CHAPTER 4
WATER RESOURCES AND WATER REQUIREMENTS

This chapter presents a perspective of the water availability in the catchment, an overview of the water requirements attributed to the various use sectors and an overview of the yield balance and reconciliation options. For the most part, the values as provided in the NWRS (availability, requirements, balance) are taken to be a summation of the best available knowledge. Where changes to these are proposed, they are identified and substantiated. Overall, the WMA is in deficit, a consequence of deficits in the Olifants River and the Sandveld, with other catchments generally in balance.

As discussed in **Chapter 2**, the WMA was divided into six sub-areas as shown in **Table 4.1** below and on **Figure 2.2**.

Table 4.1: ISP sub-areas

ISP Sub-area	Catchments
Upper Olifants	E10A to E10G
Koue Bokkeveld	E21A to E21L
Doring	E22, E23, E24A-M, E40A-D
Knersvlakte	E31A-H, E32, E33A-F, F60
Lower Olifants	E10H-K, E33F-E33H
Sandveld	G30A (part) to G30H

4.1 WATER RESOURCES AVAILABILITY

A summary of the natural mean annual runoff (MAR) by sub-area, together with the estimated average annual flow requirement for the ecological component of the provisional Reserve is given in **Table 4.2**.

The Olifants estuary is of high ecological importance (see **Section 2.1.9**) and although the estuarine freshwater requirement has not yet been determined, the Olifants Doring Basin Study Phase 1 (1998) stated that moderate further development in the WMA could be considered. There are no significant natural lakes in the WMA.

The water resources are not evenly distributed over the WMA. The highest runoff is from the relatively small southern central mountainous area of the WMA, notably the Upper Olifants, Doring and Koue Bokkeveld sub-areas, with limited runoff emanating from the arid remainder. The total natural mean annual runoff (MAR) of 1 068 million m^3/a has been significantly reduced by abstractions, mainly for irrigation. These net MAR values are shown according to the WRSM90 database, which exclude endoreic areas. The NWRS values appear to have included the endoreic areas, and were therefore higher.

Table 4.2: Natural MAR and provisional ecological Reserve requirements (million m³/a)

Sub-area	Natural MAR	Incremental natural MAR (1)	Ecological Reserve	Incremental Ecological Reserve (1)
Upper Olifants	437	437	93	93
Koue Bokkeveld	279	279	29	29
Doring	508 (2)	229	68 (2)	39
Knersvlakte	27	27	3	3
Lower Olifants	1 013 (2)	41	181(2)	17
Sandveld	55	55	8	8
Total for WMA	**1 068**	**1 068**	**189**	**189**

1) Quantities given are incremental, and refer to the sub-area under consideration only. This is the total volume, based on preliminary estimates. Impact on yield will be a portion of this.
2) Main stem cumulative.

In the 2003, *Olifants Doring River Basin Study Phase 2* Study, the Reserve was determined by using the Rapid methodology. These Reserve values were adopted for the Upper and Lower Olifants sub-areas, rather than the desktop estimate used by the NWRS, as these were more accurately calculated for the conditions in the Olifants River. Refer to the more detailed discussion in **Appendix 3**. The principle being followed is that all rivers should proportionally contribute to the Reserve. The concept of a "distributed" Reserve upstream of Clanwilliam Dam means that, to meet the Reserve, there would be a proportional impact on rivers upstream of the dam, instead of the full impact being on the dam only.

The available yield in the WMA is a combination of the yields from existing infrastructure supplying surface water, actual groundwater use and, to a small degree, usable return flows. There is also a small transfer of 3 million m³/a into the WMA from the Breede WMA. **Table 4.3** shows the availability of surface water for the sub-areas (see **Table 4.4** for Total Availability).

Table 4.3: Surface water yield for the year 2000 at 1:50 year assurance (million m³/a)

Sub-area	Yields from major dams (a)	Yields from minor dams & run of river (b)	Surface water yield before reductions (c = a+b)	Reduction in yield: Reserve (d)	Reduction in yield: Alien plants (e)	Surface water yield (c-d-e)
Upper Olifants	159 (1)	29 (2)	**188**	14	5	169
Koue Bokkeveld	0	60	**60**	0	1	59
Doring	5	5	**10**	2	0	8
Knersvlakte	0	1	**1**	0	0	1
Lower Olifants	21 (3)	5	**26**	8	0	18
Sandveld	0	5	**5**	0	3	2
Total for WMA	**185**	**105**	**290**	**24**	**9**	**257**

1) Clanwilliam Dam yield of 133 million m³/a, increased by 26 million m³/a to 159 million m³/a when the distributed Reserve is implemented.
2) The yield from *minor dams and run of river* of 55 million m³/a when no EWRs are applied, reduced by 26 million m³/a to 29 million m³/a. when the distributed Reserve is implemented.
3) Bulshoek Weir incremental yield.

Variations from the NWRS figures:

The impact of the updated Rapid Reserve on the yields of the Upper and Lower Olifants sub-areas are 14 million m^3/a and 8 million m^3/a respectively. The total impact of the Reserve on the combined Upper and Lower Olifants sub-areas is thus 22 million m^3/a, compared to the 12 million m^3/a of the NWRS.

Table 4.4 shows the yields per sub-area including groundwater, useable return flows and water transfers into the WMA or sub-areas.

Table 4.4: Available yield for the year 2000 at 1:50 year assurance (million m^3/a)

Sub-area	Natural resource		Usable return flow			Total local yield (1)	Transfers in (2)	Grand Total
	Surface water	Ground-water	Irrigation	Urban	Mining and bulk			
Upper Olifants	169	20	8	0	0	197	0	**197**
Koue Bokkeveld	59	5	3	0	0	67	0	**67**
Doring	8	3	0	0	0	11	3	**14**
Knersvlakte	1	3	0	0	0	4	4	**8**
Lower Olifants	18	1	4	2	0	25	94 (3)	**119**
Sandveld	2	30	0	0	0	32	0	**32**
Total for WMA	**257**	**62**	**15**	**2**	**0**	**336**	**3**	**339**

1) After allowance for the impacts on yield of the ecological component of the preliminary Reserve, river losses, alien invasive plants, dry land agriculture and urban runoff.
2) Transfers into sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of the transfers therefore does not necessarily correspond to the total transfers into the WMA.
3) Transfers into the Lower Olifants of 94 million m^3/a for irrigation, mainly via the Lower Olifants River canals.

Variations from the NWRS values

a.) The combined irrigation return flow for the Upper and Lower Olifants sub-area was shown as 19.2 million m³/a in the NWRS. This has been modified to a total of 12 million m³/a made **up** of 8 million m³/a in the Upper Olifants sub-area and to 4 million m³/a in the Lower Olifants sub-area, as return flow below Bulshoek Weir up to the confluence with the Doring River is generally regarded as usable (varying seasonally), but quality then deteriorates quickly due to saline inflows from the Tankwa Karoo. The return flow is generally regarded as very saline and is mostly not considered to be suitable for direct re-use, although not enough is known about this.

b. Groundwater use along the Olifants River was documented as 4 million m³/a in the NWRS. This use in the **Upper** Olifants sub-area has been increased to 20 million m^3/a, based on additional information that has since become available. Supporting information

in this regard is documented in the *Olifants/Doorn Groundwater Overview* in **Appendix 4.**

c. The transfer to the Knersvlakte from the Upper Olifants sub-area via the Lower Olifants sub-area has been increased from 3 to 4 million m^3/a to account for operational losses in the Lower Olifants sub-area.

4.1.1 Water Availability Uncertainties

The following uncertainties exist:

- The Comprehensive Reserve requirement has yet to be determined and the yield balance is currently based on Rapid Reserve estimates only;
- The preliminary Reserve estimates do not include the estuarine or wetlands Reserve requirements, as these have yet to be determined;
- The possible effect of climate change has not been allowed for in the ISP. There have been predictions that the effects of global warming could cause a possible 10-15% reduction in streamflow in the Western Cape by 2015.

4.2 WATER REQUIREMENTS AND USE

4.2.1 Existing Requirements

The water requirements and use estimates, as shown in **Table 4.5**, are based on a 1:50 year (98%) level of assurance of supply.

The agricultural sector is by far the largest water use sector with estimated requirements of about 95% (356 million m^3/a) of the total requirements. The scheduled area under the Olifants River GWS canal system is 11 500 ha with an irrigation quota of 12 400 m^3/ha/a. The canal system is used for irrigation, domestic and industrial supplies for towns (refer to **Section 2.3.2**), and to the Namakwa Sands Mine, and a number of small mining activities. The strategies in **Chapter 6** describe and respond to the uncertainty associated with estimates of actual irrigation water use.

The primary source of water for towns in the Sandveld (G30), Kromme (E31), Goerap (F60), and Oorlogskloof (E40) is groundwater. The main towns in the Lower Olifants (E33) and Upper Olifants (E10) rely on water from the Olifants River Government Water Scheme, which draws water from Clanwilliam Dam or the canal system. The Namakwa Sands Mine located in the Knersvlakte (Goerap catchment - F60), obtains water from the Olifants River Government Water Scheme.

Table 4.5: Water requirements (in million m³/a, for the year 2000) at 1:50 year assurance

Sub-area	Irrigation	Urban (1)	Rural (1)	Mining and bulk industrial (2)	Afforestation (3)	Total local requirements	Transfers out	Grand Total
Upper Olifants	100	1	1	0	1	**103**	94 (4)	**197**
Koue Bokkeveld	65	0	1	0	0	**66**	0	**66**
Doring	13	1	1	0	0	**15**	0	**15**
Knersvlakte	3	0	1	3	0	**7**	0	**7**
Lower Olifants	140	3	1	0	0	**144**	4 (5)	**148**
Sandveld	35	2	1	0	0	**38**	0	**38**
Total for WMA	**356**	**7**	**6**	**3**	**1**	**373**	**0**	**373**

1) Includes component of the Reserve for basic human needs at 25 l/c/d.
2) Mining and bulk industrial water uses, which are not part of urban systems.
3) Quantities given refer to impact on yield only.
4) Transfers out of the Upper Olifants of 94 million m^3/a for downstream irrigation, mainly via the Lower Olifants River canal.
5) Transfers out of the lower Olifants of 4 million m^3/a consist of a transfer of 2.5 million m^3/a to meet the Namakwa Sands mining requirement, and 0.4 million m^3/a to northern Sandveld urban use. The rest is provision for losses.

4.2.2 Uncertainties regarding existing requirements

Uncertainties exist regarding the following water uses:

- The accuracy of run-of-river yields and yields from farm dams, especially above Clanwilliam Dam. There is also uncertainty about the volume impounded by these farm dams;
- The extent of actual water use by irrigators, particularly those outside of WUAs;
- The extent of over-abstraction in the Olifants River sub-area, with resulting variable assurances of supply.

4.2.3 Future Requirements

Little growth is anticipated for towns, industry and mining. There is demand for further agricultural development throughout the WMA. In the Upper Olifants, Koue Bokkeveld and the Sandveld sub-areas, the demand is for ongoing expansion of existing irrigation. There is potential for further irrigation. Development in the rest of the WMA is constrained by water availability and in peak demand periods through existing infrastructure.

The *Olifants Doring Basin Study Phase 1 (1998)* recommended interim restrictions on further licensing, until more information was available on development options and the Reserve. Total new irrigation licences were restricted to the following maximums:

Koue Bokkeveld/Witzenberg:	950 ha
Citrusdal/Clanwilliam:	475 ha
Middle Doring:	150 ha
Ceres Karoo:	1 500 ha
Coastal Zone:	2 000 ha

The restrictions are currently being adhered to by DWAF. The restrictions were to apply for a period of seven years (1998-2005) when it was anticipated that there would be finality on the extent of development on the major irrigation schemes identified in the *Olifants Doring Basin Study Phase 1 (1998)*. A review of these restrictions is to take place in 2005. In most cases the irrigation development would have to be supported by resource developments such as farm dams.

The NWRS discussion of water requirements for 2025 assumes limited population growth, but more equitable distribution of wealth leading to higher average levels of water services. No adjustments were made reflecting the impacts of increased water efficiency. Tourism was considered to be the sector in the WMA undergoing the most growth between 2000 and 2025. The NWRS concluded that water requirements would remain stable perhaps decreasing slightly with the trend of depopulation of the rural areas.

The NWRS base scenario predicted that requirements would reduce in the Koue Bokkeveld, Olifants (combination of the two ISP sub-areas) and Knersvlakte sub-areas by 2025, by 1 million m^3/a each.

The NWRS high scenario predicted that requirements would reduce by one million m^3/a in the Koue Bokkeveld sub-area, and by four million m^3/a each in the Olifants (combination of the two ISP sub-areas) and Knersvlakte sub-areas by 2025. The future reconciliation scenarios are provided in **Tables 4.7 and 4.8**.

4.3 YIELD BALANCE

The reconciliation of available water and requirements for the year 2000, given in **Table 4.6**, indicates that there was an overall deficit of 34 million m^3/a in the WMA. A deficit of 29 million m^3/a is experienced in the Lower Olifants sub-area. This deficit reflects a shortage, but in practice irrigators accept a lower level of assurance.

A zero balance is shown for the Upper Olifants sub-area, because it has been assumed that users upstream of Clanwilliam Dam are not impacted on by the storage in the dam, but that the risk of shortages (deficit of 29 million m^3/a) are carried by users situated in the catchment below the dam. The catchment above Clanwilliam Dam (Upper Olifants) has therefore been assumed to be in balance. Ideally, the risk of shortages should be spread among all users. A significant portion of this deficit (22 million m^3/a) can be ascribed to the impact of the Reserve on the Olifants River, which has been taken into account in these calculations, although no releases are currently made for the Reserve.

Table 4.6: Reconciliation of water requirements and availability for the year 2000 at 1:50 year assurance (million m³/a)

Sub-area	Available yield			Water requirements			Balance
	Local yield	Transfers in (2)	Total	Local require-ments	Transfers out (2)	Total	(1)
Upper Olifants	197	0	**197**	**103**	94 (3)	**197**	**0**
Koue Bokkeveld	67	0	**67**	**66**	0	**66**	**1**
Doring	11	3	**14**	**15**	0	**15**	**(1)**
Knersvlakte	4	4	**8**	**7**	0	**7**	**1**
Lower Olifants	25	94 (3)	**119**	**144**	4 (4)	**148**	**(29)**
Sandveld	32	0	**32**	**38**	0	**38**	**(6)**
Total for WMA	**336**	**3**	**339**	**373**	**0**	**373**	**(34)**

1) Surpluses are shown in the most upstream sub-area where they first become available.
2) Transfers into and out of sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of the transfers per sub-area therefore does not necessarily correspond to the total transfers into and out of the WMA.
3) Transfers from the Upper to the Lower Olifants sub-area of 94 million m^3/a for downstream irrigation, mainly via the Lower Olifants.
4) Transfers out of the Lower Olifants sub-area of 4 million m^3/a consists of a transfer of 2.5 million m^3/a to meet the Namakwa Sands mining requirement and 0.4 million m^3/a for northern Sandveld urban use. The balance is to provide for losses.

The 6 million m^3/a deficit in the Sandveld sub-area is attributable to urban and irrigation water requirements, in excess of what can sustainably be supplied from the available resources, with the resultant over-exploitation of groundwater to make up the shortfalls. The Upper Olifants, Doring, Koue Bokkeveld and Knersvlakte sub-areas are all approximately in balance.

It is anticipated that implementation of the Reserve could influence the use of farm dams, mainly on small tributaries, where water may have to be released to meet the needs of the Reserve. In the Doring sub-area, the Reserve will mainly impact on the resource potential which may still be developed. Due to the limited occurrence and development of surface water in the Knersvlakte and Sandveld sub-areas, implementation of the Reserve will not have any significant impact in these sub-areas.

A perspective on the possible future situation is given in **Table 4.7** for the base scenario and **Table 4.8** as representative of a possible high water use scenario, in line with the changes in water requirements as foreseen in the NWRS. Little change in water requirements is foreseen unless new large-scale irrigation development occurs.

The raising of Clanwilliam Dam, which could provide additional yield of up to 40 million m^3/a, or development of the deep Table Mountain Group aquifer, are currently seen as the most promising possible large-scale developments in the WMA.

Table 4.7: Reconciliation of water requirements and availability for the year 2025 base scenario at 1:50 year assurance (million m³/a)

Sub-area	Available yield			Water requirements			Balance (1)
	Local yield	Transfers in (2)	Total	Local require-ments	Transfers out (2)	Total	
Upper Olifants	197	0	**197**	**103**	94 (3)	**197**	**0**
Koue Bokkeveld	67	0	**67**	**65**	0	**65**	**2**
Doring	11	3	**14**	**15**	0	**15**	**(1)**
Knersvlakte	4	4	**8**	**6**	0	**6**	**2**
Lower Olifants	25	94 (3)	**119**	**143**	4 (4)	**147**	**(28)**
Sandveld	32	0	**32**	**38**	0	**38**	**(6)**
Total for WMA	**336**	**3**	**339**	**370**	**0** (5)	**370**	**(31)**

1) Based on existing infrastructure and infrastructure under construction in the year 2000. Also includes return flows from growth in requirements.
2) Based on changes in water requirements as a result of population growth and general economic development. Assumed no general increase in irrigation.
3) Brackets around numbers indicate a negative balance.

Table 4.8: Reconciliation of water requirements and availability for the year 2025 high scenario (million m³/a)

Sub-area	Available yield			Water requirements			Balance (1)
	Local yield	Transfers in (2)	Total	Local require-ments	Transfers out (2)	Total	
Upper Olifants	198	0	**198**	**105**	94 (3)	**199**	**(1)**
Koue Bokkeveld	67	0	**67**	**65**	0	**65**	**2**
Doring	11	3	**14**	**15**	0	**15**	**(1)**
Knersvlakte	4	4	**8**	**7**	0	**7**	**1**
Lower Olifants	26	94 (3)	**120**	**146**	4 (4)	**150**	**(30)**
Sandveld	32	0	**32**	**42**	0	**38**	**(10)**
Total for WMA	**338**	**3**	**341**	**380**	**0** (5)	**380**	**(39)**

1) Based on existing infrastructure and infrastructure under construction in the year 2000. Also includes return flows from growth in requirements.
2) Based in changes in water requirements as a result of population growth and general economic development. Assumed no general increase in irrigation.
3) Brackets around numbers indicate negative balance.

The base scenario assumes little change in economic empowerment, no significant increase in agriculture and a slightly negative population growth in the WMA (refer to **Section 2.2.1**). This results in a slight decrease of the requirements.

The high scenario assumes a more equitable distribution of economic wealth leading to a higher average standard of living and level of water services. Due to the strong irrigation based economy in the WMA and given the high level of utilisation of currently available resources, the requirements are expected to remain close to current levels (NWRS, 2004).

