APPENDICES

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Lower Vaal Water Management Area Strategies

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INTRODUCTION TO STRATEGY TABLES

The first 2 chapters of the Lower Vaal WMA Internal Strategic Perspective (ISP) describe the ISP process, paint a broad perspective of the water situation in the WMA, and describe the key issues that have to be dealt with. The crux of the ISP is located in a series of strategy tables presented in **Appendix A**. The strategy tables for each area present the management objective (what we are trying to achieve); an assessment of the situation along with a motivation as to why the strategy is required; the required actions; responsibilities; priorities; and relevant supporting references. A version control is attached for future versions of this ISP.

Certain issues are clearly applicable to all WMAs in the country and for these a national policy to guide the strategy needs to be developed. These issues and aspects were identified and flagged, during the development of this ISP, for consideration at **National Level**.

The table below provides a brief description of the elements contained in the strategy tables.

Definitions of terminology used in the Strategy Tables

Management Objective	Description of what DWAF is trying to achieve
Situation assessment	Description of the current situation and related issues and motivations to support the management actions.
Management actions (M)	The actions which need to be taken to resolve issues and tasks identified in the situation assessment.

A1. WATER BALANCE AND WATER RESOURCE RECONCILIATION STRATEGIES

A1.1 RESOURCE AVAILABILITY

Management objective:	Ensure reliable estimates of the water resources (surface and groundwater) are available to effectively conduct Integrated Water Resources Management. The factors impacting on the water resources needs to be clearly defined and understood.
Situation Assessment:	**OVERVIEW** The water in the Lower Vaal WMA flows from the Upper Vaal, across the Middle Vaal, Lower Vaal and Lower Orange WMAs before reaching the Atlantic Ocean near the town of Alexander Bay in the western corner of the country. This cascading characteristic of the three Vaal WMAs has the consequence that the water availability in the main stem of the Vaal River is determined by the availability of water in the Vaal River System. In addition, the water availability in the Vaal River will also impact on the water availability of the Orange River in the Lower Orange WMA. This inter-dependency between the Vaal River WMAs, and the roles of the CMA and DWAF National, is described in detail in the Overarching ISP ***[Ref 3]***. A model is in place for the Lower Vaal WMA and there is sufficient hydrology available for this WMA. The water resources availability figures for the Vaal River System as a whole is covered in the overarching ISP and is associated with a high level of confidence. Consequently the water resources availability figures for the main stem of the Vaal River in this WMA also has a high confidence level. There are however uncertainties in water resources availability in the Harts sub-catchment, specifically in Spitskop and Taung Dams. In order to facilitate detail discussions and data representation, the Lower Vaal WMA was divided into three sub-areas, namely the Molopo, Harts and Vaal D/S of Bloemhof Dam. These sub-divisions are similar to those used in the NWRS for comparison purposes. A map is provided in **Appendix B (Figure B2)** illustrating layout of the sub-areas within the Lower Vaal WMA. The Vaal D/S of Bloemhof Dam will be discussed under the Main Stem of the Vaal River and the remaining sub-areas will be discussed under Sub-catchment-specific aspects. **SURFACE WATER RESOURCES** *MAIN STEM OF THE VAAL RIVER* Although the storage basin of Bloemhof Dam lies in the Middle Vaal WMA the full yield from the dam is available for the Lower Vaal WMA. Approximately 500 million m^3 per year is transferred as yield from the Middle Vaal WMA to the Lower Vaal WMA at present. As an upper scenario this figure could increase to 555 million m^3 per year. The Lower Vaal WMA is a component of the extended Vaal River System for which an integrated system's model has been compiled to account for the complex inter - dependencies that exist due to connectivity of the three Vaal WMAs. This model is currently used to assess the available water resources and is referred to as the Water Resource Planning Model (WRPM). ***[Ref 2]*** The existing (February 2003) Integrated Vaal River System Model contains a hydrological database that covers the period 1920 to 1995 (water years) and includes re-calibrated water quality (Total Dissolved Solids - TDS) modules that

were compiled as part of the *Vaal River System Updated Study* (VRSAU) **[Ref 2]**.

Given the comprehensive level of detail of the VRSAU study there is sufficient knowledge and a high level of confidence in the water resource availability and water quality TDS information that is available to provide decision support information for the management of the water resources for the main stem of the Vaal River.

The existing water resource network system covers the entire catchment of the WMA and simulates all the major dams individually. However, certain users and small dams were combined in order to simplify the system configuration. Although these simplifications are acceptable for the purpose of modelling the larger Sub-systems, finer resolution definition network configurations could be required to accurately model water resources availability at a local level. It is proposed that more detailed analysis be undertaken in situations when specific licence applications need to be assessed or where local water supply problems need to be resolved.

As shown in Table 2.4, the return flows in the WMA represents a significant proportion of the total local surface water yield. The biggest portion of the return flows is from the agricultural sector. The impact on the water resource availability in terms of water quality is an important issue that is discussed in more detail in the Water Quality Management Strategy A2.2.

The future volumes and qualities of the return flows are not known at this stage particularly with the implementation of WC&DM and direct re-use of discharges.

This sub-catchment is dominated by the releases from Bloemhof Dam to support the diversion of water from Vaalharts Weir to the Vaalharts Irrigation Scheme. Releases are also made from Vaalharts Weir into the river to support the water requirements of downstream users. Significant quantities of river losses are associated with the releases from Bloemhof Dam consisting of both consumptive (evaporative) and operating losses.

Due to the nature of the open surface conveyance conduits (the Vaal River and canal systems), it is inevitable that significant volumes of losses are incurred in the system. Broadly, the losses consists of consumptive (evaporative and seepage) losses as well as operating losses that are due to the long conveyance conduits. Preliminary assessments indicate that consumptive losses in the Vaal River is estimated at about 80 million m^3/annum and operating losses as much as 100 million m^3/annum. It is noted that these estimations were determined from basic mass balance calculations using readily available flow gauge data and model simulation results. These figures need to be substantiated with higher resolution data and possibly higher resolution modelling in order to improve estimates of the water balance.

SUB-CATCHMENT SPECIFIC ASPECTS

The Molopo sub-area

The Molopo sub-area does not form part of the model for the Vaal River System as drainage of surface water from the Molopo sub-area occurs in the direction of the Orange River and not the Vaal River. Large evaporative losses through pans and wide river beds in the lower Molopo River has the effect that limited flow, only in very extreme flood events, reaches the Orange River. However, flows from the Molopo River have not reached the Orange River in recorded history and the Molopo sub-area is therefore considered to be an endoeric area. The surface water resources in the Molopo sub-area has therefore not been studied

in any detail and it is unlikely that detailed studies will be undertaken in this sub-area as there is an absence of economic activity in the area. However, it is noted that groundwater may be an important resource in this area should the need arise for increased water supply in this area.

Harts sub-area:
Wentzel, Spitskop and Taung dams provide regulating storage in the Harts River.

The Harts sub-area can be divided into 2 sub-catchments, namely:
1. Taung Dam sub-catchment
2. Harts d/s of Vaalharts

Taung Dam sub-catchment
The Taung Dam sub-catchment is characterised by relatively good quality water which can be used for irrigation purposes. It is believed that this sub-catchment has a surplus in water availability but this needs to be verified and appropriately allocated.

Harts downstream of Vaalharts
This sub-area is dominated by irrigation activities of the Vaalharts Irrigation Scheme which generated significant volumes of return flows upstream of Spitskop Dam. The catchment downstream of Vaalharts is highly affected by return flows from the Vaalharts scheme resulting in a high Total Dissolved Solid (TDS) content in the Lower Harts sub-cathment. However this flow (return flows) forms an important resource in the Lower Harts River sub-catchment.

Due to the long and open nature of canals in the Vaalharts system, evaporation and seepage loses are relatively high. It is estimated that these losses are as much as 45 million m^3/annum in the Vaalharts canal system.

The surface water resource availability in the Harts sub-catchment is not well quantified. There is a need to verify the yield at Taung and Spiskop Dams and to consider different allocation scenarios. More detailed hydrological analyses and monitoring of the resources are required to better assess the availability of water in these areas to meet the local water requirements.

GROUNDWATER RESOURCES

General
Groundwater resources are of major importance in the Lower Vaal WMA, supporting the dispersed rural communities and urban centres. Therefore, the management of the groundwater resources is of utmost importance in this sub-catchment. It is very important that yield determinations are undertaken to identify potential groundwater yields to supplement the surface water resources, particularly at a local level.

An understanding of ground and surface water interaction is required, specifically in the heavily-utilised areas of Kuruman and Lichtenburg. There is a possibility that the yield at Wentzel Dam may diminish as a result of development of the Kuruman Eye. However, this can only be verified if the interaction between ground and surface water is better understood.

There is also the potential for deep water groundwater abstraction in the Harts sub-catchment for areas such as Schweizer Reneke. However the availability has not been quantified as yet.

As actual groundwater use generally gives an indication of water resource availability, it is important to note that groundwater is used in this WMA for :
1. Agriculture
2. Mining
3. Domestic use

Refer to Strategy A1.2: Water Requirements for details of these key groundwater users.

Groundwater Quality

The natural occurring water quality in the WMA is generally good in the dolomitic/karstic and fractured/crystalline aquifers. In the western portion of the WMA in the Kalahari group primary (sand/gravel) aquifers and clay formations the quality is often naturally poor with TDS values ranging from 1500 mg/l and higher. Water to the western parts of the WMA are therefore supplied from the Vaal River system.

A better understanding is required of the impact of irrigation return flows on the quality of groundwater resources.

Groundwater monitoring and management

There are a total of approximately 180 monitoring points throughout the Lower Vaal WMA (***See Table 3 in Appendix D***). The monitoring points serve both of the levels of groundwater monitoring, namely level 1 or national monitoring network and level 2 or regional. The monitoring includes water levels and ambient water quality. There are automatic data loggers at some stations. The aim is to expand the network but the required equipment and personnel is currently not available.

