CLASSIFICATION AND DETERMINATION OF THE RESOURCE QUALITY OBJECTIVES FOR SIGNIFICANT WATER RESOURCES IN THE LETABA CATCHMENT

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PURPOSES OF THIS BACKGROUND INFORMATION DOCUMENT ARE TO:

- Provide progress to date on the Water Resources Classification Process undertaken in the Letaba Catchment.
- Provide the consequences of operational scenarios in terms of economics, ecosystem services, ecology and water quality.
- To present scenario, and Link the scenarios to proposed management classes.
- Present RQO determination process and results.

Stakeholders are invited to participate in the process by contributing information at meetings and workshops, or by corresponding with the public participation office or the technical team at the addresses provided below.

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1. BACKGROUND AND PROGRESS MADE THUS FAR

The Department of Water Affairs in September 2012 has initiated a study on the classification and determination of the Resource Quality Objective (RQOs) for the significant water resources in the Letaba Catchment. The objective of the study is to set the Management Classes (MCs) and determine the RQOs in the Letaba Catchment.

The study follows a step-wise process whereby a class and associated Resource Quality Objectives (RQOs) of a water resource are defined by taking into account the social, economic and ecological landscape in a catchment in order to assess the costs and benefits associated with utilisation versus protection of a water resource. As such, the process is not carried out in isolation, but is integrated within the overall planning for water resource protection, development and use. A key component of classification is integrating economic and social goals into the determination of the management class. Therefore the economic, social and ecological implications of choosing an appropriate Management Class (MC) need to be established and communicated to all interested and affected parties during the Classification Process.

To determine the class and RQOs of a water resource, both the Water Resource Classification System (WRCS) and the Procedures to Develop and Implement RQOs each lay out a set of procedures grouped together into seven steps. When the steps are applied to a specific catchment will result in the determination of a class and RQOs which aim to achieve a balance between protection of a water resource and using them to meet social and economic goals. For the purpose of this study, the classification steps have been integrated with the RQOs determination steps (Table 1).

According to the integrated steps for determining MCs and RQOs (Table 1) steps 1 to 4 are completed. Currently the study team is in the process of setting the Management Class, associated RQOs (define the numerical limits and goals) and evaluating management options (scenarios) with stakeholders (Step 5 and 6). Scenarios are water resource management options available for a particular water resource that satisfy protection and use and further development and includes the water quality, quantity and distribution requirements to support ecosystem functioning.

The purpose of the 3rd and final Project Steering Committee (PSC) meeting is to provide feedback on the work that was done since the 2nd PSC meeting. This includes the evaluation of operational scenarios that have been chosen in the 2nd PSC meeting, proposed Management Classes and catchment configuration, proposed RQOs and numerical limits.

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2. DELINEATION OF INTEGRATED UNITS OF ANALYSIS (IUAS)

As part of Step 1, twelve IUAs have been identified for the Letaba catchment WMA (Figure 5). These have been based on the socio-economics of the areas, water uses and users, envisaged level of protection required and significance of the resource. An IUA is a broad scale homogenous unit (or catchment area) that contains several biophysical nodes and can be managed as an entity. These nodes define at a detail scale specific attributes which together describe the catchment configuration of the IUA. Scenarios are assessed within the IUA and relevant implications in terms of the Management Classes are provided for each IUA. The 12 IUAs were proposed, reviewed and accepted by representative stakeholder organisations and the PSC members.

Table 1: The Integrated steps for determining different classes and RQOs

Step	Description
1	*Delineate the units of analysis and Resource Units, and describe the status quo of the water resource(s)*
2	*Initiation of stakeholder process and catchment visioning*
3	*Quantify the ecological water requirements and changes in non-water quality ecosystem goods, services and attributes*
4	*Identify and evaluate scenarios within the integrated water resource management process*
5	*Evaluate the scenarios with stakeholders*
6	*Develop draft RQOs and numerical limits*
7	*Gazette and implement the class configuration and RQOs*

3. IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS WITHIN THE INTEGRATED WATER RESOURCE MANAGEMENT PROCESS

The overarching aim of the scenario evaluation process is to find the appropriate balance between the level of environmental protection and the use of the water to sustain socio-economic activities. Scenarios are water resource management options available for a particular water resource that satisfy protection and use and further development and includes the water quality, quantity and distribution requirements to support ecosystem functioning. Once the preferred scenario has been selected the Management Class is defined by the level of environmental protection embedded in that scenario.

There are three main elements (variables) to consider in this balance, namely the ecology, ecosystem services and the economic benefits obtained from the use of a portion of the water resource. The scenario evaluation process therefore estimates the consequences that a set of plausible scenarios will have on these elements by quantifying selected metrics to compare the scenarios on relative bases with one another.

The sequential activities carried out to evaluate the scenarios are presented in Figure 1, starting with the vision setting and describing the scenarios to be analysed.

