Greater Letaba Local Municipalities. Additional water for domestic and industrial use will support economic growth in the region, maintaining existing employment opportunities, contributing to the eradication of poverty and, in so doing, improving the quality of life for all.
- To prevent further degradation of the riverine ecosystem by implementing the recently signed-off preliminary Reserve determined in compliance with the National Water Act.
- To minimize further lowering of the assurance of availability of water supplies to the irrigation sector for the existing development. This sector is the major contributor to the economy of the region and worsening shortages will have serious negative socio-economic consequences through job losses and increased poverty.
- To make water available for the establishment of resource-poor farmers in the irrigated agriculture sector. About 2 000 ha is available for accommodating new resource poor farmers as commercial irrigation farmers. These new irrigators can receive reliable water allocations from the increasingly stressed water resource system once a dam is in place at Nwamitwa. In this way a positive contribution can be made to agrarian reform as well as to the economic transformation of rural communities.

The GLeWaP consists of the following infrastructure components:

- The raising of the existing Tzaneen Dam by 3m to improve the assurance of supply;
- A new major storage dam on the Groot Letaba River just downstream of the Nwanedzi River confluence, at the site known as Nwamitwa on Janetsi Farm 463LT (Nwamitwa Dam). The proposed Nwamitwa Dam, developed to a level of 479.5 m above mean sea level will increase the high assurance yield; and
- Development of bulk potable water supply infrastructure mainly to serve rural communities without adequate water supplies.

It is envisaged that first water will be stored in Nwamitwa Dam by 2019.

RECONCILING WATER REQUIREMENTS WITH WATER RESOURCES

Annual water balance diagrams were prepared for all the systems listed in **Tables 2& 3**, using the indicated yields,selecting options with the lowest URV's as well as the projected water requirements for the respective areas.

Figure 2show the water balance and reconciliation scenario for the Groot Letaba River System (Tzaneen Dam and downstream supply areas), containing the following elements:

- Total yield (high and low assurance) of 84 million m^3/annum, reflecting an average supply of about 60% to the irrigators.
- Implementation of Water Conservation and Demand Management in the urban sector (dashed red line).
- Raising of Tzaneen Dam, main purpose is to improve the assurance of supply.
- Once Nwamitwa Dam is implemented (see yellow area), water is supplied to the areas currently receiving water from Modjadi and Thapane dams.
- The excess water in Ebenezer Dam is made available to support users receiving water from Tzaneen Dam.
- Water from existing and additional groundwater resources for target areas was added as yield.
- Implemented the low flow Ecological Water Requirements for the scenario proposed by the Classification Study.

The above indicated interventions can supply the target water requirement scenario (High growth with WC/WDM) up to the year 2030