The need for data on the availability of groundwater be driven by the need for water in particular areas. Any application for the use of groundwater must be accompanied by a first order study showing that the impact on the water resource is acceptable.

MANAGEMENT ACTIONS		
	M1. Water Balance modelling downstream of Bloemhof Dam is required, taking the following into account: o Quantify and determine the causes of losses and/or illegal water uses that are associated with losses from Bloemhof Dam. (Need improved flow measurements in the system to do this) o Finer resolution modelling (calculations) is required for releases from Bloemhof Dam to the Vaalharts weir to ensure that water is supplied in accordance with the specific requirements of water users in the Vaalharts area. o All elements impacting on the river flow water balance needs to be better understood and quantified.	NWRP (Priority 1) Regional Office (Priority 1)
	M2. The hydrological models and methodologies that should be applied to address the resource availability in areas of the catchment where information is required, will be developed during a pilot study to be undertaken on the Mhlathuze River catchment. o These more rigorous models and calculation methodologies should be used to analyse the resource availability of areas where water resource problems exist. o In the short term, until the above study is completed, the existing WRYM system configurations can be refined when needed to develop local reconciliation options.	NWRP (Priority 1)

	M3. Monitoring information is required at a higher level of confidence to accurately model irrigation return flow volumes and associated water quality. Refer also to **Strategy A.8** : Monitoring and Information Management	Regional Office (Priority 1)
	M4. Determine the interaction between groundwater and surface water, specifically in the Kuruman area, which is located in the Harts river catchment.	Regional Office (Conditional Priority)
	M5. Yield analyses are required for the smaller water supply systems mainly to determine the water availability and to identify shortages and surpluses within these smaller sub-systems. This will be undertaken only on a needs basis or in reaction to licence applications. An urgent need exists for System Yield Analyses in the Harts sub-area in the Wentzel Dam/ Taung Dam area.	NWRP (Conditional Priority)
	M6. Determine the feasibility of deep aquifers as a viable water source, especially for local water requirements in stressed catchments.	Regional Office (Priority 1)
	M7. A groundwater availability map should be updated for the WMA. The map should be used to identify areas where groundwater is available to meet local demands and estimate the volume of groundwater that is available to meet water requirements. If a higher degree of confidence is required in certain areas more rigorous analysis should be undertaken. Groundwater quality should also be considered.	NWRP (Priority 1)
	M8. Guidelines are required for evaluating resource options for issuing of licences for water use from groundwater resources.	NWRP (Priority 1)
Interfaces:	**References:** 1. DWAF report number P WMA 10/000/00/0203. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. 2. DWAF report no : PC000/00/18496 "Vaal River System Analysis Update : Integrated Vaal River System Analysis: 3. DWAF report no : P RSA C000/00/0103 "Vaal River System: Overarching Internal Strategic Perspective.	

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A.1.2 WATER REQUIREMENTS

Management objective:

Ensure that the knowledge base on the water requirements in the WMA is realistic and updated on a regular basis. Furthermore, maintain and update water requirement projection scenarios for planning and management purposes.

Situation Assessment:

Water Requirements:

Information presented in Chapter 2 shows that for the year 2000 development level more than 80% of the total local water requirements in the WMA is for irrigation. Water use by urban centres such as, Kimberley, Lichtenburg, Kuruman, Taung and Vryburg is the second largest water user sector at about 11% of the total.

It is expected that the future water requirements for the irrigation and mining sectors will remain about the same. A small decrease in the water requirements are expected in the domestic sector for the base scenario [**Ref 1**] due to the expected negative growth in the population.

The water requirements (and abstractions) directly from the river by individual users is uncertain and needs to be verified.

The water requirement scenarios currently used for planning originate from the National Water Resources Strategy. The most probable scenario is based on the so-called "**Ratio Method**". In short this method uses the same ratio between the domestic portion and the remaining portion (commercial, industrial and other) as observed in 1995 to project the urban water requirement into the future (see **[Ref. 2]** for a summarised description of the scenario generation method).

Sub-catchment	Water requirements for 2000		
	Local requirement	Transfers out	Total
Harts	494	62	556
Vaal downstream of Bloemhof	113	422	535
Molopo	36	0	36
Total	643	0	643

Source: *Lower Vaal WMA: Overview of Water Resources Availability and Utilisation*

Water use data:

The actual water use data are collated from the different DWAF offices and bulk users on an annual basis and is currently captured in a spreadsheet database. This information is compared with the projected water requirements in order to make adjustments (over the short-term) for use in the annual operating analysis. Actual water use data is not available for the irrigation users that abstract water directly from the river. These irrigation users are mainly located along the Vaal River and are estimated at about 100 million m^3/a **[Ref 3]**. In order to improve the understanding of the operating losses, improved data on the actual water use (or realistic estimates) will be required.

Registration of water use:

This process has largely been completed and the process of verification of actual water use and classification in terms of lawfulness is in progress. Preliminary results indicate that there are large discrepancies between actual water use and registered water use, indicating operating losses and possible illegal use of water.

Situation Assessment:
(Continued)

Groundwater Use:

Agriculture

Agriculture plays a major role in terms of economic development in the WMA. Almost every farm unit in the WMA is dependent on groundwater for domestic use and stock watering. There are however limited abstraction volumes available but in terms of quantities of water, stock farming has a relatively small influence on the regional groundwater resource.

Large-scale irrigation is developed where aquifer types are suitable. Problems encountered at these irrigation areas are over- utilisation of the resources with the associated lowering of water tables.

Mining

There are several mining operations in this WMA. These activities vary from base-metal mining; diamond mining and even limited gold mining in the Kalahari greenstone belt. Groundwater use at most of these sites is limited and should any seepage occur into opencast pits or underground workings, the water is usually pumped and utilized in processes to minimize use of other water sources. This pumping often causes localized dewatering and is most pronounced at Kumba Resources Sishen Mine and at Beeshoek Mine.

Domestic

Several local municipalities are dependent on groundwater as a source of bulk supply. The main aquifers exploited are from dolomites and weathered fractured crystalline rocks such as andesitic lavas and granites. Some of the towns water supply is augmented by surface water supply e.g. Vryburg. The total population dependant on the source in urban areas is estimated to be 140 000 residents. **Table 2** in **Appendix D** gives a breakdown of groundwater consumption estimated for 1996.

Some groundwater utilisation for small rural settlements, takes place in the western portion of the WMA from primary or porous aquifers from the Kalahari group, but the quality and yields are often variable and not good.

Factors having significant impacts on water requirements in this WMA include:

- Current water requirement projections do not account for the impacts of WCDM (see the WCDM Strategy for more details).
- There is a lack of actual water use data for irrigation use. Improved irrigation use data will improve our understanding of operating losses in the system.
- Once the water use has been verified, it should be compared with the data applied in the models. The model database should be updated where appropriate.
- The Department of Agriculture should get involved in education of farmers on efficient irrigation methods. (**See WC/WDM Strategy**)
- Pricing strategy for irrigation needs to create incentives for farmers to conserve water and/or to trade their water. (**See Pricing Strategy**)
- The water use and return flows should be monitored on a continuous basis and checked against the water requirement projections. Appropriate intervention measures should be commissioned if the use differs substantially from the demand.
- The water requirement projections for the WMA should be updated in conjunction with the other Vaal WMAs. This task requires coordination across WMA and will have to be undertaken at a Cluster or National Level.

MANAGEMENT ACTIONS (Water Requirements)		
Required actions, responsibilities and priorities:	**M1.** **(a)** The process of verification of existing lawful use should be completed. **(b)** Comparisons should be made between the lawful use and the water use data applied in the water resource system models.	Regional Office NWRP (Priority1)
	M2. The current practice of annual updates of water use and adjustments to water requirement projections should be continued.	Regional Office (on-going)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. DWAF report no: PC 000/00/22502, "Vaal River: Continuous Investigations (Phase 2), Revision of the augmentation requirements for the Integrated Vaal River System (2001)". 3. DWAF report no : PC000/00/18496 "Vaal River System Analysis Update : Integrated Vaal River System Analysis:	

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A.1.3 WATER BALANCE RECONCILIATION

Management objective:

Manage the water resources to maintain a surplus or balance between the available water resources and the water requirements through progressive implementation of management measures. The aim is to schedule and implement low cost measures first, whereby the most costly measures (usually large capital intensive developments) are postponed.

Situation Assessment:

The following table provides a breakdown of the water balance in each of the sub-areas of the Lower Vaal WMA for the year 2000.

Sub-area	Available water (2000)			Water requirements (2000)			Balance (2000)
	Local yield	Transfers in	Total	Local requirement	Transfers out	Total	
Harts	136	419	555	494	45	539	16
Vaal downstream of Bloemhof	(46)	545	499	65	423	488	11
Molopo	35	4	39	36	0	36	3
Total	125	500	625	643	0	595	30

Note: The figures provided here are different from the figures provided in the Lower Vaal WMA Overview of Water Resources Avaliability – See explanation on page 2-2, Chapter 2 of this ISP

MAIN STEM ASPECTS

The Lower Vaal WMA as a component of the extended Vaal River System has been the subject of various studies in the past, which had the purpose of quantifying the water resources availability and/or evaluating measures to augment the water resources. For more information on the water balance situation in the whole of the Vaal River System please consult the Vaal Overarching ISP document.

The Lower Vaal WMA receives most of its water from the Middle Vaal WMA. There is a total water requirement of 643 million m^3/annum and a total available supply of 673 million m^3/annum. The small excess available in the WMA is due to the irrigation return flows that are not used in the catchment.

In the Lower Vaal WMA, no growth in water demand is expected. However should a demand for high value use occur in this WMA, the conditional surplus that is available in the Vaal River System will be used to supplement local water resources.