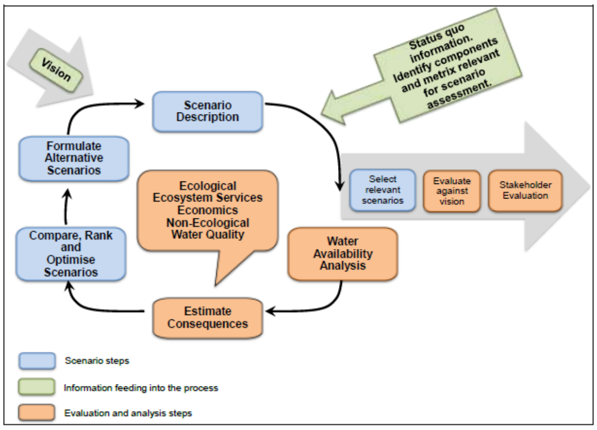


Figure 1: Schematic representation of scenario analysis process

The status quo information was applied to identify the components requiring evaluation and defining the relevant parameters to be quantified. Water availability analyses were carried out for the scenarios, which feeds into the activity to determine the consequences on the Ecology, Ecosystem Services, Economy and Non-Ecological Water Quality. The scenarios were ranked, first, for the individual variables and secondly an overall integrated ranking was derived based on multi-criteria analysis methods.

The results of the initial set of scenarios were interpreted to identify alternative release rules to improve the integrated scores with the objective to find and recommend an optimised scenario.

Six scenarios were identified for discussion and consideration by the stakeholders as described below.

SCENARIO DESCRIPTION

The Letaba River System is highly developed and regulated, both physically through various large storage dams, weirs, river abstractions and conveyance infrastructure as well as institutionally through water user associations, municipalities and irrigation boards whom all reports to the Department of Water Affairs.

The scenarios considered for evaluation were identified in context of the prevailing water resource management and planning activities in the Letaba River System. To this end the possible development options identified in the parallel study, *Development of a Reconciliation Strategy for the Luvuvhu and Letaba Water Supply System* form the basis for the selection of the preliminary list of scenarios. This list was presented to the Project Steering Committee for their consideration and a final list was taken further by the study team for analysis and evaluation. The full list of scenarios is presented in Table 5 below. Short narrative descriptions of the six scenarios that will be discussed with stakeholders are presented below:

Maintain Present Ecological State (PES or Scenario 1)

This scenario assumes no further water resource developments will be taking place in the Letaba System and the flow regime in the rivers is to maintain the Present Ecological State. The socio-economic parameters are quantified in accordance with the present conditions. This can be seen as the status quo scenario prepared for reference purposes.

Recommended Ecological Category (REC) – Scenario 7d

This scenario implements all the identified water resource development options and introduces releases from the existing and proposed dams in accordance with the flow requirements specified for the Recommended Ecological Category. This scenario represents the case where the ecology would score the highest while the water available for abstraction is reduced below the current levels of supply. Due to the reduction in the water availability (compared to Scenario 1) this scenario results in reduced economic activity.

Full water resource development with no releases for the ecological (Scenario 5):

This scenario represents the situation where the maximum volume of water is made available for abstracted from the system for economic activities without any releases for the ecology. This scenario evaluates conditions that are directly opposed to what is assumed in Scenario 7d.

Scenarios 6, 9 and 10 (alternative ecological release strategies):

These scenarios apply different ecological release regimes exploring alternatives to find a balance between protection and use. Scenario 6 is where releases are made to provide the low flow component of the PES (no high flows were released). Scenario 9 apply the low flow component of the REC scenario as well as one high flow event in each year except when Tzaneen and Nwamitwa dams were near empty. Scenario 10 introduced high flow events in three months (January, February and March) in addition to the PES low flow releases. The high flows were not releases when Nwamitwa Dam is below the 17% level for Scenario 10.

4. ECONOMIC CONSEQUENCES OF SCENARIOS

Currently in the Letaba WMA three water-based economic activities can be identified, namely irrigation, water service sector aimed at domestic households and light industries.

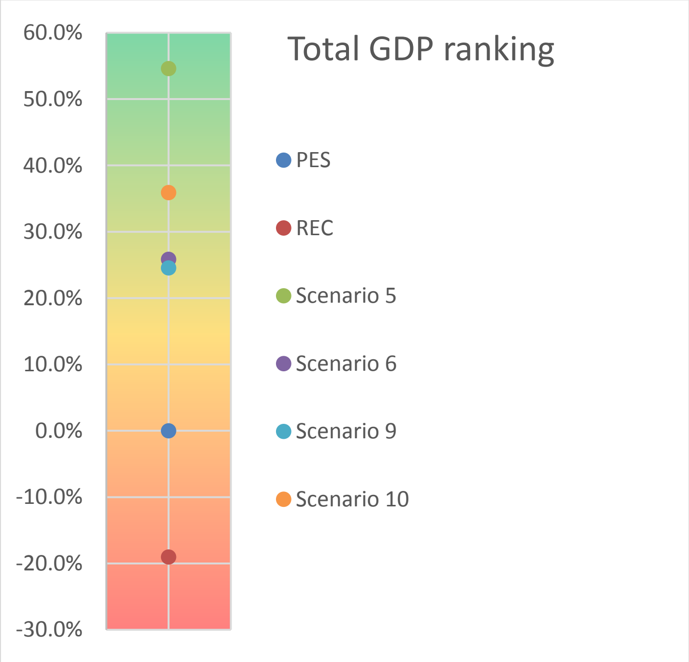
The different identified scenarios investigated provide different water volumes allocated to the different economic sectors. In some of the scenarios if implemented, irrigation could be impacted very negatively, in others the current status is maintained and even provide improved results.