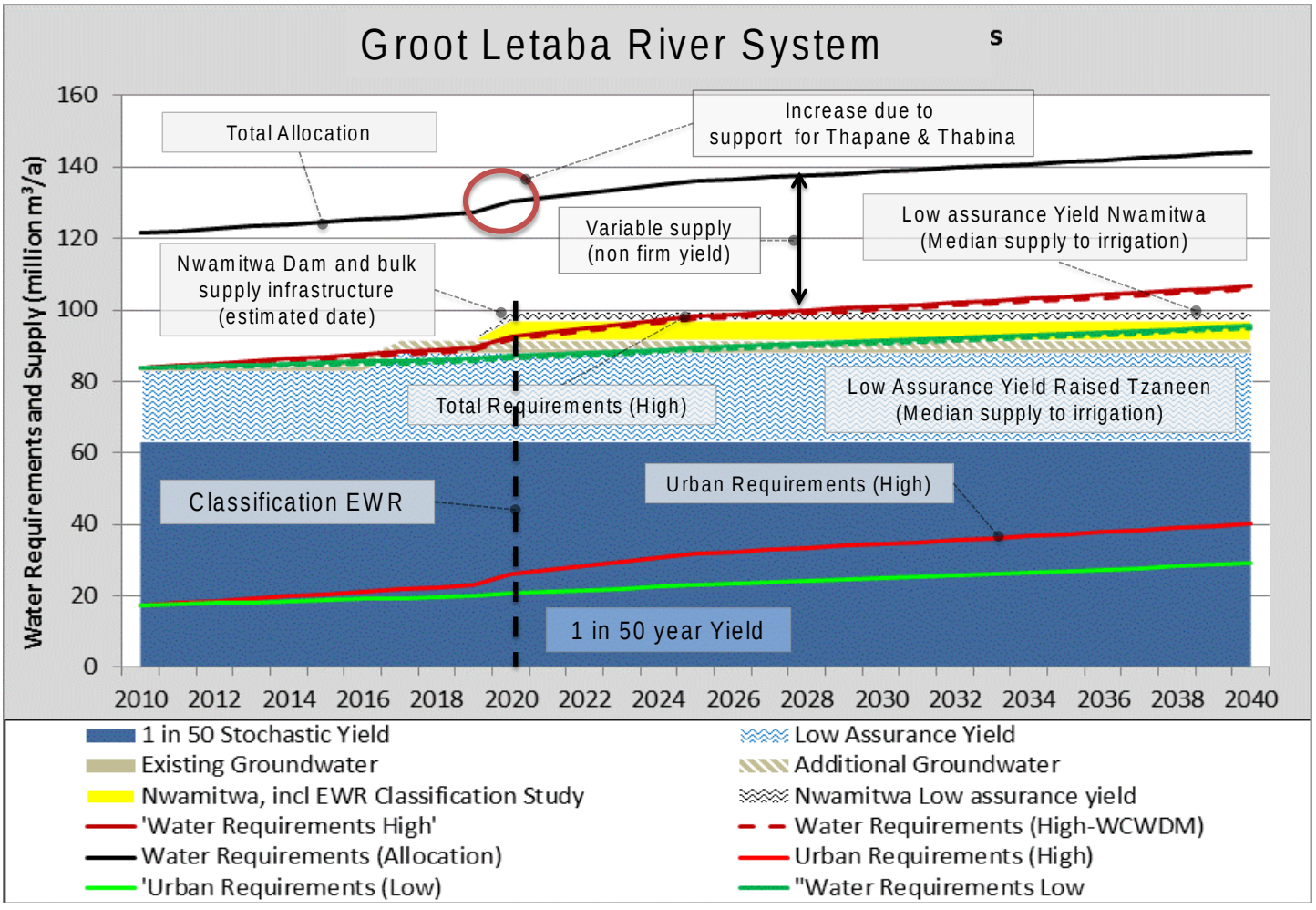

Figure 2: Groot Letaba River System water balance and reconciliation scenario

Figure 3shows the water balance for the Middel Letaba and Nsami dams, indicating the following elements:

- Yield of both dams as well as the existing groundwater resources.
- Implementation of Water Conservation and Demand Management in the urban sector (dashed red line).
- Transfer from Nandoni Dam, indicated by the orange augmentation option.
- Some of the current Middle Letaba supply areas were already committed to receive water from Nandoni Dam by2017 and some later by approximately 2014, reducing the load on Middle Letaba Dam as indicated by the drop in demands as shown by the red and green demand projection lines.
- Replacement of the canal transferring water from Middel Letaba Dam to the waterworks at Nsami Dam with a pipeline as indicated by the brown intervention option.
- Developing additional groundwater resources from 2012.

By implementing all these interventions, sufficient water can be made available to supply the high water requirement scenario with WC/WDM until 2040.

