

### 3. WATER RESOURCES

## Sectoral Water Requirements

### Current Requirements

The bulk of the water used in the Inkomati water management area is by the irrigation sector, which represents 70% of the total requirements for water in the water management area. Water use by afforestation, from the perspective of impact on yield, amounts to about 16% of the total. Urban water requirements represent 7% of the total, with the remainder split between rural requirements and water for mining and bulk industrial users (paper and sugar mills).

Reflecting the predominantly industrialized nature of the economy in the Upper Vaal water management area, 80% of the requirements for water is by the urban, industrial and mining sectors; with 9% for irrigation, 7% for power generation and the remainder for rural water supplies. Geographically, over 75% of the total requirements for water is in the sub-area downstream of Vaal Dam and nearly 20% in the sub-area upstream of Vaal Dam

Of the total water requirement within the Usutu to Mhlatuze water management area, nearly 60% is for irrigation, 13% for mining and bulk industrial use, 8% for urban purposes and 6% for rural domestic supplies and for stock watering. The remaining 15% represents the impact of afforestation on the yield from surface water resources.

Most of the water used within the Upper Usutu sub-area is by the forestry sector. The bulk of the water used in the Olifants water management area is by the irrigation sector, which represents 57% of the total requirements for water in the water management area. Power generation represents 19% of the water requirements and urban, industrial and mining together use a further 19%.