Also taken into consideration in the final evaluation is the fact that irrigation is currently operating at near capacity, while the assumption is that the domestic and light industry sectors will expand and take up all the allocated water over a period of time. Obviously there is a risk factor that the development might not take place as envisaged. On the one side the possibility that the existing irrigation sector can experience a decline, while the other two sectors do not deliver the envisaged growth. This risk factor is taken into consideration in the estimation of the total impact of the three sectors.

The overall evaluation is that some of the scenarios will be from an economic point of view be very beneficial to the region, while others will not be.

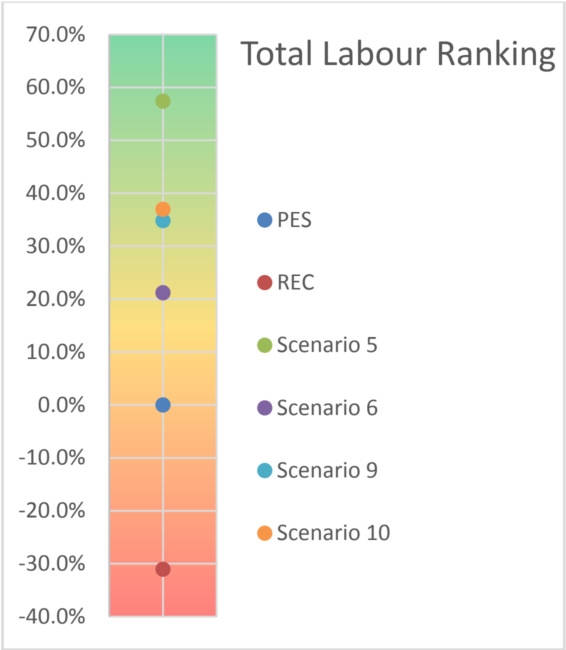
The final integration with the environmental and goods and services sectors must still take place, but it should be possible to select a scenario which will be good to the environment without causing too much of a negative economic impact.

In the following figure the ranking of the different scenarios are presented in terms of their impact on Gross Domestic Product (GDP).



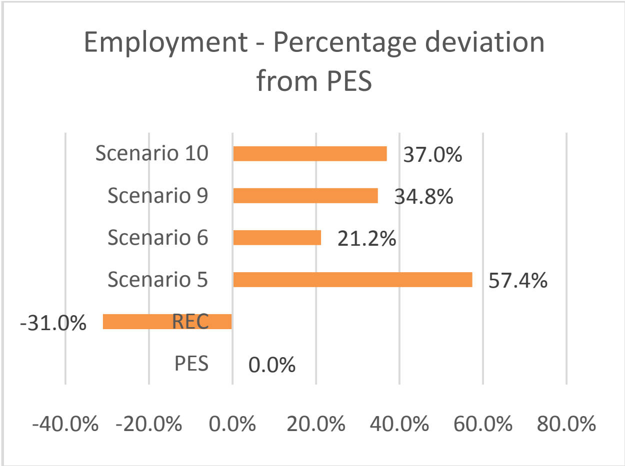
The above diagram shows that Scenario 5, 6, 9 and 10 would probably all provide a positive outcome in economic terms. The REC scenario predicts a very negative impact.

In the following figure the ranking of the different scenarios are presented in terms of their impact on Employment.



The above diagram shows that Scenario 5, 6, 9 and 10 would probably provide a positive outcome beneficial in employment terms. The REC scenario 10 is the only one predicting a negative outcome. Considering the current position of irrigation in the project area, either Scenario 9 or 10 would be the preferable option.

In the following figure the employment impact of the different scenarios on irrigation are presented.



In the final evaluation process taking into consideration the very high unemployment in the project area the employment rating should carry more weight than the GDP rating.

5. ECOSYSTEM SERVICES CONSEQUENCES OF SCENARIOS

Natural habitats and ecosystems provide a range of environmental goods and services that contribute enormously – and are even essential – to human well-being. River systems and their associated use values are of particular importance. For operational purposes this study follows the approach defined in the 2005 Millennium Ecosystem Assessment and classifies ecosystem services along functional lines using categories of provisioning, regulating, cultural, and supporting services.

With this in mind an analysis of the EWR sites 1, 2, 3, 4, 5, and 7 was undertaken. Ecosystem Services associated with the sites, bearing in mind that they represent a wider area, were listed and where they were deemed to generate value they were evaluated against the scenarios applicable to the site. Each site was evaluated under the impact against a base value of 1, representing the status quo. Anticipated change was evaluated against the base value with a negative impact represented as a score lower than 1 and an overall positive score represented as greater than1. The process to determine an integrated ranking of the different scenarios required determining the relative importance of the different EWR sites. Here the perceived vulnerability of households dependent on the provisioning aspect of ecosystem services played a major role. EWR sites 3 and 4 and to a lesser extent EWR 2 were thus given a higher ranking. Overall Scenario 3 was deemed to have least negative impact, followed in order of least negative impact, by Scenarios 9 and 10, then Scenario, 4 and lastly Scenario 6. Overall results are presented in the figure below.