4.4 RECONCILIATION INTERVENTIONS

The Olifants-Doring WMA is stressed and the following reconciliation interventions[5] must be considered in order to reduce the deficit (refer to the **Reconciliation Strategy 6.3):**

- On-farm losses in the agricultural sector, which is by far the largest water use sector should be quantified and measures implemented to reduce this;
- Infrastructural losses: The feasibility of upgrading the canal system from Bulshoek Weir and improving the canal system operational procedures have been investigated by LORWUA and the recommended actions should be considered for implementation;
- Although invasive alien plants currently only have a limited impact on the WMA yield, removal should be prioritised to prevent expansion which could have a significant impact in the future;
- Development of groundwater, including the TMG aquifers;
- The investigation of the raising of Clanwilliam Dam should proceed;
- Investigations of other potential development schemes should be considered together with the Clanwilliam Dam Raising before any final development decisions are made;
- Implementation of water conservation and demand management measures by local authorities.

4.5 WATER QUALITY

4.5.1 Surface water

The surface water quality of the Olifants-Doorn WMA is quite variable. Water quality in the Clanwilliam Dam area is suitable for all uses. There is a slight increase in concentration of total dissolved solids (TDS) in a downstream direction. Previous studies (*Olifants Doring Basin Study Phase 1, 1998*) found that there was a difference between unimpacted catchments and the main stem of the Olifants River that was impacted by agricultural activities. Unimpacted catchments, like the Jan Dissels River, showed evidence of a seasonal trend in the data. The seasonal trend indicated elevated TDS concentrations at the end of summer (March/April) and decreased concentrations at the end of winter (July – October). It was found that TDS concentrations in the main stem Olifants River were higher but still suitable for agricultural and domestic purposes (*DWAF Basin Study, 1998*). No trend was evident but

[5] It should be noted that these interventions are not ranked in terms of which would produce the highest volumes.

there were strong seasonal variations with higher concentrations early in winter probably originated from the wash-off of salts from the catchment, and reduced concentrations at the end of winter. In the Olifants River downstream of Clanwilliam Dam and upstream of the Doring River confluence the water quality remained suitable for agriculture and domestic water supplies.

Water quality in the Koue Bokkeveld is ideally suited for all uses. A trend of increasing TDS over time was observed in the Leeu River even though the quality is still acceptable. Marked seasonal differences were also found, with higher concentrations in summer than in winter (*Olifants Doring Basin Study Phase 1, 1998*).

The quality of water in the upper Doring River (E22), when flowing, is suitable for agriculture and domestic water supplies. However, TDS concentrations in the Kruis River are very high and variable and the water quality has been classified as marginal to poor (*Olifants Doring Basin Study Phase 1, 1998*). Water quality in the Doring River (E24) is marginal and TDS concentrations increase in a downstream direction. In the lower reaches, the water quality varies between good at the end of winter and marginal at the end of summer, probably as a result of the predominantly winter rainfall in the catchment. The water quality is still suitable for all uses but it does indicate deterioration. It has been reported (Dr Cate Brown, Southern Waters pers. comm. 2004) that farmers stop irrigating when the water begins tasting salty. Highly saline flows from the Tankwa Karoo tributaries have a sporadic influence.

The water quality status in the Oudekraal (E23), Oorlogskloof (E40), Kromme (E31), Hantams (E32), Lower Olifants (E33) and Namaqualand (F60) areas is not adequately known. It should be noted that water availability in these rivers is limited.

In the Sandveld sub-area water quality is poor to completely unacceptable in the Kruis River catchment (upper reaches of the Verlorevlei River). It improves slightly in a downstream direction but the lack of data precludes any concrete conclusions about water quality in the Verlorevlei River and in Verlorevlei itself. The cause of the poor water quality is the result of agricultural activities on the Malmesbury shales, which are high in salts and cover a large part of the Kruis River catchment (Sinclair *et al*., 1986).

Other water quality variables were also examined in the Olifants Doring River Basin Study Phase I (1998) and it was concluded for the Olifants River that:

- The source water of the Olifants River had elevated TDS and nitrogen concentrations, probably as a result of agricultural activities in the upper catchment which have an impact on the river, especially during the summer months;
- Physical and chemical characteristics of the Olifants River gorge and the mountain river reaches largely resemble natural conditions in unimpacted streams of the Western Cape. Water quality is very good until the valley widens at Citrusdal;
- The middle reaches of the river (Citrusdal to Bulshoek Weir) are impacted by agricultural activities which lead to elevated levels of dissolved and suspended solids, and nutrients, in particular nitrates. The effect of poorer water quality is exacerbated during the summer months;

- Downstream of the confluence of the Doring and Hol (in quaternary E33E) Rivers, the concentrations of TDS, total suspended solids (TSS), anions, cat-ions and alkalinity increased dramatically. This was ascribed to the introduction of more saline Doring River water coupled with additional saline irrigation return flows. A marginal decrease in nutrient concentrations was observed suggesting that nutrient enrichment in this reach was marginal.

For the Doring River it was concluded that:

- The Doring River is influenced by two distinct water chemistry systems, the one originating in the Karoo, and the other in the Cederberg Mountains. The differences in these two systems are largely the result of geological characteristics of their catchments although land use affects it to some degree.
- Rivers flowing into the Doring River from the Karoo region tend to have higher salinities, higher pH and elevated levels of nutrients and TSS (mostly clay particles).
- Rivers flowing off the southern Cederberg have low nutrient levels and lower TDS concentrations. These rivers are similar to "fynbos" rivers of the Western Cape.
- The combined effect of the two systems results in elevated salinities during periods of high flow from the Karoo rivers. When the Karoo rivers stop flowing, continued discharge from the Cederberg tributaries continue to dilute Doring River water, resulting in lower salinity levels. Towards the end of summer, salinities tend to increase again when there is no longer flow in the Doring River.

4.5.2 Groundwater Quality

Groundwater quality is generally controlled by aquifer lithology and geochemistry. Accordingly groundwater quality in the Olifants/Doorn WMA varies significantly between the fractured-rock (quartzitic) aquifers and the “intergranular (weathered) and fractured” aquifers that overlie generally impermeable shale- or granite-dominated pre-Cape formations.

- The waters in fractured-rock aquifers such as the TMG and the Witteberg Quartzites generally have an electrical conductivity (EC) of less than 70 mS/m and are moderately acidic (pH 5.5 – 6). The fractured rock aquifers yield neutral to alkaline groundwater with an EC greater than 300 mS/m, locally > 1 000 mS/m.

- Malmesbury fractured rock aquifers have acceptable water quality only where there is potential for groundwater leakage from higher-quality TMG aquifers.

- Bokkeveld groundwater is of acceptable to marginal quality. In the E10 catchments it has a mean pH of 7.7, relatively high salinity and low alkalinity. The TDS is more than 3 000 mg/l (~600 mS/m). Compared with the Bokkeveld and Karoo fractured rock aquifers adjacent to it, the quality of groundwater from the Dwyka Formation seems very poor (300-1 000 mS/m).

- Groundwater of the lowest quality (>1 000 mS/m) is found in primary aquifers overlying Dwyka tillite and lower Ecca shale in the Kliprand area, and from

Namaqua basement aquifers of low yield and low recharge potential in the northwest. The average EC for 186 groundwater-sampling points in the Nuwerus-Stofkraal-Bitterfontein area is 709 mS/m, ranging between 463-530 mS/m near Nuwerus and 566-720 mS/m near Bitterfontein.

- The groundwater in the south-western part of the WMA is generally of ideal or very good quality (EC < 70 mS/m). It is suitable for use in small towns and rural settlements where surface water scheme supplies are not in place.

The existing aquifer vulnerability map (**Figure 4.1**) appears to underestimate the aquifer vulnerability to contamination throughout the WMA. "Most vulnerable" areas (shown in red) appear in the primary coastal aquifer south of and around Elands Bay, and also north of Lamberts Bay, reflecting the potential risk of seawater intrusion from exploitation of groundwater in this area. Some areas of "moderate" aquifer vulnerability cover fractured-rock aquifers of the TMG south of Citrusdal, and Witteberg-Bokkeveld aquifers south of Wuppertal (shown in yellow). In the urban centres throughout the ISP-area it is imperative that the local authorities appreciate that the aquifers are vulnerable to contamination from urban discharge (for example, leachate from solid waste disposal sites, spills from wastewater treatment works (WWTWs) and/or quality of treated effluent used for irrigation). The importance of spring protection and well-head protection should be appreciated and understood, also in the rural areas (refer to **Appendix 4** for a more detailed description).

4.5.3 Water quality monitoring

Water quality is poorly monitored in the Olifants/Doorn WMA, although the Upper and Lower Olifants have a fair distribution of its seven monitoring points. The best-monitored surface water sampling point is the Jan Dissels River at Clanwilliam. In the Doring River catchment there are eight routine surface water quality-monitoring stations. The E3 (Hantam) catchments are poorly sampled, with the F6 (Goerap) catchment having no routine DWAF river/stream monitoring points. The G3 (Sandveld) catchment has six routine monitoring points (refer to **Strategy 13.1**).

The distribution of boreholes, which can be used for water quality monitoring, is discussed in **Section 2.3.3b.** The distribution is controlled by climatic and not geological criteria and therefore provides very poor coverage of the various aquifers (refer to **Strategies 6.2, 13.1 and 13.2**).

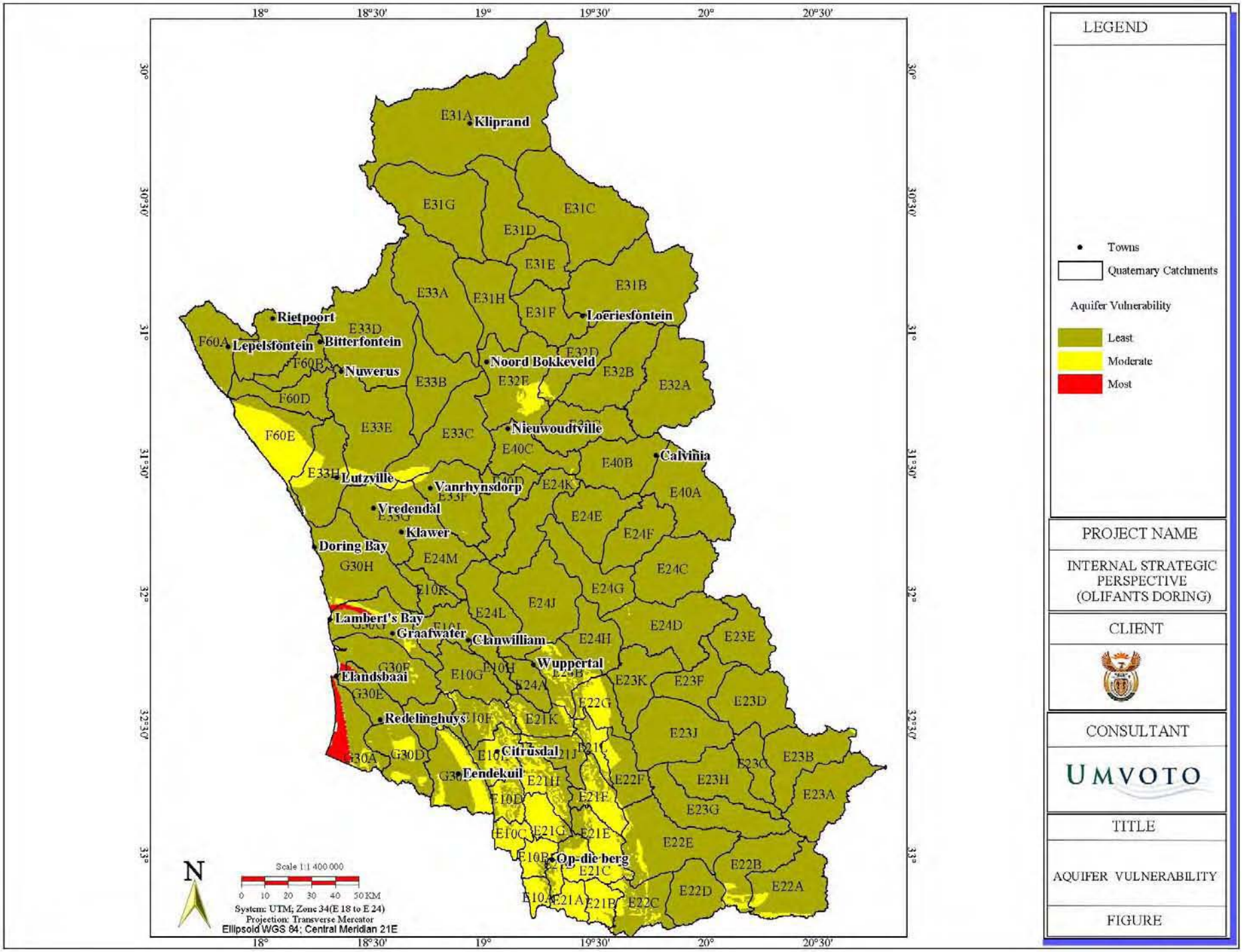

Figure 4.1: Aquifer Vulnerability

CHAPTER 5
INTRODUCTION TO THE ISP STRATEGIES

The many issues and concerns identified in the WMA will be addressed through the implementation of appropriate regional water management strategies. DWAF staff has identified the essential management strategies to manage the Olifants/Doorn WMA. Additional required strategies may be developed in future.

As stated in **Chapter 1**, the objective of this ISP is to provide a framework for DWAF's management of the Olifants/Doorn WMA both now and when the management functions are handed over to an established CMA. This ensures consistency when answering requests for new water licences, and informing existing water users (including authorities) on how the Department will manage the water resource within the area of concern.

Ten broad strategy groups, called main strategies, that cover all necessary current and required future water management activities, were identified from current DWAF Regional Office activities, and the requirements of the NWA and the NWRS. These main strategies are:

- Yield balance and reconciliation;
- Water resources protection;
- Water use management;
- Water conservation and demand management;
- Institutional development and support;
- Social and environmental considerations;
- Integration and co-operative governance;
- Waterworks development and management;
- Monitoring and information management; and
- Implementation.

Under each of these main strategy groups, specific strategies particular to the Olifants/Doorn WMA were developed.

For each strategy, the following aspects are addressed:

- ***Management objectives*** in terms of the envisaged solutions for the strategy;
- ***Situation assessment*** providing a synopsis of the current situation with a focus on the issues;
- ***Strategic approach*** stating the approach or plan that DWAF will follow to reach its objectives for the strategy;
- ***Management actions*** states the required actions to implement the strategy;
- ***Responsibility*** names the responsible offices or Directorates;
- ***Priority*** in terms of the ISP rating system (low, medium, high and very high).

Responsibilities for main strategies and for individual strategies were assigned to responsible DWAF Directorates or Sections within the Western Cape Regional Office. DWAF head office champions were identified where appropriate. A total of 25 strategies were developed for implementation under the ten main strategy groups, in the six sub-areas.

Additional strategies that may be required in future could become apparent and should be developed as they become necessary. Some strategies combine aspects that may need to be expanded into separate strategies. The effectiveness, issues or problems encountered with water supply and sanitation programs in rural areas were not addressed in this ISP.

CHAPTER 6
YIELD BALANCE AND RECONCILIATION STRATEGIES

The current and future management perspectives and the yield balance situation were discussed in ***Chapters 3*** and ***4***.

Yield balance and reconciliation strategies address the need to:

- Clarify uncertainties and information needs regarding the availability of surface water and groundwater;
- Undertake detailed water use and requirement investigations;
- Determine and implement water reconciliation strategies for specific systems, geographical areas or water sectors.

The following specific strategies have been developed further:

- Reliability of water availability and use;
- Groundwater;
- Reconciliation.

6.1 RELIABILITY OF WATER AVAILABILITY AND USE

Management Objective:

To improve the reliability of the information on existing and potential water availability and use in the Olifants/Doorn WMA.

Situation Analysis:

There are seven main areas of uncertainty regarding the yield balance in the WMA, namely:

Farm Dams **-** There is concern that the yields of farm dams in the Koue Bokkeveld and Upper Olifants sub-areas have been underestimated; verification and validation of existing lawful use in these areas will resolve this. The particular sources of water (groundwater or surface water) being used at different times of the year also need to be established. An understanding of "on farm" water balances is needed.

Water Usage **-** Irrigation water usage in the Upper Olifants is not adequately quantified. Some users in the Lower Olifants sub-area abstract directly from the river and this needs to be quantified. Validation of registration is required throughout the WMA (refer to the **Verification Strategy**).

Groundwater **-** Current and potential groundwater use has been under-estimated in parts of the WMA**.** Resource assessments on regional and local scales are available from studies such as CAGE and the IWRM project. The discrepancies in the available numbers, and the gaps in formation, highlight the need for scientifically defendable estimates of the resource potential acceptable to most groundwater practitioners. Reconciliation of these figures is required (refer to the **Verification Strategy**).

Monitoring **-** Basic knowledge of flow, rainfall and snowfall are not well monitored. A more integrated strategic monitoring network needs to be established. This WMA is in a transitional climatic area and predictions for climate change indicate a possible reduction of rainfall by up to 15% with an increase in variability. The WMA water resources are already under stress and weather variations of this nature will only exacerbate such stress (refer to the **Monitoring Strategy**).

Reserve **-** (Refer to the **Reserve and Resource Quality Objectives Strategy**)

The effect of the Reserve on the yield of Clanwilliam Dam is given as a reduction of 12 million m^3/a in the NWRS. The *Olifants Doring River Basin Study Phase 2 (2003)* calculates the reduction in yield to be 40 million m^3/a if the EWR is supplied by Clanwilliam Dam alone and 14 million m^3/a if it is "*distributed Reserve*" (refer to **Section 4. 1** and **Appendix 3** for the discussion of this aspect).

The principle being followed is that all rivers should proportionally contribute to the Reserve. The concept of a "*distributed Reserve*" upstream of Clanwilliam Dam means that, to meet the Reserve, there would be a proportional impact on rivers upstream of the dam, instead of the full impact being on the dam only. For implementation of the *distributed Reserve*, all in-channel storage facilities will have to make appropriate releases, while a single point Reserve would release the entire Olifants River contribution from the Clanwilliam Dam alone.

Water losses and return flows - There are high losses from the Olifants Government Water Scheme canal system. These losses are significant with estimates range from 20% to 38% during peak demand. These losses need to be quantified and action taken to reduce losses in conveyance. In this sub-area the water in summer is of such poor quality that it does not dilute return flows sufficiently for them to be allocated as re-usable. Due to this the NWRS values were reduced for the ISP.

***Invasive Alien Plants (IAPs)* –** There is concern that the impact of IAPs on primary aquifers in the Sandveld has been under-estimated.

