

Classification of water resources and determination of the Resource Quality Objectives in the Letaba Catchment

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Purpose of this newsletter

The purpose of **Newsletter No 1** is to provide an update to stakeholders of the water resource classification process and the determination of resource quality objectives that has been initiated by the Department of Water Affairs in the Letaba Catchment. Through this process significant water resources within the catchment will be classified in accordance with the Water Resource Classification System and the resource quality objectives will be determined.

Stakeholders are invited to participate in the process by corresponding with the public participation office or the technical team at the addresses provided below.

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Background and purpose of the study

This study entitled "Classification of Water Resources and determination of the Resource Quality Objectives (RQOs) in the Letaba Catchment" was commissioned by the Chief Directorate Resource Directed Measures of the Department of Water Affairs (DWA) in September 2012.

The ultimate goal of the study is the implementation of the Water Resource Classification System (WRCS) in the Letaba Catchment according to the steps proposed by the WRCS as well as to determine the Resource Quality Objectives in the catchment.

The WRCS is a set of guidelines and procedures for determining the desired characteristics of a water resource, and is represented by a Management Class (MC). The Management Class outlines those attributes that the DWA and society require of different water resources. The WRCS prescribes a consultative process to classify water resources (Classification Process) to help facilitate a balance between protection and use of the nation's water resources. The determination of Management Classes of the significant water resources in the Letaba will essentially describe the desired condition of the resource, and conversely, the degree to which it can be utilised by considering the economic, social and ecological goals of the users and stakeholders.

Water resources must be classified into one of the following Management Classes:

- Class I water resource is one which is minimally used and the overall ecological condition of that water resource is minimally altered from its pre-development condition;
- Class II water resource is one which is moderately used and the overall ecological condition of that water resource is moderately altered from its pre-development condition; or
- Class III water resource is one which is heavily used and the overall ecological condition of that water resource is significantly altered from its pre-development condition.

Classes	Description of use	Dominant Ecological categories
Class I	Minimally used	A and or B
Class II	Moderately used	C
Class III	Heavily used	D

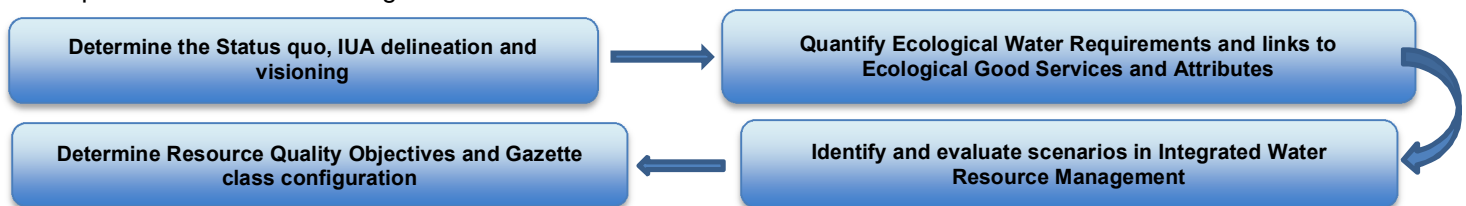
Ecological Category (EC) - means the assigned ecological condition to a water resource in terms of the deviation of its biophysical components from a pre-development condition.

The purpose of determining Resource Quality Objectives is to establish clear goals relating to the quality of the relevant water resources. RQOs capture the Class and the ecological needs into measurable goals that give direction as to how the resources need to be managed. The RQOs can be numeric or descriptive statements relating to the biota, habitat, flow, ecological and user water quality.

Study approach and progress

The Letaba River system has been the subject of various studies and information is available for this Classification study. Some of this information available includes water resource analysis (hydrology), development planning investigations (such as the recently completed *Groot Letaba Water Resource Development Feasibility Study*) and the current study for the *Development of a Reconciliation Strategy for the Luvuvhu and Letaba Water Supply System*. Various Ecological Water Requirement (EWR) determination studies have been carried out in the study area and the Letaba River is one of the few river systems where the implementation of the EWR has taken place in accordance with the recommendations and tools from the study on the *Development and Pilot Implementation of a Framework to Operationalise the Reserve*. A detailed update of the hydrology and the development of high resolution network simulation models are underway as part of the above-mentioned Reconciliation Strategy Study. Application of the data in this Classification study is essential to ensure consistency in planning, operation and the selection of the appropriate management classes.