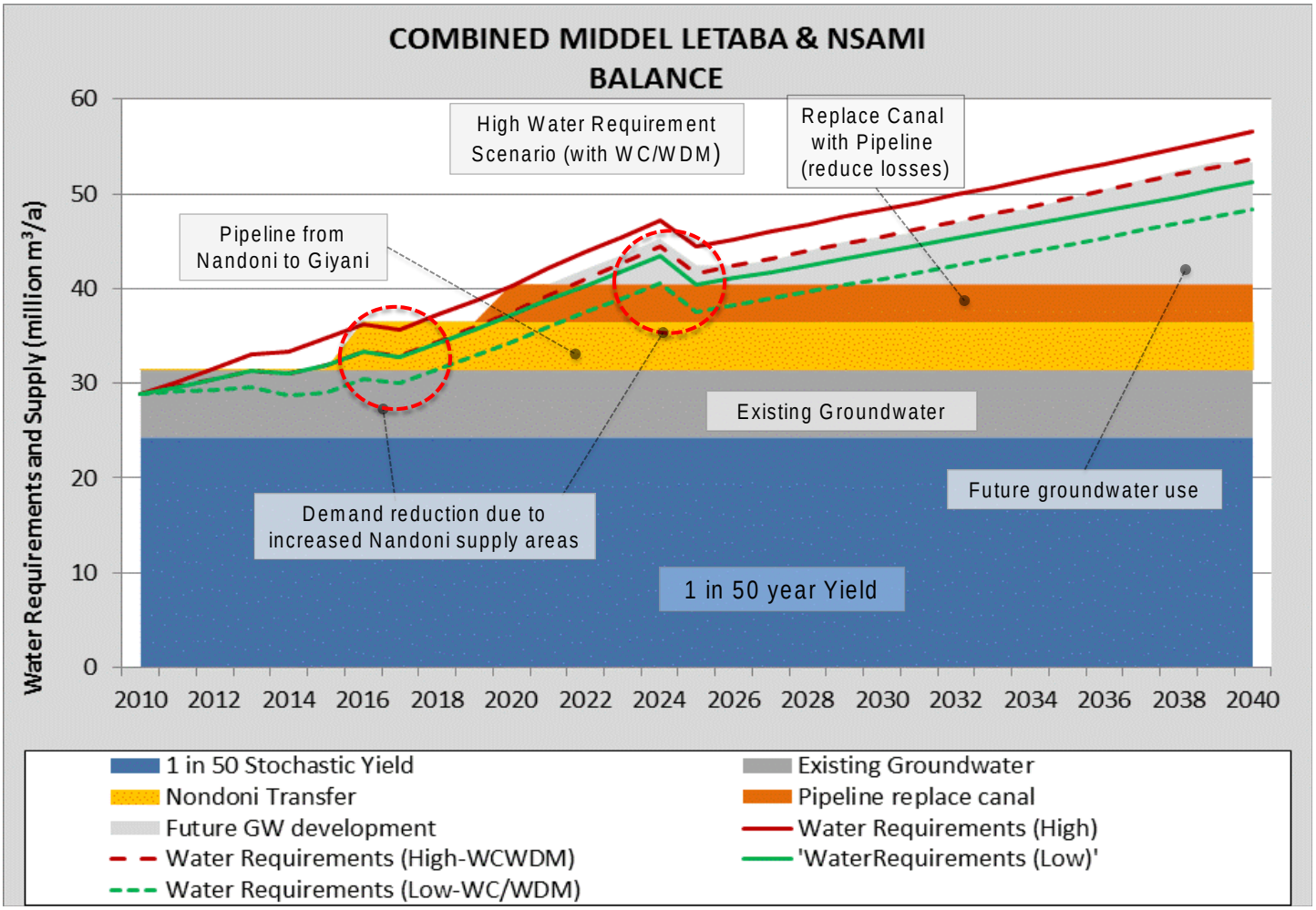

Figure 3: Water balance projection and reconciliation scenario for MiddelLetaba and Nsami dam system

Figure 4shows the water balance for the Nandoni and Greater Thohoyandou sub-system indicating the following elements:

- Total 1 in 50 year yield of 82 million m^3/a plus an incremental 1 in 20 year yield of 13 million m^3/a, resulting in a total yield of 95 million m^3/a
- The Greater Thohoyandou sub-system includes Vondo, Tshakhuma, and Phiphidi dams as well as two runoff river package plants.
- Increased groundwater resources from 2030 onwards.
- Several areas located outside the Luvuvhu catchment were also committed to receive water from Nandoni Dam. These areas include Sinthumule/Kutama, Makhado, Giyani, Matoks,Middle Letaba supply areas as well as areas currently supplied from Damani Dam of which the bulk is located in the Mutale catchment. The inclusion of these areas is evident in the sudden steep increases shown on the urban demand projection.