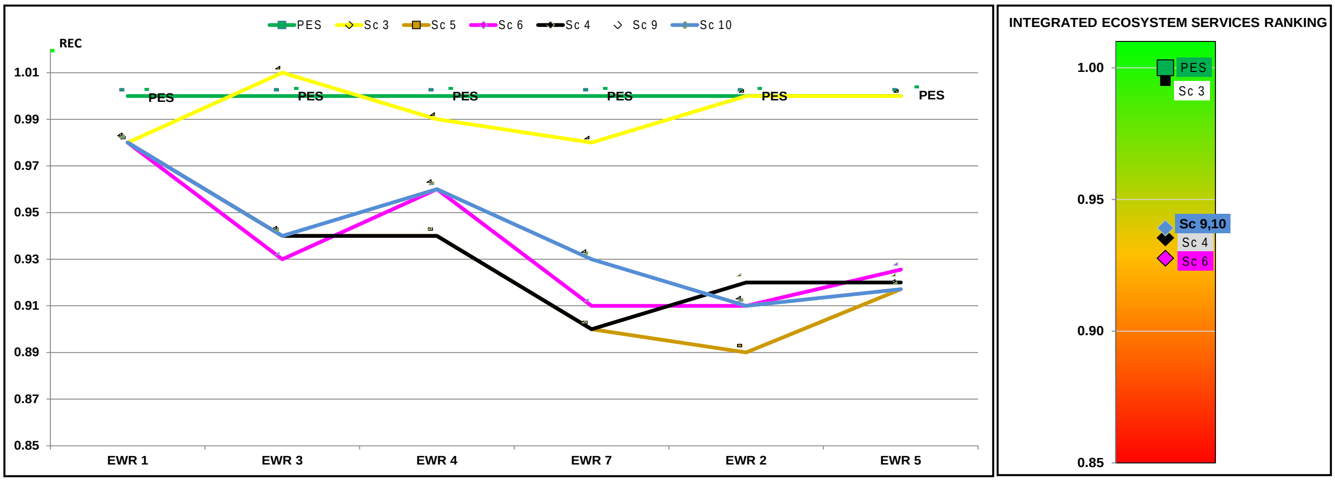
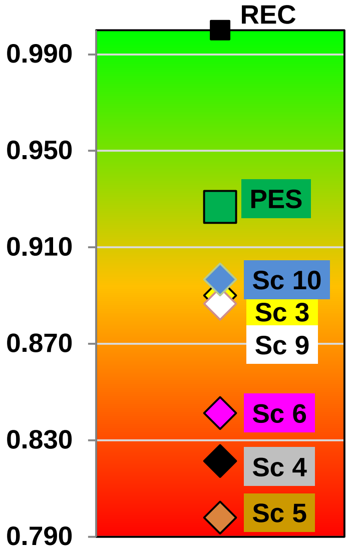


Figure 2: Schematic representation of the overall results

6. ECOLOGICAL CONSEQUENCES OF SCENARIOS

The ecological consequences (rivers) of the scenarios are evaluated at the key biophysical nodes (EWR sites) by determining the impact on the Ecological Category. The process to determine the ecological consequences consists of analysing the scenario's flow regime and determining how the biophysical components (drivers: geomorphology and physico-chemical variables; responses: fish, riparian vegetation and macro-invertebrates) will respond to these changes. A range of models are then applied and the predicted Ecological Category for each component determined. An Ecological Category can also then be determined.



Once this information is available for each scenario at each EWR site, then the scenarios must be ranked from better to worse considering the change in ecological state at the EWR site. The ranking illustrates the degree to which a scenario meets the Recommended Ecological Category (REC) (or one can describe it as the degree to which the ecological objectives which is represented by the REC are met). The scoring of one to zero is defined as follows:

- 1: REC is met for all components*
- 0: REC is not met at any component and each component would be evaluated individually as zero.

Components: Drivers (physico-chemical, geomorphology) and responses (fish, macro-invertebrates, and riparian vegetation).

This process is undertaken for each EWR site and a combined ranking must then be provided for the system as a whole. This process is based on a weight for each EWR site that considers its ecological importance. An overall ranking is then supplied and the results are shown below

This ranking shows that none of the scenarios meet the REC and PES for the system. The highest ranking Scenario is Sc 10 followed closely by Sc 3 and 9.

7. WATER QUALITY (USER) CONSEQUENCES OF SCENARIOS

This short paragraph describes how non-ecological water quality (i.e. UserSpecs for uses such as irrigation and stock watering, industrial, domestic, recreation) were incorporated into an evaluation of the consequences of scenarios on a stretch of river. The following steps were followed:

- Identify the IUAs or nodes of interest which may potentially be impacted by the scenarios;
- Gather background information on water users in the catchment (i.e. produce a systems activity analysis);
- Use land use information and the Water Quality Status Quo task conducted for the Letaba study to identify which types of users are located where, and where the water quality hotspot areas are found;
- Link users to the IUAs or nodes of interest which may potentially be impacted by the scenarios;
- Identify the primary user group's water quality requirements and drivers of water quality;
- Provide an impact rating of selected scenarios on water quality at identified sites for the driving user(s);
- Weight sites to achieve ranks relative to each other and rank the rank the scenarios in terms of water quality impact.

To summarize the information above, the non-ecological water quality state per scenario and per relevant IUA will be scored using the <u>driving</u> water quality variables linked to the <u>primary</u> water quality user.