There are three DWA processes which forms the basis for the completion of this study. These are the determination of the Management Classes (within the application of the WRCS), the determination of the Reserve, and the description of the RQOs which qualitatively and numerically describe the Management Classes. Each of these processes has specific steps and various methods and tools which have been reviewed and or published by the DWA. The steps for each of the processes are linked and will be applied in an integrated manner during this study. Key aspects that will be assessed during this study are the determination of the status quo of the Letaba Catchment, the determination (including the use of existing Ecological Water Requirement results) of the Ecological Water Requirements for approximately 50 nodes in the Letaba system and, once the Management Classes have been approved, RQOs will be developed to describe the Management Classes.



Since the inception of the Study in September 2012, the Department of Water Affairs (DWA) approved the **Inception Report** which was compiled to guide the project over its 24 month duration. The report which was available for stakeholder comment is in the process of being approved by DWA. The **Status Quo Report** was compiled and it defines the current status of the water resources in the study area in terms of the water resource systems, including the Integrated Units of Analysis (IUAs), the ecological characteristics, the socio-economic conditions and the community well-being. Approval of the report is pending comments from the Project Steering Committee members and the DWA.

The first **Project Steering Committee** (PSC) was held on 12 March 2013 in Tzaneen. The objectives of the meeting were to establish the PSC, provide comment on the Inception Report as well as on the information contained in the Status Quo Report and to set a vision for the Letaba Catchment. Several stakeholders attended the meeting. The minutes and presentation delivered are available on the DWA web site.

Determination of the Status Quo of water resources in the Letaba Catchment

The purpose of the status quo assessment is to define the current status of the water resources in the study area in terms of the water resource systems, the ecological characteristics, the socio-economic conditions and the Ecological Goods Services and Attributes. The status quo for each of the Integrated Units of Analysis (IUAs) is provided in terms of the following aspects:

- Water resource infrastructure and availability;
- Ecological status;
- Socio-economic conditions; and
- Ecological Goods, Services and Attributes (communities and their well-being).

Below is a summary of the status quo findings which are detailed in a Status Quo Report which is available on the DWA web site.

Integrated Unit of Analysis (IUA) - What is it and how is it used?

An IUA is a broad scale unit (or catchment area) that contains several biophysical nodes. 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 identification and selection of the Integrated Units of Analysis (IUAs) were based on the following considerations:

- The resolution of the hydrological analysis and available water resource network configurations currently being modelled.
- Location of significant water resource infrastructure.
- Distinctive functions of the catchments in context of the larger system.
- The Present Ecological State (PES) of each biophysical node was considered as well the type of impacts and the homogeneity of the state and impacts.

The following IUAs were delineated in the Letaba Catchment (see map on the next page):

IUA 1:	Letaba upstream of Tzaneen Dam
IUA 2:	Letsitele and Thabina
IUA 3:	Letaba downstream of Tzaneen Dam to the proposed Nwamitwa Dam
IUA 4:	Letaba from proposed Nwamitwa Dam to Klein Letaba confluence
IUA 5:	Southern tributaries of Letaba IUA 4
IUA 6:	Northern tributaries of Letaba IUA 4
IUA 7:	Upper Middel Letaba and tributaries upstream of Middel Letaba Dam
IUA 8:	Klein Letaba upstream of Middel Letaba Dam
IUA 9:	Klein Letaba downstream of Middel Letaba Dam
IUA 10:	Lower Klein Letaba tributaries
IUA 11:	Letaba main stem in the Kruger National Park
IUA 12:	Letaba tributaries in the Kruger National Park