The operating losses from Bloemhof Dam is currently benefiting the Douglas scheme in terms of wate quality, that is, if releases/ losses from Bloemhof are minimised, then the water quality at the Douglas will deteriorate.

The reconciliation of the water requirements indicates that there is currently a surplus of 30 million m^3 / annum which is expected to remain relatively constant into the future. Currently surpluses are shown at Spitskop and Taung which need to be appropriately allocated. There is no further potential for the development of local surface water resources although there is potential for development of groundwater resources.

	The water balance currently and in the future is dependent on the transfer of water into the WMA from the Middle Vaal WMA. Water transfers from the Middle Vaal and Upper Vaal WMAs resort under national control. Currently these amount to 500 million m^3/a, and may as an upper scenario increase to about 555 million m^3/a during the period of projection. The transfer of 18 million m^3/a from the Upper Orange WMA to Douglas Weir in the Lower Orange WMA will also remain under national control. Poor water quality from the Upper Vaal WMA and the added salinity of the irrigation in the Lower Vaal WMA has a negative impact on the usability of the water resources. Impacts of alien vegetation on the groundwater resources were identified as a concern. *SUB-CATCHMENT-SPECIFIC ASPECTS* *Harts Sub-catchment:* The above table indicates that the Harts sub-catchment has surplus yield. This surplus is available at Taung and Spitskop dams. At Taung Dam, the water quality is relatively good but Sptskop Dam has poor quality water in terms of TDS. The options available for utilisation of the surplus are: 1. allocate Taung yield for irrigation use by emerging farmers, 2. replace some of the transfer from the Vaal River, resulting in more water being available from Vaal Dam to Rand Water 3. blend Taung water with Spitskop water to reduce the TDS concentration (as an interim measure) The North West Provincial Department of Agriculture has strong initiatives for the yield from Taung Dam. These plans need to be reviewed and supported by DWAF if appropriate for addressing water requirements of emerging farmers. *Molopo sub-catchment* Although this sub-catchment has a small overall surplus, it is known that deficits occur in loaclised areas due to over-abstraction of groundwater. According to Reference **[Ref 1]**, the bulk of the water used in this sub-catchment is from groundwater. Management intervention is required to prevent the over-exploitation of groundwater experienced in localised areas (notably Tosca). De-watering of mines and possible pollution of groundwater through mining activities need to be carefully managed, based on appropriate scientific investigations and compliance monitoring. Consideration should be given to the possible beneficial utilisation of excess water from the de-watering operations. The impacts of farm dams and of invasive alien vegetation on the groundwater resources need to be investigated. Joint management of the trans-border aquifers with Botswana is to be addressed at a national level.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** System analysis is required for the smaller water supply systems mainly to determine the water availability and to identify shortages and surplus within these smaller sub-systems. This will be undertaken only on a needs basis or in reaction to licence applications.	Regional Office (As Reqd.)

	M2. A strategic approach to the allocation of surplus water from the following areas is required : **(a)** Spitskop (possibly allocate to Resource Poor Farmers) **(b)** Taung (possibly allocate to Resource Poor Farmers) **(c)** Groundwater (as required)	Regional Office (Priority 1)
	M3. Conduct discussions with Northern Cape and North West departments of Agriculture regarding the allocation of surplus water, possibly to emerging farmers.	Regional Office (Priority 1)
	M4. Monitor the supply situation through annual operating analysis to ensure that the required management measures are implemented on time.	NWRP (on-going)
	M5. Identify sites where potential exists for future problems due to infestation and direct Working for Water to the most effective targets. Issues at specific sites to be documented.	Regional Office WfW (Priority 1)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203.	

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A.1.4 TRANSFER AND RESERVATION OF WATER

Management objective:	Reserve adequate water resources to support the transfers out of the WMA and secure internal transfers as well as the water supply to existing users within the borders of the WMA.
Situation Assessment:	**Existing transfers into the Lower Vaal WMA *(See Overarching ISP)*:** There is one transfer into the WMA, namely: (a) 500 million m^3/annum from the Middle Vaal WMA. **Existing transfers within the Lower Vaal WMA.** There are three major transfers within the WMA as listed below: 1. The bulk of the water requirements in the Harts Sub-catchment (mainly the Vaalharts Irrigation Scheme) are supplied from the Vaal Downstream of Bloemhof Sub-catchment. 2. The Vaal Downstream of Bloemhof Sub-catchment transfers 5.7 million m^3/annum water to the Molopo sub-catchment through the Vaal Gamagara and Kalahari Water Supply Schemes. 3. Return flows from the Harts Sub-catchment also contributes to the water resources of the Vaal Downstream of Bloemhof Sub-catchment. **Future transfers:** No further transfers are envisaged in the future for the Lower Vaal WMA. However, it is possible (by reversing the existing Gamagara Scheme infrastructure) to augment water resources from groundwater in the Molopo sub-catchment back into the Vaal sub-catchment, if required. As already indicated, if large urban growth is experienced, then water can be allocated from the "conditional surplus". This will constitute an additional transfer.

Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101

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A.1.5 COMPULSORY LICENSING

Management objective:	Ensure equitable sharing of the available water resources for the Reserve and to redress social inequities (both of which have priority calls on water) and activities to maintain the economic and social structures that rely on the water resources of the Lower Vaal WMA.
Situation Assessment:	**Compulsory Licensing Principle:** Considering the three variables (Reserve, Over-allocations and Equity Adjustments), as discussed in the Vaal Overarching ISP, there is no immediate need to undertake a compulsory licencing process for the Vaal River System in terms of: a. Equity b. Water Balance c. Ecological Reserve These principle variables are discussed in detail in the Overarching ISP **[Ref 3]**. In principle, compulsory licesing will only take place if there is a need to address Equity, to ensure that the system is balanced in terms of water availability and requirements, and to meet the need of the ecological reserve, as necessary. **Main Stem Issues:** In terms of water balance, the system has a surplus in terms of water availability and water requirements and any additional water requirements can be made available from the surplus or through releases from the Middle Vaal WMA as a result of the conditional surplus that exists in the Vaal River System. Therefore, in terms of the water balance of the system compulsory licencing is not a priority within this WMA. In terms of the ecological reserve, the economic activities supported by the water resources in the Vaal River System are recognised as the economic engine of South Africa and the Vaal River is considered to be a "work horse" river. However the Ecology of the river should be managed to prevent further degradation and improve areas where unacceptable ecological conditions exists without causing a significant reduction in the water availability (Refer also to the **Vaal River System Analysis Update Study *[Ref 2]*** with regard to Ecological Reserve Management). There are no sensitive areas downstream of the main dams within the Lower Vaal WMA implyng that there is no urgent need for the determination of a Comprehensive Reserve and full implementation thereof. **Sub-catchment Issues:** Although the above status indicates that Compulsory Licensing is not an immediate priority in this WMA, it may be required in selected sub-catchments where specific issues were raised at the workshops, for example, Tosca experiences problems due to over-exploitation of water resources. There have also been reports of groundwater over-utilisation in the Mafikeng area. However it is considered that other interventions (such as verification of lawful use, implementation of WC/WDM, use of groundwater, etc) must be explored to address the specific problems before a compulsory licensing programme is pursued.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1**. Regularly evaluate the priority of compulsory licensing for localised stressed catchments.	Regional Office (Priority1)
	M2. Implement compulsory licensing in Tosca	Regional Office (Priority1)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101. 3. DWAF report no : P RSA C000/00/0103 “Vaal River System: Overarching Internal Strategic Perspective.	

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A.1.6 SUPPLY TO DISTRICT AND LOCAL MUNICIPALITIES

Management objective:	Ensure that local and other authorities have sufficient water resources to supply their requirements and implement measures for efficient utilisation of the available resources. The objective with water supply to local authorities should be to implement economical feasible supply options with acceptable environmental impacts.
Situation Assessment:	**Appendix C** provides a list of all towns within the Lower Vaal WMA and their water sources. **Surface water resources:** • Water is distributed from the Vaal River by pipeline to the towns on the western areas of the Molopo catchment in the Lower Vaal WMA. • The water requirements for the Lower Vaal WMA are considered as part of the water balance of the Integrated Vaal River River System. However, a second supply situation exists where the towns rely partially or fully on local water resources. • There are only two water service providers in the Lower Vaal WMA, the Kalahari East Water User Association and the former North West Water Supply Authority (absorbed by Sedibeng Water). The Kalahari East WUA receives water from Vaal Gamagara and distributes this to farmers in the Kalahari for stock-watering and domestic use. • Schweitzer Reinecker would like to get water from Bloemhof Dam. However, there is groundwater available in this area but specific investigations are required in this regard, specifically in respect of exploring deep aquifers. Funding for this investigation is required and will probably be provided on condition that proper groundwater management plans are in place. • As a general rule DWAF will not initiate new surface water schemes for local authorities unless all other options have been exhausted, such as water conservation & water demand management, exploitation of groundwater, etc. **Groundwater:** It is expected that sufficient groundwater resources are available to supply the needs of small towns. It is however critical that the groundwater resource is properly managed to ensure its sustainability. Where water resources are stressed, the following options must be considered: 1. WC&DM (DWAF can influence but it is a LA responsibility) 2. Investigate local ground and surface water resources 3. Consider trading of water rights 4. Transfers from further afield <u>Water Conservation/ Demand Management</u> An important role that the Department/CMA must pursue is the promotion of effective WC&DM measures amongst local authorities in the WMA. This must be pursued both with the local authorities and water service providers. <u>Investigate Local Water Resources</u> The approach to be adopted with the towns reliant on local water resources, is that the Department/CMA together with Water Service Providers, where appropriate, will give guidance on the approach to follow and the possible supply options that should be investigated. The towns will then apply for a

	licence through the normal channels. In addition, consideration must be given to investigating transfer of water resources from areas adjacent to the towns in question to determine whether water requirements of these towns can be sourced from the adjoining areas. <u>Trading of Water Rights</u> Local Authorities within the WMA can also consider trading of water rights. Water rights can be traded from other users and/or adjacent sub-catchments before consideration is given to augmentation of water from the Vaal River System at full cost.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1**. o A list of municipalities with water supply problems needs to be identified. (Table in Appendix C to be updated). o Enter into discussions with individual municipalities to identify the best solution/s to their water supply problems. o Provide water resource availability assessments for areas where extensions to the water resources are required. The need for this information should be identified in the WSDP development process and the results should be included in the WSDP reports.	Regional Office (Priority 1)
	M2. Promote and encourage the utilisation of groundwater resources for local water supply. Water Service Development Plans and feasibility studies (business plans) should indicate what groundwater supply options were considered for development. This investigation must not be restricted to the boundaries of the specific town.	Regional Office (Priority 1)
	M4. Promote the implementation of WC&WM measures within local authorities. In support of WC/WDM, provide guidelines for the proper operation of boreholes for municipalities.	Regional Office (As required)
Interfaces:	**References** 1. Water Resources Situation Assessment : Lower Vaal Water Management Area. DWAF Report No. P03/000/00/0101.	