Future Potential

The future potential for the development of the water resources in the WMA relies on five options:

- Increased storage of high flows in the Upper Olifants by constructing off-channel storage dams, to be filled by pumping during the winter;
- Decrease in assurance of supply where appropriate;
- Water conservation and demand management measures – particularly related to upgrading and improving operation of the Olifants Government Water Scheme canal;
- Various options which have been investigated for additional storage in the WMA, which are detailed in **Table 2.4**. The raising of Clanwilliam Dam is the option which is currently favoured due to the advantage afforded by the need to strengthen the dam;
- Groundwater as local reconciliation and conjunctive use option.

Strategy:

The registration and validation process of existing lawful use will be prioritised and continued. The surface and groundwater modelling for areas or aquifers under stress must be improved in conjunction with increased monitoring. The Department will continue to increase efforts to confirm the WMA groundwater use and availability and collection of aquifer-specific information will be encouraged.

Management Actions:

- Validation of registration.
- Undertake more detailed assessments of the availability of groundwater data within the TMG Aquifer regions and verify groundwater use data, once registered, to amend groundwater yields if necessary. This will be in terms of priorities identified in the **Groundwater Strategy** (for detail of studies underway refer to the **Reserve and resource quality objective (RQO) Strategy**).
- Determine run-of-river and farm dam yields in the Upper Olifants and Koue Bokkeveld sub-areas as outlined in the **Verification Strategy**.
- Update the yields when the current Comprehensive Reserve Study has been completed.
- Undertake further investigation on the water use of invasive alien plants in the Sandveld sub-area.

Responsibility: Regional Office with input from the Directorate National Water Resource Planning.

Priority: Very high

6.2 GROUNDWATER

Management Objective:

To ensure:

- Proper management of currently utilized aquifers;
- Reasonable evaluation of existing groundwater resource use and potential use from different aquifers; and
- Scientifically robust recommendations in management and licencing guidelines for exploration and aquifer development programmes (in specific areas) to support management decisions.

Situation Analysis:

Aquifer specific, spatially weighted or spatially averaged resource assessments on regional and local scales are available from studies such as CAGE (DWAF 2001), the Olifants/Doring WMA Water Resources Situation Assessment (DWAF 2002), the WODRIS Study (PAWC 2004), the IWRM project (DANIDA 2003) and DWAF funded projects on the Sandveld (1990 and 2003). Groundwater information is provided in **Section 2.3.3** and within each sub-area in **Chapter 3** of this document.

The discrepancies in the available numbers as well as the data and information gaps highlight the need for agreement on an appropriate scientific methodology and scale at which to quantify the resource, RQOs and licencing conditions.

Regionally there are five strategic aquifer systems in this ISP area. These are:

- The Peninsula Aquifer (fractured rock aquifer);
- The Nardouw Aquifer (fractured rock aquifer);
- The Sandveld Aquifers (primary aquifers of marine and fluvial origin);
- The Witteberg Quartzites (fractured rock aquifer); and
- The Dolerite dyke system (fractured rock aquifer).

In the northern part of the WMA, use of groundwater is of low volume but of high dependency. In the southern parts there is a higher volume available for seasonal use for agricultural production. Economic and social costs can be high in the event of failure in respect of either quantity or quality of supply.

RQO and Monitoring

At present it is unknown exactly how many boreholes are in operation throughout the WMA, particularly in the Upper Olifants, Sandveld and Lower Olifants sub-areas. A comprehensive audit of groundwater usage and current exploration is required. Current groundwater monitoring sites are opportunistic rather than designed (refer to the **Monitoring Strategy**). Determination of the groundwater Reserve has been done at an Intermediate Level in the G30E, G30F, and G30G catchments and at the Preliminary/Rapid level in the following catchments: E10E, E10F, E10G, E10J, E10K, G30H, E33G (refer to the **Reserve Strategy**).

Current protection, monitoring and management of springs are inadequate (refer to the **Resource Protection Strategy**). A number of groundwater Reserve studies have recently been completed or are currently underway or planned (refer to **Section 2.1.8**).

Water Quality

Appreciation of the movement of contaminants in fractured rock aquifers and thus protection of the groundwater resource in this WMA is poor (refer to the **Water Quality Strategy**). Poor or limited spring protection and wellfield management, and poor land-use practices pose a significant threat to RQOs (refer to the **Reserve and RQO Strategy**). The aquifer vulnerability mapping needs to be re-assessed, as it hasn't taken fractured rock aquifers into account.

Licencing and Registration

As of July 2004 there were nine groundwater use licence applications awaiting decisions in quaternaries E33F, E31E, E10C, E, F and G30A and H. Licence applications are taking up to two years or more to be processed, which perhaps reflects a lack of capacity or guidance to deal with these applications.

This is a resource management issue and requires a high degree of co-operation amongst users. For this reason consideration needs to be given to the licencing of an aquifer to a single or a group of Water Service providers, WUAs or other purposeful institutions, such that the cumulative impact of individual or small-scale groundwater developments is limited. Apportionment of individual borehole allocations within a defined aquifer zone/province then becomes the role of the local institution, and not of DWAF.

Strategic Approach:

The groundwater resource must be utilised sustainably through appropriate wellfield management and maintenance at an appropriate scale as well as at an aquifer specific scale where appropriate. Conflicting information regarding groundwater yield potential must be resolved and groundwater usage as registered on the water use authorization and registration management system (WARMS) database must be validated. Groundwater plays a critical role in this WMA and the resource management challenge of the potentially linked Upper Olifants and the Sandveld must be met. A pilot institution should be established to undertake large area aquifer management in the Upper Olifants to ensure integrated control of abstraction.

Management Actions:

- Undertake a groundwater use and exploration audit along the lines of the GRIP projects underway in the Limpopo and Eastern Cape Province;
- Establish a pilot institution to undertake large area aquifer management in the Upper Olifants to ensure integrated control of abstraction;
- Consider the option that a licence be awarded to a Water User Association rather than to individual users, where such bodies exist. DWAF would still maintain the responsibility to develop and/or authorize the aquifer specific management plans for a catchment and a wellfield scale (refer to the **Licencing Strategy**);

- Review and if necessary revise General Authorisations to limit over-abstraction (refer to the **General Authorisation Strategy**);
- Initiate a co-ordination programme to improve communication between the past, current and proposed regional studies in this WMA to support the integration of groundwater understanding, insight of regional groundwater flow patterns contributing to rivers and wetlands into regulatory decisions and the design of monitoring networks;
- Develop an acceptable and sound approach to water resource evaluation such that confidence in the groundwater resource quantification increases;
- Develop scientific recommendations for exploration and aquifer development programmes, sustainable technology, quantitative management tools, interfaces with environmental and earth science education initiatives and vulnerability to/protection from pollution and soil erosion;
- Develop and implement a strategy for integrating the results of the current DANIDA and WRC funded studies into the practice and knowledge base of the RO, and any other groundwater development.

Responsibility: Regional Office Geohydrology in conjunction with WRPS: IHP.

Priority: Very High

6.3 RECONCILIATION OF WATER AVAILABILITY AND REQUIREMENTS

Management Objective:

- To achieve an improved understanding of the balance between the available resources and requirements.
- To identify possible interventions to reconcile existing and future supplies and demand.

Situation Analysis:

Available yield

Table 6.1: Available yield for the year 2000 at 1:50 year assurance (million m^3/a)

Sub-area	Natural resource		Usable return flow			Total local yield (1)	Transfers in (2)	Grand Total
	Surface water	Ground-water	Irrigation	Urban	Mining and bulk			
Upper Olifants	169	20	8	0	0	197	0	**197**
Koue Bokkeveld	59	5	3	0	0	67	0	**67**
Doring	8	3	0	0	0	11	3	**14**
Knersvlakte	1	3	0	0	0	4	4	**8**
Lower Olifants	18	1	4	2	0	25	94 (3)	**119**
Sandveld	2	30	0	0	0	32	0	**32**
Total for WMA	**257**	**62**	**15**	**2**	**0**	**336**	**3**	**339**

1. After allowance for the impacts on yield of the ecological component of the preliminary Reserve, river losses, alien invasive plants, dry land agriculture and urban runoff.
2. Transfers into sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of the transfers therefore does not necessarily correspond to the total transfers into the WMA.
3. Transfers into the Lower Olifants of 94 million m^3/a for irrigation, mainly via the Lower Olifants River canal.

The available yield is 339 million m^3/a. The available yield is *inter alia* determined by the infrastructure in the WMA. The Clanwilliam Dam and Bulshoek Weir feed water into the irrigation canal system and it has limited capacity and high conveyance losses. There are also numerous small farm dams in the Koue Bokkeveld and Upper Olifants used to store the high flows in winter. Additional off-channel storage is required in the Upper Olifants to increase the yield and to reduce abstractions during summer low flows. The groundwater potential needs to be resolved but the indication is that there is capacity for groundwater use to be increased in the southern portion of the WMA. Ensuring appropriate releases for the EWR is a key issue.

Current Water Requirements

The current water requirements are 373 million m^3/a. Irrigation is the largest user in the WMA. There are opportunities for water conservation and demand management in the agricultural sector as well as in urban supplies. A key issue is the leakage from the Bulshoek Weir and high conveyance losses from the canal system. This aging canal infrastructure is noted for its conveyance losses, which are estimated to be nearly 30% and does not have sufficient capacity to meet the summer peak demands.

Table 6.2: Water requirements for the year 2000 at 1:50 year assurance (million m³/a)

Sub-area	Irrigation	Urban (1)	Rural (1)	Mining and bulk industrial (2)	Afforestation (3)	Total local requirements	Transfers out	Grand Total
Upper Olifants	100	1	1	0	1	**103**	94 (4)	**197**
Koue Bokkeveld	65	0	1	0	0	**66**	0	**66**
Doring	13	1	1	0	0	**15**	0	**15**
Knersvlakte	3	0	1	3	0	**7**	0	**7**
Lower Olifants	140	3	1	0	0	**144**	4 (5)	**148**
Sandveld	35	2	1	0	0	**38**	0	**38**
Total for WMA	**356**	**7**	**6**	**3**	**1**	**373**	**0**	**373**

1) Includes component of Reserve for basic human needs at 25 l/c/d.
2) Mining and bulk industrial water uses, which are not part of urban systems.
3) Quantities given refer to impact on yield only.
4) Transfers out of the Upper Olifants of 94 million m^3/a for downstream irrigation, mainly via the Lower Olifants River canal.
5) Transfers out of the lower Olifants of 4 million m^3/a consists of a transfer of 2.5 million m^3/a to meet the Namakwa Sands mining requirement, and 0.4 million m^3/a to northern Sandveld urban use. The rest is due to losses.

Current Water Balance

Table 6.3: Reconciliation of water requirements and availability for the year 2000 at 1:50 year assurance (million m³/a)

Sub-area	Available yield			Water requirements			Balance (1)
	Local yield	Transfers in (2)	Total	Local requirements	Transfers out (2)	Total	
Upper Olifants	197	0	**197**	**103**	94 (3)	**197**	**0**
Koue Bokkeveld	67	0	**67**	**66**	0	**66**	**1**
Doring	11	3	**14**	**15**	0	**15**	**(1)**
Knersvlakte	4	4	**8**	**7**	0	**7**	**1**
Lower Olifants	25	94(3)	**119**	**144**	4 (4)	**148**	**(29)**
Sandveld	32	0	**32**	**38**	0	**38**	**(6)**
Total for WMA	**336**	**3**	**339**	**373**	**0**	**373**	**(34)**

1) Surpluses are shown in the most upstream sub-area where they first become available.
2) Transfers into and out of sub-areas may include transfers between sub-areas as well as transfers between WMAs.
3) Addition of the transfers per sub-area therefore does not necessarily correspond to the total transfers into and out of the WMA.
4) Transfers from the Upper to the Lower Olifants sub-area of 94 million m^3/a for downstream irrigation, mainly via the Lower Olifants.
5) Transfers out of the Lower Olifants sub-area of 4 million m^3/a consists of a transfer of 2.5 million m^3/a to meet the Namakwa Sands mining requirement and 0.4 million m^3/a for northern Sandveld urban use, losses making up the balance.

The current water balance shows a theoretical deficit of 34 million m^3/a. Of this 24 million m^3/a is the present estimate of the Reserve which is currently not implemented. There is therefore an over-allocation of resources. Farmers have adjusted their irrigation practices to allow for this apparent deficit of 10 million m^3/a, and with that approach an uneasy balance exists. Due to the low storage capacity the WMA is vulnerable to shifts in rainfall patterns and calculations of yield and dam operating rules must adapt to reflect this. A comprehensive Reserve study is currently being undertaken and the deficit may be shown to be even higher. Decisions will have to be made on the implementation of the Reserve, and how the resultant impacts are to be addressed.

Current and Future Demands

The domestic/urban use is very small in relation to the overall use. The scenarios for future use vary from a small decrease to a small increase and hence should not be difficult to meet. The base 2025 scenario for urban use indicated that 7 million m^3/a would be required whereas the high 2025 scenario estimated that 17 million m^3/a would be required. The NWRS discussion of water requirements for 2025 assumes limited population growth but more equitable distribution of wealth leading to higher average levels of water services. Tourism was considered to be the sector in the WMA undergoing the most growth between 2000 and 2025. The NWRS concluded that water requirements would remain stable, perhaps decreasing slightly with the trend of depopulation in the rural areas.

Agriculture is the main economic activity in the WMA. The NWRS assumes no increase in irrigation requirements from the current use to 2025. There is however some demand for further irrigated agriculture throughout the WMA and this is particularly notable in the Upper Olifants and Koue Bokkeveld. There is land available for expansion in the Koue Bokkeveld, as well as in the Doring around the proposed Melkbos, Melkboom and Aspoort dams. For new development to occur water resource development will be necessary.

The cost of resource development will determine the expansion. It is likely that small additions could be undertaken through private schemes and that large development would only occur if government subsidies were in place.

The theoretical shortage of water for irrigation will however have to be addressed first, especially the EWR supply.

Potential Resource Developments:

- Raising of Clanwilliam Dam;
- Increased off-channel storage (farm dams) of high flows in the Upper Olifants sub-area;
- Water conservation and demand management – specifically related to upgrade, maintenance and efficient operation of the Olifants Government Water Scheme canal;
- Groundwater scheme development for local reconciliation;
- Surface water development options recommended by the WODRIS study.

Funding of Infrastructure

It should be noted that Government policy under normal circumstances is that the users will be required to pay for any additional resource development that may be required to provide for the ecological water requirements of the Reserve, or water for additional use. The exception is RPFs, for whom limited State subsidies may be available for bulk water infrastructure.

Strategy:

Water Conservation and Demand Management (WC&DM) in the conveyance and distribution of agricultural water, as well as improved operational efficiency of the canal system are priorities in this WMA. Urban WC&DM will also result in small water savings. Ongoing eradication of IAPs throughout the WMA will have a beneficial effect, albeit small as far as the added volume of water is concerned. Implement sustainable management of stressed aquifers. Water trading should be encouraged.

To provide a holistic picture of the WMA and options for development, the feasibility of the various large-scale storage schemes investigated over the past few decades should be discussed with the users and water forums. DWAF should make a statement regarding its position on these schemes once the Comprehensive Reserve Determination study and the Raising of Clanwilliam study have been completed in 2006. The development of off-channel farm dams should be encouraged, to store high winter flow in order to reduce the abstraction of summer low flows. Groundwater scheme options must be investigated and appropriate development options initiated.

Management Actions:

- Undertake a study to confirm run of river and farm dam capacities in the Koue Bokkeveld and Upper Olifants;
- Undertake verification of water use as per the **Verification Strategy;**
- Undertake more detailed assessments of the availability of groundwater data;
- Verify groundwater use data, as registered, to amend groundwater yields if necessary. This will be in terms of priorities identified in the **Groundwater Strategy** and **Verification Strategy;**
- A groundwater reconciliation study is required. It must address the assumptions and definitions, which provide a standard DWAF approach to the groundwater yield in conjunction with surface yield;
- All affected yields should be updated, following completion of the Comprehensive Reserve Determination which is currently under way;
- Ensure that the Clanwilliam Dam Raising Study proposes appropriate guidelines for Reserve implementation in the Upper Olifants sub-area;
- Provide a statement regarding DWAF's position on the various investigated large-scale storage schemes, once the Clanwilliam Dam Raising Study and Comprehensive Reserve Determination have been completed in 2006;
- Set up a detailed model for comparison of availability and requirements.

Responsibility: Regional Office with input from the Directorate National Water Resource Planning.

Priority: Very High

CHAPTER 7
WATER RESOURCES PROTECTION STRATEGIES

The *Water Resources Protection Strategies* address the need to achieve the protection of water resources to ensure their continuing availability for human use by providing enough water of appropriate quality while maintaining acceptable ecological and system functioning. This will be achieved by:

- Classification of freshwater bodies and determination of their human and environmental Reserves;
- Setting resource quality objectives for freshwater bodies;
- Addressing water quality management, pollution control and sanitation; and
- Addressing solid waste management.

Therefore, water required for socio-economic growth must be balanced with the availability of water that is fit for use by all users, including the protection of aquatic ecosystems. The NWRS defines two complementary approaches for the protection of water resources. **Resource Directed Measures** focus on the character and condition of the in-stream and riparian habitat, whilst **Source Directed Controls** focus on the control of water use at the point of potential impact, through conditions attached to water use authorisations.

These strategies aim to achieve adequate protection for surface and groundwater resources, in terms of the desired states of these resources, in order to reach a balance between protection and sustainable use.

The following specific strategies have been developed:

- Reserve and resource quality objectives;
- Water Quality Management; and
- Wastewater Treatment and Solid Waste Management.

7.1 RESERVE AND RESOURCE QUALITY OBJECTIVES

Management Objective:

The strategy in the Olifants/Doorn WMA seeks to ensure that:

- All the river systems in the Olifants/Doorn WMA are classified and RQOs are determined within the constraints of the national RDM priorities;
- Reserve (i.e. surface, groundwater, estuarine and wetland) determinations are carried out timeously and at appropriate levels, depending on the ecological and yield balance requirements on the system;
- Implementation Strategies for the Reserve and the RQOs are developed, once they have been determined.

Situation Analysis:

The Olifants/Doorn system comprises of two very ecologically different river systems. Flow in the Olifants River is perennial and is of good quality, because of the southern Cederberg mountains with their high winter rainfall. Much of the remainder of the WMA is located in the Karoo, resulting in low runoff of high variability and of poor quality. There are eight endemic fish species in the Olifants River, which is indicative of the significant bio-diversity. The major tributaries of the Doring River are the Groot, Tankwa, Tra-tra, Bos, Biedou and Brandewyn. The Groot River is a perennial river formed by a number of tributaries flowing from the Cedarberg mountains.