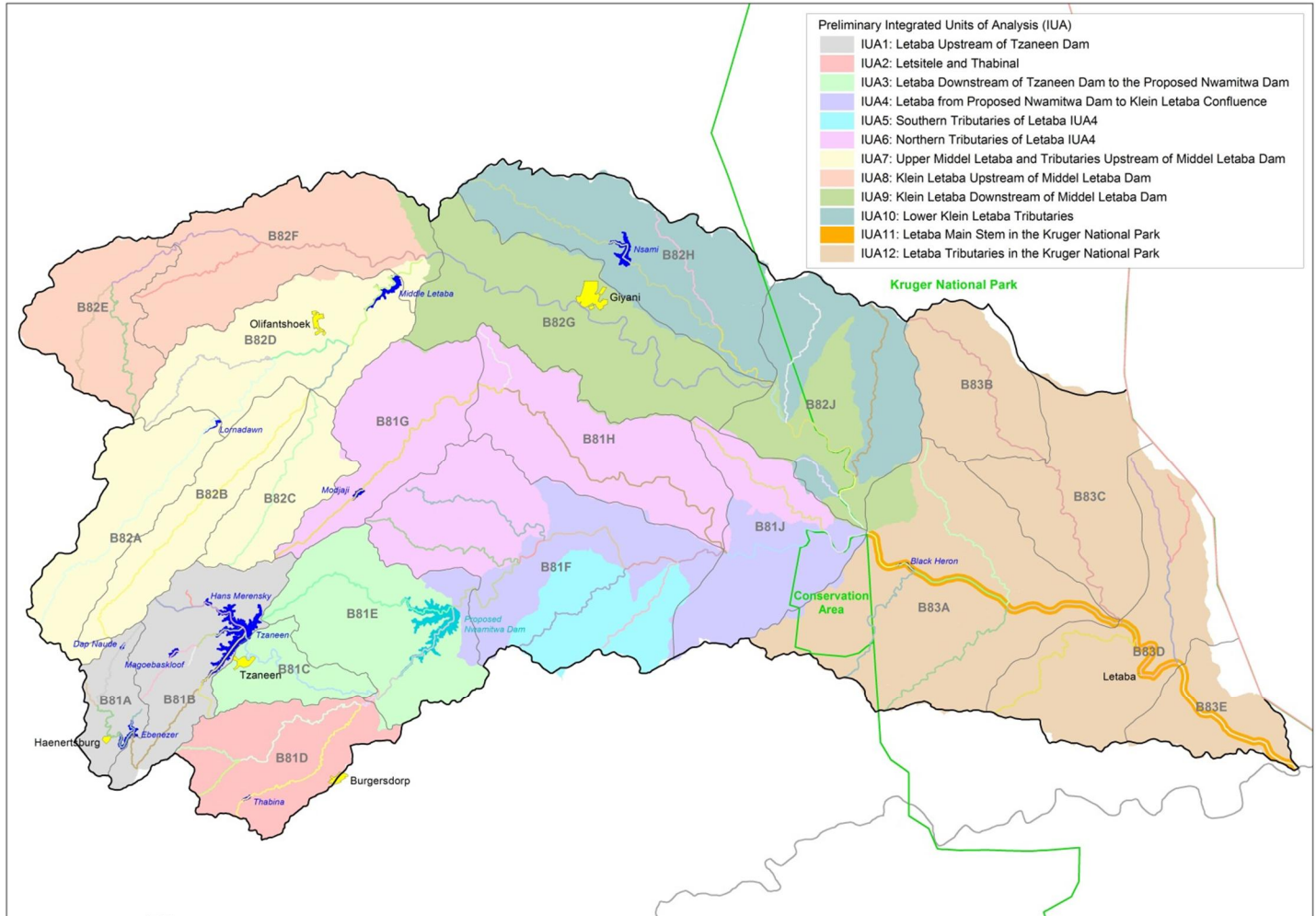
A summary of the status quo of the Letaba Catchment is provided below.

Water resources assessment

The Letaba River Catchment can be grouped into three major subsystems, namely:

- **The Groot Letaba River sub-system** stretching down to its confluence with the Klein Letaba River (includes Dap Naude, Ebenezer, Magoebaskloof, Tzaneen and Thabina Dams).
- **The Middel Klein Letaba River sub-system** stretching down to its confluence with the Groot Letaba River (includes Middel Letaba and Nsami Dams).
- **Lower Letaba River sub-system** which stretches from the confluence of the Klein and Groot Letaba Rivers to the confluence to the Olifants River just upstream of the border with Mozambique.