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A.2 WATER RESOURCES PROTECTION STRATEGY

A.2.1 RESERVE AND RESOURCE QUALITY OBJECTIVES

Management objective:	A Comprehensive Reserve determination needs to be undertaken for the Vaal River catchment and strategies for implementation developed.
Situation Assessment:	*The following situation assessment has been summarised and adapted from the Overarchng ISP **[Ref 4]**.* The Vaal River and it's tributaries are generally accepted as "workhorse" rivers to support the water requirements of the hub of South Africa's economy. As indicated in the Vaal Overarching ISP report, the Vaal River Catchment has sub-catchments whose natural flow and water quality regimes are significantly changed from natural conditions, whilst others are close to natural. The impacted river systems in the Vaal River catchment are highly regulated by major and small dams. The natural flow patterns in many of these river reaches have been substantially modified by return flows from wastewater treatment plants, mine dewatering, agricultural return flows and releases of water from transfer schemes into the river systems. It is expected that the ecosystems have largely adapted to the changed flow and water quality regimes. There are also substantial areas of the Vaal River catchment where land use development is low and the flow patterns are therefore largely unimpacted. A Comprehensive Reserve has not been determined for the Vaal River Catchment. However, as part of the VRSAU study an Environmental Flow Management Plan was developed for the main stem of the Vaal River **[Ref. 3]**. The products from the study were basic definitions of flow requirements and preferred operating regimes. Currently applied reservoir release and transfer operating rules do not explicitly contain the flow requirements defined in the abovementioned study. Furthermore, the Resource Directive Measures (RDM) Directorate is also determining low confidence desktop estimates of the Reserve for catchments where it is needed for the issuing of licences. The water resources of the Vaal River System are augmented by transfers into the catchment from other WMAs. The Reserve still needs to be determined for many of the catchments supplying the Vaal River System. The implementation of these Reserves and the Vaal River System Reserve will affect water availability in the Vaal River System. The impact of the implementation of the Reserves for the various augmentation schemes in the Vaal River System will have to be derived and an implementation schedule determined. The current operating rules of the Vaal River System has been applied for a long time without having major negative effects on the ecology. (No serious ecological problems were highlighted at the workshops). An environmental Flow Management Plan has been developed for the main stem of the Vaal River and the implementation thereof will be an overarching function for the National Department **[Ref 3]**. Given the above-described situation, there is no urgent need to implement the Reserve in the Lower Vaal WMA. However, in areas where compulsory licensing is being considered, there may be a need to determine the reserve, for example, in the Tosca area.

	At present, a formally published river classification system for the ecology does not exist and a national system is currently being developed. None of the rivers in the Lower Vaal WMA have Water Quality Objectives in place. These are urgently required for proper management of the quality of water in the Lower Vaal WMA. *The following requirements and guidelines have been identified in terms of Resource Directed Measures at the ISP workshops :* **1.** Reserve determination investigations are required for the following purposes: • To determine the share of water availability required for the Reserve. • For issuing of licences. • To determine when the next large augmentation scheme has to be implemented. **2.** It has been identified that the planning activities for the implementation of the Reserve in the Integrated Vaal River System should be undertaken across WMA boundaries (as described in the **Overarching Vaal ISP, Strategy A.2.1 : Reserve and Resource Quality Objectives**). This approach is necessary to ensure the combined impact of the Reserve in the different water resources (located in different WMAs) is taken into consideration in the Reserve determination process. **3**. The impact of the revised EWR's on the supply capability of the Integrated Vaal River System needs to be determined. This issue is addressed in the Overarching ISP. (See **Strategy Table A2.1 : Reserve and Resource Quality Objectives**). **4**. In most instances a rapid reserve determination must be carried out while an intermediate reserve will be undertaken only in selected areas. **5.** Groundwater reserve table is available from the Directorate : Resource Directed Measures. The Directorate : Resource Directed Measures has developed a database of all areas where groundwater Reserves have been determined. This information should be used to direct the procedure that has to be followed when assessing licence applications.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1**. The time schedule for determining the Comprehensive Reserve is needed for the Vaal River. A committee needs to be established to assess if the Reserve for the entire catchment and or system needs to be determined or only sections of the catchment and when should this determination take place. This determination should be co-ordinated with catchments augmenting the Vaal River System and the determination of the Orange River Reserve. It is dealt with in the **Vaal River Overarching ISP**.	NWRP (Priority 1)
	M2. Water Quality Objectives for all rivers in the Lower Vaal need to be set.	Regional Office (Priority 1)

Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101. 3. DWAF report no : PC000/00/18496 "Vaal River System Analysis Update : Integrated Vaal River System Analysis. 4. DWAF report no : P RSA C000/00/0103 "Vaal River System: Overarching Internal Strategic Perspective.

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A.2.2 WATER QUALITY MANAGEMENT STRATEGY

Management objective:	DWAF is responsible for the management of South Africa's water resources in a sustainable manner. This implies that in its pursuit to stimulate development and socio-economic growth, that there will be a negative water quality impact on our environment. The main objective is therefore to ensure a sound and reasonable balance between development impacts and the protection of the resource. Fitness for use by all users (especially downstream users) and protection of the natural ecosystems is an important management objective.
Situation Assessment:	The water quality situation in the Lower Vaal WMA is discussed in terms of the main stem of the Vaal River, which runs through the WMA and the tributaries discharging to the Vaal River. **Vaal River Main Stem** The Vaal River catchment is a cascade of three WMAs. The water quality of the main stem of the Vaal River in the downstream WMAs is therefore impacted on, not only by the activities in the WMA itself, but also by the water received from upstream. The water quality in Vaal River will also impact on the water quality of the Orange River in the Lower Orange WMA. A water quality management strategy can therefore not be developed in isolation for individual WMAs but the entire Vaal River System will have to be considered in an integrated manner. Integrated Water Quality Management Plans will therefore be developed for the Vaal and Orange Rivers. The management actions related to the development of these plans are discussed in the **Vaal and Orange Overarching ISPs**. The approach adopted by the Department of Water Affairs and Forestry in managing the water quality in the Vaal River catchment is to set water quality objectives (WQO) for the sub-catchments. The WQO are based on the water user requirements in the catchments. The WQO includes three categories of water quality variables, viz. ideal, tolerable and unacceptable. A phased approach has been adopted for the development of strategies to manage the water quality in the sub-catchments of the Vaal River Catchment. The first phase is a situation assessment, which is followed by further phases to develop catchment management strategies. The approach adopted for the management of the water quality in the WMA is on a sub-catchment basis. Water Quality Management Strategies (WQMSs) need to be developed for the individual sub-catchments, where necessary. These plans involve the setting of water quality objectives (WQO), identification of pollution sources, modelling and the development of management actions. These plans for the individual areas need to be linked to an assessment of the overall water quality management of the Vaal River. According to the limited analysis carried out as part of this WRSA study, the water quality in the Vaal River is reasonable. However, the water quality in the lower Harts River is marginal due to saline return flows from the Vaalharts irrigation scheme. Water quality management will have to intensify in future with the aim of protecting the water resource to ensure utilisation under growing urban, industrial and coal mining land use activity. The impacts of pollutants such as Microbiological organisms, Nutrients and Salinity on the Vaal River System have been quantified and monitored to date. The downstream effects of these pollutants on the Vaal River System are water quality issues to be considered. **Harts Sub-area** The water quality in the Harts River is affected by concentrating the salts in the return flows from the irrigation schemes in the catchment and by evaporation while the return flows from the Vaal Harts Scheme are stored in the Spitskop Dam. The

TDS concentration of the intake water to the Vaal Harts Scheme is generally good and ranges from 250mg/l to 350 mg/l.

The salts in the return flows from the Vaal Harts Scheme are concentrated to about 1000mg/l to 1500mg/l. There is a further concentrating of salts in the Spitskop Dam due to evaporation. Once back in the Vaal River, the salinity load is diluted before being used in further irrigation schemes downstream in the Lower Orange River. Water quality problems have been reported at the Douglas weir.

A salt mass balance has been undertaken for the Vaal Harts Irrigation Scheme. Not all the mass could be accounted for. A recent study undertaken by the IGWS showed that there is an increase in TDS concentrations in the groundwater at the Vaal Harts irrigation scheme. This increase in groundwater concentration could explain the unaccounted for mass.

In addition to the concentration effect in the return flow, fertilisers are also applied, which add to the nutrient load in the return flows. The nutrients have resulted in the growth of algae in the Spitskop Dam. The Spitskop Dam has been cited as the source of algae, in particular blue green algae found in the main stem Orange and Lower Vaal WMA.