The remainder of the tributaries stem from lower rainfall areas, bordering on the Karoo and therefore many are ephemeral. Nine indigenous fish species (seven of which are endemic) and the unimpounded nature of the Doring River makes this a conservation worthy river. The Doring River is particularly sensitive to in-stream water storage structures which would change the flow dynamics and impact on the opportunity for fish to move up and down the river (refer to **Section 2.1.7**).

The Reserve

The NWRS recommends the following management classes at catchment outlets:

Table 7.1: Management classes at catchment outlets

Item	Management class at catchment outlet
Kouebokkeveld	B
Sandveld	[2] C, D
Olifants	D
Knersvlakte	C
Doring	C

1. A = Rivers of highest ecological status, D = Rivers of low to medium ecological status
2. Varies for different coastal rivers

The mouth of the Olifants River is permanently open. The tidal influence extends 36 km upstream during spring tides. The Olifants River Estuary has high conservation status. It has large areas of intertidal and supratidal salt marsh and a large number of fish and bird species which depend on the estuary. The estuary is sensitive to decreases in river flow and flood frequency. The river water quality entering the estuary is influenced by high agricultural runoff in the Lower Olifants.

The Sandveld rivers are ephemeral and feed the coastal wetlands of Verlorevlei, Langvlei, Wadriftsoutpan and Jakkalsvlei near Lambert's Bay. These systems are vulnerable due to the pressure placed on the groundwater resource and the poor quality of irrigation return flow.

The ongoing Reserve determination studies are discussed in **Section 2.1.8.** The *Olifants Doring River Basin Study Phase 2 (2003)* undertook some EWR determinations and these are integrated into the water balance in **Chapter 4**.

The Koue Bokkeveld is a highly utilised, complex system which has a unique natural environment. Hence, there is a lack of understanding regarding the Reserve requirements to ensure the functioning of the tributaries and the impact of farm dams.

The Doring sub-area is also an area of concern as many of the tributaries are ephemeral and the ecological functioning of these systems is not well understood. During summer these tributaries dry up into a series of pools in which the fish and other aquatic species survive the summer. It was recently discovered that indigenous fish species only survive in pools which have groundwater inflow during the summer. The link between groundwater baseflow and the ephemeral streams may therefore be even more critical than previously thought. Groundwater use in these drier areas must be carefully considered. It should be noted that a constraint in the Reserve Determination process is a lack of flow and water quality data throughout the WMA (refer to the **Monitoring and Data Management Strategy**).

Olifants River

Implementing the Reserve requirement at Clanwilliam Dam will result in a reduction in the yield of the dam. This reduction in yield based on the Desktop Reserve is given as 12 million m^3/a in the NWRS. The model used in the *Olifants Doring River Basin Study Phase 2 (2003)* calculates the reduction in yield to be 40 million m^3/a if the Reserve is met from the dam alone, and 14 million m^3/a for a *distributed Reserve* (refer to **Appendix 3**). The outlet structure of the Clanwilliam Dam will be affected by the EWR and the possibility of a multi-level outlet structure and concomitant water quality issues will be considered in the *Raising of Clanwilliam Dam Study*.

Groundwater and Springs

Current protection, monitoring and management of springs are inadequate. There is limited quantitative understanding of variations in spring discharge and current understanding of the relationship of different aquifers to spring flow and baseflow is uncertain. The fractured rock aquifers are especially vulnerable to contamination. The groundwater supply to small coastal resorts and the towns is also vulnerable (refer to the **Water Quality Strategy**).

Strategy:

The Olifants/Doorn WMA was identified and prioritised for Comprehensive Reserve Determination studies to be undertaken. These studies should be encouraged and supported to ensure that the work is undertaken as efficiently as possible. New licences should be discouraged in the stressed areas (Koue Bokkeveld, Upper and Lower Olifants and Sandveld) until the EWR and RQO have been finalised by the Comprehensive Reserve Determination Study.

The interim licencing practices must not jeopardise the Reserve. A precautionary approach should be adopted to licence applications, which need to be resolved in the interim. These decisions will continue to rely on *ad hoc* Rapid Reserve determinations. Only empowerment initiatives should be dealt with in this manner on account of their priority. Where possible, licences can be issued for shorter periods where there is still uncertainty about the EWR. The Regional Office must encourage and educate users regarding the importance of the EWR so as to encourage a willingness to implement the Reserve (refer to the **Capacity Building and Communication Strategy**).

EWR determinations for wetlands and groundwater will continue to be done on an *ad hoc* basis according to the latest, existing RDM methodologies. Following the development of methodologies for wetlands and groundwater, timeous identification and initiation of such Reserve studies can take place to ensure a better understanding of groundwater dependent ecosystems in the WMA. All large-scale groundwater applications will require quantification of surface -groundwater interaction.

The infrastructure development investigations such as the possible raising of Clanwilliam Dam must include designing appropriate outlet structures for appropriate flood releases. Operating rules must be updated to achieve the aims of the EWR once the Dam is raised. Once identified the operator of the dam must be trained to understand the EWR.

Management Actions:

- Utilise the River Health Programme annual surveys and other specified monitoring programmes to monitor Reserve implementation;
- Utilise technical information provided by the 2003-2005 Comprehensive Reserve Determination Study and the Sandveld Preliminary Reserve study once complete to inform Reserve implementation;
- Implement operating rules for Clanwilliam Dam after raising which meet EWR. Monitor and audit the results of these releases;
- Undertake a study to develop methods for Groundwater- Surface water interactions. Focus on contributions to river and wetland systems;
- Implement an education programme to explain the implications of the RQO and the Reserve, as informed by the comprehensive study, to local authorities, WUAs and water forums (see the **Capacity Building and Communication Strategy**);
- The results of the Reserve Determination must be integrated into an Integrated Resource Management Plan for the Koue Bokkeveld;
- Implement a baseline-monitoring programme to collect required information for wetland EWR study (refer to the **Monitoring Strategy**).

Responsibility: The implementation of this strategy is the responsibility of the Southern Cluster with contributions by the Directorate Resource Directed Measures.

Priority: Very High

7.2 WATER QUALITY MANAGEMENT

Management Objective:

This strategy seeks to achieve improved understanding of the condition and quality of water resources in the WMA and to meet the RQOs by implementing a receiving water quality management approach.

Situation Analysis:

Surface water

The high winter rainfall and the natural geology in the upper reaches of the Olifants River ensure that the water quality is good. There is an increase in salinity downstream of the confluence of the Olifants and Doring Rivers. This is attributed to the geological formations in the Doring and saline return flows from agricultural areas in the Olifants River. Many of the Doring's tributaries are ephemeral and subject to erosion which means high levels of turbidity when they are flowing during the wet season. Surface water in the northern sub-areas tends to be of lower quality on account of its higher salinity. It is generally not of potable standard (TDS of 1 000 mg/ℓ at best).

Water quality standards must be reviewed in light of the European Common Agricultural Policy standards (EURO CAP) to ensure that the export market is not jeopardised. Encourage EURO CAP and ISO14000 standards to be implemented.

Groundwater

The groundwater in the Upper Olifants sub-area is of a high quality as it is drawn from the Table Mountain Group (TMG) Sandstones. Some of the groundwater in the Sandveld is believed to be utilising Peninsula Formation hydrotechts and therefore draws on the same aquifer in the TMG Sandstones. The remaining Sandveld groundwater is contained in sandy primary aquifers which are vulnerable to infiltration by irrigation runoff. There is also some saline intrusion from the sea along the Sandveld coast due to over-abstraction.

Appreciation of the movement of contaminants in fractured rock aquifers and thus protection of the groundwater resource in this WMA is poor. Systematic monitoring of a background, diffuse and a point source nature is required to monitor and protect groundwater resources from contamination by Irrigation Return Flow (IRF) and or seawater intrusion. Groundwater in the primary aquifers of the Doring sub-area is of low quality as it is influenced by the chemistry of the Karoo Basin rocks which increase the salinity and iron content of the water. Water in the Knersvlakte is variable, from reasonable quality in the Vanrhynsdorp Karstic aquifers (E33F) near the coast to poor quality groundwater in the inland region.

Water Quality Issues and concerns in the WMA are:

- Lack of RQOs;
- Pollution (nutrient enrichment) of surface water, groundwater, estuaries and wetlands by agricultural return flow;
- Micro-organism pollution;
- Intrusion of seawater- coastal aquifers;
- Sedimentation and turbidity.

Specific water quality issues raised for sub-areas are:

Upper Olifants - The Citrusdal valley experiences eutrophication which is largely attributed to agricultural return-flows, especially in the summer months when the flow is relatively low in the river. Further to this municipal effluent, municipal solid waste management and informal settlements cause poor water quality. Effluent from fruit and wine industries needs to be monitored in Citrusdal. The fish kills, which have previously been attributed to temperature inversions in Clanwilliam Dam, need to be monitored in conjunction with water quality.

Lower Olifants - Effluents from fruit and wine industries cause seasonal water quality problems. Wine industry effluents from Klawer, Vredendal and Lutzville require on-going monitoring and management. The process of irrigation normally results in saline return flows. Poor agricultural and land management practices could result in even more undesirable agricultural return flow (refer to the **Co-operative Governance Strategy**). Due to the poor water quality, micro-organism pollution can be a problem in the Lower Olifants.

Sandveld – Pollution of wetlands and shallow aquifers by agricultural return flow is a concern and requires monitoring. Seawater intrusion into the coastal aquifers due to over-abstraction has been recognised as a threat to the sustainability of coastal water supplies.

Koue Bokkeveld – The lack of adequate sanitation for farm workers creates water quality concerns in the Koue Bokkeveld. This is exacerbated by the influx of seasonal workers during harvesting. Siltation is also a problem on account of the intensive agricultural practices.

Doring –The eastern tributaries of the Doring River have high salinity in this area as a consequence of the geology and the fact that many of the tributaries are ephemeral. This is completely natural but has consequences for utilisation.

Knersvlakte – The Knersvlakte is a naturally saline system. The brine effluent from the desalination plant at Bitterfontein which is released into evaporation ponds and the mining effluent from the Namakwa Sands operations requires on-going monitoring to prevent possible detrimental impacts.

Strategy:

A key element of the water quality strategy is to focus on improving the quality of agricultural runoff through co-operative governance with the Department of Agriculture Western Cape (see the **Co-operative Governance Strategy**).

The water quality concerns need to be better understood and therefore monitoring must be improved (refer to the **Monitoring and Data Management Strategy**). Borehole design and abstraction should be managed to avoid seawater intrusion (refer to the **Groundwater Strategy**).

Management Actions:

- Establish RQOs;
- Utilise existing guidelines for borehole design in sensitive areas and where necessary update them to be area specific. Prioritise aquifers most stressed with respect to over-abstraction, poor management and threat of contamination for purposeful intervention to improve groundwater management and resource protection;
- Identify and implement groundwater recharge protection zones for the resource;
- Engage with the Department of Agriculture regarding programmes to limit poor agricultural practices that impact on water quality;
- Encourage the CCAW to consider all new irrigation applications in terms of their impacts on water quality;
- Develop and implement Pollution Incidence Plans where appropriate;
- Focus surface water quality monitoring efforts on agricultural return flow and bacteriological pollution. Focus groundwater monitoring on seawater intrusion in coastal abstraction schemes (refer to the **Monitoring Strategy**);
- Ensure water quality standards meet European export industry standards so that the economic base of the WMA is not threatened;
- Monitor water quality in the Clanwilliam Dam in relation to the occasional fish kills;
- Develop a better understanding of the short-term (day to day) water quality variability in the Doring River and its relationship with the ecology.

Responsibility: The implementation of this strategy is the responsibility of the Regional Office.

Priority: Medium

7.3 WASTEWATER TREATMENT AND SOLID WASTE MANAGEMENT

Management Objective:

To improve the negative impact that waste management practices in the WMA has on water quality.

Situation Analysis:

Issues and concerns in the WMA are:

- It is unknown which WWTWs have adequate contingency plans to deal with power outages and spills;
- Each town has its own Solid Waste Disposal Site (SWDS), some of which do not meet the full legislated standards;
- Control of solid waste on farms can be problematic, as it is perceived that farmers often dump solid waste near river courses resulting in pollution;
- The European standards for water quality need to be met in order for export produce to be accepted in the European Union (EU).

Specific Water Quality issues raised for sub-areas are:

Upper Olifants - The WWTWs at Citrusdal and Clanwilliam require urgent attention, as they do not meet the legislated standards. The SWDS of Citrusdal requires urgent attention, as it is currently not meeting required standards.

Lower Olifants - The SWDSs of Clanwilliam and Vredendal require urgent attention, as they are currently not meeting required standards.

Sandveld - Graafwater's WWTW is not meeting legislated effluent standards.

Strategy:

Sections 19 and 20 of the National Water Act state that a land owner, a person in control of land or a person who occupies land on which activities are undertaken which cause or might cause pollution is responsible for preventing and remedying the effects of such pollution. Despite this, there appears to be confusion within the WMA regarding which tier of government is responsible for pollution control. Intervention is required to establish whether provincial or local authorities are responsible for this issue. DWAF should provide standards for farm dump sites and provide limited solid waste technical assistance to local authorities through Water Service Development Plans (WSDPs).

Water quality standards must be reviewed in light of the European Common Agricultural Policy standards (EURO CAP) to ensure that the export market is not jeopardised. Encourage EURO CAP and ISO14000 standards to be implemented.

Management Actions:

- Update the list of all WWTWs (**Appendix 7**) in the WMA and identify those which have problems meeting prescribed discharge standards;
- Monitor the effectiveness of maturation ponds at the various municipalities at regular intervals;
- Assess the needs required to ensure improved management of SWDSs and WWTWs and develop a priority list;
- Through co-operative governance with local authorities, build capacity to ensure that operators of WWTWs develop responsibilities and procedures for emergency control of spillages, power failures and mechanical breakdowns;
- Highlight to the Municipal Infrastructure Grant (MIG) the concerns that the DWAF have regarding the SWDSs and the WWTWs which require infrastructure upgrades. Encourage appropriate funds to be made available for necessary upgrades;
- Liaise with the Department of Health to provide guidance regarding WWTWs and SDWSs that do not meet requirements;
- Through co-operative governance with local authorities, implement the Department's Sanitation Policy and monitor it;
- Ensure strict pollution control measures are given in new water use authorisations issued (refer to the **Licencing Strategy**).

Responsibility: The implementation of this strategy is the responsibility of the Regional Office in consultation with the national Waste Discharge and Disposal Directorate.

Priority: High

CHAPTER 8
WATER USE MANAGEMENT STRATEGIES

Chapter 4 of the NWA describes the provisions by which water use may be progressively adjusted to achieve the Act's principle objectives of equity of access to water, and sustainable and efficient use of water. Many of the Act's sustainability and efficiency related measures apply through conditions of use imposed when authorisations to use water are granted. These authorisations facilitate administrative control of water use by water management institutions, form the basis upon which charges for water use may be made, and provide for the collection of water-related data and information.

Verification of existing lawful use in terms of the water use authorisations is essential and in water stressed areas Compulsory Licensing may be required. General Authorisations provide a means of reducing the number of authorisations that require processing but should not compromise the protection of the water resource.

The *Water Use Management Strategy is required to address*:

- Usage of general authorisations to manage water use
- Verification of the extent and legality of existing water use
- Processing and issuing of new water use authorisations
- Control of invasive alien plants and weeds, and
- Implementation of pricing for water use.

The following specific strategies have been developed further:

- Water allocation and licensing;
- Verification of existing lawful use;
- Management of non-compliant use;
- Compulsory licensing;
- General authorisations;
- Invasive alien plant control; and
- Support to local authorities.

8.1 WATER ALLOCATION AND LICENCING

Management Objective:

This strategy deals with abstraction and storage licences, dam safety licences, effluent disposal licences, stream-flow reduction activity licences and licences to abstract groundwater. These are guidelines for the response to water-se applications. This strategy is to ensure that:

- licences are not issued in stressed catchments;
- optimal use of available resources;
- surplus water in the WMA is allocated as a priority to resource-poor farmers.

Situation Analysis:

The *Olifants Doring Basin Study Phase 1 (1998)* recommended restrictions on further licensing until more information was available on development options and the Reserve. Further allocations were restricted to the following limit on total licence quantity:

Koue Bokkeveld/Witzenberg	950 ha
Citrusdal/Clanwilliam	475 ha
Middle Doring	150 ha
Ceres Karoo	1500 ha
Coastal Zone	2000 ha

The restrictions are currently being adhered to by DWAF. The restrictions were to apply for a period of seven years, up to the end of 2005, to ensure that *ad-hoc* development did not preclude the development of any of these schemes by the Northern Cape. At the end of 2005, DWAF should reconsider the situation in the light of new information available at that stage. It is preferred that the High Confidence Reserve Determination and Raising of Clanwilliam Dam Feasibility studies should be completed, prior to a review of the restrictions to ensure that the relevant information is available. This could mean that the review may have to be postponed to 2006.

Licensing Farm Dams

This WMA is in a transitional climatic zone but much of its water comes from winter rainfall. This leads to the condition that the greatest demand is during summer when river flow for abstraction is limited. Farm dams play a very important role in two of the sub-areas in the WMA, namely, the Upper Olifants and the Koue Bokkeveld. There are opportunities for additional farm dam storage in the upper and the lower tributaries of the Doring River, depending on the requirements for the ecological reserve.

Stream Flow Reduction Activity Licensing

There is very little commercial forestry in this catchment. Approximately 10 km^2 is registered in the Upper Olifants sub-area. Further applications are not expected but would be evaluated in the same way as any other water use licence application.

Groundwater Licensing

It should be considered whether a groundwater abstraction licence from the fractured rock aquifers should be awarded to a Water User Association rather than to individual users so as to ensure integrated regional management of the resource. DWAF would require that aquifer-specific management plans are developed and the Water User Association would be required to implement the operating rules. RQOs and capacity building are needed to ensure compliance and adaptation of the operating rules as the monitoring information becomes available.

Issues raised for the sub-areas are detailed below:

Doring - The water resource in the vicinity of Calvinia and Niewoudtville is stressed. Trading of water use authorisations is to be encouraged to benefit resource-poor farmers. In-channel dams should be discouraged on the Doring River on account of the ecological flow requirements of the river. Limited off-channel storage can be considered where the impact on the EWR would be acceptable. Large portions of this sub-area rely on groundwater. The Western Cape Provincial Government *Olifants Doring River Irrigation Study (WODRIS study 2002-2004)* is investigating opportunities in this area.

Koue Bokkeveld - There is a lot of pressure on the water resource in the southern region of this sub-area. Numerous farm dams have been developed and there is pressure for new allocations where possible trading rather than new allocations should be encouraged. The area may need to be considered for compulsory licensing should the Reserve not be met.