The water resources in the area can, in general, be described as fully utilised as the demand for water from the Letaba River already exceeds its yield capability. The Letaba River Catchment was delineated based on similar water resource operation, location of significant water resource infrastructure (including proposed infrastructure) and distinctive functions of the catchments in context of the larger system. This process was incorporated into the final identification and selection of the Integrated Units of Analysis (IUAs).



**Figure 1: The twelve preliminary Integrated Units of Analysis (IUA) found in the Letaba Catchment
Twelve IUAs were delineated in the Letaba Catchment**

Water quality issues

Undesirable levels of water quality not only impact negatively on irrigation crop yields and quality and have an adverse impact on industrial water use, but also impact negatively on aquatic ecosystems, thereby degrading the very resource that so many services are dependent on. Bringing the quality of the water to acceptable levels for specific users can also be a costly process. The first step in the Classification process is evaluating the Status Quo of water quality across the catchment, for which an evaluation of land use is necessary.

Land use in the Letaba Catchment consists largely of nature conservation in the form of national, provincial and private nature reserves and forest reserves. The primary land use along the rivers is citrus and sub-tropical fruit production, with grazing in the less fertile sandy loam soils. Removal of the vegetative cover by overgrazing has led to erosion in some places, resulting in an increased sediment load in the rivers. The main industrial development points are at Tzaneen (along the Groot Letaba River downstream of Tzaneen Dam), Nkowakowa and Giyani, with a number of sewage works spread throughout the catchment. Approximately 80 to 90% of the population can be considered as rural, scattered

throughout the catchment. A large proportion of the population depends on subsistence farming. Intensive irrigation farming is practised in the upper parts of the Klein Letaba River catchment, upstream and downstream of the Middel Letaba Dam, and particularly along the Groot Letaba and Letsitele rivers. Land use in the catchment upstream of the Middel Letaba Dam is characterized by irrigated crop farming where tomato is the major crop.

There is little industrial or mining development in the catchment. Northern Cannery at Politisi and the industrial complex at Nkawkawa near Tzaneen provide the major industries.

An extensive literature survey and review of Reserve data available to the study, has identified the following water quality hotspots, i.e. areas where water quality impacts range from large to serious. No critical water quality hotspot areas were identified. These are listed below:

- Poorly functioning WWTWs with concomitant impacts on elevated nutrients, salts and algal growth. These are in particular the Ga-Kgapene WWTW (Molototsi River); Modjadjiskloof-Duiwelskloof WWTW (Brandboontjies River); Lenyenye WWTW (Thabina River) and Giyani WWTW (Klein Letaba River).
- The extensive agricultural area of the Middel Letaba River, particularly upstream of Middel Letaba Dam, resulting in elevated nutrients, salts, algal growth and herbicides/fertilizers. Commercial fruit farms are fed by the Middel Letaba Canal Irrigation Scheme. Note that the tomato-growing area is on the upper section of the SQ due to high rainfall conditions. Location of the biophysical nodes will account for the spatial variability in water quality along the SQ.
- Citrus plantations, particularly on the Groot Letaba downstream from Die Eiland and the Letsitele River (at Letsitele Tank), with increases in nutrients, salts, algal growth and herbicides/fertilizers.

Ecological status quo

A desktop analysis was undertaken to determine the ecological status quo (otherwise referred to as the Present Ecological State (PES)) of 75 river reaches covering the Letaba Catchment. The PES is described in terms of Ecological Categories (EC) of A to F with A being almost natural and F meaning critically modified. Reasons for the change from natural is provided and what is especially important, is whether these are flow (eg abstraction) or non-flow (eg riparian vegetation removal or land use practices) related.

The Letaba Catchment is characterised by large dams, of which the majority are concentrated in the upper reaches of the Letaba, irrigation of mainly orchards, rural settlements and subsistence agriculture (with the often associated overgrazing, trampling and erosion) and the conservation areas at the lower end (Kruger National Parks and Letaba Ranch). Flow modification in terms of decreased flows is one of the most severe impacts (Letaba, Klein and Middel Letaba Rivers).