By implementing these interventions the system is able to supply the growth in demands until 2035. By then a dam in the Mutale River is an option that was identified for possible future support.

Figure 5 shows the water balance for the Mutale River system containing the following elements:

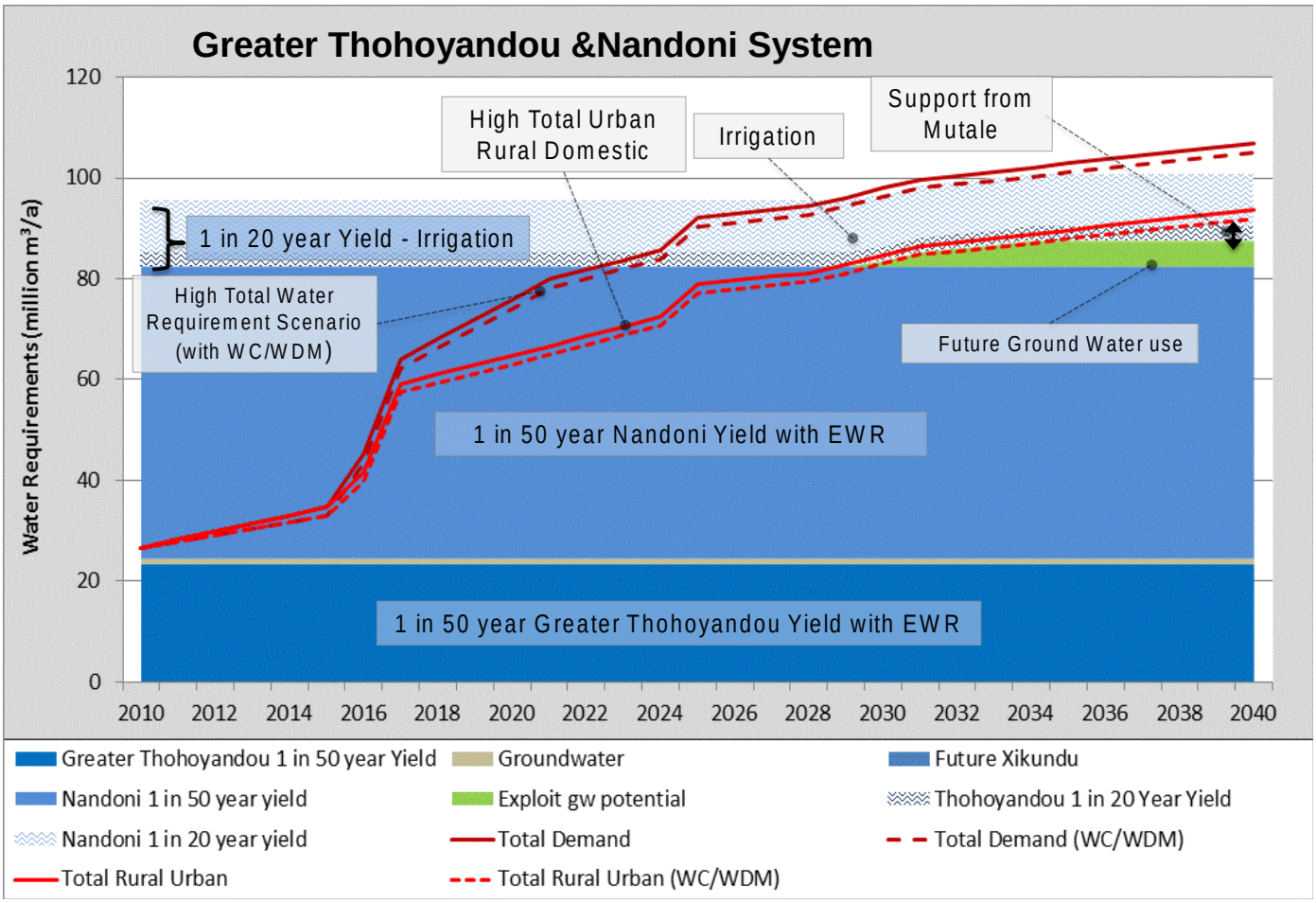

Figure 4: Water balance projection and reconciliation scenario for Greater Thohoyandou and Nandoni System