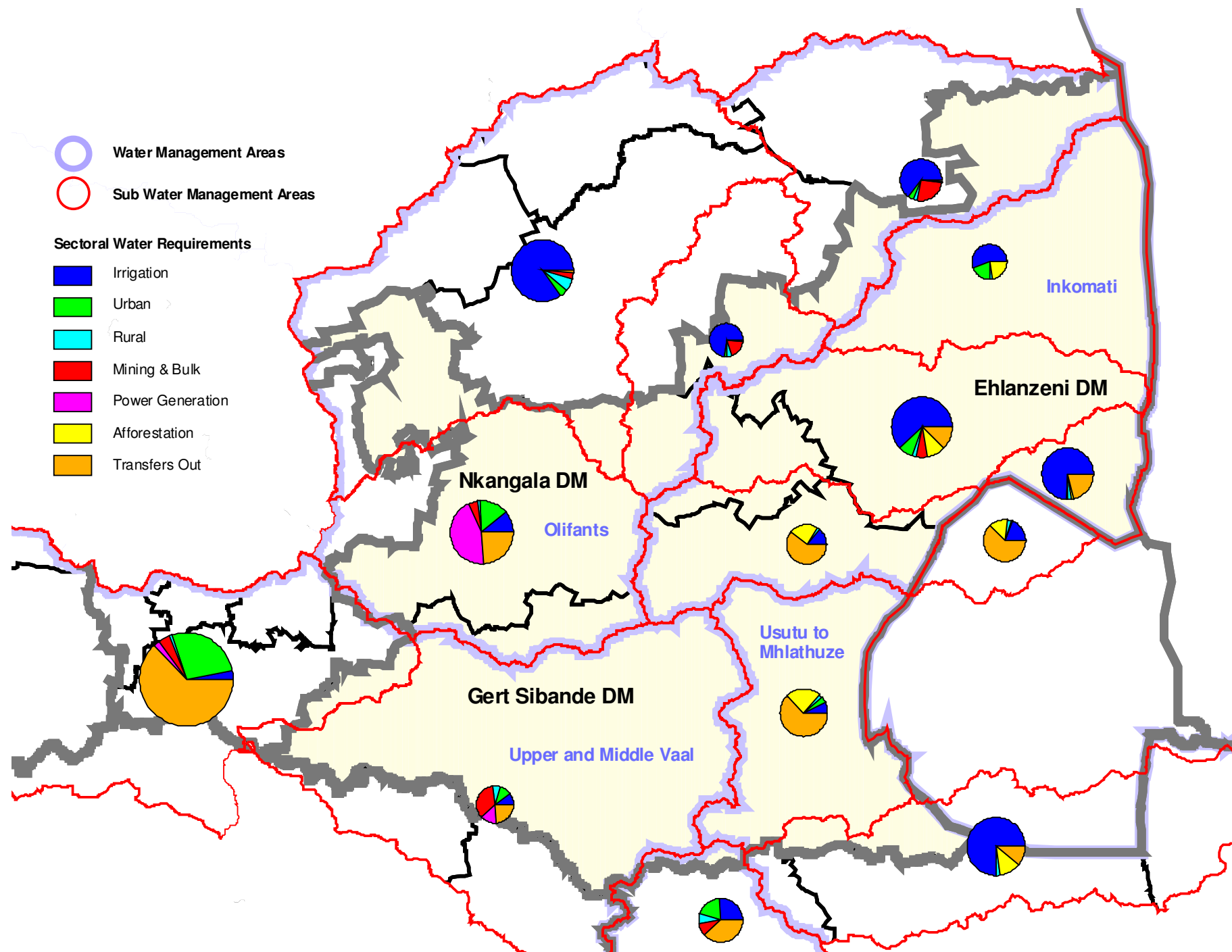
### Future Requirements

Given the largely rural character of the Inkomati water management area, with agriculture as the only comparative advantage of the region and which is already highly developed, there are no strong stimulants for growth in the water management area. Further economic development will mainly be concentrated at the existing urban/industrial centres such as Nelspruit, with some people migrating towards these areas. No large mining developments are foreseen in the water management area. Growth in water requirements is therefore expected to largely be concentrated in the Crocodile sub-area, with some growth also in the Sabie sub-area. No meaningful change in the requirements for water is foreseen in the Komati sub-areas. Although a need exists for further irrigation and forestry development in these as well as other parts of the water management area, the availability and cost of water is likely to be restrictive.

General trends in the Upper Vaal water management area are for continued concentration of economic development in the Johannesburg-Vereeniging- Vanderbijlpark area and increasing urbanisation of the population. A strong growth in water requirements can therefore be expected in the sub-area downstream of Vaal Dam.

Attributable to the small changes in population and even negative population growth projected for the Usutu to Mhlatuze water management area, together with the largely agrarian socio-economic nature of the water management area and the general lack of stimulants for strong economic growth, little change in the requirements for water is expected.

Future growth in water requirements in the Olifants water management area will mainly be in the power generation, mining, urban and industrial sectors, with the largest impact on the Upper-Olifants sub-area. Water requirements for power generation in this sub-area are expected to increase from the current 180 million m<sup>3</sup> per year to about 220 million m<sup>3</sup> per year by the year 2025. Planning is in progress for two new platinum mines in the Middle Olifants sub-area and one in the Steelport valley, together with a smelter and accompanying housing developments. It is provisionally estimated that about 25 million m<sup>3</sup> per year of water will be required for future mining developments.



# Water Availability

The catchments of the three main rivers, the Komati, Crocodile and Sabie, all encompass areas of higher rainfall and steep topography from where much of the surface flow in the Inkomati water management area is generated.

There are no natural lakes in the water management area. Small pan areas occur in the south-western extremity of the water management area, and isolated wetlands also occur. The main land use impact is the reduction in runoff as a result of the vast commercial plantations in the water management area. Significant quantities of water are also intercepted by invasive alien vegetation, which covers the equivalent of about 132 000 ha. In the natural state the quality of surface water is of a high standard.

The main storage dams are:

- Nooitgedacht Dam and Vygeboom Dam (together with the Gladdespruit diversion) on the Komati River west of Swaziland;
- Driekoppies Dam on the Komati River, in the Komati River north of Swaziland;
- Kweni, Witklip, Klipkopjes and Ngodwana Dams in the Crocodile River catchment; and Longmere Dam
- Inyaka and Da Gama Dams in the Sabie River catchment.

Main dams in the other two co-basin countries are Maguga Dam on the Komati River and the Sand River Dam on a tributary, both in Swaziland, and Corumana Dam on the Sabie River in Mozambique.

Potential for further development of the surface water resources in the water management area is limited.

The largest proportion (46%) of the surface flow in the Upper Vaal water management area is contributed by the Vaal River upstream of Vaal Dam, together with its main tributary the Klip River.

The Wilge River and the Liebenbergsvlei River contribute 36%, with the remaining 18% originating from the tributaries downstream of Vaal Dam.

There are no natural lakes in the water management area. (One of the largest natural lakes in South Africa, Chrissiesmeer, lies in an endoreic area in the Usutu to Mhlathuze water management area, on the divide between the Komati, Usutu and Vaal Rivers.)

