

# Classification of significant water resources in the three Vaal Water Management Areas

## Background Information Document

February 2011



### PURPOSE OF THIS DOCUMENT

The purpose of this Background Information Document (BID) is to inform stakeholders about the water resource classification process that has recently been initiated by the Department of Water Affairs (DWA) in the three Vaal - Upper, Middle and Lower - Water Management Areas (WMAs).

Through this process water resources within the WMAs will be classified in accordance with the Water Resource Classification System (WRCS).

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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### BACKGROUND

The National Water Act (NWA) – Act No. 36 of 1998 – is founded on the principle that the South African Government has overall responsibility for and authority over water resource management for the benefit of the public without seriously affecting the functioning of the water resource systems.

In order to achieve this objective, Chapter 3 of the NWA provides for the protection of water resources through the implementation of resource directed measures (RDM) which includes the classification of water resources, setting the Reserve and Resource Quality Objectives. The Chief Directorate: Resource Directed Measures of the Department of Water Affairs (DWA) is responsible for the classification of water resources in terms of the recently published Water Resource Classification System (WRCS) to ensure that a balance is sought between the need to protect and sustain water resources on one hand and the need to develop and use them on the other.

The DWA has identified the need to undertake the classification of significant water resources (rivers, wetlands, groundwater and lakes) in the Vaal Water Management Areas (WMAs) in accordance with the WRCS and has commissioned Professional Service Providers to assist with the classification process.

### WHAT IS THE WATER RESOURCE CLASSIFICATION SYSTEM?

The Water Resource Classification System (WRCS) places water resources into different classes commonly referred to as Management Classes. The WRCS is a set of procedures for determining the different classes of water resources as defined in Regulations (R810) which was published in Government Gazette No 33541 on 17 September 2010.

**The DWA brochure: *Implementation of a Water Resource Classification System* provides a detailed explanation of the procedures for determining different classes of water resources. Go to the DWA website (see below) for a copy of the brochure.**

### PURPOSE OF THE STUDY

As South Africa's water resource are becoming more stressed due to an accelerated rate of development and the changing weather patterns resulting in the scarcity of water resources, there is an urgency to ensure that water resources are able to sustain their level of uses and be maintained at their desired states specifically in the three Vaal WMAs.

The determination of Management Classes (MCs) of the significant water resources in Vaal River System will essentially describe the desired condition of the resource,

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and conversely, the degree to which it can be utilised by considering the economic, social and ecological goals of the users and stakeholders.

## STUDY AREA

The study area comprises the water resource of the Vaal River System which includes the catchments of the **Upper**, **Middle** and the **Lower Vaal** WMAs – from Kuruman in the west to Ermelo in the east and Johannesburg in the north to the Lesotho border in the south. (See map on back page).

Other sub-systems that also form part of Integrated Vaal River System or are linked to Vaal River System are indicated on the map. These linked sub-systems will form part of the water resource system analysis (either directly or indirectly) to ensure the MC is determined in an integrated manner.

Considerable variations in climatic conditions occur over the three WMAs. The Mean Annual Precipitation (MAP) decreases from 800 mm in the Upper Vaal to 500 mm in the Middle Vaal and 100 mm in the Lower Vaal WMA. This tendency is reversed when considering potential annual evapo-transpiration, which increases from 1300 mm in the Upper Vaal to 2800 mm in the Lower Vaal WMA.

The land use in the **Upper Vaal WMA** is characterised by the sprawling urban and industrial areas in the northern and western parts of the WMA. There is also extensive coal and gold mining activities located in the Upper Vaal WMA.

These activities are generating substantial return flow volumes in the form of treated effluent from the urban areas and mine dewatering that are discharged into the river system.

These discharges are having significant impacts on the water quality in the main stem of the Vaal River, throughout all three the WMAs.

The Upper Vaal WMA is economically important, contributing nearly 20% of the Gross Domestic Product of South Africa, which is the second largest contribution to the national wealth amongst all nineteen of the WMAs in the country.

The potential for future economic growth in this WMA remains strong. Growth will largely be attracted to the already strong urban and industrial areas in the Johannesburg-Vereeniging-Vanderbijlpark complex.

The **Middle Vaal WMA** is rural in nature with the land use characterised by extensive dry land agriculture. Irrigation is practiced downstream of dams along the main tributaries as well as at locations along the Vaal River. The largest urban areas are Klerksdorp, Welkom and Kroonstad.

The economy of the Middle Vaal WMA contributes about 4% of the GDP of South Africa with the most dominant economic activity being the mining sector, generating more than 45% of the GDP in the WMA. As in the Upper Vaal

WMA, mine dewatering and the subsequent Acid Mine Drainage impacts on water quality.

The land use in the **Lower Vaal WMA** is primary livestock farming, with some dry land cultivation in the northeast. Intensive irrigation is practiced at Vaalharts as well as locations along the Vaal River. Diamond bearing intrusions occur near Kimberley (the most important urban area) and alluvial diamonds are found near Bloemhof. Iron ore and other minerals are found in the south-eastern parts of the WMA.

Due to the extensive development in the Vaal River System and Crocodile (West) WMA, which are supplied from the Upper Vaal WMA, the local surface water resources in all three the Vaal WMAs have been fully exploited more than three decades ago.

## STUDY APPROACH

A key consideration in defining the activities, tasks and resources for the execution of the study was the availability of data and information from past studies of which the most important source is the recently completed Comprehensive Reserve Determination Study.