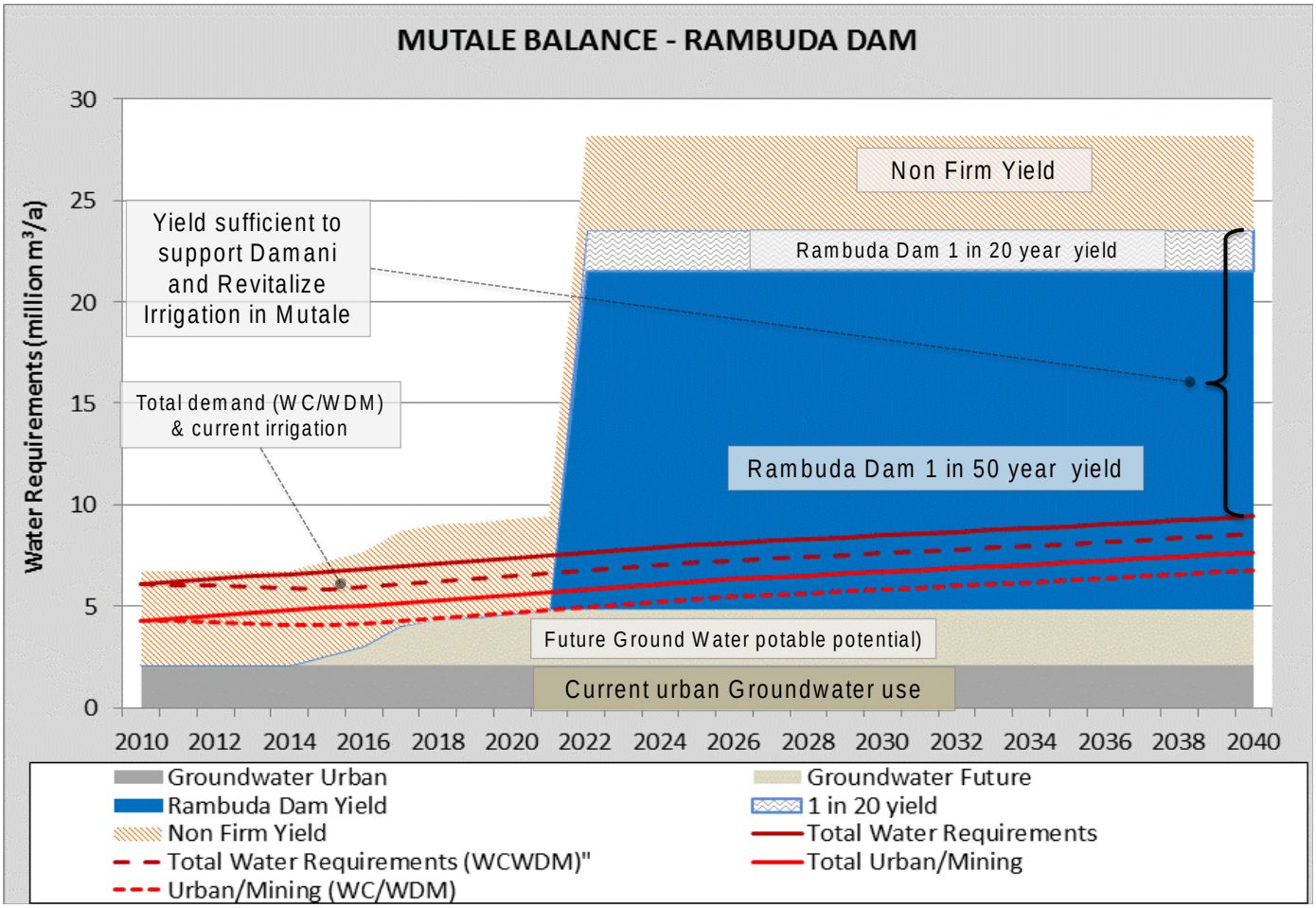

Figure 5: Water balance projection and reconciliation scenario for the Mutale System

- The 1 in 50 year yield from a possible future Rambuda Damplus the incremental 1 in 20 year yield from this dam.
- Current groundwater use.
- Possible future groundwater development
- Current runoff river abstractions (non firm yield)

The water balance shows that all the water demands can be supplied to beyond 2040 with a Rambuda Dam in place. This option will also allow for the revitalising of irrigation in this catchment.

PRELIMINARY RECONCILIATION STRATEGY AND RECOMMENDATIONS

The above presented water balances points to the following reconciliation strategy:

- Excess water from Ebenezer Dam should be allocated to users in the Groot Letaba System (Tzaneen Dam). Increased augmentation to Polokwane should therefore take placefrom the Olifants River System and not from Ebenezer Dam.
- Additional monitoring of flows and dam balances are required to improve the confidence in the yield estimates of Thabina, Modjadji, and Thapane dams.
- Groundwater is an important resource and in some areas the current level of use exceeds the availability. High level catchment wide groundwater assessments however indicate that additional groundwater abstraction is possible – as reflected on the water balances.
- Augmentation is required from the Groot Letaba System to the supply areas currently receiving water from, Thapane and Thabina dams.
- Augment the Modjadji Dam supply area from the Middle Letaba System.
- Nandoni Dam used to support part of Giyani and the already committed Middle Letaba Dam supply areas.
- Nandoni Dam to be used to support the already committed areas located outside the Luvuvhu catchment.
- Reduce irrigation upstream of Albasini dam based on findings from the validation and verification study.
- Use a possible dam in the Mutale River (Rambuda or Tswera dam) to augment future requirements in the Mutale and Luvuvhu.