Naturally the quality of surface water in the Upper Vaal water management area is good, however, the large quantities of urban and industrial effluent, together with urban wash-off and mine pumpage, have a major impact on the water quality in some tributary rivers. Limited potential for further development remains. From a water management perspective, the Upper Vaal water management area is in a pivotal position in the country.

The Usutu to Mhlathuze water management area is the water management area with the third highest mean annual runoff (MAR) in the country.

In the natural state the quality of surface water in the water management area is of a high standard. However, wash-off from areas with insufficient sanitation infrastructure and services causes unacceptable bacteriological pollution, particularly at rural villages and dense settlements.

Significant potential for development exists.

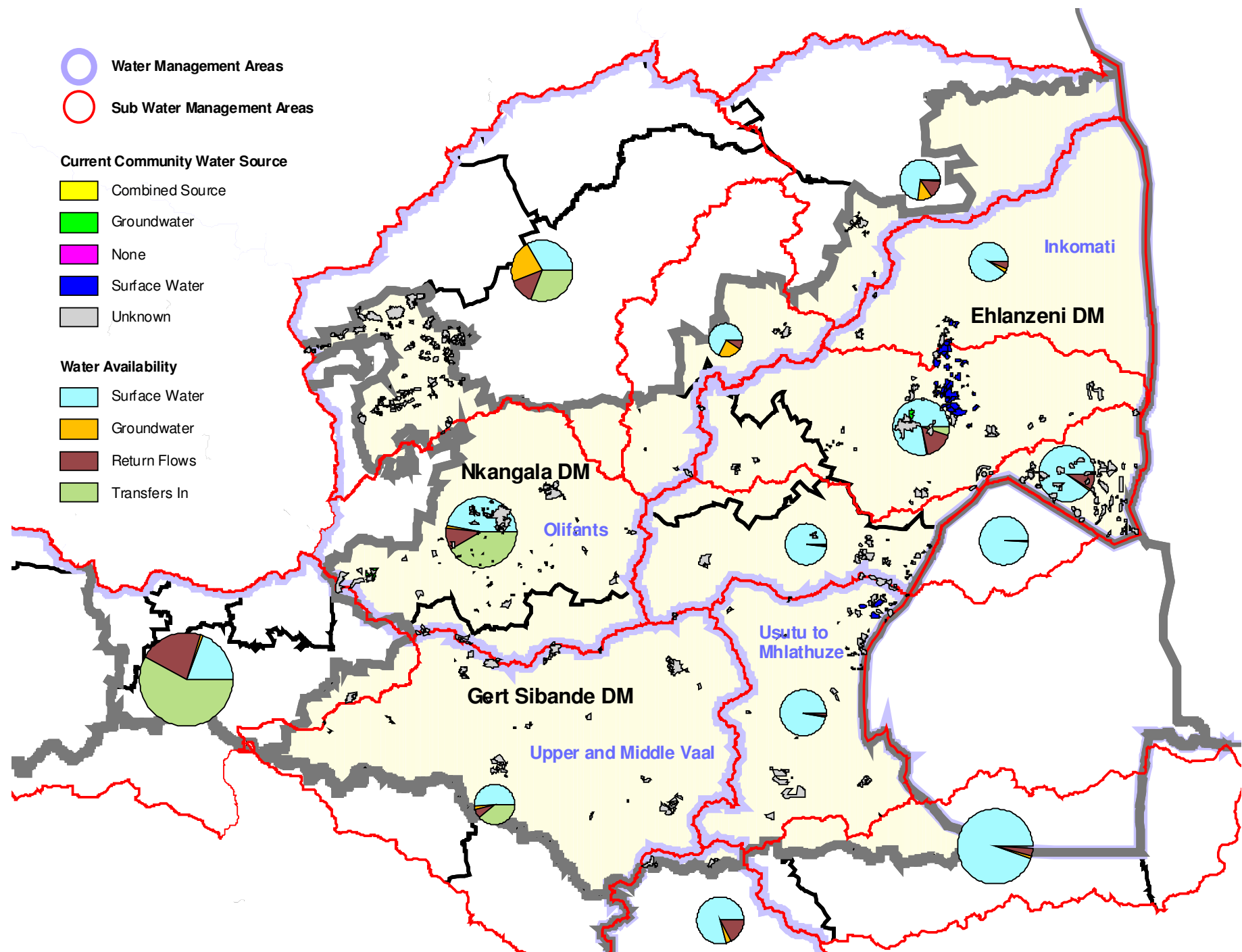
Most of the surface runoff originates from the higher rainfall southern and mountainous parts of the **Olifants water management area**. Serious infestation of alien vegetation occurs in parts of the water management area, while severe land degradation is experienced mainly in the Middle Olifants sub-area. Of particular importance is the ecological water requirements with respect of the Kruger National Park at the downstream end of the water management area.