Upper Olifants - There are numerous farm dams in the headwaters of the Upper Olifants sub-area and in the vicinity of Citrusdal. There are a number of applications to construct more off-channel dams to store winter water abstracted from the Olifants River in accordance with the water allocations. The Upper Olifants is stressed in summer and there is insufficient storage in farm dams. Registration of farmers' boreholes is important to determine the level of conjunctive use. The implementation of the Reserve upstream of the Clanwilliam Dam could be problematic and may result in a need for Compulsory Licensing.

Sandveld - A Reserve study is being undertaken in the Sandveld where the groundwater resources are stressed and the cumulative impact of individual or small-scale groundwater developments are not sufficiently accounted for.

Lower Olifants – The Lower Olifants is stressed, as there is over-allocation of the yield from Clanwilliam Dam which serves the Olifants River Government Water Scheme. There is pressure for development in the Vredendal area but there are limited unused allocations which can alleviate the pressure. Downstream of Bulshoek Weir, abstraction from the river is allowed under conditional authorisations (only when water is available) and below the confluence with the Doring River there may be opportunities for winter abstraction and off-channel storage, based on winter surplus flow.

Knersvlakte - Bitterfontein-Nuwerus, Rietpoort and Molsvlei urban supply areas are stressed. Further groundwater development and continued desalination seems to be the only source of future supply. Increased domestic use of groundwater had led to an urgent need for ongoing monitoring and reporting back to the water users.

Strategy:

The licensing approach will be to evaluate and process water use and storage licences only in those catchments or aquifers that clearly have allocable volumes of water. The processing will be subject to the constraints posed by the availability of resources and information. New licences for additional surface water abstraction should be discouraged until the Comprehensive Reserve Determination Study has been completed (2006).

Off-channel storage is to be encouraged in areas where surplus winter water can be stored to supplement summer low flows. The cumulative impacts of developing additional storage must take the Reserve and ecological functioning of the river system into account and ideally should benefit these. Licences should be issued for a shorter period increasing water-resource management flexibility.

The unused allocations should be quantified and trading encouraged to present opportunities to provide water to resource-poor farmers. Additional groundwater abstraction licences should be considered where abstraction will not negatively impact on surface water sources.

Area specific strategies

Koue Bokkeveld - The high winter rainfall regime with concomitant low summer flows occurs but the development of additional farm dams is not supported due to the uncertain impact that these dams may have on the small Doring River tributaries. New licences for farm dams in the Koue Bokkeveld should be discouraged until the Comprehensive Reserve Determination Study has been completed (2006).

Upper Olifants - Farmers should be encouraged and licensed to develop their off-channel storage capacity to store winter water to replace summer low-flows abstraction and thereby limit the impact on the Olifants River during the dry season. A licence to raise Clanwilliam Dam should also be considered. Pending the determination of the Reserve, storage capacities of existing or new off-channel storage dams should be in accordance with the DWAF's current licencing policy, i.e. storage is limited to a maximum of 60% of the annual allocated volume of abstraction. Additional groundwater licences can be considered.

Lower Olifants - Licences for additional surface water abstraction should be discouraged in this area. Additional groundwater licences can be considered.

Sandveld - The total groundwater abstraction needs to be capped and trading encouraged within this volume.

Management Actions:

- Initiate an education programme to improve registration and compliance to licence conditions
- Implement the recommendations of the National Licencing Strategy;
- A Water Allocation Plan should be developed for the Sandveld;
- Licence conditions must be refined with assistance of the WUAs. Licences for regional discharge conditions should be reviewed i.t.o. effluent (refer to the **Water Quality Strategy**);
- Ensure that more information about boreholes is provided with groundwater licence applications including borehole logs.

Responsibility: Regional Office

Priority: Very High

8.2 VERIFICATION OF EXISTING LAWFUL USE

Management Objective:

Verification is required as a preliminary step towards compulsory licensing to improve the knowledge about water use and enable water pricing to be implemented.

Situation Analysis:

As the first step towards verification, there needs to be a validation process of water use registration information contained on the WARMS database for the Olifants/Doorn WMA. A particular concern is the lack of reliable measurements of irrigation water being used in areas which do not have WUAs. Quantities registered are accepted without being measured. There are insufficient Water Control Officers in the field to undertake such validation and control activities.

Issues identified in specific sub-areas

Upper Olifants - There is limited information on groundwater abstraction on farms and surface water abstraction from the Olifants River tributaries. It is necessary to understand the different water sources upon which users rely during different months of the year.

Sandveld - The area is highly stressed and verification of registered groundwater abstraction is critical, as is the use of surface water. Seawater intrusion and dewatering of wetlands add significance to understanding the utilisation in the area. Unlawful use is a concern in this sub-area (refer to the **Management of Non-compliant Use Strategy**).

Doring - The groundwater abstraction in the Doring needs to be better defined.

Koue Bokkeveld - A more accurate determination of the number and capacities of the farm dams in this area needs to be undertaken. The amount of groundwater abstraction is also subject to poor information.

Lower Olifants - The quantity of water being abstracted between Clanwilliam Dam and Bulshoek must be determined. Some of the farmers appear to have expanded illegally. The abstraction from the Lower Olifants' tributaries such as the Jan Dissels must also be quantified as this is uncertain and the area is stressed during peak demand.

Once there is a better understanding of the legal water use in the WMA the legal process of verification can be initiated.

Strategy:

Validation of the water-use registration should be undertaken as a matter of urgency in the five sub-areas identified. The validation of surface water and groundwater-use registration for the two highest priority sub-areas should be undertaken within 1-2 years. Validation of the water use registration for the remaining sub-areas should be undertaken within 2-4 years. Once completed, the verification process can be initiated to enable compulsory licensing in those sub-areas which are confirmed to require intervention. Verification should be in line with the National Verification Guidelines.

Management Actions:

Implement the regional verification of registered water use, verification of the status of illegal dams (regarding impoundment), abstraction and afforestation, as well as the procedure for dealing with unauthorised water use according to the policy being developed by the Directorate Water Abstraction and In-stream Use as follows:

- Outsource implementation of the validation and verification processes;
- Encourage further registration of use and complete the population of the WARMS database with water user registration information (information management);
- Improve knowledge of the assurance of supply of registered water use;
- Use the Departmental *pro forma* letters to deal with under-, over- or no- registration, based on the administrative process in Section 35;
- Audit the WARMS data and use appropriate remote-sensing data, maps, aerial photography or any other relevant information in the audit and do random or targeted field-check verifications according to available resources;
- Improve knowledge of impoundments, farm dams, diversion works, groundwater use and irrigation, SFRAs and domestic and industrial use through the registration process, after such uses have been registered.

Responsibility: Regional Office assisted by the Directorate Water Abstraction and In-stream Use, where necessary.

Priority: Very High for the Sandveld and Koue Bokkeveld, and medium for other areas.

8.3 MANAGEMENT OF NON-COMPLIANT USE

Management Objective:

To manage non-compliance with lawful water use and provide appropriate approaches suited to the Olifants/Doorn WMA.

Situation Analysis:

There is a perception that non-compliant use is occurring in certain areas in the WMA. Many of these require validation before it can be determined whether non-compliance is occurring. Some officials have expressed concern that some users appear to develop infrastructure, i.e. farm dams, prior to obtaining licences due to the protracted nature of the licensing process after which the applicants expect the dams to be approved *ex-post facto*. In other cases there is concern that users are over-abstracting during periods of low flow.

There are also reported incidences of exploitation of the General Authorisations in the WMA. Generally authorised water use for both surface and groundwater abstraction requires regular review, to ensure that there is compliance and that the resource is protected (refer to the **General Authorisations Strategy**).

Upper Olifants - In the Citrusdal area there are several dams which do not have licences. This is currently being rectified, by applications having been submitted for licensing or structures being removed.

Lower Olifants - Below Bulshoek Weir, the historical ten morgen developments are not necessarily authorised. Use downstream of Bulshoek Weir should be validated as soon as possible, and compliance monitoring is implemented.

Sandveld - In the Sandveld, wetlands are being modified and in-filled illegally (refer to the **IEM Strategy**). Further to this, some irrigators (potato farmers) in the Sandveld are abstracting groundwater without the proper licencing arrangements. Groundwater usage in the Sandveld requires urgent verification (refer to the **Verification Strategy**).

Strategy:

This strategy follows verification unless there are known contraventions. Unlawful use will not be tolerated. Decisive action will be taken against clear cases of illegal use. Compliance monitoring must be improved to ensure operational compliance. Self-regulating measures by WUAs are to be encouraged and DWAF should then audit results regularly.

Management Actions:

(Refer to the **Verification Strategy, Capacity Building and Communication Strategy** and **Co-operative Governance Strategy**).

- Follow steps in national guidelines;
- Establish procedures and information for compliance monitoring;
- Regional Office to ensure legal support to prosecute illegal activities;
- Put monitoring system for compliance monitoring in place (procedures and infrastructure).

Responsibility: Regional Office

Priority: Very High

8.4 COMPULSORY LICENSING

Management Objective:

To plan for compulsory licensing in the identified catchments.

Situation Analysis:

Compulsory licensing is driven by the need to curtail resource use so as to comply with the Reserve, redress inequities and resolve over-allocation where necessary.

Compulsory licensing is seen as a medium priority within this WMA. Although compulsory licensing is seen as a last resort for resolving the negative yield balances, there are areas in the Olifants/Doorn WMA which may require compulsory licensing if verification and water-rights trading do not resolve over-allocation and inequity in the area and if the requirements of the Reserve cannot be met.

In this WMA the problems of over-use, over-allocation and the need to provide for the Reserve are key drivers for compulsory licensing. Inequities in allocation are important but play a secondary role due to there being relatively limited demand and alternative strategies to provide water to RPFs. There are subsidies available which can be utilised to buy water-use rights for RPFs.

The priority for compulsory licensing within the WMA is:

1. Sandveld;
2. Upper Olifants;
3. Koue Bokkeveld;
4. Lower Olifants.

Sandveld - The water resources of the Sandveld sub-area are seriously over-allocated, groundwater resources are being depleted and wetlands and rivers seriously damaged. Within the Sandveld sub-area, Elandsbaai and Verlorevlei require critical attention and Langvlei may also require intervention, as local sources are over-utilised. A Sandveld Management Plan is expected to be an outcome of the current RDM Sandveld Study. This plan will detail the appropriate response to the stress, over-allocation and inequity currently being experienced.

Upper Olifants - The Upper Olifants sub-area is the second priority in the WMA as there is over-allocation and there is a need to provide for the Reserve. The verification process must be completed to determine the level of stress in this sub-area prior to considering compulsory licensing. Conjunctive use between groundwater and surface water to fully use allocations should be considered.

If the planned raising of Clanwilliam Dam is not realised, and additional off-channel storage not created by upstream users, the urgency of compulsory licensing along the Olifants River will increase.

Koue Bokkeveld - There is increasing demand for agricultural expansion in the Koue Bokkeveld. The rivers in this sub-area are expected to have high Reserve requirements due to the nature of the riverine ecosystem and the water quality concerns during summer. The results of the High Confidence Reserve Determination will inform the need for compulsory licensing.

Lower Olifants - Water trading is occurring in the Lower Olifants sub-area through the Lower Olifants River Water User Association (LORWUA). It is planned that some of the water-use rights available for trade will be bought by LORWUA and held in trust for resource-poor farmer initiatives. Although the Lower Olifants is over-allocated, the process of verification and water trading must be allowed as an opportunity to resolve as much of the stress as possible, prior to considering compulsory licensing. The need for compulsory licensing is linked to the similar need in the Upper Olifants sub-area and will also depend on whether the possible Clanwilliam Dam raising occurs or not**.**

Strategy:

Compulsory licensing should be undertaken for the Sandveld because of the existing stressed situation. The need for compulsory licensing in the other sub-areas needs to be re-assessed after verification. The evaluation of the equity needs in the WMA needs to be undertaken and re-allocation could, if necessary, be done along with compulsory licensing to provide water for the Reserve and to balance requirements with water yields.

Management Actions:

Implement the compulsory licensing process in the identified catchments, if the water requirements are not resolved in another way, in a phased, integrated manner as a step-wise process in the Sandveld and other required sub-areas according to the National guidelines.

Responsibility: Regional Office

Priority: Medium

8.5 GENERAL AUTHORISATIONS

Management Objective:

To use GAs as a management tool to alleviate the administrative processes of licensing.

Situation Analysis:

Current General Authorisations (GAs) are listed in **Appendix 8.** These GAs can and will change and the ISP should be updated to reflect any changes. General authorisations as published on 26 March 2004, in terms of Section 39 of the NWA have stipulated the following:

- Areas excluded from GAs for the taking of water from a water resource and storage of water, currently only apply to:
  - E10A-K Olifants River (above the confluence with the Doring);
  - The Groot River E21 (tributary of the Doring River) Koue Bokkeveld sub-area; and
  - The Verlorevlei River G30 in the Sandveld sub-area.

- The Sandveld sub-area (G primary drainage region) includes Subterranean Government Water Control Area which is excluded from the GA for groundwater abstraction:
  - Strandfontein;
  - Wadrif;
  - Graafwater.

- Portions of the WMA are limited "Groundwater Taking Zones". These are listed in **Appendix 8;**
- It is also classified for irrigation with waste and for the disposal of waste;
- GAs apply for limited discharges to water resources for the whole WMA;
- The Olifants River is the only water resource to which a special limit effluent standard applies;
- There is one RAMSAR listed wetland in the WMA, namely Verlorevlei;
- Control and management of river channel modification is regulated through the March 2004 General Authorisations (see **Appendix 8)**.

Strategy:

GAs are generally in place but the need for some changes or refinements has been identified. The more urgent identified changes to the GAs must be evaluated and motivated to enable changes to be made. GAs should be reviewed regularly and should attend to WMA-specific needs. GAs should be made more specific for tributaries, and for groundwater. Groundwater GAs need to reflect the aquifer being used, and need to consider the cumulative impact of small users.

Management Actions:

- Introduce area-specific GAs, where water-use limits are determined by availability of water;
- Regular Review;
- Revise GAs to be more specific.

Responsibility: Regional Office

Priority: High

8.6 INVASIVE ALIEN PLANTS

Management Objective:

To prioritise invasive alien plant clearing operations from a water-resource perspective.

Situation Analysis:

In 1999-2001 aerial photography was undertaken for the WMA and converted into IAP infestation-density information. There is no waterweed problem in the WMA, although algae in the waterways is a concern. The Working-for-Water (WfW) programme has implementation projects in the following areas:

- Citrusdal;
- Clanwilliam;
- Loeriesfontein;
- Calvinia;
- Nieuwoudtville;
- Witzenberg.

The effect of clearing IAPs in this WMA on discharge to the river and recharge to groundwater should be assessed. WfW are currently undertaking a reprioritisation due to limited funds.

DWAF sees the WMA needs and priorities as follows:

Upper Olifants - Tributaries along the Upper Olifants sub-area need to receive attention before the infestation becomes too widespread. The effect of IAPs on the low flow in the Upper Olifants sub-area needs to be determined.

Lower Olifants - The Clanwilliam Dam to Bulshoek Weir clearing is scheduled to terminate in 2004. This area is only partially cleared and the work should preferably continue until the main infestation is cleared and only maintenance is required.

Sandveld - The Sandveld sub-area is also largely groundwater dependent but it doesn't have any IAP clearing programmes and this should be a priority. There is a need to initiate programmes in the Sandveld sub-area as preservation of the coastal wetlands require IAP clearing, monitoring and education to ensure retention of critical wetland functions (refer to the **Integrated Ecological Management Strategy**). Vaardrift and Jakkals River are the highest priority catchments within the Sandveld sub-area.

Koue Bokkeveld - The Koue Bokkeveld sub-area is at risk of becoming heavily invaded and pre-emptive work is required in this area. The clearing is in difficult mountainous terrain and the cost will be lower if preventative measures are taken soon rather than waiting for infestation to become dense and necessitating a higher priority.

The WfW programme is currently receiving a much higher payment from users (through the Catchment Management charges) in this WMA and across the Western Cape than elsewhere in the country. This should entitle the water users to higher levels of service in terms of IAP clearing. Since the Olifants/Doorn is one of the poorest WMAs in the country there are significant poverty relief benefits to any clearing initiatives in the WMA.

Strategy:

Since the WMA stress on water resources is particularly high during summer, the low flows are important both to users and the Reserve. This should result in a WfW focus on riparian IAPs to release as much low flow as possible. Recommended water resource priorities for IAP clearing programmes in the WMA are:

1. Upstream of Clanwilliam Dam (Citrusdal);
2. Sandveld;
3. Clanwilliam Dam to Bulshoek Weir;
4. Koue Bokkeveld;
5. Downstream of Bulshoek Weir;

Any water released due to IAP clearing should be allocated to alleviate water restrictions and/or to the Reserve and/or to resource-poor farmer initiatives where opportunities exist. The concept of "Water Enhancement and Allocation"[6] should be considered in this WMA. It is critical to consider ongoing maintenance. Where WfW has provided the initial clearing service, a follow-up maintenance programme must be negotiated with the landowner.

Management Actions:

The following actions are required to manage the removal of invasive alien plants:

- Review priority of IAP clearing activities in the WMA with the WfW Area Manager;
- Initiate a "Working for Wetlands" project in the Sandveld;
- Compile a regional WfW "follow-up" strategy for handover of maintenance responsibility to landowner after WfW has completed primary clearing;
- Design a regional strategy for co-operation with the Department of Agriculture in the Western Cape and the Department of Environmental Affairs and Development Planning (DEA&DP) to educate farmers on the importance of wetlands and the eradication of IAPs;
- Resolve WfW funding in the WMA;
- Initiate a programme to monitor and respond to excessive algae in the canals.

Responsibility: Regional Office in consultation with WfW.

Priority: Medium

[6] Users who are willing to take on the responsibility for IAP clearing and ongoing maintenance are given a portion of the water which is released by their IAP clearing.

8.7 SUPPORT TO LOCAL AUTHORITIES

Management Objective:

Co-operatively ensure adequate water supplies to local towns and municipalities, including appropriate provision for future supply. Establish local authority requirements for logistical, financial and information support.

Situation Analysis:

Free basic water is implemented throughout the WMA. Available water should be sufficient to meet the requirements of the various water supply schemes in the short term. DWAF is currently phasing out its involvement in supply services and is handing over the responsibility to local authorities who are then supported by DWAF.

Section 2.3.4 and **Appendix 9** details the towns and their sources of supply. There is currently a review being undertaken of all licences and use in towns. This should be completed during 2004. All towns appear to be using more than their 1998 use and this additional use needs to be authorised (Pers Comm Willie Enright DWAF Regional Office, February 2004). Towns in the Upper Olifants sub-area get their water mostly from the Olifants River with some additional supply from groundwater. Towns in the Lower Olifants sub-area and the southern portion of the Knersvlakte sub-area get their water from the canal and supplement this with groundwater. Those not near the canal or the Olifants River mostly use groundwater (Sandveld sub-area, northern parts of the Knersvlakte sub-area and the Doring sub-area). The Koue Bokkeveld sub-area does not have any significant towns but the water supplies are from the river and groundwater to small communities.