- The water use, needs to be monitored to confirm which water requirement scenario (projection) should be applied over the long term.

Details of all the interventions applicable to each dam / system will be presented in the Reconciliation Strategy Report.

The following further work will be carried out as part of the study towards finalising the reconciliation strategy:

- Incorporate comments from the SSC on the water balances and proposed reconciliation strategy.
- Coordinate scenario analysis and results with the Classification process and study.
- Undertake WRPM Risk analyses with expected growth and proposed future resource developments, to provide improved estimates of when intervention options are required.

Follow up studies/work that will be required include:

- To undertake a Pre-feasibility study to determine the most feasible dam development option (Rambuda or Tswera dam) in the Mutale River to augment expected future deficits in the Mutale and Luvuvhu systems.
- Consider further information from the water use validation and verification study as an estimate of possible unlawful water use, when it becomes available.
- Commission a Classification study on the Luvuvhu and Mutale rivers.
- Commission Feasibility studies on groundwater developments in relevant areas.
- Continuous integration between Water Balances and related Water Supply Planning of water services schemes needs to take place.

The DWA recognises the importance of stakeholder contributions as a key requirement to develop the Reconciliation Strategy. Your attendance at the fifth SSC meeting will assist with evaluating the preliminary reconciliation strategy as you will be contributing information relevant to the prevailing conditions in the study area. The proposed reconciliation strategy report will be made available to after the stakeholder meeting in June 2014. Your comments on the report will be appreciated and will assist in the compilation of the draft reconciliation strategy report. The final strategy will be prepared and presented in October 2014 at the Public meeting.