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 information/results on the Ecological Water Requirements;
- Provide an understanding of the purpose of conducting a socio-economic assessment and the associated decision-analysis framework that will guide the process of linking the value and condition of water resources in the catchment as well as social well-being;
- Illustrate the methodology used to generate scenarios.

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) needs 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 that when 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 and 2 were completed. Currently the study team is in the process of setting up the required flow (quantity) and quality (step 3) as well as coming up with the possible set of the management options (scenarios). 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 2nd Project Steering Committee (PSC) meeting is to provide feedback on the work that was done since the 1st PSC meeting. This includes the quantification of Ecological Water Requirements (EWRs) and changes in non-water quality ecosystem goods, services and attributes (EGSAs). The purpose thereof is to have sufficient information to be able to evaluate operational scenarios that form part of step 4 (to identify and evaluate scenarios within the integrated water resource management process).

The outcome of the EWR work is a set of flow regimes that cater for different ecological states. When ecological consequences of the operational scenarios are being determined (step 4) the change in ecological state will be determined. At this stage EGSAs have been identified and the key EGSA that will change when operational scenarios are imposed on the system will be used to determine the consequences of operational scenarios on the EGSAs. This work is currently ongoing and will be reported on at the 2nd PSC meeting.

2. DELINEATION OF INTEGRATED UNITS OF ANALYSIS (IUAS)

As part of step 1, twelve IUAs have been identified for the Letaba catchment WMA (Figure 2). 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. QUANTIFICATION OF THE ECOLOGICAL WATER REQUIREMENTS (EWR) AND CHANGES IN NON-WATER QUALITY ECOSYSTEM GOODS, SERVICES AND ATTRIBUTES

Ecological Water Requirements (EWRs) can be quantified using a variety of tools and at different levels of detail. EWR refers to flow and its associated characteristics (water quality, sediment, patterns) that should be left or provided in the river system for those biota dependant on it as well as any people dependant on a natural functioning river (Ecological Goods, Services and Attributes (EGSA)).

Resource Units (RU) is a section of river which is significantly different to warrant a Reserve determination. The RU is nested within an Integrated Unit of Analysis (IUA). RU is required as it may not be appropriate to set the same numerical Reserve for the headwaters of a river as for the lowland reaches. Different sections of a river frequently have different natural flow patterns, react differently to stress according to their sensitivity, and require individual specifications of the Reserve appropriate for that reach. Detailed RU assessment was undertaken for the rivers selected based on the presence of hotspots.

The quantification of Ecological Water Requirements (EWRs) in the classification of the Letaba catchment has been determined through previous Reserve Studies and update of the Present Ecological State (PES) and Ecological Importance and Sensitive (PES/EIS) (current DWA study: 2012).

The EWRs at 38 desktop biophysical nodes will be estimated using the Revised Desktop Reserve Model and the outputs will be presented as EWR rules for the Recommended Ecological Category (REC). The process is currently taking place and preliminary results will be provided during the Project Steering (PSC) Committee meeting.

4. SOCIO-ECONOMIC DECISION FRAMEWORK

A key component of classification is integrating economic and social goals into the determination of the management class. The following guidelines are applied in making a contribution to the Classification decision making process:

- Maximising economic returns from the use of water resources;
- Allocating and distributing the costs and benefits of utilising the water resource fairly; and
- Promoting the sustainable use of water resources to meet social and economic goals without detrimentally impacting on the ecological integrity of the water resource.

In order to ensure that the determination of a MC and RQOs is supported by a robust technical assessment and decision-analysis process, the methodology supporting the socio-economic components of the WRCS implementation in the Letaba addressed the following key components:

- Source and critically review of available socio-economic data describing the communities and economies of the Letaba catchment and aligned to the IUAs already identified.
- Identify socio-economic zones describing the socio-economic status aligned to the IUAs. Based on the land tenure and land use within the study area, the Letaba catchment is divided into eight relatively homogenous socio-economic zones, including the following namely; rural agriculture, conservation and agricultural, agro processing and forestry; and
- Describe and value the use of water and aquatic ecosystems in order to establish the dependence of communities, the economic value of water use in the

Letaba and the dependence of communities on the in-stream goods and services provided by the water resources.

An economic baseline is established that provides the impacts of water usage when the full water allocation is available in the respective socio-economic zones or Economic Regions (ERs) for variables such as Gross Domestic Product (GDP), employment, and income received by low income households. Gross Domestic Product is an indication of the contribution of the available water to the economic growth, while employment and income paid to low income households is indication of the contribution of the water to poverty alleviation.

To accomplish this, an econometric model is constructed with as basis the multipliers synthesised from the Limpopo Provincial Social Accounting Matrices (SAMs), referred to as a Water Impact Model (WIM).

The Water Impact Model (WIM) will be used for the primary sectors such as irrigation agriculture and commercial forestry. The SAM and its multipliers will also be applied to the secondary and tertiary sectors. A production economic modelling approach is used for the industries.