An accurate and up-to-date DWAF database of all Local Authority use called Muniwater, is maintained by the Water Services Directorate. Information provided in the WSDPs is generally insufficient and local authorities require assistance to improve the WSDPs (refer to the **Capacity Building Strategy**).

Groundwater

Conjunctive use of surface and groundwater to satisfy allocations should be considered for future supply, particularly in the Citrusdal area (refer to the **Groundwater Strategy**).

Local authorities who use groundwater need to develop operational plans to ensure sustainable use as the mismanagement of groundwater resources can have a dire effect on the supply to towns. Supplies to towns which are dependent on groundwater, namely the coastal towns and those in the northern reaches of the WMA have no back-up supply if the resource fails. These operational plans should be included in the WSDPs. There is such an initiative under the Masibambane project. The artificial storage of groundwater has been investigated in some areas such as Calvinia.

Eco-tourism and other forms of Tourism

The WMA has tourism potential and this must be provided for. Tourism peaks during summer and storage must be provided to accommodate this.

Seasonal workers

Large numbers of seasonal workers create peaks in demand during the harvesting period and adequate storage must be provided to accommodate this.

Strategy:

DWAF is no longer responsible for management of direct water provision, however, it is committed to providing support to local authorities who are responsible for water provision. Future needs, although anticipated to be reasonably small, need to be quantified and future sources of supply secured. Education, advice and practical support for water conservation and demand management initiatives and support for the WSDPs are required.

Management Actions:

- Assist local authorities in implementing successful water conservation and demand management;
- Assist local authorities with groundwater operational plans and drought-management plans;
- Encourage conjunctive use of groundwater and surface water to satisfy allocations (see the **Groundwater Strategy**);
- Ensure that all local authority water use data is updated and provide assistance if necessary;
- Assist local authorities in identifying and securing local supplies for future augmentation;
- Provide assistance to local authorities in the drafting of WSDPs, relevant sections of integrated development plans (IDPs) and relevant disaster management initiatives (refer to the **Capacity Building Strategy**).

Responsibility: Regional Office

Priority: High

CHAPTER 9
WATER CONSERVATION AND WATER-DEMAND MANAGEMENT STRATEGIES

The options for further augmentation of water supply by developing physical infrastructure are limited. Attention needs to be devoted to managing the demand for water, encouraging the efficient and effective use thereof and minimisation of loss or waste of water. The foundation of effective water conservation and demand management is the creation of a water conservation and demand management culture within all water management and water services institutions and among water users.

The National Water Conservation and Demand Management Strategy is currently being developed. This strategy is based on the reasonable premise that many water users can maintain their quality of life whilst using less water. Furthermore significant reductions in water use can be achieved by changes in behaviour and the adoption of water-saving technologies. DWAF will continue to encourage all water users to voluntarily comply with the water conservation and demand management principles and strategies.

The **Urban/industrial/agricultural water-use efficiency Strategy** is required to address urban, agricultural and industrial conservation measures and water-demand management.

9.1 URBAN/INDUSTRIAL/AGRICULTURAL WATER-USE EFFICIENCY

Management Objective:

To improve the efficiency of water use by providing and encouraging effective WC&DM measures by local authorities, industries, mines and agriculture, as an alternative to, or as a means of postponing, new water supply schemes.

Situation Analysis:

Agricultural WC&DM

Irrigation in the WMA is by far the largest water-use sector with estimated water requirements of 95% of the total water requirements. Many of the farms are already using high tech efficient water systems and savings from these farms will be limited.

Conveyance: Olifants River Irrigation Scheme Canal

There are significant losses from the long, open canals which convey water throughout the Lower Olifants. According to the DANIDA IWRM WC&DM Situation Assessment (2002) study, the canal water losses are up to 28%. Several repairs have been made to the canal over the past five years but the high losses can be reduced further. The losses are due to the age and type of open canal, evaporation, leakage, spills and occasional mismatch of timing of releases and water abstraction. There is a short period during which maintenance can be undertaken annually as downstream users are dependent on the canal system. The operational losses in the canal in the north-west have been reduced by the introduction of a balancing dam at Ebenhaezer. The DANIDA IWRM study estimated that losses along the canal could be reduced to approximately 15% through proper maintenance and refurbishment. Such an improvement will reduce the current deficit in the Lower Olifants. This additional water would reduce the probability of compulsory licensing being undertaken in the near future and any excess water could be provided to RPFs. The repair and maintenance of the canal is therefore a priority.

Crop type

The Provincial Department of Agriculture started tests on crops in the 1990s in order to establish the optimum water needs for these crops. The project will be extended to potato farming in the Sandveld and the cultivation of wine grapes in the Lower Olifants. Lessons learnt in these pilot projects will be shared with agricultural water users and institutions. A WC&DM strategy is being developed for the Lower Olifants through the Western Cape Provincial Government *Olifants Doring River Irrigation Study* (WODRIS Study 2002-2004).

Urban and Industrial WC&DM

Although urban requirements are comparatively small in this WMA, improved efficiency through WC&DM would potentially save 1 million m^3/a. Currently, only losses from the purification works are monitored. There are notable losses in Vredendal, Elandsbaai and Clanwilliam purification works. This could be attributed to the age and inefficient management of the existing infrastructure by local authorities. The cost savings for municipalities could be significant and will support their WC&DM efforts.

An IWRM WC&DM project funded by DANIDA was undertaken in 2002 and the pilot projects are now being run in the Cederberg Municipality. This work should be extended throughout the WMA. There are few large industries in the WMA. Re-use of effluent from wineries, distilleries and the fruit processing/packing industries should be encouraged wherever possible.

Strategy:

The reduction of the Lower Olifants deficit through the upgrading and maintenance of the Olifants River Government Water Scheme canal is the WC&DM priority for the WMA. This requires better measurement of losses by measuring allocations at point of release to monitor improvements.

Improving urban use inefficiencies and clearing of IAPs will provide a small but significant increase in availability. Agricultural rationalisation (crop changes) in the long-term will enhance agricultural sustainability.

The National Directorate of Water Use Efficiency has developed sectoral strategies (e.g. urban and agricultural WC&DM Strategies). The local authorities and WUAs must implement these broad-based strategies.

Management Actions:

The following management actions are required:

- Assist LORWUA to quantify losses in irrigation and canal systems and assess the rehabilitation and management options;
- Assist LORWUA to develop an appropriate long-term management and maintenance plan for the Olifants River Government Water Scheme;
- Encourage WUAs, and the local authorities (through their WSDPs) to implement the broad-based sectoral strategies developed by the DWAF Water Use Efficiency Directorate;
- Assist local authorities to quantify losses (unaccounted for water) in the reticulation system of the main towns and distribution systems between dams and users. A pilot project in one town could be used to determine the scale of the problem;
- Conduct water conservation and demand-management awareness campaigns.

Responsibility:

Regional Office in conjunction with the National Directorate of Water Use Efficiency.

Priority: High

CHAPTER 10
INSTITUTIONAL DEVELOPMENT AND CO-OPERATIVE GOVERNANCE STRATEGIES

The NWA provides for a fundamental transformation of water resources management and governance, to appropriate and representative regional and local institutions. Such institutions include any organisation or person who fulfils the functions of a water management institution. Water-user associations and Catchment Management Agencies are such organisations. Water-resource management requires co-operative data collection, information sharing, sharing of visions and plans, and co-operative making of joint decisions. Consequently, there is an inherent need for establishing co-operative relationships with such organisations. This is required to ensure that management and control of the water resources in the ISP-area are integrated with the relevant strategies of other organisations, whilst meeting the requirements of particular legislation with which it must comply.

The *Institutional Development and Support Strategy* is required to address:

- Formation of Catchment Management Agencies;
- Catchment Forums and Advisory Committees related issues;
- Formation of Water user associations;
- Education and capacity building in the water sector;
- Community awareness;
- Communications relating to water;
- Public consultation and participation;
- Co-operation regarding water management.

The following specific strategies have been developed further:

- Institutional development (CMA, WUA and Forums);
- Co-operative Governance;
- Capacity Building and Communication.

With no international rivers no internationally-related strategy is required.

10.1 INSTITUTIONAL DEVELOPMENT (CMA, WUA AND FORUMS)

Management Objective:

The institutional development strategy in the Olifants/Doorn seeks to ensure that:

- Transformation of existing irrigation boards into representative, viable WUAs that includes all water users is achieved;
- Transformation of the institutional structures to be fully representative of the water users in the WMA;
- The development and operation of catchment forums is supported;
- The establishment process of the CMA for the Olifants/Doorn is supported and monitored;
- The performance of the WUAs is monitored and audited;
- The performance of the CMA is monitored and audited.

Situation Analysis:

The Olifants/Doorn WMA is one of three pilot WMAs where the DANIDA-funded Integrated Water Resource Management (IWRM) project, 2001 – 2004, was implemented. One of the project's tasks was aimed at developing the capacity within the WMA to support the necessary water forums and the establishment of the CMA.

Catchment Forums

In 2001, eleven catchment forums were established throughout the WMA. These forums will continue to promote IWRM even after the CMA is established. Problems challenging the forums consist of the reference group's ability to hold regular meetings (travel distances are significant) and the "buy-in" by previously disadvantaged sectors.

It is interesting to note that forums based in areas where groundwater is utilised as the major source of supply, such as the Knersvlakte, Sandveld and the Elandskaroo, have less coherence and experience more problems than those formed in more controlled irrigation areas. This may be due to the fact that users in these areas have less of a culture of co-operation regarding their resource utilisation. Users still frequently regard groundwater as a private resource and they are reluctant to co-operate to the same degree as surface water users.

CMA Establishment

CMA reference group meetings were held during 2002-2004 and the proposal for the establishment of the Olifants Doorn Catchment Management Agency was finalised in 2004 with assistance from the DANIDA project. The proposal for the establishment of the CMA was evaluated and accepted. It is envisaged that the CMA will be established in 2005.

Several issues relating to the viability of the CMA are raised namely:

- The CMA can be financially viable, however:
  - concern was expressed that water charges may become too expensive for the agricultural community, which is the key in this WMA economy;
  - the high cost of WfW programmes in the Western Cape must be addressed;
- The CMA must make provision for the socio-economic divide in the WMA. Capacity building, communication and equal representation will be critical to the functioning of the CMA;

- Catchment forums will need ongoing support in the medium to longterm;
- The land-reform process must be informed by water resource constraints and water supply to resource-poor farmers should be assured;
- There are limited resources and only a small staff can be supported. The CMA will therefore only be able to undertake mainly managerial and liaison functions. This is appropriate if strongly supported by the WUAs and government bodies;
- Revenue collection is the key functions and will dictate the success of the CMA.

WUAs

Doring – The Elandskaroo Irrigation Board is in the process of being disestablished. The Ceres Karoo and Cederdoorn forums represent the Doring sub-area.

Koue Bokkeveld - Four WUAs will be established in the Koue Bokkeveld area. Each major river will have its own WUA associated with it. Currently the Koue Bokkeveld and Witzenberg Forums represent this area.

Lower Olifants - The Lower Olifants River WUA, Clanwilliam WUA and Vanrhynsdorp WUA were established with the Minister's approval. The Lower Olifants and Middle Olifants forums represent this area.

Sandveld - The Sandveld Forum has been experiencing poor support and cohesion. This may be due to the fact that as a groundwater dependent area, there is no history of user co-operation as practised elsewhere with irrigation boards. The Langvlei and Graafwater WUAs are in the process of being established.

Upper Olifants - The Citrusdal WUA was established with the Minister's approval. The Upper Olifants Forum represents this area.

Knersvlakte - The South Namakwaland, Hantam and Nama-Karoo forums represent this area.

Co-ordinating Committee for Agricultural Water

The Co-ordinating Committee for Agricultural Water (CCAW) for the Western Cape, carries the responsibility for issues relating to the use of irrigation water. This committee is also responsible for reviewing and approving subsidies for irrigation development for RPFs. The CCAW comprises representatives from the DWAF Southern Cluster, Department of Agriculture, Department of Land Affairs and the Department of Environmental Affairs and Development Planning.

Strategy:

Continue with support for the capacity-building and support work initiated by the DANIDA IWRM project in terms of the establishment and operation of the catchment forums, WUAs, CMA, and other structures. The transformation of Irrigation Boards into WUAs and especially the establishment of new WUAs and other supporting structures should be expedited. Facilitate the establishment of the CMA.

Management Actions:

- Provide continued financial support for administrative costs incurred by the catchment forums;
- The Southern Cluster will continue to support and facilitate full transformation of irrigation boards to WUAs and establishment of new WUAs;
- Catchment forums and WUAs will be suitably capacitated by DWAF to undertake appropriate local water resource management tasks;
- Implement the CMA proposal once it has been approved by the Minister;
- Use institutions for bulk licences – e.g. groundwater wellfields (refer to the **Licensing Strategy**).

Responsibility: Regional Office

Priority: High

10.2 CO-OPERATIVE GOVERNANCE

Management Objective:

To improve co-operation between DWAF and other authorities regarding shared decision-making and so achieve effective IWRM in the Olifants/Doorn WMA.

Situation Analysis:

The WMA falls into two provinces, namely the Northern Cape and Western Cape. Authorities of both provinces therefore play a role in the management of the water resource. Despite this division, DWAF Western Cape is responsible for management of the entire WMA. The key co-operative governance partners for this WMA are Department of Environmental Affairs and Tourism, Department of Agriculture, provincial departments of environmental affairs and agriculture as well as the local authorities (refer to **Section 2.2.11**). Further to this, co-operation by the CCAW and the WUAs are all critical to successful water resource governance.

Key areas for co-operation:

- RPF initiatives;
- Land management and environmental considerations (including environmental processes for dam approvals);
- Water quality;
- Monitoring and maintenance of WWTWs and SWDSs;
- Support to local authorities;
- Education initiatives;
- Water conservation and demand management.

Strategy:

Promote the effective management of water resources in the WMA through co-operation between DWAF, other government departments and local authorities. Continue involvement in the various co-operative management bodies already established, and ensure active involvement in new bodies that are being or will be established, where they can contribute towards improved water-resource management.

Management Actions:

- Obtain the Northern Cape and the Western Cape Provincial Development Strategies. Study them focusing on areas where water is a constraint or opportunity and provide feedback;
- Liaise with both Provincial Governments and get involved with the compilation of the Provincial strategies;
- Facilitate improved co-operation between DWAF and DEA&DP regarding the management of wetlands, estuaries and invasive alien plant control programmes;
- Facilitate improved co-operation between DWAF and DEAT, DEA&DP and DOA regarding provincial procedures for dam approvals and solid waste disposal facilities;

• Facilitate the development of a Memorandum of Understanding with the Department of Agriculture to co-ordinate approvals for land clearing with water allocations and licencing; • Identify information-sharing needs with other departments, local authorities and institutions to avoid duplication of effort; • Optimise the effectiveness of the CCAW and other liaison structures (e.g. water forums); • Facilitate co-operation with the Department of Agriculture's Land Care Programme to reduce poor farming practices; • Liaise with local authorities regarding their integrated development plans and WSDPs and inform them of possible impacts and DWAF requirements.
Responsibility: Regional Office
Priority: High

10.3 CAPACITY BUILDING AND COMMUNICATION

Management Objective:

To support and develop capacity building and training within water management bodies operating in the WMA.

Situation Analysis:

Capacity within DWAF

There is concern regarding the existing capacity of the Southern Cluster to undertake required tasks within the WMA, particularly with regard to tasks requiring scientific knowledge (i.e. monitoring and interpretation of monitoring data). There is ongoing loss of staff with experience and knowledge.

Capacity within local authorities

In the past, the West Coast District Municipality performed most of the water service-related duties. Now that the local municipalities have the responsibility as water service authorities, they require applicable training and capacity building to prepare, for example, water service development plans (WSDPs). Capacity building within local authorities is also needed to facilitate management of their water supply schemes. The IWRM DANIDA project supported local authority WC&DM efforts.

Water user capacity

There are different levels of capacity building needed in the WMA. Broad training and awareness programmes are required for some to raise water user's awareness of water issues and educate them regarding the Reserve, resource health, over-abstraction, WC&DM and monitoring techniques. Further to this many users require capacity building to enable them to actively participate in water management bodies such as catchment forums, WUAs and ultimately the CMA.

The DANIDA IWRM project has provided practical capacity building through public participation during the formation of the water forums, followed by the administrative support of the forums. Local previously disadvantaged individuals have been provided with training courses to provide the necessary skills to run the forums. In addition, a "water-champion" programme is in operation which develops skills to generate proposals, apply for funding and implement and manage small scale IWRM projects.

WMA Communication priorities

Monitoring results - Communication of water quality and quantity monitoring results is needed to sensitise water users and authorities to problems such as over-abstraction and requirements for maintenance of infrastructure.

Non-payment and reluctance to pay - DWAF can assist in marketing the concept and educate people regarding payment and water conservation. All users need to understand that water is not owned but is a shared resource and that they must pay for the use thereof.

Groundwater - Users and water resource professionals need to be informed regarding the time and space scale of processes and the geology that govern groundwater, its quantification and the risk and adaptive management approach most suited to its management. User education material and methodologies should be encouraged to facilitate and ensure compliance with the law and co-operation as regards monitoring and exploration practice.

Strategy:

Promotion of the education, training and awareness raising regarding the WMA water resources is required to achieve effective management and efficient use. Utilise all reasonable opportunities to build capacity and train staff and water users at all levels.

Management Actions:

- Provide technical support and information transfer workshops to local authorities and other water institutions that have insufficient capacity to manage their water resources;
- Initiate education programmes together with the DOA, covering good irrigation and land management practices;
- Initiate education programmes together with the DEAT and DEA&DP regarding the importance of wetlands and ecological water requirements;
- Initiate and support an Internet self-monitoring programme allowing farmers and municipalities to submit monitoring information on-line;
- Create a library of all WMA reports for the CMA;
- Deepen and strengthen the water-champion programme as well as forum secretary programmes;
- Develop and implement a strategy for interfacing with existing education initiatives in order to support sustainable groundwater supply;
- Develop a concept document for groundwater education at various levels of government, community and schools.

Responsibility: Regional Office in conjunction with the Communication Directorate

Priority: High

CHAPTER 11
SOCIAL AND ENVIRONMENTAL STRATEGIES

Water for development or "water for equity" is a major focus that will be pursued under this strategy. In addressing inequities of the past, the provision of an equitable share of available water to previously disadvantaged communities is addressed as one way of improving the livelihoods of the poor and to get a more equitable distribution of water use. The establishment of resource-poor farmers and the adequate provision of water to areas in which land restitution is in progress must be prioritised as one of the ways to eradicate poverty. The water reconciliation for the WMA has shown that little water is available for allocation to resource-poor farmers. Procedures must therefore be introduced to make this water available.