The main impacts upstream of Tzaneen Dam are related to forestry, abstraction, dams and their barrier effect, alien vegetation and irrigation. The Letsitele River PES varies from a B (near natural) Ecological Category (EC) (at the source) to a D (Largely modified) EC for most of the rest of the river. This is mainly due to the presence of many tributary dams, irrigation, settlements and abstraction. The Thabina tributary is also in a D PES, but it must be noted that the source zone and some other small sections are in a much better state than a D PES.

Two of the north east flowing tributaries are in a B PES as they both flow through private conservation areas.

The Middel and Klein Letaba Rivers are, outside of conservation areas, mostly in a D and C PES. The PES is mostly due to many dams (main river and mostly tributaries), irrigation and the presence of large settlements. Two of the rivers are in an E PES and the reasons for this are:

- Intensive irrigation and many dams present throughout the whole reach.
- Presence of a large dam in the reach which impacts on instream continuity and contributes to flow modification. There are also extensive canal systems present in this reach.

The lower section of the river in the conservation areas are a mix of mostly A PES for those rivers with their source and whole length of river in the conservation area, and a C PES for the main Letaba River. In these reaches the main Letaba

River bears the brunt of all the severe utilisation of the water resources outside of the conservation areas, as well as sedimentation which impacts on the channel. In effect, the river is physically much smaller than natural within a very large macro channel which is maintained by the low frequency large floods that still come through.

Status quo of Ecological Goods, Services and Attributes

Ecological Goods, Services and Attributes (EGSA) are the goods and services provided by the river (and associated ecological systems) that result in a value being produced for consumers. Provisioning services are the most familiar category of benefit, often referred to as ecosystem goods such as foods, fuels, fibres, medicine, etc., that are in many cases directly consumed. Other services include cultural services (ritual use of rivers, aesthetic or historical importance), regulating services (e.g. water quality inputs), and supporting services (e.g. nutrient formation).

The study area is located in a region that is largely rural in nature with a number of regionally important urban nodes and smaller satellite towns, as well as rural settlements. Based on the status quo analysis the catchment has been divided into zones that reflect the ecological goods and services attributes as a direct dependent of land use. For the purposes of this catchment five different land use forms that reflect types of ecological goods and services that might be associated with the usage have been identified. The land use based zones are:

- **Commercial Agriculture and Plantation:** This is largely given over to zones dominated by commercial farming entities. Utilisation of ecological goods and services tends to be low and restricted often to farm workers or incidental recreational aspects.
- **Subsistence agriculture:** These areas are dominated by subsistence agriculture but in areas where population densities are relatively low. Utilisation of ecological goods and services tends to be higher here and the populations that make use are often poor and marginal.
- **Rural Closer Settlement . Subsistence:** These are the former homeland areas that have generally higher population densities than the purely subsistence areas. In some instance densities are high enough to be categorised as closer settlement/informal urban. Utilisation of ecological goods and services tends to be higher here and the populations that make use are often poor and marginal. However, the population densities are such that resources tend to be under pressure.
- **High Density Formal Urban:** These are the SQs heavily influenced by the town of Tzaneen. The utilisation of ecological goods and services tends to be low as the populations tend to be urbanised and alienated from direct use of the resources.
- **Recreational/Dams/Game Farms.** These are areas given over to game farms (notably the Kruger Park) as well as SQs dominated by dams. Recreational usage tends to dominate ecological goods and services attributes.

Socio-economic status quo

The economic analysis consists of the status quo in the Letaba Catchment regarding the large water users such as irrigation agriculture, commercial forestry, saw mills, tomato and fruit juice fruit processing plants and eco-tourism. The economic value of water use for each economic sector was determined.

The use of the Water Impact Model (WIM) and Production Impact Model (PIM) was applied to the Letaba Catchment. Some of the components that were used includes the Limpopo Social Accounting Matrix (SAM), computer based crop budgets (Combuds), turnover of industries such as the tomato and fruit juice factories. For eco-tourism the number of bed nights sold was also used. These results were expressed GDP, job opportunities and distribution of household income to the low, medium and high income groups.