The above situation points to the need for pro-active management of the Harts River sub-catchment with particular focus on the Vaal Harts Irrigation Scheme. This may include a review of the drainage system to also address the possibility of a rising water table (See Management Action M1 below).

In addition, due to the interdependencies of the water quality in the different WMAs, an integrated water quality management tool modelling nutrients and salinity is needed to allow for the development of an integrated water quality management plan for the Vaal River catchment.

Molopo Sub-area

The Morokweng area currently experiences problems with the quality of groundwater. Nitrate pollution from agriculture and sewage pollution from domestic sources are evident in the area. The effects of nitrate pollution and domestic sewage on groundwater in the Morokweng area need to be curbed. It is important that the groundwater protocol is adhered to and good farming practices are implemented to protect the quality of groundwater resources. It is noted that the reserve will need to be determined if compulsory licensing to be pursued.

WMA Issues

Mining-related issues

There are extensive diggings in parts of the catchment which impact largely on the river courses. Sections of the Harts River upstream of Taung Dam are severely impacted on by digging activities, which causes sedimentation. An approach needs to be developed to manage the diamond diggers.

The mines in the WMA could also be impacting on groundwater quality. There is however very little monitoring data available to determine the extent of the groundwater pollution.

Municipal Sewage Treatment Issues

Many of the sewage works and sanitation systems of the towns in the WMA are inadequate and are in a poor state. The reasons for this are both poor management and the overloading of the plants and reticulation systems. The overloading is sometimes due to the replacement of pit latrines with water borne sewerage

	systems without upgrading the sewage works. This results in the overloading of sewage plants and the consequent discharge of poor quality effluent into the downstream rivers. Problems in meeting required water quality standards from the Bloemhof, Christiana and Warrenton sewage treatment works was identified as a problem that impacts on the water quality in the Vaal River. The reason cited for the problem is the lack of capacity at municipalities and the need for integrated planning with regard to the installation of waterborne sewerage systems and the associated upgrading of sewage treatment plants. It has been proposed that the Municipal Infrastructure Grant (MIG) Funding programme should be used to address this problem.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1** A water quality management strategy needs to be developed for the Harts River. The WQMS should include the setting of WQO's, management systems on irrigation schemes and the use of surplus water in the catchment.	Regional Office (Priority 1)
	M2. An integrated water quality management plan needs to be developed for the Vaal River System. The terms of reference for the study need to be developed. (Refer to the Over-arching ISP for the Vaal River)	NWRP (Priority 1)
	M3. The Environmental Management Plan Report (EMPR) and licensing process should be used to ensure monitoring and reporting is practised by the mines on groundwater.	Regional Office (on-going)
	M4. The EMPR and licensing process, together with best practice guidelines from DWAF, should be used to manage the "diggers".	Regional Office (on-going)
	M5. More stringent controls over municipalities are required to prevent the occurrence of sewage overflows and spillage. Funding and control of the problem should be addressed through the MIG programme.	Regional Office (on-going)
	M6. An education/communication campaign is required to make farmers aware of the negative impacts that poor agricultural practices can have on groundwater.	Regional Office (Priority 1)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101. 3. DWAF report no : P RSA C000/00/0103 "Vaal River System: Overarching Internal Strategic Perspective.	

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A.3. WATER USE MANAGEMENT STRATEGY

A.3.1 GENERAL AUTHORISATIONS & SCHEDULE 1 STRATEGY

Management objective:	To optimise the use of these authorisations with a view to cutting down on unnecessary administrative efforts of water use activities that can be allowed without individual water use licences. Both the DWAF and the users falling in the General Authorisation category would save resources (time and money) by not having to apply for and process licenses for certain water use activities.
Situation Assessment:	**General Authorisations** The local water resources in the Vaal River System is limited with the result that local water resources are augmented by large scale transfers from the Thukela–Vaal Scheme and the LHWP. Consequently there are no general authorisations for the following water uses: Abstraction of surface water along the main stem of the Vaal River Abstraction of water from Bo-Molopo Groundwater Scheme In terms of Section 39 of the NWA, General Authorisations are permitted for the following in the Lower Vaal WMA **[Ref 1]**: a. Surface water abstraction, at a maximum rate of **6000m^3** per hectare per annum for irrigation or **100m^3/day** for uses other than irrigation, in quaternary catchments C31A,B,C,D,E,F, C32A,B,C,D, C33A,B,C, D41B,C,D,E,F,G,H,J,K,L,M, D42C, D73A,C. (See **Appendix B** for Map indicating quaternary catchments). b. Groundwater abstraction, at a maximum rate of **60m^3** per hectare per annum, in quaternary catchments C31F, C32A,B,C, C91A,B,C,E, D73A. c. Storage of up to 50 000m^3 water provided that storage exceeding 10 000m^3 is registered. d. Groundwater abstraction, at a rate of **300m^3** per hectare per annum, in quaternary catchments C31A,B,C,D,E, C32D, C33A,B,C, C92A,B,C. e. Irrigation with wastewater of up to 500 m^3/day provided that rirrigation with wastewater exceeding 50m^3/day is registered , except within the Bo-Molopo Groundwater Scheme located in drainage region D41, where irrigation with groundwater is prohibited. f. Treated effluent up to a maximum of 2 Ml/day is permitted provided that certain quality limits and monitoring requirements are met. g. Disposal of domestic sewage up to 1Ml/day provided that certain conditions and limits are satisfied, except within the Bo-Molopo Groundwater Scheme located in drainage region D41. h. Removal of groundwater (for purposes such as mining) up to a maximum volume of 50 Ml/day. All other activities are not covered by general authorisations but applications are currently being considered to permit GA's for the following: a. Impeding or diverting flow up to certain limits. b. Altering the shape of the river bank (with limits). The following requirements have been identified in terms of General Authorisations*:* **1**. Smaller feed lots need to be included under General Authorisations. The

	bearing capacity of the property needs to be taken into account. There is currently a process underway at a National Departmental level to develop the criteria for this water use. **2.** General Authorisations need to be reviewed on a regular basis. **3.** Pick and shovel diggers on the Vaal main stem should be allocated water not exceeding 9170m^3 per hectare per annum. This provision should be renewed annually. In conclusion, it is recommended that the responsibility for the reviewing and future publication of General Authorisations should be the function of the CMA, currently the Regional Office. The implementation of this delegated responsibility is currently being considered by the National Department for application in all WMA's.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Refine the conditions specified for General Authorisations to incorporate the abovementioned requirements and other necessary adjustments.	Regional Office (Priority 1)
	M2. Water use in the WMA should be monitored to ensure that water uses without licenses do indeed fall in the General Authorisation categories. (Also see Strategy A.8 : Monitoring & Information Management)	Regional Office (Priority 1)
Interfaces:	**References** 1. General Authorisations in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998). Government Notice No. 1352 dated 12 November 1999. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101.	

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A.3.2 LICENSING STRATEGY

Management objective:	Licensing of water use (as defined in the National Water Act) should be considered on a continuous basis when applications are received. The licences should be considered in accordance with the framework as presented below:
Situation Assessment:	Although there is little or no growth expected in this WMA an important water resource issue facing the WMA is the licensing of current water users and the licensing of water discharges (e.g. urban effluent returns, mines decanting ground water etc) into the surface water system. This issue needs to be resolved as the issuing of new licences is dependent on whether existing and future water resources can meet the existing and future requirements as well as ecological and social reserve requirements. It is recommended that a study to compile a comprehensive and reliable licence database be undertaken as soon as possible. Verification of water use in the Lower Vaal WMA is yet to take place. There are current plans to verify water use along the main stem of the Vaal River but the process has not yet started. **Considerations for water user licences:** Due to the "conditional" excess water available in the Vaal River System (see **Strategy A.1.3**) the issuing of licences for water abstraction could be considered under specific conditions as indicated in the Overarching ISP **[Ref 1]**. This opportunity for new licences is made possible only as a result of the transfer of water into the system, which implies that the full cost of the water will have to be charged for the intended user. Because water is transferred into the system and is available not only to users in the Vaal WMAs, but also to users in other WMA's, the allocation of the surplus will remain under DWAF's national control. *Directives and guidelines to apply when evaluating new licences to be allocated from the conditional surplus (Refer to Overarching ISP **[Ref 1]**)*: • Existing lawful use must be verified. • No new licence application will be considered unless water conservation and demand management is satisfactorily practiced and proved. This will apply to all users. • An applicant with indirect access to transferred water will be able to receive a licence for water abstraction at a cost to be determined by the impact of the abstraction on the water resource. • An applicant will be able to receive a license for water abstraction at the applicable pricing structure provided that one can prove the availability of the resource. • Water quality impacts of any new licence must be considered. • When the trading of water rights is considered, the net impact of the water users involved needs to be taken into consideration . The existing trading policy on in- sectoral trading should be applied. A draft trading policy and mechanism has been developed for inter sectoral trading and across WMA trading, and is awaiting approval from the Director General. • Included in draft trading policy is that trading of water rights should only be

	allowed in cases where the water resource is clearly shared by trading users and, should they have different reliability requirements, that they be based on equal impact on the water resource. • The allocation of water needs to be reviewed and amended to ensure the optimal allocation and beneficial use is being maintained. A process needs to be set up and reviewed after 5 years.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Apply the administrative and principal licensing rules as outlined in the situation assessment above.	Regional Office (Priority 1)
Interfaces:	**References** 1. DWAF report no : P RSA C000/00/0103 "Vaal River System: Overarching Internal Strategic Perspective. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101.	