The *Social and Environmental strategies are required to address:*

- Compliance with environmental legislation;
- Mitigation of environmental and social impacts;
- The environmental development approval process;
- Strategic environmental assessment;
- Poverty eradication issues pertaining to resource-poor farmers and other measures;
- Water-related land-reform issues.

The following specific strategies have been developed:

- Integrated Environmental Management;
- Poverty Eradication (Resource-poor Farmers).

11.1 INTEGRATED ENVIRONMENTAL MANAGEMENT

Management Objective:

The Environmental Management strategy in the Olifants/Doorn WMA seeks to ensure that the resource is managed in a manner which recognises and sustains the environmental health of the system.

Situation Analysis:

Terrestrial environment

There are a number of important pristine environmental areas in the southern catchments. The vegetation is sensitive to impact – there is seldom rehabilitation after agricultural land-use. Soil which has elevated salinity from irrigation practices, will not easily support natural growth. A lack of post-farming rehabilitation allows increased erosion. Removal of riparian vegetation has a significant impact on sedimentation and water quality. IAP infestation is dealt with in **Strategy 8.6**.

Aquatic environment

The Olifants River estuary is ecologically significant. All the tributaries should be managed properly to protect the indigenous species as well as the undeveloped nature of the WMA. Wetlands in the Sandveld sub-area are vulnerable to degradation due to over-abstraction of groundwater as well as physical modification and infilling. The Western Cape Wetlands Forum was recently formed to assist with the cataloguing, assessment and monitoring of wetlands in the province. It consists of a number of government and NGO bodies. The Reserve requirements are detailed in **Strategy 7.1** and water quality issues are dealt with in **Strategy 7.2**.

Social environment

An overview of the WMA socio-economic situation is given in **Section 2.2.3.** Many locals and visitors use Clanwilliam Dam as a recreation area. The dam is used predominantly for fishing and water sports.

Situation per sub- area

Doring - Nine indigenous fish species (seven of which are endemic) and the unimpounded nature of the Doring River makes this an important river. There is a great deal of resistance from conservationists to developing storage (dams) on the Doring River. The vegetation of the area is unique and has been evaluated in the Succulent Karoo Ecosystem Plan (SKEP). The area has tourism potential which is being developed. The Cape Action Plan developed a proposal for the Greater Cederberg Biodiversity Corridor for People and the Environment (CAPE) to protect the biodiversity of the area.

Knersvlakte – The Knersvlakte is trying to develop tourism.

Koue Bokkeveld – The sub-area includes the Swartruggens Conservancy, the Cederberg National Park Wilderness Area and the Cederberg Conservancy which have high conservation value and are largely pristine terrestrial environments.

Upper Olifants - The Cederberg mountain landscape and vegetation are world-renowned. The associated wilderness areas, private nature reserves and the Cederberg Conservancy play an important conservation and tourism role in this key area. There are eight endemic fish species in the Olifants River.

Lower Olifants - The estuary is sensitive and is likely to have a significant effect on the Reserve requirement (refer to the **Reserve and RQOs Strategy**). Subsistence fishers utilise the lower estuary. Fish counts have been undertaken for a number of years. A process has been initiated to encourage aquaculture in the Lower Olifants. Western Cape Nature Conservation Board (WCNCB) has been involved in developing this initiative. The wetland near Clanwilliam is threatened by the activities of the town's adjacent SWDS.

Sandveld - Erosion due to rapid expansion activities and poor erosion protection is a problem in the Sandveld. Fertiliser and pesticide run-off is problematic for the coastal wetlands such as Verlorevlei.

Strategy:

Ensure that all water-related activities comply with the requirements of the National Environmental Management Act (NEMA), Environmental Conservation Act (ECA) and other related environmental legislation for water use activities and make sure WUAs and CMA (once constituted) comply. Support the Western Cape Wetlands Forum.

The Department has developed a National Integrated Environmental Strategy. The local authorities and WUAs must implement these broad-based strategies.

Management Actions:

- Contribute towards the work of the Working-for-Wetlands and Western Cape Wetlands Forum;
- Initiate Working-for-Wetlands programmes in the Sandveld sub-area.
- If storage is required on the Doring River, off-channel storage would be the most likely choice;
- Undertake a study with respect to the impacts of aquaculture on the system;
- Ensure that DWAF construction and maintenance activities are guided by Environmental Management Plans.

Responsibility: The implementation of this strategy is the responsibility of the Regional Office in consultation with the National Directorate WA&IU.

Priority: Low

11.2 POVERTY ERADICATION (RESOURCE-POOR FARMERS)

Management Objective:

The Poverty Eradication strategy in the Olifants/Doorn WMA seeks to ensure that:

- Inequities in water allocations are rectified;
- Viable resource-poor farmer initiatives are supported and provided with water;
- Ways of best providing water to the poor are researched and implemented.

Situation Assessment:

Resource-poor Farmers

The *Olifants Doring River Basin Study Phase 1 (1998)* and *Olifant Doring Water Resources Situation Assessment (2002)* and the NWRS (2004) provide an outline of the demographics, economics and socio-economic aspects of the WMA (also see **Section 2.2**) These documents together with the public participation undertaken for the River Basin Study Phase 1 and the CMA establishment process established a need for poverty eradication, land reform and establishment of resource-poor farmer initiatives in this WMA. The Western Cape's Department of Agriculture's WODRIS study has focussed on this issue in the Lower Doring, Lower Olifants and northern Sandveld sub-areas.

Many of the current initiatives are sponsored by local municipalities or the Western Cape Department of Agriculture. Municipalities in the WMA fund resource-poor farmers (RPFs) through**:**

- Providing the use of municipal land for RPF farming activities;
- Providing water to RPF farming activities;
- Providing loans which will be repaid once the RPFs start making profit.

The Department of Agriculture has also been providing technical support to the establishment of RPFs in the WMA. Assisting RPFs requires more than the provision of land and water. Ongoing support (through partnerships with commercial farmers for example) is key to their success. The DANIDA IWRM project (2002-2004) has developed a process of mentoring and building the capacity of "water champions" in each of the forums through small development and water conservation projects. An emerging farmer project database was developed in 2003 by the IWRM project. The database is linked to GIS farm cadastral data to aid decision-making. A list of RPF initiatives per sub-area is included as **Appendix 12**.

Some commercial farmers have provided portions of their land to their workers as joint venture schemes in order to start RPF initiatives with benefits and water allocations accruing to both the original farmer and the worker. There is no monitoring to check these operations and their benefit to the previously disadvantaged individuals is yet to be verified.

A challenge to the transformation process in the WMA was identified during the IWRM water forum establishment process. RPFs feel that they are allocated land with little or no water use rights, while commercial farmers receive "large water quotas". There is a perception amongst RPFs that previously advantaged water users dominate the water forums and WUAs, and that despite having representation on these forums, their ability to give meaningful input is constrained. Three emerging-farmer forums have been established to develop capacity in the Lower Olifants (Matzikama) and in the Upper Olifants (Cederberg and Witzenberg) areas.

Food Security Use (Schedule 1)

The use of water for food gardens is covered under Schedule 1 use. The water balance is unlikely to be effected by Schedule 1 use due to the limited application in this WMA. There is no need to constrain Schedule 1 use provided it is used for its intended purpose, to improve the livelihoods of the poor and previously disadvantaged through subsistence farming.

Other Empowerment Initiatives

A further poverty eradication initiative in this WMA is the Working-for-Water projects being undertaken. The Olifants/Doorn is the one of the poorest WMAs in the country and the provision of employment opportunities through these IAP eradication programmes provide significant poverty relief (refer to the **IAP Strategy 8.6** for more detail on these initiatives).

Sub-area overview

(Refer to **Appendix 12** for details of empowerment initiatives in each sub-area)

Upper Olifants - The Cederberg Municipality has been investigating the availability of land upstream of Clanwilliam Dam but to date no tangible solutions have been achieved. There are individual farmers in this part of the catchment who are selling ownership of their farms to employees as part of black empowerment initiatives. The Cederberg Emerging Farmer Forum and the Witzenberg Emerging Farmer Forum have been established to encourage and capacitate RPFs.

Knersvlakte - In the Hantam region (i.e. Calvinia and Niewoudtville), establishment of RPFs is led by the Provincial Department of Agriculture.

Doring - The focus of the WODRIS study was on poverty-reduction opportunities. WfW has a clearing programme which brings poverty relief in the Oorlogskloof sub-catchment.

Koue Bokkeveld - There has been a few proposals for land reform in this sub-area, but these have achieved limited success.

Lower Olifants - The Matzikama Municipality has initiated the establishment of the Lower Olifants RPFs in collaboration with LORWUA. The Matzikama Emerging Farmer Forum has been established to encourage and capacitate RPFs. LORWUA is currently using water trading to provide for RPF initiatives. The WODRIS study recommended that groundwater be used for supplying RPFs in the vicinity of the coast.

Access to Funding

There is existing, ongoing liaison regarding access to funding. However, there is a need to formalise the process as it is currently confusing and time consuming. The IWRM undertook "emerging farmer" roadshows during late 2003. These aimed to educate people about the assistance available to them. DWAF can however only subsidise farmers for bulk water infrastructure where they are included in WUAs or other water management institutions.

Strategy:

Pro-actively support poverty eradication and land reform principles, by initiating or supporting initiatives through co-operative governance, via the various implementation vehicles provided by legislation. Review the position of farm workers and water allocations for them. Co-operate with the Western Cape Department of Agriculture to understand the water implications of the RPF opportunities and land reforms.

Management Actions:

- Continue to support RPFs through co-operative governance and co-ordination with Department of Land Affairs (DLA), DOA and DEA&DP. This should continue to be focussed through the CCAW;
- Encourage WUAs to identify and initiate RPF projects;
- Through the licensing process, mechanisms to be sought to benefit empowerment initiatives;
- Implement pertinent recommendations of the WODRIS study;
- Streamline the funding application procedures.

Responsibility: The implementation of this strategy is the responsibility of the Regional Office in consultation with CCAW.

Priority: High

CHAPTER 12
WATERWORKS DEVELOPMENT AND MANAGEMENT STRATEGIES

Alternative options for the future management and ownership of major water resource infrastructure currently owned and operated by DWAF, is being investigated at national level. In the interim, there is an ongoing need to economically and safely manage the existing water resource infrastructure at both national and regional level.

The Waterworks development and management strategy is required to address:

- Strategies for major infrastructure systems or components;
- Strategies for specific geographical areas or rivers;
- Recreation relating to water resources;
- Disaster management planning.

The following specific strategies have been developed:

- Waterworks Management, Operation and Ownership;
- Waterworks Development Strategy;
- Public Health and Safety/ Disaster Management;
- Recreation.

12.1 WATERWORKS MANAGEMENT, OPERATION AND OWNERSHIP

Management Objective:

- Ensuring that existing infrastructure is repaired, operated and maintained in an efficient and safe manner;
- Ensuring that users receive water at agreed assurances of supply and safety;
- Implementing transfer of ownership and delegation of operating and maintenance functions and infrastructure to appropriate water management institutions.

Situation Assessment:

The water supply should be sufficient to meet the requirement of the various water supply schemes in the immediate future. DWAF is currently trying to phase out their involvement with Water Supply Services, and instead focus their efforts on supporting the initiatives of the local authorities.

Section 2.3 describes the water supply system in the Olifants/Doorn WMA and **Section 2.2.11** provides information on the WMA water service providers. The water sources and other system infrastructural details are shown in **Appendix 9. Appendix 10** shows existing irrigation scheme information. The existing major dams are listed in **Appendix 11.**

The various components of the system are as follows:

- Olifants River (Vanrhynsdorp) Government Water Scheme;
  - Clanwilliam Dam;
  - Clanwilliam Canal;
  - Bulshoek Weir;
- Main Irrigation Canal and Distribution Canals;
- Southern Namaqualand Government Water Scheme (Bitterfontein);
- Sandveld Government Supply Scheme (Graafwater);
- Inverdoorn Canal.

Olifants River (Vanrhynsdorp) Government Water Scheme

The Olifants River Government Water Scheme (ORGWS) supplies raw water from the Clanwilliam Dam to farmers, municipalities, mines and industries in the Olifants River valley between the dam and the river estuary via the Bulshoek Weir and canal. The 1:50 year yield of Clanwilliam Dam and Bulshoek Weir combined is 154 million m^3/a. The Bulshoek Weir and canal system has reported conveyance losses of up to 28% due to poor maintenance and the age of the system. The ORGWS is operated in an integrated, shared manner, in which the major components of infrastructure are owned by DWAF and parts of it is operated and maintained by LORWUA. The Clanwilliam canal is operated and maintained by the Clanwilliam WUA. It is important to note that support of the ORGWS is critical since much of the WMA economy relies on this scheme.

Clanwilliam Dam

Clanwilliam Dam is the largest water storage facility in the WMA and forms a key element in the utilisation and management of water resources. A study has been commissioned by DWAF to investigate the raising of Clanwilliam Dam (2004 –2005) after a dam safety report recommended that the existing dam wall be strengthened. Sedimentation in Clanwilliam Dam was reported at 17% as surveyed in the *DWAF, Clanwilliam Dam, Capacity Determination, 1994*.

A privately owned hydro-electric power station is situated directly below Clanwilliam Dam. It is currently not in operation due to the high operating expenses. DWAF would like it to be closed permanently as the timing of its water requirements hamper management of flow through the canal system.

Clanwilliam Dam is currently being operated by DWAF but the Department aims to transfer responsibility for operation and maintenance jointly to the two WUAs (LORWUA and Clanwilliam WUA). A small canal supplying irrigation water to farmers directly from Clanwilliam Dam is operated and maintained by the Clanwilliam WUA.

Bulshoek Weir

Extensive work is necessary for the repair of electrical and mechanical components. Water leaks also need to be sealed. The maintenance budget is R8 million for the year 2003-2004 and R13 million overall. Sluice gates, which are currently hand-operated, are to be automated as part of the second phase of refurbishment. Operation and maintenance of the Bulshoek Weir has been transferred to LORWUA. The refurbishment of the sluices and sealing of leakages are DWAF responsibilities.

Canal

There are considerable challenges related to maintenance and repair of both the Clanwilliam WUA and LORWUA canals. In addition to the high cost of maintenance, the canal can only be closed for a relatively short period each year for maintenance. Canal capacity constraints and conveyance losses must be addressed. A balancing dam has been built (2003-2004) on the canal near Ebenhaezer in order to regulate the flow in the canal at this point. Operation and maintenance of the canal has been transferred to LORWUA. During 2003, LORWUA appointed consultants to investigate the condition of the canal systems downstream of Bulshoek Weir.

Southern Namaqualand Government Water Supply Scheme (Bitterfontein)

This scheme supplies water from boreholes to the towns of Bitterfontein and Nuwerus. The scheme has recently been extended to also supply the communities of Rietpoort and Molsvlei. The operators of the scheme have managed to reduce the running costs of the desalination plant considerably over time but it is still incurring financial losses. The West Coast District Municipality currently operates this scheme on behalf of DWAF, but ownership will be transferred to the West Coast District Municipality as the water service authority.

Sandveld Government Water Supply Scheme (Graafwater)

This scheme supplies water from boreholes to the town of Graafwater. The scheme is currently operated by DWAF but ownership will be transferred to the Cederberg Municipality as the water service authority.

Inverdoorn Canal

The Inverdoorn Canal is the only inter-WMA transfer in the Olifants/Doorn WMA. 2.5 million m^3 per year is transferred from the catchment area of the Lakenvallei Dam in the Breede WMA through the Inverdoorn Canal for irrigation purposes in the upper Doring catchment. The scheme is privately owned.

Privately owned irrigation schemes

- In the Koue Bokkeveld in the upper reaches of the Doring River and in the upper reaches of the Olifants River a number of conjunctive schemes with small farm dams and boreholes have been constructed for the irrigation of fruit and vegetables;
- At the confluence of the Tankwa and Doring Rivers water is abstracted from the Doring River for the irrigation of 350 ha of land through the water works of the Elandskaroo Irrigation Board;
- The Oudebaaskraal Dam on the Tankwa River, with a capacity of 34 million m^3, supplies water to irrigate approximately 320 ha of land.

Ongoing operation and routine maintenance

The following issues and concerns regarding operation and maintenance were identified:

- The economy of the area is heavily dependent on regional water schemes and it is essential that these function well;
- Losses at Bulshoek Weir and along the canal conveyance system are unacceptably high. Refurbishment of Bulshoek Weir/Clanwilliam Dam needs urgent attention. Some of these refurbishment works are being carried out (refer to the **Urban/industrial/ agricultural water-use efficiency Strategy 9.1**);
- Management of the canal capacity constraints and conveyance losses must be dealt with.
- The refurbishment and ongoing maintenance of the canal, now the responsibility of the Lower Olifants River Water Users Association (LORWUA) is extremely costly;
- The canal is being used to capacity most of the time and it is therefore difficult to maintain;
- Clanwilliam Dam wall needs to be strengthened for dam safety reasons.

Strategy:

The ownership and management responsibilities are separated and the need for co-operative and integrated management will continue to grow as operation and maintenance of schemes are transferred to WUAs. Proper management of the system is required to meet the needs of users in an efficient manner.

Management Actions:

- DWAF to assist LORWUA to implement the findings of their canal investigation so as to address canal capacity constraints and conveyance losses;
- DWAF to assist LORWUA to develop operation and maintenance plans for the canal
- Refurbishment of Bulshoek Weir must be completed as soon as possible;
- Implement appropriate findings of the Raising of Clanwilliam Dam study (2004-2005);
- Consult with the owner of the hydro-electric plant to determine whether it can be permanently closed.

Responsibility: Regional Office

Priority**:** Medium

12.2 WATERWORKS DEVELOPMENT

Management Objective:

To outline likely future waterworks developments in the WMA.

Situation Analysis:

In response to the WMA deficit **(**refer to **Chapter 4** and the **Reconciliation Strategy 6.3)** and the water restrictions which have been implemented annually for the past few years, there is consideration of development of new waterworks. It should be noted that the High Confidence Reserve Determination study is still underway, however, the current yield balance implies a lack of ability to meet the EWR. Despite limited population-growth predictions there is demand in the Koue Bokkeveld, Sandveld and Upper Olifants for agricultural expansion. The expansion of irrigated agriculture in the Lower Olifants is currently limited by the infrastructural conveyancing capacity constraints of the canal.

A table of the various water resource infrastructure options historically considered throughout the Olifants/Doorn WMA is provided in **Section 2.3.4.** It should be noted that the development of many of these options would be mutually exclusive. Due to high comparative financial and ecological costs of many of the options, the raising of Clanwilliam Dam is currently considered the most favourable surface water development because dam safety requirements stipulate that the wall be strengthened irrespective of whether or not the wall height is raised. A feasibility study has been commissioned to investigate the possible raising (see **Section 2.3.1**). Associated complementary options such as increased system effectiveness and WC&DM options will also be addressed.