In the natural state, the quality of surface water is high. This, however, is highly impacted upon by coal mining in the Upper Olifants sub-area.

The main storage dams are:

- Bronkhorspruit, Witbank, Doringpoort, Middelburg and Loskop in the Upper Olifants sub-area;
- Rhenosterkop, Rust de Winter and Flag Boshielo in the Middle Olifants sub-area; and Orighstad Dam
- Blyderivierspoort in the Lower Olifants sub-area, Phalaborwa Barrage

Only a few small dams have been constructed in the Steelpoort sub-area. Several options for new dams have been identified, of which the proposed Rooipoort Dam on the Middle Olifants River and the De Hoop Dam on the Steelpoort River are the most likely.

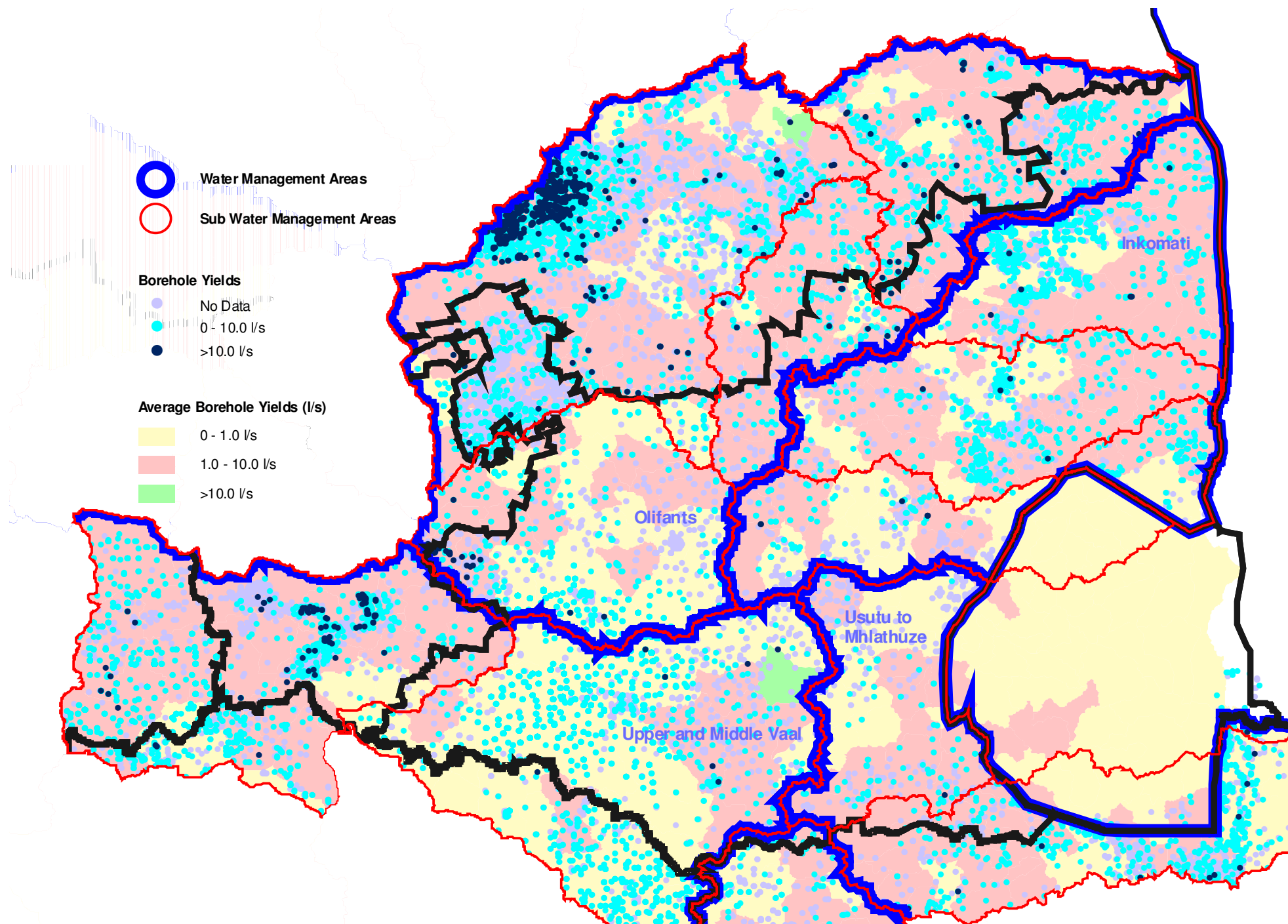


## Borehole Yields

The geology underlying the Inkomati water management area is generally not of high water bearing capacity and, given the relatively good availability of surface water, only limited abstraction of groundwater occurs in the water management area. Close inter-dependence exists between groundwater and surface water, with most of the base flow in perennial rivers probably representing spillage from groundwater. Further development of groundwater is likely to directly impact on the availability of surface water. The quality of groundwater is mostly of a high standard. An important feature with regard to the groundwater resources of the Upper Vaal water management area, is the large dolomitic aquifers which extend across the north-western part of the water management area. Large quantities of water are also abstracted through pumping for urban use and for irrigation. As a result of the direct connections between the dolomitic aquifers and surface streams, the resources are in balance and increases in groundwater abstraction will result in corresponding decreases in surface flow.