8. INTEGRATION OF CONSEQUENCES AND LINKS TO MANAGEMENT CLASSES

The determination of the overall grading of the scenarios (from best to worst) were undertaken by integrating the consequences of the four variables, ecology ecosystem services, economy and employment by applying multi-criteria analysis techniques. This method is ideal for comparing scenarios where the outcomes of the drivers are quantified in dissimilar numeric values. In this analysis the consequences for the economy is expressed in rand, employment in terms of number of people, while the ecology health is rated relative to the Recommended Ecological Category scenario and the ecosystem services relative to the present conditions. The scenario scores for the four variables are visually presented together in Figure 3 and at the bottom of each bar the relative weight applied to each variable indicates the relative importance of each variable. At the one side of "the balance" is the ecology and as indicated it is assigned a weight of 0.5 or 50%. The remaining three variables represent the "other side of the balance" with their combined weights adding up to 0.5 of 50%. These weights are used to "weigh" the variable ratings in deriving the overall score for each scenario. (Further details will be provided at the meeting).

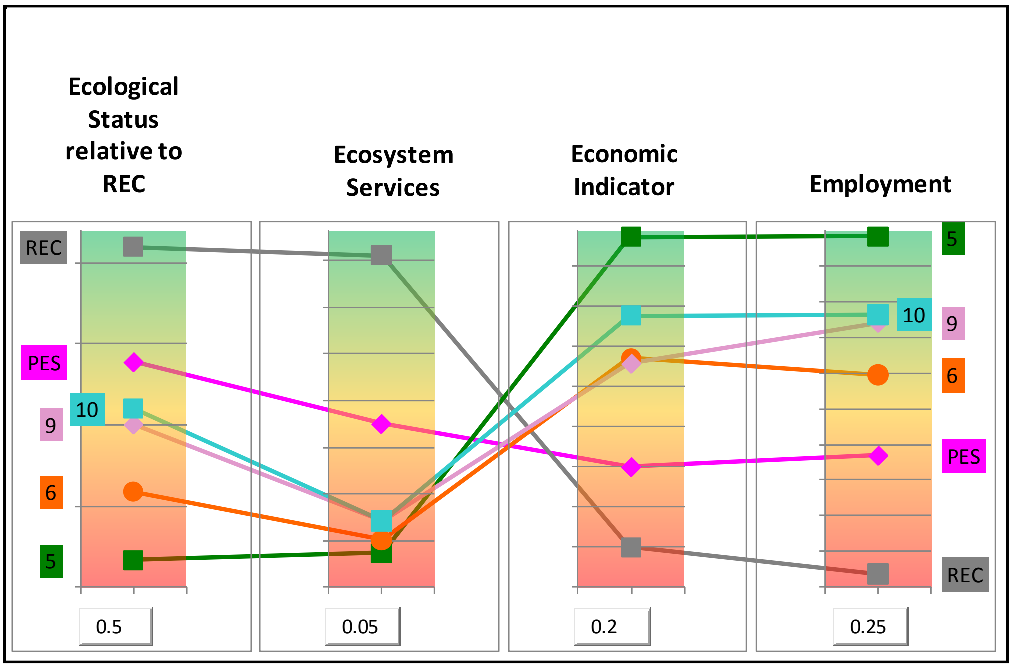


Figure 3: Graphical results of individual variables

The figure show the scenario with the highest ecological health metric (the REC scenario) reduces the water availability (compared to the current yield) to the extent that the economic and employment metric is the lowest of all the scenarios. This represents a curtailment (reduction) of the economy and employment in comparison with the present situation (PES scenario). At the other extreme, the scenario where no provision is made for releases, ecology scores the lowest (Scenario 5) while the available water for socio-economic development is high with corresponding high socio-economic benefits which results in Scenario 5's score for the economy and employment being the highest among all the scenarios. The scores for the other scenarios fall within these extremes and various alternative scenarios were evaluated in an attempt to find an optimum balance.

The final step in the multi-criteria analysis was to determine the integrated and overall rank of the scenarios and this is depicted in Figure 4a and Figure 4b for two alternative ranking methods. These results indicate that Scenario 10 has the highest integrated rank of all the scenarios.

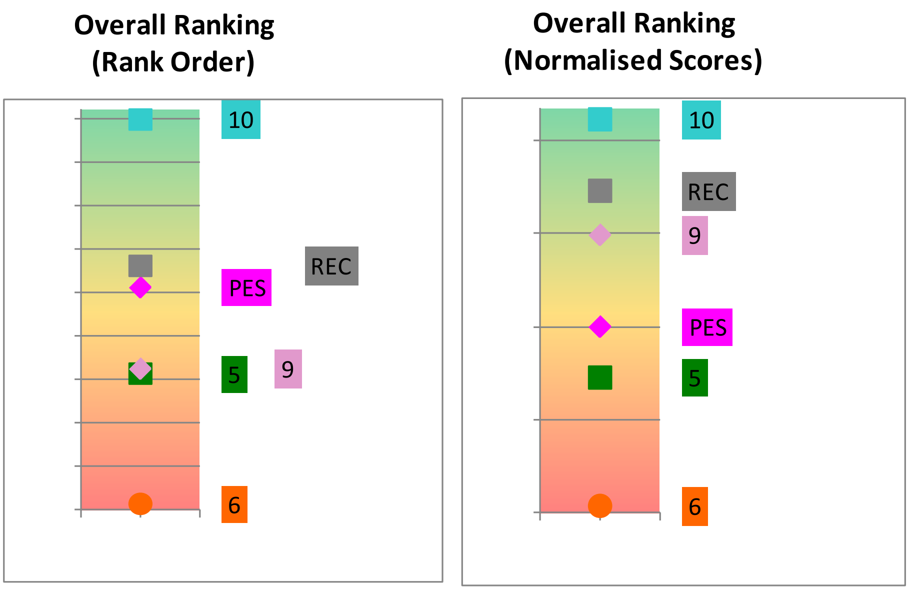


Figure 4a and 4b: Graphical results of overall ranking from the multi-criteria analysis