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A.3.3 PRICING STRATEGY

Management objective:	Implementation of the water resource use charge as well as other types of charges (e.g. polluter pays charges) as a means of funding water resource management and development in future.
Situation Assessment:	DWAF has established a "Pricing Strategy for Raw Water User Charges" which sets out procedures for determining and implementing charges for water resource management, development of water works and charges for economic incentives and/or disincentives in order to promote the equitable and efficient allocation of water. DWAF is currently developing a waste discharge charge system. This system needs to explore different tariffs for different catchments or rebates for downstream catchments that are affected by waste discharges from upstream catchments. These tariff adjustments will be incorporated into the Pricing Strategy which is currently being updated.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Continue implementing the National Pricing Strategy which will finance necessary water resource development and activities of WMAs on a sustainable basis, encourage greater efficiency of use and facilitate the provision of affordable basic services to everyone.	Regional Office (Priority 1)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101.	

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A.4 WATER CONSERVATION & WATER DEMAND MANAGEMENT STRATEGY

Management objective:	1. To improve efficiency of water use by developing and implementing targeted measures to monitor and control water use efficiency. 2. To make more effective and efficient use of the existing available water resources in all water user sectors. This will enable the Catchment Management Agency (and indeed DWAF) to conserve this scarce resource and avoid expensive schemes for transfers and storage when these may not be necessary if demand is properly managed.
Situation Assessment:	**General** Evidence of inefficient water usage can be found in all water use sectors throughout the country and the value of water seems largely unrecognised by many water users. South Africa is a developing country that is water stressed and requires improved management of its limited water resources. The implementation of water conservation and water demand management principles is essential in meeting the national goals of basic water supply for all South Africans and the sustainable use of water resources. Based on experience elsewhere in South Africa an overall sustainable reduction in water use of up to 25% can be expected without having a detrimental effect on users. **Municipalities** As urban/industrial uses is a relatively small component in this WMA, Water Conservation and Demand Management Programs or strategies for urban centers would have a small impact on the overall water resources in the WMA as a whole. However, focussed WC/WDM initiatives could have significant impacts in some of the localised sub-catchments. The benefits of introducing WC&DM measures are with respect to improving local availability, postponing capital expenditure (to extend bulk distribution systems), reducing water supply operating costs and (potentially) decrease the costs of wastewater treatment due to lower volumes of return flow. These factors have a direct benefit to the financial situation of municipalities implying that WC&WDM must therefore be promoted in this WMA. There are currently several initiatives by Local Authorities and Service Providers around the country to implement Water Conservation and Demand Management (WC&DM) measures and it is perceived that large savings could be achieved in the gross demand of the urban sector. These programs need to resolve issues related to conveyance losses, to Unaccounted for Losses, to re-use and to return flows. These programs must include surface water and groundwater pollution mitigation strategies that will require monitoring by the CMA. The programs should set best practice norms and minimum requirements.

	Agriculture Irrigation is the main water user in this WMA and. The agricultural sector is the largest consumer of water in the Lower Vaal WMA with irrigation accounting for a large portion of water use. It is therefore important that water conservation and demand management should be focussed on this user group to obtain maximum savings. Farmers should be encouraged to: • Conserve water by implementing WC&DM measures. • Use allocations beneficially for agriculture. • Sell unused allocations of water. Significant savings can also be obtained by reducing conveyance losses in canals, proper irrigation scheduling, metering and pricing of irrigation water and the improvement of irrigation systems. **Mining** A DeBeers mining operation in Kimberley has expressed the need for further water allocation. Currently the option of indirect use of treated wastewater discharged into a pan is being investigated. This practice is considered to be a sound water conservation/ water demand management measure and should be encouraged in al municipal areas.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** In the Over Arching ISP the need was identified for a study to determine how the projected water requirements and return flows would be affected by WC&DM measures.	NWRP (Priority 1)
	M2. Creating awareness of the benefits of WC&DM measures among Local Authorities as well as at the various Forums that are active in the Vaal River System.	Regional Office (Priority 1)
	M3. WC&DM must be promoted in the agricultural sector. Farmers must be encouraged to save water by demonstrating to them that WC&DM has several benefits for them. (eg. increase in irrigation area with same quota or trade their water savings.)	Regional Office (Priority 1)
	M4 For effective WC&DM measures to be implemented, reliable information on conveyance losses is required. With this information it would be possible to set initial targets for WC&DM. *(Refer also to Strategy A.8 : Monitoring and Information Management)*	Regional Office (Priority 1)
	M5. Applications for abstraction licences must demonstrate Water Conservation and Demand management initiatives and the first priority of solving water deficit problems should be to implement WC&DM. Augmentation options should only be considered if it is proved that WC&DM will not improve the situation.	Regional Office (Priority 1)
	M6. Identify areas where alien vegetation needs to be removed for highest impact in terms of conserving water.	Working for Water (Priority 1)

Interfaces:	**References** 1. Water Resources Situation Assessment : Lower Vaal Water Management Area DWAF Report No. P03/000/00/0101. 2. DWAF Report no : P RSA C000/00/0103 "Vaal River System: Overarching Internal Strategic Perspective.

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A5. INSTITUTIONAL DEVELOPMENT & SUPPORT MAIN STRATEGY

A.5.1. LOCAL AND CATCHMENT LEVEL STRATEGY

Management objective:	The Regional Office (as the interim CMA) needs to take institutional control of all Water Resource Management functions and will be supported by DWAF Head Office Directorates. Their main objective is to responsibly manage the water resources of the Lower Vaal WMA in the interim until such time as the Catchment Management Agency can take over some of the functions.
Situation Assessment:	**General** There are 3 sub-areas in the Lower Vaal WMA, and no established catchment management forums are present in the area. Forums are generally established on a project/study basis and dissolved on completion of the project/study due to lack of interest. These forums are normally made up of interested and concerned citizens, as well as the major water users, and play an active role in the practical review and implementation of the various water resource management issues in the catchments. Problems with representivity at these forums generally threaten their effective existence. It is proposed that these forums are established on a district municipality or WSA basis to ensure continuity in its activities. Institutions at District and Local Municipal level are relatively new on the scene and water resource and water service capacity is slowly being built in these institutions. The responsibilities of WSAs and CMAs are currently being debated with a position paper being prepared by SALGA. Liaison between the various institutions needs to be encouraged in the interest of integrated water resources management in the Lower Vaal WMA. Government water schemes (GWS) have recently been transformed to Water User Associations. This process will continue and these institutions will fulfil their roles in line with the NWA , WSA and the NWRS. The situation with the current water user association must be assessed. There are currently no forums established in the WMA, however the Regional Office is in the process of first consulting with the water use sectors, including the district and local municipalities, agricultural unions and tribal authorities, regarding water issues.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Continue assisting SALGA and CBO's in the establishment and empowerment of the local water resource management authorities. More support (especially basic financial support) needs to be considered to the founding of forums, since they fulfil a key role in the establishment of these institutions. Promotion of these forums is crucial in order to ensure that the forums are representative of all the role players / stakeholders in the catchment.	Regional Office (Priority 1)

Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area, DWAF Report No. P03/000/00/0101.

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A.5.2. POVERTY ERADICATION

Management objective:	The main objective is to contribute to the eradication of poverty through the provision of basic Community Water Supply and creation of employment in developing Community Water Supply and Sanitation Infrastructure. Due to the mostly rural composition of the population and dependence on agriculture, make specific allowances for irrigation water to resource poor farmers.
Situation Assessment:	DWAF has identified the need to implement programmes to eradicate poverty as part of government's overall objective of addressing poverty in South Africa. The Department is attempting to achieve this by making water easily available to poor communities/ farmers, and in many cases redressing imbalances in water allocations. There are certain schemes that have been initiated but need to be revitalised, particularly the Taung Scheme in the Lower Vaal WMA. It is evident that these schemes need to be coordinated with other relevant authorities, such as the Department of Land Affairs and the Department of Agriculture, in order to ensure the successful implementation of these poverty eradication initiatives. To this end the recently established Coordinating Committee of Agricultural Water (CCAW) should be made aware of the potential excess water in the WMA and assistance to Resource Poor Farmers should be promoted through this forum. The exact amount of water available for this purpose should, however, first be determined through detail water resource assessments. The utilisation of sustainable groundwater resources for food gardens, particularly in rural areas, should be encouraged and DWAF will continue to assist other government departments with those initiatives. In this regard, the following requirements to alleviate poverty have been identified : **1.** The Department must identify opportunities (specifically groundwater as well as water from Taung and Spitskop dams) and facilitate the transfer of water rights from the commercial irrigation sector to RPF. **2.** The Department of Social Services and the Department of Agriculture should be contacted to find out if they have any plans, which the Department can support. In addition, DWAF needs to give assistance in terms of making available information on water availability in certain catchments. **3.** Resource Poor Farmers need to be encouraged to form WUAs in order to obtain subsidies from DWAF. 4. Implement standard poverty eradication principles in the managing and administrating of water supply schemes funded by DWAF. 5. Poverty Eradication should be included, as far as possible, in any new developments funded by DWAF.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Actively pursue the implementation of sustainable poverty eradication initiatives in the process of providing water supply and sanitation systems in rural areas.	Regional Office (on-going)
	M2. If poverty eradication schemes are shown to be feasible, the Department should encourage and facilitate the submission of the necessary licence applications and formation of the required institutional structure early in the process.	Regional Office (on-going)
	M3. Collaboration with the Departments of Land Affairs and Agriculture in terms of schemes relating to Equity farmers.	Regional Office (Priority 1)
	M4. Encourage RPFs to associate with or form WUAs in order to qualify for subsidies and incentives in the pricing policy.	Regional Office (Priority 1)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area, DWAF Report No. P03/000/00/0101.	