Although of specific importance in some areas, only 3% of the total water requirements in the water management area are supplied from groundwater. The quality of groundwater is generally of a very high standard. Although significant quantities of water could be abstracted from groundwater in the Usutu to Mhlathuze water management area, the actual utilisation is relatively small. The quality of groundwater is generally of a very high standard.

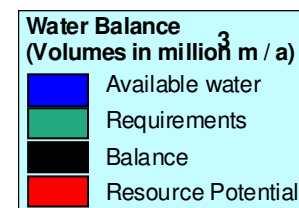
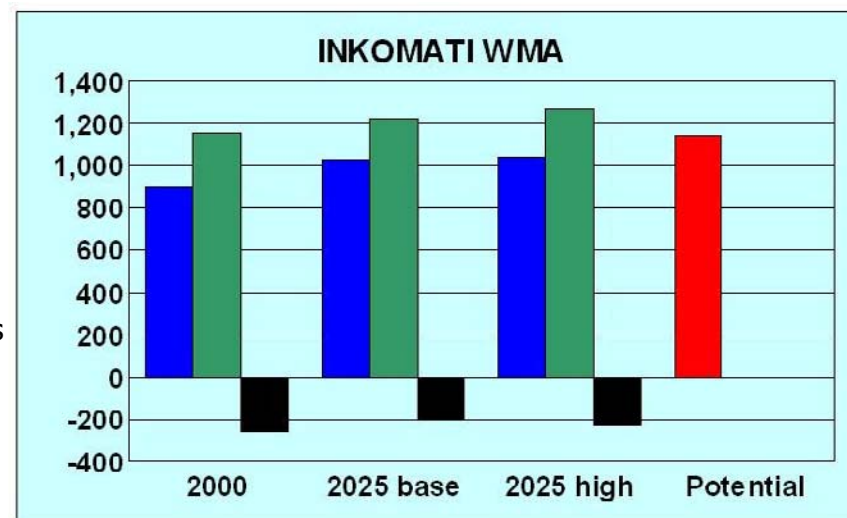
Large quantities of groundwater are abstracted for rural water supplies throughout the **Olifants water management area**. The greatest use of groundwater occurs in the Middle Olifants sub-area where most of the rural population in the water management area resides, and where large quantities of groundwater are abstracted for irrigation in the Springbok Flats area. (Higher natural recharge of groundwater is presumed to occur in the Springbok Flats area, due to the lack of surface drainage.) Substantial potential for increased groundwater utilisation has been identified on the Nebo Plateau (in the vicinity of Jane Furse). The quality of groundwater is naturally of a high standard, although high iron and fluoride concentrations are found in some areas. Concern exists about the pollution of groundwater with acidic mine leachate in the coal mining areas in the Upper Olifants sub-area.