RECOMMENDED MANAGEMENT CLASSES AND ECOLOGICAL CATEGORIES

Given the results presented it can be concluded that Scenario 10 is the preferred scenario that achieves the best balance between protection and use among the scenarios considered. However, one of the characteristics of Scenario 10 is the inclusion of additional abstractions out of Ebenezer Dam for possible transfer to Polokwane. This transfer is causing a reduction in the Ecological Category at EWR Site 1 (downstream of Ebenezer Dam) changing from a C Ecological Category for the PES Scenario to a C/D Ecological Category for Scenario 10. This reduction also results in a Management Class of III for IUA 1 for Scenario 10 compared to Management Class of II for the PES Scenario (see Table 3). Furthermore, it was shown in the scenarios prepared for the Reconciliation Strategy Study that there is not sufficient water to supply the current and likely future water needs in the Letaba River System making further transfer to Polokwane infeasible from a water availability perspective.

Therefore, it is recommended that Scenario 10 without the additional transfer to Polokwane be selected as the preferred scenarios which will imply the configuration of ECs and Management Classes for the IUAs as presented in Table 4 is recommended.

These results and the recommendations will be presented at the Project Steering Committee Meeting to be help in April 2014 for comments after which the final scenario and results will be prepared for gazetting.

Table 2 Recommended Management Class Criteria Table

		% EC representation at units represented by biophysical nodes in an IUA				
		≥ A/B	≥ B	≥C	≥ D	< D
Class 1		*0*	*60*	*80*	*95*	*5*
Class 2			*0*	*70*	*90*	*10*
Class 3	**Either**			*0*	*80*	*20*
	Or				*100*	

Table 3: Resulting IUA Management Classes for each scenario

Integrated Unit of Analysis	Scenarios and Management Class					
	PES	REC	5	6	9	10
1	*II*	*II*	*III*	*III*	*III*	*III*
2	*III*	*III*	*III*	*III*	*III*	*III*
3	*III*	*II*	*III*	*III*	*III*	*III*
4	*II*	*II*	*III*	*III*	*II*	*II*
5	*I*	*I*	*I*	*I*	*I*	*I*
6	*III*	*III*	*III*	*III*	*III*	*III*
7	*XXX*	*III*	*XXX*	*XXX*	*XXX*	*XXX*
8	*II*	*II*	*II*	*II*	*II*	*II*
9	*II*	*II*	*III*	*III*	*III*	*III*
10	*I*	*I*	*I*	*I*	*I*	*I*
11	*II*	*I*	*III*	*II*	*II*	*II*
12	*I*	*I*	*I*	*I*	*I*	*I*

The resulting Management Classes for the six scenarios were determined by applying the criteria defined in Table 2 and is shown in Table 3.

Therefore, it is recommended that Scenario 10 without the additional transfer to Polokwane be selected as the preferred scenarios which will imply the configuration of ECs and Management Classes for the IUAs as presented in Table 4 is recommended.

These results and the recommendations will be presented at the Project Steering Committee Meeting to be help in April 2014 for comments after which the final scenario and results will be prepared for gazetting.

9. RESOURCE QUALITY OBJECTIVES

RQOs capture the **Management Class** of the Classification System and the **ecological needs determined in the Reserve** into **measurable management goals** that give direction to resource managers as to how the resource needs to be managed. Resource Quality Objectives provide **numerical and/or descriptive statements** about the **biological, chemical and physical attributes that characterise a resource for the level of protection defined by its Class**. The NWRS therefore stipulates that "*Resource Quality Objectives might describe, among other things, the quantity, pattern and timing of instream flow; water quality; the character and condition of riparian habitat, and the characteristics and condition of the aquatic biota*".

Different level (in terms of detail) RQOs are set for river reaches or Resource Units which are represented by biophysical nodes. During this study the aspects that feed into the determination of RQOs have already been undertaken eg:

- Identification of priority Resource Units (rivers and wetland).
- Determination of EWRs (flow component of RQOs).
- Determination of Ecological categories
- Determination of water quality hotspots that provides indication of the priority areas for user specifications.

More recently, the biological indicators and driving variables for water quality has been identified, and the narrative RQOs determined for rivers, wetland and groundwater. The RQOs will be provided and further discussed at the PSC meeting.