The econometric model makes it possible to determine the deviation from the baseline in the evaluation of any water reallocation scenarios. This deviation is used together with the other available tools to determine the overall impact of any defined scenario by using an integrated process. This is a very necessary process, because what is often economically the best option is not necessarily the best for the local community and the environment.

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

During this step various scenarios are evaluated and the consequences of these scenarios in terms of ecological, economic and Ecological Goods Services and attributes (EGSA) consequences presented to stakeholders. Once a scenario is accepted, this leads to the formulation of the Management Classes (MC). These scenarios are referred to as operational scenarios, as they deal with different ways that the river and catchment can be operated and includes changes to present operation and/or landuse as well as future developments.

The starting point will be the Ecological Sustainable Base Configuration (ESBC) which needs to be tested for feasibility, iteratively using calibrated hydrological and water quality (where available) models. The proposed ESBC scenario must meet the requirement of the National Water Act, 1998 (Act No 36, 1998) ensuring protection for use. The ESBC scenario is static configurations constructed as a starting point for hydrological analysis and in this case the ecological present state and water use is used as the starting point.

After the starter scenarios have been tested a subset of catchments configurations scenarios (operational scenarios) will then be taken to stakeholders for evaluation. The first step in this process is to present a range of operational scenarios to stakeholders and to agree on the list of scenarios that will be evaluated.

Selection of Operational Scenarios

The study "Development of a Reconciliation Strategy for the Luvuvhu and Letaba Water Supply System" is running parallel with the Letaba Classification Study. The purpose of the Reconciliation Strategy is to identify priorities and to confirm the intervention options required to reconcile the water requirements with the available water resources in the study area at current and future development levels. The preliminary screening workshop done as part of the Reconciliation Strategy Study was held to identify possible intervention options to be investigated in the study. These possible intervention options were used as basis for the compiling of the matrix of possible operational scenarios for this study.

The raising of Tzaneen Dam and the building of Nwamitwa Dam were already approved and construction is expected to start within the next two to three years. Other possible intervention options that were listed, are the Letsitele River Dam and the Mulele Dam in the Molototsi River. The purpose of the latter dam is to recharge groundwater below the river bed combined with sand abstraction schemes along the river. The Middle Letaba Dam proved over time to yield much less than initially estimated in previous studies. A possible future intervention option to increase the Middle Letaba Dam system yield, is the Crystalfontein Dam that will be used to divert water from the Klein Letaba River into Middle Letaba Dam.

Groundwater is in general an important resource in large areas of the Letaba catchment. Due to the limited surface water resources the optimum development of the ground water resources is crucial. Polokwane is requesting an increase in its current allocation from Ebenezer Dam which needs to be evaluated. Court order releases from Dap Naudé Dam is not taking place in reality as it significantly impacts on the yield available from the dam. This will however improve the yield at Ebenezer Dam. Another important component or driver to take into account is the transfer from Nandoni Dam in the Luvuvhu River to the Giyani area. This scheme is already in the construction phase. All the above mentioned options are therefore important drivers that need to be taken into account in the Letaba Classification Study.

A very important component of the Reconciliation Strategy Study is the revision of the hydrology for the entire study area. The previous hydrology used in studies has many areas with uncertainties and therefore resulted in low confidence

hydrology. The new hydrology from the Reconciliation Strategy Study made use of recent validated water use determined as part of an additional task added to the study. Although there were still difficulties regarding observed flow readings and insufficient rainfall data in the drier areas, a much improved hydrology was developed which will also be utilised for the purpose of the Letaba Classification Study.

The preliminary operational scenarios are provided as a matrix in Table 2. The scenarios consist of a range of scenario drivers that are included in some scenarios and not in others. Together, the range of scenario drivers that are activated for a scenario define the scenario.

6. 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 document (BID), the first Information Document (March 2013) 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**.

Table 2: Preliminary operational scenarios

Scenario	Groot Letaba River Drivers							Middel & Klei Letaba Drivers			EWR Drivers			
	Raised Tzaneen Dam	Nwamitwa Dam & supply infrastructure	Letsitele River Valley Dam	Mulele Dam GW recharge	Additional allocation to Polokwane	Max GW use	Court order releases from Dap Naude	Crystal-fontein Dam	Max GW use	Transfer from Nandoni Dam	KNP EWR of 0.6	EWR 1,2,3,4,5,7 (low flows) REC included	EWR total flow	EWR low flows
1 (PD)											●			
2												●		
3	●									●	●			
4	●	●			●	●	●		●	●	●			
5	●	●	●	●	●	●	●	●	●	●	●		●*	
6	●	●	●	●	●	●	●	●	●	●	●			●*
Note * - These EWR releases apply to new / future dams														
- EWR releases from existing dams will be considered in combination with these listed scenarios														

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Figure 2: Letaba catchment IUAS