# Water Balance

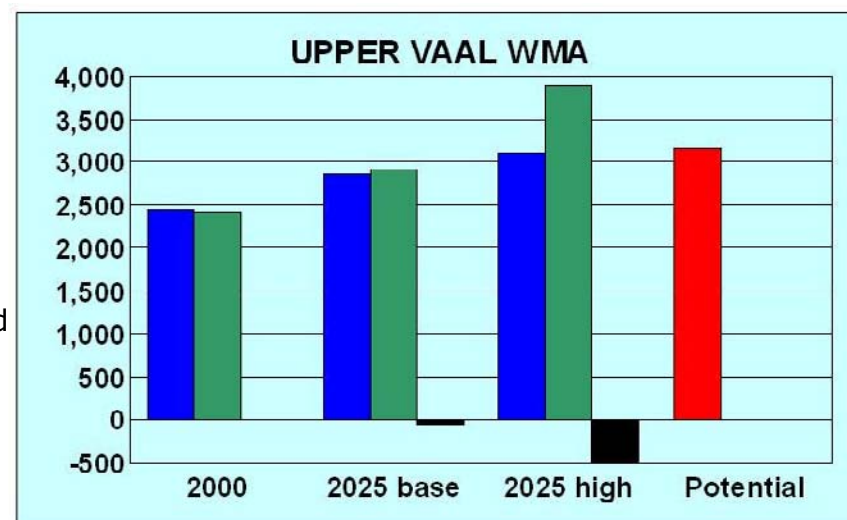
Key considerations with respect to the **Inkomati** water management area are:

- The international nature of the Incomati River Basin and the sharing of water resources with Swaziland and Mozambique, have a pronounced impact on water management in the water management area. It is important that the international obligations be met at all times, and that all three co-basin countries subscribe to common standards with respect to the environmental requirements for water.
- Water requirements already exceed the availability of water in several parts of the water management area. The situation is particularly serious in the Crocodile sub-area, where the strongest potential for economic growth in the water management area exists, and which will exacerbate the existing shortages.
- Management of the Sabie River and Crocodile River (with respect to quantity, quality and temporal flow distribution) is of particular importance with respect to ecosystems in the Kruger National Park.
- It is of national importance that the transfer of high quality water from the Komati sub-area west of Swaziland to the Eskom power stations in the Olifants water management area be maintained.
- Implementation of the Reserve will increase the already existing deficits in the Crocodile sub-area and the Komati sub-area west of Swaziland. (Potential deficits in the Sabie sub-area to be ff-set by Inyaka Dam.)



Key considerations with respect to the **Upper Vaal** water management area are:

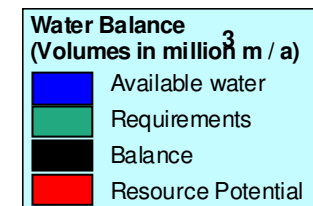
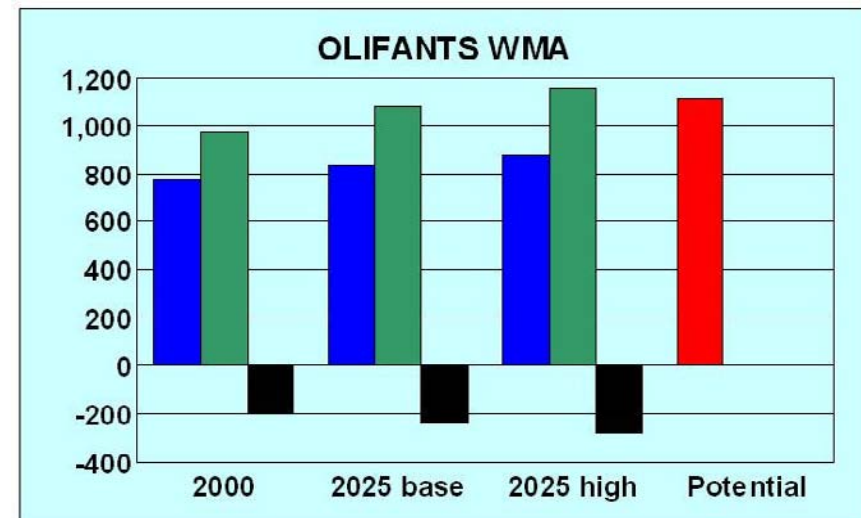
- The high degree to which the water resources naturally occurring in the water management area has been developed, and the already full utilisation of these resources. Only limited potential for further water resource development exists.
- Continued strong growth expected in the Greater Johannesburg area and surrounds, which is one of the key growth areas in the country, with accompanying increases in water requirements.
- Increasing requirements for water for industrial purposes and power generation in the sub-area upstream of Vaal Dam, where the yield available from Grootdraai Dam will shortly be fully taken up.