The scale at which the analysis will be undertaken was selected in line with the resolution of the available data as well as the main water resource features in the Vaal River System. This informed the identification of the Integrated Units of Analysis (IUAs) and the associated additional Ecological Water Requirements (EWR) sites.

The approach adopted is that new EWR sites will be analysed by applying the extrapolation method that has already been implemented in the Upper Vaal WMA and in other catchments in the country. Extrapolation consists of determining which sites are sufficiently similar to the comprehensive EWR sites in terms of biophysical similarity as well as indicator guilds used for setting EWRs; and deriving the EWRs for these sites using the comprehensive EWR results at the EWR sites.

Since the above extrapolation method rely on the integrity of existing information, a thorough review of all data will be carried out in preparation of the final scope of work which are defined in the Inception Report.

During the Comprehensive Reserve Study the approach, assessment and analysis of the goods and services of the Vaal River System was standardised and therefore the results generated during this study will form the basis for this component.

The most appropriate and latest water resource network model configuration as well as hydrological database will be identified and selected for use in the study. A review of other models applied in the study area will be carried out and evaluated for possible application in the study. Particular attention will be given to local water quality models.

A wide range of information is available regarding the water quality of the Vaal River System, e.g. the Integrated Water Quality Management Plan (IWQMP) produced for the System in 2007, and the Water Quality Report for the Comprehensive Vaal Reserve Study, due to be released early in 2011.

Particular emphasis will be placed on evaluating and reviewing the water quality modelling conducted for the System, which was undertaken primarily during the IWQMP study and focussed on salinity modelling.

## INTEGRATED UNITS OF ANALYSIS

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; and
- Available budget for refinement of the existing network and undertaking scenario analysis of each IUA.

It has been recognised that the characteristics of individual small tributaries can differ from the larger rivers and may warrant a different Management Class. The constraint is however that if the same intensity of investigation has to be applied for all tributaries (to satisfy scientific sound practice) much more time and money would be required to undertake the classification of all the water resources. It is therefore proposed that a practical qualitative evaluation method be devised to consider classifying tributaries within the identified IUAs.

**Twelve IUAs have been identified in the Upper WMA of which three areas are defined as secondary IUAs. The Middle Vaal WMA has 11 IUAs of which four are secondary IUAs and the Lower Vaal WMA has five IUAs. The secondary IUAs and tributary rivers within each main IUA will be evaluated in a qualitative manner only.**

## PUBLIC PARTICIPATION PROCESS

### *Identification of stakeholders*

The identification of stakeholders in the Vaal WMAs will be an ongoing process. Some of the stakeholders included in the database currently are relevant government departments on national and provincial level such as the Department of Environmental Affairs, the Department of Mineral Resources and the Department of Agriculture, Forestry and Fisheries; municipalities; agriculture; mining and industry; conservation organisations; relevant parastatals (e.g. Eskom); community representatives; and civil society.

### *Project announcement*

The project will be announced to the public with a letter of invitation addressed to all Interested and Affected Parties (I&APs) currently on the database, accompanied by this BID, the DWA brochure on WRCS and a reply sheet for

I&APs to register for participation.

A media release will be sent to the media and an advertisement will be placed in national and local newspapers.

### *Technical Task Groups*

Technical Task Group meetings will be held to discuss and formulate scenarios for analysis. These meetings will include various sectors in the study area, such as agriculture and industry. Stakeholders will be identified (per relevant sector of society) and invited to attend the meetings.

### *Project Steering Committee*

Stakeholders representing specific sectors of society (e.g. agriculture, mines, conservation, civil society) will be identified and asked to serve on a Project Steering Committee (PSC) for the duration (two years) of this project. The PSC members will be key stakeholder representatives that will oversee the classification process and provide strategic advice and guidance.

### *On-going consultation with stakeholders*

Stakeholders will continue to be informed of progress with the study through a newsletter and will be asked for their inputs on an ongoing basis. The DWA website will also be used for the publishing of information regarding this study.

## DEFINITIONS

**Significant Water Resources:** Water resources that are deemed to be significant from a water resource use perspective, and/or for which sufficient data exist to enable an evaluation of changes in their ecological condition in response to changes in their quality and quantity of water. Water resources are deemed to be significant based on factors such as, but not limited to, aquatic importance, aquatic ecosystems to protect and socio-economic value.

**Integrated Units of Analysis:** The basic unit of assessment for the classification of water resources. The IUAs incorporate socio-economic zones and is defined by catchment area boundaries.

**Ecological Water Requirements:** The flow patterns (magnitude, timing and duration) and water quality needed to maintain a riverine ecosystem in a particular condition. This term is used to refer to both the quantity and quality components.

**Ecological Water Requirement Sites:** Ecological Water Requirement (EWR) sites are set at specific points on the river. These sites provide sufficient indicators for the specialists to assess environmental flows and information about the variety of conditions in a river reach. An EWR site consists of a length of river which may consist of various cross-sections for both hydraulic and ecological purposes.

**Node:** These are modelling points representative of an upstream reach or area of an aquatic eco-system (rivers, wetlands, estuaries and groundwater) for which a suite of relationships apply. A node is set at the outlet of an IUA where the flow and water quality requirements required to be met for a particular scenario are set. The flows set are based on the different categories set at the EWR sites.