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A.6. ENVIRONMENTAL STRATEGY

A.6.1. ENVIRONMENTAL MANAGEMENT STRATEGY

Management objective:	Ensuring that there is a balance between the need for development (i.e. including all activities undertaken by DWAF) and the need to protect the natural and social environment for the benefit of all.
Situation Assessment:	DWAF has been very proactive over the years regarding the institution of international best practice in the field of Integrated Environmental Management. The Directorate: Water Abstraction and Instream Use has recently published the Department's Environmental Implementation and Management Programme and is currently developing specific strategies to implement processes that will take due consideration of all impacts that water resource and other water management activities will have on our broader environment in which we live. There is a current drive to determine the Reserves and Resource Quality Objectives of all rivers in the WMA in order to facilitate the licencing process as well as effective water management. There is also a need to operationalise the Reserve and Resource Quality Objectives once they have been determined. In addition, water resources management calls for certain developments that have an impact on the environment (whether positive or negative). These environmental impacts need to be understood and addressed where necessary. Wetlands, in particular, need to be accorded more attention as they form a vital link in the sustenance of natural life and can act as water quality filters. Therefore all the environmentally sensitive areas in the Lower Vaal WMA needs to be identified and a clearly described in order to place Water Resource Managers in an informed position when evaluating current and future developments in these areas. In an effort to properly manage the environment, all the mines are forced to have an EMP in place for their on-going operations as well as for mine closures. EMPs are also required for the small diamond digging operations. The lack of waste management and licensing in the areas of Warrenton, Schweizer Reneke, Amalia, Danielskuil, Bloemhof, and Christiana is worrying as the effluent from these unmanaged waste sites is harmful to the environment. These are arguably the most serious environmental impact considerations in the catchment. These include: • solid waste and wastewater seeping into the river system from urban areas; • overgrazing and silting; • effluent return flows and salination of water sources; • groundwater pollution from rural settlements and industrial/agricultural activities; • positive and negative aspects of poverty eradication efforts; etc.

	The following actions are required in terms of environmental management in the Lower Vaal WMA: • Proper receiving stream mitigation planning needs to be undertaken in future in cases where water is transferred into small river systems • Solid waste management in the area must be investigated to identify problem areas for improvement and upgrading. • Removal of alien vegetation is vital in the Kuruman River as the river system is blocked with the potential that a flood will result in a change in river course. • Monitoring of activities that have an impact on the environmental. • Barberspan, located in the C31D quaternary catchment in the Harts River catchment is a declared RAMSAR site and should be managed to maintain its current ecological function. • The Kuruman and Polfontein Eyes located in the Molopo sub-catchment re potentially vulnerable water resources which requires judicious utilisation and management practices.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Identification and a clear description of all the environmentally sensitive areas (especially wetlands) in the Lower Vaal WMA needs to take place in order to place Water Resource Managers in an informed position when evaluating current and future developments in these areas. Typically the available resource needs to be quantified and the water quality situation has to be described.	Regional Office (Priority 1)
	M3. Co-operative governance and institutional aspects: Authorities should provide an enabling environment to promote economic growth as well as to protect the environment for the benefit of all life forms in the catchment. A communication strategy needs to be developed that allows for optimum governance in this regard. Innovative forms of communication to meet the needs of overloaded officials need to be implemented. Alignment with other laws and policies (eg NEMA) needs to be carried out.	Regional Office (On-going)
	M4. Environmental Impact considerations need to be monitored and actions co-ordinated to ensure a sustainable environment.	Regional Office (On-going)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area, DWAF Report No. P03/000/00/0101.	

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A.7 WATER SUPPLY INFRASTRUCTURE DEVELOPMENT & MANAGEMENT STRATEGY

A.7.1 INFRASTRUCTURE DEVELOPMENT & SUPPORT STRATEGY

Management objective:	Provision of adequate water resource development infrastructure (storage) and bulk water supply infrastructure to sustain and encourage social and economic growth.
Situation Assessment:	**General** There are no major industries or operational power generation facilities in this WMA The primary economic activity in this WMA is mining and agriculture, with livestock farming being the most important agricultural activity **[Ref 1]**. The general trend in the Lower Vaal Water Management Area is the continued concentration of economic development and population in the urban centres and mining districts, and a decline in rural population. Mining water requirements have also decreased due to a general decline in mining activity in some areas and more efficient water use by mines in other areas. The net result is an expected decline in water use in the catchment. The Lower Vaal WMA is part of the Vaal River System. This system is supported by water supply infrastructure located in surrounding WMAs and countries. Any future growth in the water requirements of the Lower Vaal WMA will be met by transfers. The planning of the future infrastructure development and implementation is discussed in detail in the Vaal and Orange Overarching ISPs. For details these reports should be consulted. **Planning approach:** A holistic planning effort will be required to identify the optimum bulk water storage and supply infrastructure layout that will make optimal use of the local water resources in the Lower Vaal WMA. This needs to be done in conjunction with the National Water Resources Planning Directorate. This is essential to ensure that control of national water resources is not in the hands of a WMA. Operational issues relating to blending, releases, etc. are overarching in nature and therefore should be controlled by National Government. The operation and management of local resources, such as tributary dams and groundwater resources, will be the responsibility of the CMA. There are currently no plans for further dams or large pipelines in this WMA. Infrastructure will be restricted to the operational level, eg. Construction of weirs, monitoring stations, etc. to improve system operations.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1**. It is required to regularly review the augmentation requirement of the Vaal River System, particularly when information is received that the water balance is negatively affected. (Refer to Vaal Overarching ISP)	NWRP (On-going)

Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area, DWAF Report No. P03/000/00/0101.

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A.7.2 SYSTEM MANAGEMENT STRATEGY

Management objective:	Implement system management measures to optimally utilise the available water resources, in terms of short-term benefits and to maintain the reliability of supply over the long-term. The aim is to postpone the need for the development of new costly infrastructure for as long as possible into the future while saving operating costs over the short-term.
Situation Assessment:	***Vaal Main Stem*** This cascading characteristic of the three Vaal WMAs has the consequence that the operational requirements of the main stem of the Vaal River is impacted on by the operations in the Vaal River System. In addition, the strategic operations in the Vaal River will also impact on the water availability and operational requirements of the Orange River in the Lower Orange WMA. Due to this inter-dependency it was identified that the current process of managing water at sub-catchment level should be expanded to integrate management activities across sub-catchments to meet shared water resources in the main stem of the Vaal River. Operational issues relating to blending, releases, etc. are overarching in nature and therefore should be controlled by National Government, with the necessary collaboration with CMAs. ***Sub-catchment Issues*** The operational requirements of the tributaries, including Wentzel, Taung and Spitskop dams, will be managed by the CMA as a local resource. **Vaal Downstream of Bloemhof** Problems are currently experienced at Bloemhof Dam in terms of water levels being lower than the lowest model projections. It is also important to note that although Douglas is not located within the lower Vaal WMA, Douglas benefits from the operating losses at Bloemhof Dam in terms of water quality. Should these operating losses be reduced, then the water quality situation at Douglas will deteriorate. Douglas does, however, have access to Orange River water, which has a cost consequence as water from the Orange River will need to be pumped to Douglas.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Undertake annual operating analysis to determine the operating rules to apply as defined in the Situation Assessment Above (overarching strategy).	NWRP (Priority 1)
	M2. Document and implement drought allocation rules for Vaal River tributaries, Specifically Taung and Spitskop dams. This will result in restrictions in supply during drought periods. (Vaal main stem will be done by NWRP)	Regional Office (Priority 1)
	M3. Investigate hydraulic modelling to control system losses.	Central Cluster (Priority 1)

	M4. Alert local authorities to the proper management of their groundwater resources. Management guidelines for groundwater use have been developed through the NORAD project and these guidelines should be used by municipalities.	Regional Office (Priority 1)
	M5. Monitor the supply situation through annual operating analysis to ensure that the required management measures are implemented on time.	Regional Office (on-going)
	M6. Promote and encourage the correct utilisation of groundwater resources for local water supply, including borehole management. Water Service Development Plans and feasibility studies (business plans) should indicate what groundwater supply options were considered for development.	Regional Office (On-going)
Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area, DWAF Report No. P03/000/00/0101	

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A.7.3 RECREATION ON DAMS & RIVERS STRATEGY

Management objective:	To regulate recreation on all water bodies in the catchment, but also to restrict access to water bodies at water levels that negatively impact on the natural environment or on the local population. Developments must adhere to guidelines and criteria specifically prepared for recreational purposes. These developments must be evaluated on a consistent basis taking into account the need for such a development as well as the implications on the environment, current water users and public safety.
Situation Assessment:	All the water bodies are important for recreational purposes. There are several recreational sites located in the Lower Vaal WMA which range from historical, cultural and heritage sites to holiday destinations. Resorts are present at Christiana, Riverton and Barkley West. The following dams are of particular significance in the Lower Vaal WMA: Taung Dam Spitskop Dam Wentzel Dam Vaal Harts Weir Kuruman Eye No serious problems are encountered at these facilities at present. The Directorate: Social and Ecological Studies have fairly sophisticated processes to determine the impacts of recreation on water bodies and to promote recreation and tourism within realistic frameworks. The impact of pollution on the river systems is of particular significance to users of rivers and dams for recreational purposes and requires regular monitoring. The following requirements have been identified: **1**. It is important that the dam sites located in the Lower Vaal be utilised for recreational use. **2**. The rezoning of these sites for recreation and the investigation of mechanisms for development is required, eg. Privitisation, Concessions, etc.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1**. DWAF needs to encourage the use of existing dam sites for recreational use by making these sites available to the tourism and leisure industry.	Regional Office (Priority 1)
	M2. DWAF needs to develop guidelines for safety when using water bodies for recreational purposes.	Regional Office (Priority 1)

Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10/000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area, DWAF Report No. P03/000/00/0101

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A.7.4 PUBLIC HEALTH & SAFETY STRATEGY

Management objective:	The water resource needs to be protected, and it must be ensured that users in the Vaal River Catchment area are safe from the effects of poor water quality that can create health problems (e.g. cholera), and it must be ensured that strategies are in place to deal with floods and droughts as these impact on the socio-economic environment.
Situation Assessment:	In the Lower Vaal, the primary concerns regarding public health and safety are: • Water quality problems in the main stem of the Vaal River • Lack of emergency preparedness plans for flooding of dam as well as operation and maintenance manuals for all dams in the catchment. The Department's current commitments are associated with: • Managing floods and drought disasters by direct intervention on the ground. • Reducing pollution and preventing serious or hazardous pollution events and promoting dam safety. • DWAFs (and the CMAs in some cases) future commitments under National Disaster Management Act which is to be promulgated in 2003 will be: • DWAF/CMA will be required to become involved in supporting and enforcing disaster management planning by all relevant authorities. • Drafting a National Flood Management Policy (DWAF). • Dam safety policy (DWAF). • Co-operating with the Department of Agriculture on drought relief strategies and policy formulation.