Table 4 Recommended Ecological Categories and Management Classes for the Letaba River System

Nodes	River	IUA	EC	MC
B81A-00242	Broederstroom		C	
B81A-00256			D	
B81A-00263			D	
B81A-00270	Broederstroom		C	
B81B-00233	Mahitse		C	
B81B-00234	Mahitse		C	
B81B-00246	Politsi	1	C	II
B81B-00251			D	
B81B-00269	Morudi		B	
B81B-00227	Mahitse		D	
B81B-00240	Politsi		C	
B81B-00247	Great Letaba		C	
EWR1	Great Letaba		C	
B81D-00277	Thabina		D	
B81D-00280	Bobs		B	
B81D-00296	Mothlaka-Semeetse	2	B	III
EWR2	Letsitele		D	
B81D-00272	Letsitele		C	
B81C-00245	Great Letaba		C	
B81E-00213	Nwanedzi	3	D	III
B81E-00244	Great Letaba		D	
EWR3	Great Letaba		C	
B81F-00212	Great Letaba		C	
B81F-00215	Great Letaba		C	
B81F-00218	Great Letaba	4	C	II
B81F-00231	Great Letaba		C	
B81J-00209	Great Letaba		C	
EWR4	Great Letaba		C	
B81F-00228	Reshwele	5	B	I
B81F-00232	Makwena		B	
B81F-00189	Merekome		C	
B81F-00203	Lerwatlou		C	
B81G-00164	Molototsi	6	D	III
B81H-00162	Metsemola		C	
B81H-00171	Molototsi		D	
B81J-00187	Mbhawula		C	
B82A-00168	Middel Letaba		C	
B82B-00173	Koedoes		D	
B82C-00175	Brandboontjies		E	
B82D-00163	Lebjelebore	7	C	III
B82D-00154	Middel Letaba		D	
B82D-00166	Mosukodutsi		D	
B82D-00146	Middel Letaba		E	
B82E-00149	Khwali		B	
B82E-00150	Little Letaba		C	
B82F-00141	Soeketse	8	C	II
B82F-00128	Little Letaba		C	
B82F-00137	Little Letaba		D	
EWR5	Little Letaba		C/D	
B82J-00165	Little Letaba		C/D	
B82J-00178	Little Letaba	9	C/D	III
B82J-00201	Little Letaba		C/D	
B82J-00207	Little Letaba		C/D	
B82H-00127	Nsama		C	
B82H-00139	Magobe		B	
B82H-00157	Nsama	10	B	I
B82J-00153	Nalatsi		A	
B82J-00159	Byashishi		A	
B82J-00197	Ka-Malilibone		B	
B83A-00220	Letaba		B	
B83A-00230	Letaba		C	
EWR6	Letaba		C	
B83A-00252	Letaba	11	C	II
B83D-00250	Letaba		C	
EWR7	Letaba		C	
B83E-00265	Letaba		C	
B83A-00193	Shipikani		A	
B83A-00238	Nharhweni		A	
B83A-00254	Ngwenyeni	12	A	I
B83B-00161	Tsende		A	
B83D-00204	Manyeleti		A	
B83D-00208	Makhadzi		A	

10. WHY SHOULD YOU REMAIN INVOLVED IN THE STUDY?

It is important to understand that this study will eventually impact on you as a water user, as it will determine the management measures in order to sustainably manage the Letaba catchment catering for all water users including the aquatic ecosystem. Since this is your catchment, it is important that you become involved in the stakeholder engagement process and technical process.

Stakeholders are invited to participate in the process by contributing information at meetings, workshops or on requests by the study team, by communicating with a PSC member or by corresponding with the public participation office with queries and comments.

Previous information on this study comprises a background information documents (BIDs), the Information Documents and a newsletter, which are available on the DWA website.

Should you wish to review these documents and completed study reports, you are welcome to access them on the DWA website:

http://www.dwa.gov.za/rdm/WRCS/default.aspx.