- The strong dependence of the Upper Vaal water management area on water transfers from other water management areas as well as from Lesotho. Surplus capacity currently exists, which will be increased with the commissioning of Mohale Dam. It may also be necessary for some transfer capacities to be reduced as a result of implementation of the Reserve in the source catchments (eg. Upper Usutu).
- Large dependence of other water management areas on transfers and releases from the Upper Vaal water management area.
- The re-use of return flows, together with the management of water quality in the Barrage and lower reaches of the Vaal River.
- Impacts of mine closure on water quality and possibly on surface flows.
- The highly regulated nature of the Vaal River from Grootdraai Dam downstream, and the relevance thereof to the ecological requirements for water.

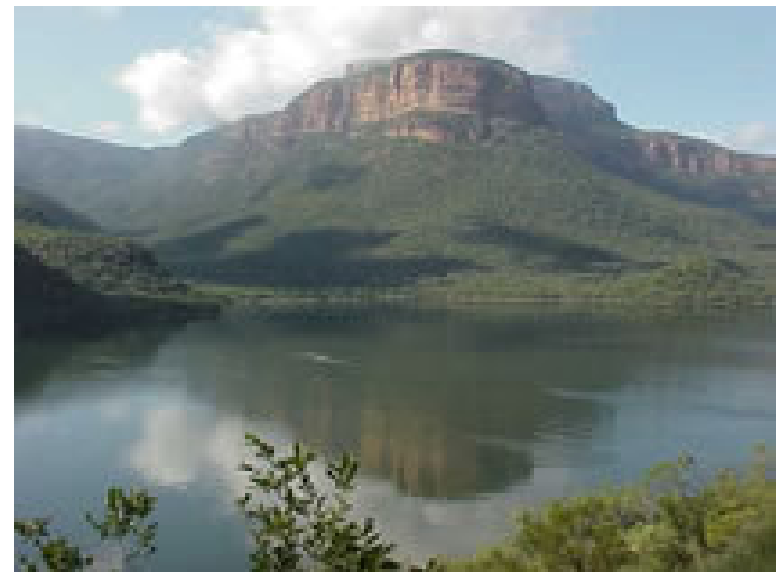
Key issues with respect to the **Olifants** water management area are:

- The already full utilisation, and over-commitment in certain areas, of the water resources as currently developed and available.
- Substantial deficits that will result from implementation of the ecological component of the Reserve.
- Strong growth expected in the mining sector along the Bushveld Igneous Complex, together with continued urban and industrial growth at Witbank, Middelburg and Phalaborwa.
- The need for increased transfer of water into the water management area for power generation.
- Water quality management in the Upper Olifants sub-area in particular, as well as related to mining activities elsewhere in the water management area.
- Ensuring the adequate availability of water of appropriate quality with respect to the ecological requirements in the Kruger National Park.
- Improved measurement and monitoring of irrigation abstractions and return flows, to facilitate the more informed allocation and management of the resources.
- Possible impacts of water resource management in the Olifants water management area on Mozambique and honouring of all obligations with respect to Mozambique.



## 4. EXISTING SUPPORT PROGRAMMES

- Project Consolidate
- DWAF support with MIG BP's (Technical reports and feasibility studies)
- WSDP support to LM's
- SIP 7 – Placing of resources (people) in LM's to support
- 20/20 Vision – Water & Sanitation issues incorporated into school curricula
- DWAF hands on support with sanitation programmes
- Water conservation and demand management programmes
- Support to LM's with implementation of free basic water
- Support with sector collaboration
- Premier special projects (bucket eradication)
- Chinese materials (pipes & water meters)
- LM support with transfers
- Support to MIG PMU's
- Drought support programme
- Support to WSA's with water quality monitoring



## 5. ABBREVIATIONS

DWAF	Department of Water Affairs & Forestry
DM	District Municipality
m.a.s.l.	meter above sea level
LM	Local Municipality
WSDP	Water Service Development Plan
IDP	Integrated Development Plan
O&M	Operation & Maintenance
MIG	Municipal Infrastructure Grant
CMA	Catchment Management Agency
RDP	Rural Development Programme
BP	Business Plan
VIP	Ventilated improved pitlatrine
HH	Household
SIP	Special Intervention Programme
PMU	Project Management Unit
WSA	Water Services Authority
DPLG	Department of Local Government