MANAGEMENT ACTIONS			
Required actions, responsibilities and priorities:	**M1.**	Compliance with the above-mentioned requirements.	Regional Office (Priority 1)
	M2.	Clarify roles and delegated responsibilities regarding flood management control and disaster management rules. Warning systems for hazardous events, such as spills, are required. The issues related to flood management are dealt with in the Vaal Overarching ISP.	Regional Office (Priority 1)
	M3.	Water quality management must be implemented in areas where water bodies are used for recreational purposes in order to ensure that public health is not jeopardised	Regional Office (Priority 1)
	M4.	The O&M manuals for dams in the Lower Vaal are in the process of being updated. The contents of the updated manuals must be communicated and implemented.	Regional Office (Priority 1)
	M5.	Communication between authorities must be developed and maintained.	Regional Office (Priority 1)

Interfaces:	**References** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation. DWAF report number P WMA 10000/00/0203. 2. DWAF report no : P RSA C000/00/0103 "Vaal River System: Overarching Internal Strategic Perspective.

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A.8 MONITORING AND INFORMATION MANAGEMENT STRATEGY

Management objective:	The design and implementation of effective monitoring networks and repository databases to ensure adequate quantification of the balance between sustainable water use and protection for surface freshwater bodies and groundwater.
Situation Assessment:	**Water use control** Irrigation is by far the main water user in this WMA and almost no data is available on the actual water use by and return flow from irrigation, as irrigation abstractions are not gauged. **Monitoring networks and data capturing.** Resources currently available for monitoring are generally inadequate throughout all existing systems. However it is considered that the responsibility for monitoring should rest with local authorities and water user associations. Some notable issues in the ISP-area are briefly discussed below: ▪ Groundwater monitoring is focused at the towns and groundwater user areas but is not adequate for the affected areas such as informal mining and new irrigated areas. Groundwater quality samples are taken every six months as part of a National program. Various studies are underway in the catchment to better understand the groundwater resources in the region. ▪ Inadequate monitoring of water quality throughout the catchment with data not continuous enough to determine trends and pollution sources. Ad-hoc monitoring generally occurs downstream of sewage treatment plants but is not adequate for water quality management. ▪ Compliance monitoring by the Department of Mineral and Energy Affairs and the mines exist for Sishen and Blackrock mines and did not show any elevated elements or TDS problems. ▪ Streamflow monitoring is focused at the major rivers with real-time data available at key point in the system. Upgrading of the Douglas weir is required to allow for the monitoring of flows in the range of 8 to 100 m^3/s. Douglas weir has been surveyed but funding has not been allocated for the upgrade. ▪ A study defining the data requirements to support the system analysis model was undertaken as part of the Vaal River System Analysis Update Study. The main recommendations from the study report with the title "*Data Inventory: Vaal Water Supply System Area"* should form the point of departure for the identification of all monitoring needs. ▪ As the irrigation sector is the largest water user in many sub-catchments, and at the same time has the poorest available data regarding water use and return flows, it is recommended that projects should be initiated to obtain better information regarding irrigated areas and the monthly irrigation water usage as well as irrigation return flows. **Information Management** **(**To be considered at National Level) Information Management in the Lower Vaal WMA is problematic due to the difficulties experienced with the existing information management systems, viz. WMS and NGDB (National Geohydrological Database). Water use control is an issue on the whole of the Vaal and can be managed better if more information is available and if more attention is given to data capture and storage. It is important to continue monitoring, specifically regarding water quality. This issue has to be dealt with at a regional level and needs to be in accordance with National policy.

Situation Assessment (Continued):

A study defining the data requirements to support the system analysis model was undertaken as part of the Vaal River System Analysis Update Study. The main recommendations from the study report with the title "*Data Inventory: Vaal Water Supply System Area"* should form the point of departure for the identification of all monitoring needs.

The following gaps have been identified in the knowledge base in terms of system monitoring:

- Limited, almost no observed data available with regards to irrigation water use. Quaternary-based irrigation data is unreliable. A need exists to determine crop distribution and type on a quaternary catchment scale.
- Regular water quality monitoring by DWAF and the water boards is required to improve the data records of the water quality in the WMA. A fuller record of water quality is required for this WMA.
- Streamflow and channel monitoring is inadequate in some of the areas. The measurement of flow at Douglas weir is of regional importance.
- Groundwater monitoring is inadequate for selected areas, in terms of yield, quality, contamination, etc.
- There is a need to develop an integrated monitoring and information management plan. The plan must assess requirements, priorities, costs and provide motivation for funding.
- The exact position of new flow gauging points has not been identified and must form part of discussions. Douglas weir has, however, been surveyed and is yet to be constructed.
- Compliance monitoring of EMPR by mines.

The following actions are required in this WMA in terms of monitoring:

- Details of the various data related problems and shortcomings is given the recommendations of the relevant study reports and should be consulted to evaluate and prioritise the monitoring needs.
- The National Water Act requires the Minister to establish national monitoring systems for water resources to collect appropriate data and information necessary to assess:
    - The quantity, quality and use of water in water resources.
    - The rehabilitation of water resources.
    - Compliance with resource quality objectives.
    - The health of aquatic ecosystems.
    - Atmospheric conditions, which may influence water resources.
    - Other data and information, which may be necessary.

This effort needs to be co-ordinated with regional offices to ensure that information is managed in a consistent manner. As part of the Overarching ISPs a need was identified to undertake an assessment of all the monitoring needs to support Integrated Water Resource Management in the Vaal and Orange river catchments. The most important needs are given in the situation assessment of this strategy. Details of the monitoring needs must be obtained from the recommendations given in the relevant study reports.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1.** Develop a strategy and action plan to identify all monitoring needs and to co-ordinate all monitoring in the region, specifically identifying roles and responsibilities of National and Regional officials in terms of monitoring requirements. Flow gauging facilities are required at abstraction points as well as effluent discharge points in order to provide adequate data for calibrating and verifying the water quality models.	Regional Office (Priority 1)
Interfaces:	**References:** 1. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation, DWAF report number P WMA 10000/00/0203. 2. Water Resources Situation Assessment : Lower Vaal Water Management Area, DWAF Report No. P03000/00/0101 3. "Vaal River System Analysis Update : Integrated Vaal River System Analysis**:** DWAF report no : PC000/00/18496	

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A.9 IMPLEMENTATION MAIN STRATEGY

Management objective:	The above-mentioned strategies and approaches need to be implemented in future depending on priority. The work needs to be carried out by the designated responsible party, either the Regional Office or National Directorate. The activities in the ISP should be included in the annual budget cycles of the relevant directorates. Detailed scheduling of activities should be undertaken through the normal business planning human resource scheduling of DWAF. To gradually phase in a thorough public involvement process in parallel with the establishment of the Catchment Management Agency and the drafting of the Catchment Management Strategy. It should be communicated to the public and stakeholders that the ISP is DWAF's initial input to the formulation of the Catchment Management Strategy.
Situation Assessment:	The current Internal Strategic Perspective, as its name implies, has been intended to achieve a common water resources management approach within the Department and the intention is that the document will be made available to stakeholders once the first version is completed. Interaction has been limited to stakeholder awareness regarding this ISP development process. It is envisaged that the finally accepted Lower Vaal WMA ISP will be circulated to water user associations, forums and other pertinent stakeholder groups to inform them of the way in which DWAF wants to manage the water resources of the catchment. Stakeholder comment will then be requested. This effort may need community education with a view to empowering these stakeholders to fully understand the Department of Water Affairs and Forestry's perspective and in so doing to be capacitated to yield constructive comment. The ISP is intended to provide DWAF's input to the development of the Catchment Management Strategy, which will involve a thorough public participation process. This process could commence within a year or three (to be debated at the workshop) after the Lower Vaal WMA ISP depending on the approval of the Catchment Management Agency establishment proposals by the Minister.

MANAGEMENT ACTIONS		
Required actions, responsibilities and priorities:	**M1**. List of strategies that need to be tackled along with the bigger picture and assign responsible persons. These officials may need to employ others depending on the scale of the assignment.	Regional Office (Priority 1)
	M2. Design a public involvement/participation process (using current forum structures) that will eventually lead up to the formulation of a Catchment Management Strategy.	Regional Office (Priority 1)
	M3. Submit proposal to DWAF National for approval.	Regional Office (Priority 1)

	M4. Communicate to Catchment Management Forums, Bulk Users, Provincial Liaion Committees, Municipal Managers, etc. Initially circulate the finalised Lower Vaal WMA ISP to water user associations, forums and other pertinent stakeholder groups to inform them of the way in which DWAF wants to manage the water resources of the catchment. Stakeholder comment will then be requested.	Regional Office (Priority 1)
	M5. To get feedback from stakeholders in terms of reviewing the ISP. Incorporate comments and revise accordingly.	Regional Office (Priority 1)
	M6. Preparation of presentation material for strategic decision-makers, as well as operational managers. Develop toolkit for presentation of ISP's to the various stakeholders and roleplayers.	Regional Office (Priority 1)
	M7. Undertake presentation "roadshow".	Regional Office (Priority 1)
Interfaces:		

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