Figure 5: Letaba catchment IUAS

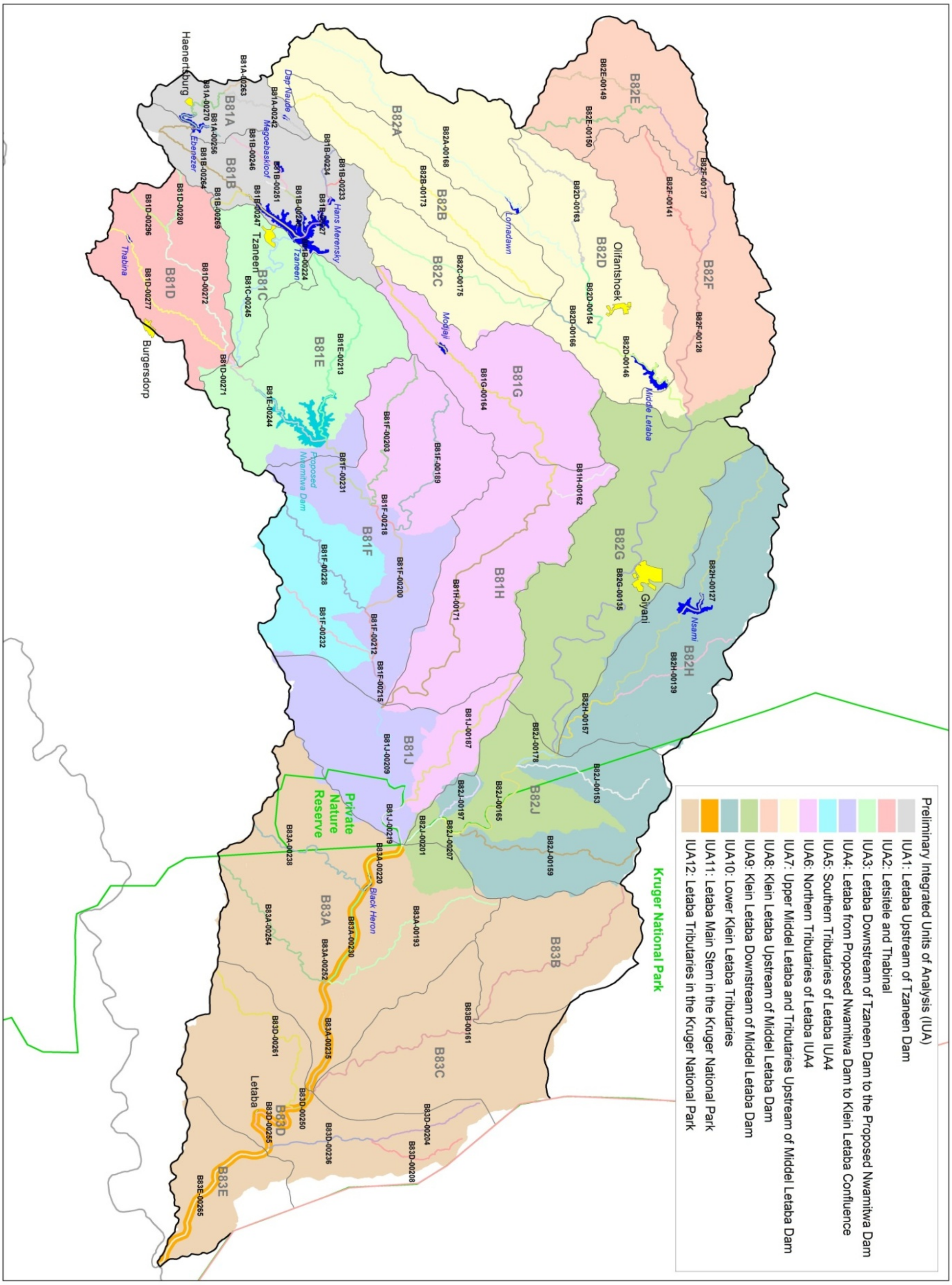


Table 5: Scenario definition matrix

Scenario	Groot Letaba Drivers								Middel Letaba Drivers			EWR Drivers						
	Restriction rule included	Raised Tzaneen Dam	Nwamitwa Dam	Letsitele River Dam	Mulele Dam GW[1] Recharge	Additional Allocation to Polokwane	Max GW use	Court order releases from Dap Naude	Crystalfontein Dam	Max GW use	Transfer from Nandoni Dam	KNP EWR of 0.6 m^3/s	EWR 1	EWR 2	EWR 3	EWR 4	EWR 5	EWR 7
1 (PES)	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
2a	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*Low*	*Low*	*Low PES*	*Low PES*	*Low*	*Low PES*
2b	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*Low*	*Low*	*Low REC*	*Low REC*	*Low*	*Low REC*
3a	*No*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
3b	*Yes*	*Yes*	*No*	*No*	*No*	*Yield*	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
4a	*No*	*Yes*	*Yes*	*No*	*No*	*Request*	*No*	*Yes*	*No*	*No*	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
4b	*No*	*Yes*	*Yes*	*No*	*No*	*Request*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
4c	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
5	*No*	*Yes*	*Yes*	*Yes*	*No*	*Request*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*No*	*No*	*No*	*No*	*No*	*No*
6	*No*	*Yes*	*Yes*	*Yes*	*No*	*Request*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*No*	*Low*	*Low*	*Low PES*	*Low PES*	*Low*	*Low PES*
7a	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*Low PES*	*Low PES*	*Total*	*Low PES*
7b	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*Low REC*	*Low REC*	*Total*	*Low REC*
7c	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*Total PES*	*Total PES*	*Total*	*Total PES*
7d (REC)	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*Total REC*	*Total REC*	*Total*	*Total REC*
8a	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*2High REC*	*2High REC*	*2High REC*	*2High REC*
8b	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*1High REC*	*1High REC*	*1High REC*	*1High REC*
9	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*1High PES/REC*	*1High PES/REC*	*1High REC*	*1High PES/REC*
10	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yield*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Low*	*No*	*3High PES*	*3High PES*	*Low*	*3High PES*

Notes:	
1	*Ground Water*
Low	*Low flow requirements (PES and REC are the same).*
Total	*High and low flow requirements (PES and REC are the same).*
Low PES	*Low flow requirements for the PES scenario.*

Total PES	*High and low flow requirements for the PES scenario.*
Low REC	*Low flow requirements for the REC scenario.*
Total REC	*High and low flow requirements for the REC scenario.*
2High REC	*Highest two flow months retained in each year in addition to the Low flow requirements for the REC scenario.*
1High REC	*Highest flow month retained in each year in addition to the Low flow requirements for the REC scenario.*
1High PES / REC	*Highest flow month retained in each year for the PES scenario in addition to the Low flow requirements for the REC scenario.*
3 High PES	*High flows in January, February and March for the PES scenario in addition to the Low flow requirements for PES.*
Request and Yield	*Additional allocation to Polokwane: Request = Additional water requested, an increase from 16.2 million m^3/annum current to 27 million m^3/annum.* *Yield = Total yield available from Ebenezer Dam, 32 million m^3/annum.*