Direct employment creation and payments to low-income households is the two macro-economic parameters providing the best indication of the positive impact of a specific economic activity on the local social-economic conditions of the local population.

The irrigation agriculture sector appears to have the highest economic impact in the Letaba Catchment, with citrus and tomato production the leading crops. The income from the economic activity resulted in creating job opportunities and

income being distributed to the low income households.

Determining the Resource Quality Objectives (RQOs)

Once the Management Classes have been approved, RQOs will be developed to describe the Management Classes. Some RQOs will be numerical, and other descriptive; all depending on the extent of data available. The numerical RQOs will for example be used in monitoring which is very important to see that the Management Classes are being maintained and improvement within these Management Classes being achieved where necessary.

Visioning for the Letaba Catchment

It is widely acknowledged that a fundamental objective of integrated water resource management (IWRM) is to ensure that resource-based costs and benefits are appropriately distributed in society (Van Wyk et al., 2006a). Visioning is a process of articulating society's aspirations for the future. In this case, the basket of benefits to be derived from aquatic ecosystem services and the costs associated with their use.

The visioning process is important as it generates a dialogue that promotes ongoing shared awareness and understanding amongst resource users and encourages people to adjust their individual demands on the resource in the broader interests of sustainability and co-operative management. This promotes equity and shared understanding of the costs and benefits of different resource use options.

A visioning for the water resources of the Letaba Catchment started at the 1st PSC meeting on 12 March 2013. Stakeholders had the opportunity to contribute to the visioning process until the end of March 2013. The visioning assists to link management actions to the vision and ensure that societal values and management objectives are linked and realised. The water resource is defined to include a watercourse, surface water, estuary or aquifer, on the understanding that a watercourse includes rivers and springs, the channels in which water flows regularly or intermittently, wetlands, lakes and dams into or from which water flows, and where relevant the bed and banks of the system. The quality of the resource (the resource being the ecosystem providing services beneficial to people) is defined broadly to include fluxes in flow; physical, chemical and biological characteristics of the water; the character and condition of the in-stream and riparian habitat; and composition, condition and distribution of the aquatic biota.

The Letaba Catchment is a very large and diverse area in terms of its ecology, and the economic and social activities that characterise it. Therefore smaller areas will be used that have been identified based on their similar socio-ecological characteristics. These areas are called the Integrated Units of Analysis (IUA). See map on page 4. Use and user needs, plus the state of the resource, are dynamic over space and time. It has therefore been divided into 12 IUAs based on socio-economic, ecological and water infrastructural characteristics.

A document summarising stakeholder inputs for the Visioning of the Letaba Catchment will soon be published on the DWA web site.

Next steps in the process

The Status Quo Report will be reviewed by the DWA and finalised. The visioning document will be finalised and published on the DWA web site. The next PSC meeting will take place on 10 September 2013 in Tzaneen.

The Ecological Water Requirements will be quantified, reviewed and analysed. These will be linked to the Ecosystem Goods, Services and Attributes. The outcome of this will be documented and discussed at the next PSC meeting to be held in September 2013. At the next meeting, the proposed operational scenarios will be discussed and defined.

Why should you stay involved in this study?

It is important to understand that this study will eventually impact on you as a water user. The outputs of the study will be a set of management goals to satisfy the Management Class objectives. The Management Class outlines those attributes that the DWA and the society require of different water resources in terms of quality and quantity. Implementation of the management goals will relate to all water users.

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 to 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 sent out on this study comprises a Background Information Document (BID), a brochure on the Water Resource Classification System, advertisements which were published in the Mopani Herald, Capricorn Voice and Letaba Herald. An Information Document was also sent to members of the PSC in preparation for the meeting held on 12 March 2013.

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>

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



The Letaba River runs from the mountainous Haenertsburg area stretching down to its confluence with the Klein Letaba River. Major dams include the Dap Naude, Ebenezer, Magoebaskloof, Tzaneen and Thabina Dams. Dense forestation have been established in the upper parts of the catchment and the intensive irrigated agriculture on the banks of the Groot Letaba River upstream of the Kruger National Park (KNP) are the major water users in the area.