Groundwater scheme options could be developed complementary to surface water development options such as the raising of Clanwilliam Dam. These have been outlined in the CAGE and WODRIS studies. Pre-feasibility studies would need to be undertaken to determine the most beneficial options or combination of options, reliant on identified demands.

Strategy:

Investigate the raising of Clanwilliam Dam and appropriate complementary groundwater schemes to a suitable feasibility level and implement findings appropriately.

Management Actions:

- Implement appropriate findings of the *Raising of Clanwilliam Dam* study;
- Initiate pre-feasibility studies and borehole drilling to confirm the suitability of the various groundwater opportunities for large-scale development;
- Implement appropriate findings of the WODRIS study.

Responsibility: Regional Office with input from the Integrated Water Resource Planning Directorate

Priority: Medium

12.3 PUBLIC HEALTH AND SAFETY/ DISASTER MANAGEMENT

Management Objective:

Effective disaster management planning and implementation relating to flood management, operation during droughts, dam safety and emergency spills.

Situation Analysis:

Disaster Management planning

The West Coast District Municipality and local municipalities are in the process of transforming their disaster management body into the disaster management forums required by the Disaster Management Act (Act No 57 of 2002). A Western Cape Disaster Management Forum will be established.

Emergency response is documented in the Emergency Preparedness Plans (EPP) for Clanwilliam Dam and Bulshoek Weir. The response teams provided for in the document primarily come from the DWAF Regional Office and Western Cape Provincial Administration. The emergency supply arrangements need to be developed for various durations of possible non-supply from the system or its components, for the various user groups.

Flood management

DWAF heads the Flood Disaster Response Committee for the WMA. Further to provisions for full dam failure made in the EPP, in 2003, DWAF produced a flood management operating rule for Clanwilliam Dam. The Cederberg Municipality has a dam-break plan and included a disaster management chapter in their IDP.

Drought management

There is a current drought operating rule for Clanwilliam Dam that is revised from year to year. The rule assumes that the dam empties under 1:50 year drought conditions. If the dam does not spill at the beginning of November, restrictions are applied. The Clanwilliam Dam is only a 30% MAR dam hence provision for a long-term drought is not feasible. DWAF intends undertaking system analyses to update these drought operating rules.

Dam Safety

Bulshoek Weir underwent work to secure the weir through the construction of a concrete curtain at the base of the wall preventing excess water leaks below the foundations. Clanwilliam Dam wall requires strengthening due to poor geology founding conditions and possible concrete failure. To meet the national safety requirements this will need to be undertaken by 2010 (pers. Comm.. Dr Chris Oosthuizen, DWAF Civil Design-Dam Safety, June 2004).

Strategy:

DWAF must assist in the WMA to ensure compliance with the Disaster Management Act and Dam Safety legislation requirements. This will require assistance in the development of disaster management forums required in the WMA. It will also require support, where appropriate, of the Public Safety Unit. DWAF should assist provincial and local government in capacitating and training these disaster management forums, committees and units. The EPPs must be kept up-to-date and contact people in the EPPs must be regularly reminded of its requirements. Despite the fact that dam storage capacity in the WMA is limited an effort should be made to control droughts or floods.

Management Actions:

- Review EPPs after floods and other emergency events; update procedures where appropriate;
- Regularly update the contact list and undertake the occasional drill to ensure preparedness
- Compile disaster management plans in accordance with the Disaster Management Act;
- Encourage the establishment of disaster management forums in all district and local municipalities according to the Disaster Management Act;
- Review and improve operating rules regularly;
- Document the existing drought management rule and review it regularly. Address both surface and groundwater resources;
- Implement the requirements of the NWA regarding dam safety.

Responsibility: Regional Office

Priority: Low for Disaster Management and High for Dam Safety.

12.4 RECREATION

Management Objective:

Ensuring the sustainable and equitable management and regulation of the use of water resources, especially state-owned dams, for recreation.

Situation Analysis:

The NWA defines recreation on rivers and dams as a water use. There is an existing policy in place for zoning of dams, concessions, and stakeholder involvement as far as recreational use is concerned.

Within the Olifants/Doorn WMA, the Clanwilliam Dam and the Bulshoek Weir are currently extensively used for recreational purposes. Motorised water sport is permitted on both Clanwilliam Dam and Bulshoek Weir. The potential raising of Clanwilliam Dam will increase the inundation area and future planning will need to take this into account.

Strategy:

DWAF sees its role as being to maximize recreational benefit from the use of state assets. At the same time this should not be at unreasonable cost to other water users. The future management of these assets, and the likely negative impacts that current use might have, need to be evaluated. At the same time the very real social benefits of the recreational opportunities provided by dams and rivers need to be taken into account. No asset should be further restricted or closed to use without very close consideration of the social cost that this might carry, and such a decision should not be taken lightly. It is important that facilities should not be exclusive and bound to traditional users. DWAF must ensure that equity is achieved in making its resources available to all users.

Management Actions:

- Review and implement the existing recreational use policy in the Olifants/Doorn WMA
- Utilisation of the dams for recreational purposes should be promoted;
- Strategies developed by the Department on how these dams could best be utilised, should be implemented.

Responsibility: Regional Office

Priority: Low

CHAPTER 13
MONITORING, DATA AND INFORMATION MANAGEMENT STRATEGIES

The Act requires the Minister to establish national monitoring systems for water resources to collect appropriate data and information. The Department is addressing the shortcomings of the current arrangements by amalgamating all existing and planned monitoring and assessment systems into a structured and coherent monitoring, assessment and information system.

Monitoring is required to introduce billing, to ensure compliance with water authorisation conditions, and to control all water use.

The Monitoring, Data and Information Management Strategies are required to address:

- Water-use control from freshwater bodies and bulk water infrastructure;
- Monitoring networks and data capturing for physical, chemical and biological aspects of surface and groundwater;
- Issues relating to information systems;
- Information access and requirements;
- Ensure that the ecological water requirements are fulfilled;
- Ensure that aquifers are not over-abstracted.

The following specific strategies have been developed:

- Monitoring and Data Management;
- Information Management.

13.1 MONITORING AND DATA MANAGEMENT

Management Objective:

Effective regional monitoring networks, support linkages and databases to ensure adequate management information for sustainable water use and protection of surface and sub-surface water bodies.

Situation Assessment:

The design of an integrated regional monitoring network (surface and groundwater) is critical to obtaining data for water resource management. This will increase confidence in resource evaluation, inter- and intradepartmental system understanding and regulatory decisions. Given the scarcity of water in the WMA (current deficit estimated to be 34 million m^3/a), appropriate monitoring is a priority. The monitoring network must have a medium to long-term scientific context that is regularly re-evaluated. The existing flow-gauging infrastructure is documented in **Appendix 13.**

A *Strategic Framework for National Water Resource Quality Monitoring Programmes and Guidelines for Designing Such Programmes*, as well as a national Departmental Five-year Monitoring Plan has recently been completed, which addresses the following monitoring programmes:

- National Microbial, Chemical, Eutrophicaion, Radioactivity and Toxicity Monitoring Programmes;
- River Health Programme, Ecological Reserve Determination and Monitoring, Hydrographic Surveys for sedimentation, Dam walls for dam safety, Hydrological Monitoring Programme and Geohydrological Monitoring Programme;

The inter-departmental, integrated monitoring strategy must ensure that the following specific issues are addressed:

Meteorological

The South African Weather Services (SAWS) is responsible for undertaking weather monitoring and forecasts. It is of concern that the Olifants/Doorn WMA is vulnerable to climate change as its economy is based on agriculture. Weather stations and concomitant data are decreasing as budget cuts require SAWS to prioritise their data collection.

Reserve Monitoring

The High Confidence Reserve Determination Study (2003-2005) will resolve Reserve requirements and provide guidance for Reserve monitoring. River Health Monitoring is being undertaken and will be used to assist in monitoring the EWR to ensure that the goals are being achieved.

Groundwater Monitoring

Groundwater monitoring sites are not considered adequate. The frequency of monitoring requires attention and the distribution of sites is inadequate for aquifer specific monitoring. In general, municipal supplies are not being routinely monitored. The Lower Olifants sub-area was specifically highlighted as having insufficient groundwater monitoring. REGIS and HYDRAS III are the groundwater databases in operation.

Surface Water

In general, the quality and quantity of surface water is inadequately monitored in the WMA (refer to the **Water Quality Management Strategy 7.2** and **Capacity Building and Communication Strategy 10.3**).

Monitoring issues by key area include:

Upper Olifants - The only reliable flow monitoring points are at Clanwilliam Dam and at the Citrusdal Bridge. It is important to determine water abstraction above Clanwilliam Dam, therefore the highest priority sites for additional gauging stations are situated along the Upper Olifants River. A priority site is in the upper reaches at Rosendaal.

There is a need to monitor in-stream flows and water quality in the Clanwilliam Dam to accurately determine the nature of recent fish kills. These kills have previously been blamed on temperature stratification which exacerbates water quality and oxygen content issues within the dam.

Lower Olifants - Flow gauging points are located downstream of Lutzville. Groundwater is insufficiently monitored in this area.

Knersvlakte – Flow-gauging stations are required in the northern part of the WMA as it is currently inadequately gauged. The groundwater resource in the Kromme River catchment needs to be studied. Some rainfall stations need to be established.

Sandveld - The ground and surface water interaction needs to be further researched. The coastal areas including the extensive wetlands of the Sandveld need to be monitored.

Doring - There are flow gauging points at the Aspoort and Melkboom sites. Water quality and flow-gauging sites are required on the Tra-Tra, Biedou and Tankwa Rivers. A further gauging station between the Matjies River and Doring River stations is required on the Groot River. Other, lower priority, sites for gauging stations include the Koebee River and Kransgat River.

The following specific monitoring-related issues and concerns were identified:

- Data collected by consultants is not being routinely integrated into the DWAF databases;
- Water quality information is not integrated into the groundwater database in a routine manner which undermines groundwater protection;
- Transcription/capturing of data and regular interpretation of results is limited by staff capacity constraints;
- The sites designated for River Health Monitoring should be utilised for both water quality as well as flow monitoring. Water quality monitoring should be undertaken monthly;
- Water user "self-monitoring" programmes utilising the Internet as an interface should be investigated to counteract DWAF's limited monitoring resources (refer to the **Capacity Building and Communication Strategy 10.3**);

- The time intervals between groundwater monitoring readings are too long. This could result in the non-capture of seasonal events;
- The groundwater monitoring needs must be established for the north of the WMA.
- The focus of regular groundwater monitoring should be on water levels and conductivity (an indicator of salinity);
- Surface-Groundwater interactions and vertical and lateral recharge patterns need to be better understood to ensure efficient monitoring programmes. There is insufficient co-ordination between groundwater, surface water and environmental monitoring and monitoring of spring flows is inadequate;
- The monitoring network should include groundwater interactions with solid waste.

Strategy:

DWAF must co-ordinate its monitoring efforts with all role-players in the WMA to ensure efficient and effective data collection, capturing and analysis to provide sufficient information for management of the water resource. The WMA strategy must be in line with Regional Office and national strategies which are still being developed.

Management Actions:

- Develop a Monitoring and Data Management Plan (see text box below);
- Update the priority list of monitoring requirements based on research and the needs assessment;
- Evaluate and interpret groundwater monitoring data and information and integrate the outcome into groundwater management actions;
- Capacity building and development of appropriate monitoring of municipal groundwater and surface water supplies. The WSDPs of local authorities must define their current water requirements and estimates of future water requirements;
- Co-ordinate the groundwater and water quality monitoring and regular information exchange, particularly with respect to the management and monitoring of effluent from WWTWs;
- Initiate a pilot study using advanced technology to measure regional changes in groundwater level rather than borehole-by-borehole measurements based on the principle of appropriate technology in the logistic and social circumstances;
- Select preliminary sites for prioritised groundwater monitoring based on best available information. Integrate the insights and results gained through all relevant studies;
- Implement improved weather monitoring;
- Establish snow gauges in the high mountains to develop an understanding of the contribution of snowmelt to surface water runoff and groundwater recharge in the Olifants River catchment;
- The National Eutrophication Monitoring Programme should be implemented at Clanwilliam Dam and Bulshoek Weir;
- Clanwilliam Dam water quality information must be communicated to the public during incidents of fish kills.

Responsibility: Regional Office

Priority: Very High

Guidelines for compiling a WMA Monitoring and Data Management Plan:

- Review or identify all aspects that need to be monitored. Group all monitoring needs into logical systems with common goals according to functional areas, which are then divided further into sub-systems;
- Develop a detailed information requirement and monitoring needs assessment for the various systems, which were grouped by functional areas;
- Identification and motivation of required or additional monitoring points or functions required for the WMA;
- Amalgamation of the identified existing and planned monitoring and assessment systems needs into a coherent and structured monitoring, assessment and information system;
- Review resources required for adequate monitoring of surface and groundwater (and other water-related aspects e.g. rainfall);
- Motivation for the regional share of the national monitoring budget;
- Regularly review and update the WMA monitoring strategy; and feed this back into the regional strategy;
- Initiate and encourage co-operative, collaborative relationships between the Department and other organisations or individuals that have relevant data or operate water-related monitoring, assessment and information systems.
- Development of monitoring programmes in the WMA should take cognisance of existing and developing National Monitoring Programmes e.g. National Eutrophication Monitoring Programme, National Microbiological Monitoring Programme etc.

13.2 INFORMATION MANAGEMENT

Management Objective:

To establish and maintain acceptable procedures and standards for storage, manipulation, backup, archiving, dissemination, access to and sharing of accurate water management-related information, within DWAF and other institutions involved in water resource management within the WMA.

Situation Assessment:

Spatial data

DWAF is the custodian of an extensive GIS (UNIX based) corporate spatial database (CSDB) based in Pretoria and managed by Directorate: Geomatics. The region keeps a copy of the CSDB which is updated regularly. It includes data obtained from other companies, state departments, consultants and academics. A list of available data with metadata is available on the DWAF website (www.dwaf.gov.za).

Aerial Photography

The Department owns 1: 30 000 aerial photography covering the most of the Western Cape which was undertaken by the regional Working-for-Water programme in 1999/2000.

Invasive Alien Plants Mapping

Invasive alien plants density mapping has been undertaken for the WMA in 1999-2001. Working-for-Water is using this mapping for planning purposes.

Surface Water Hydrology and Water Quality

The Hydrological Information System and related systems were replaced with an Australian hydrological database system called HYDSTRA in 2002. It is functioning effectively and is providing support for management decisions utilising water quality and quantity data.

WARMS

The Water Use Authorisation and Registration Management System (WARMS) is not currently supporting management sufficiently in the Olifants/Doorn WMA. The system is unable to provide basic information (for example, it does not produce a list of all farmers scheduled in a particular quaternary). It also has no way of graphically displaying all registered users on a map. The registration data must be verified before it can be used for decision-making purposes. If, once verified, this information was publicly available it would allow for refinement and self-policing by other registered users, forcing more unregistered users to come into the fold. Maximum allowable water use is not captured, but only average use. It should be noted that assurance of supply is the same in all cases.

POLMON, WMS and AFS

The Pollution Monitoring Information System (POLMON) is still active. This is currently used in conjunction with the Water Management System (WMS) and Administrative Filing System (AFS), developed locally, for the water quality resource management.

Strategy:

Appropriate resources must be allocated to implement an approved Information Management Plan.

To reduce the resource requirements the approach may best be to develop water user "self-monitoring" capacity. The internet could be used as a data capture tool if users were able to regularly enter their own standardised readings into a database. This may need to be included as a condition on new licences in order to enforce submission of information. Quality of the data is essential and DWAF resources would have to be made available to check and verify data on a regular basis before accepting it. User-friendly guidelines would also have to be developed to support self-monitoring.

Feedback of all monitoring data to landowners and local government in an accessible and useful format is required in order to encourage co-operation, capacity building and good water resource management.

Management Actions:

Compile a WMA Information Management Plan as follows:

- Identify what information the Departmental information managers require;
- Implement an appropriate knowledge management system within the Regional Office;
- Determine IT and GIS-specific requirements such as hardware and software for storage;
- Develop an information sharing policy which should detail the following:
  - What information should be shared?
  - Who should have access to it?
  - What is the integrity of the information to be shared?
  - With whom is sharing of information beneficial?
- Upgrade Head Office and Regional Office software to enhance interaction between monitoring hardware, databases and PCs, e.g. data from automatic data loggers and the National Groundwater Database (NGDB). Identify information requirements from other departments, provincial and local government and other organisations;
- Ensure implementation of the information sharing policy;
- Implement the information-sharing policy through co-operative governance with other departments, local authorities and institutions through various formal and informal committees or other forms of effective co-operation;
- Install adequate storage, backup and archiving facilities and library systems in all the Western Cape regional offices;
- Engage with the WARMS managers to facilitate the development of a management-friendly interface and outputs for the Olifants/Doorn WMA;
- Formulate an approach to deal with available information that is not being systematically captured;
- Source all work which has been done in the area including minor studies (e.g. MSc and PhD theses).

The Regional Office should:

- Address custodianship of the databases and requirements for auditing of information or databases for shared databases;
- Establish scientific posts that are responsible for the interpretation of data, dissemination of information and development of the GIS-based Data, Information and Knowledge Management;
- Initiate the planning of a GIS-based data and information base useful to local government, Department of Land Affairs and Education, other DWAF Directorates, Aid organisations, NGO's and the private sector at WMA or larger scale level. Any GIS-based system must provide data as well as information and best-practice and/or planning guidelines relevant in any particular area and be regularly updated;
- Promote the integration of surface, groundwater and ecological monitoring/data collection, centralisation of results and access at ROs and regular interpretation and use of the results as input into an accessible GIS- based information system.

Responsibility: The Regional Office is responsible for implementing this strategy within the WMA in conjunction with the Directorate: Information Management.

Priority: Very High

CHAPTER 14
IMPLEMENTATION STRATEGIES

The Implementation Strategy is required to address:

- Implementation programme for the ISP;
- Resources to implement the ISP;
- Delegation of responsibility;
- Budgeting priorities.

14.1 IMPLEMENTING THE ISP

Management Objective:

To ensure that the approaches put forward by the Department through this ISP are adopted and implemented in the Olifants/Doorn WMA. This will require commitment, funding and capacity.

Situation Assessment:

The ISP is an internal document developed by the Department of Water Affairs and Forestry. The ISP sets out the approaches which the Department is taking towards water management in the Olifants/Doorn WMA and lists suggested actions towards achieving good management of the water resources.

The wider public has had no direct input into the writing of this ISP - yet it is recognised that the approaches suggested have a significant impact on the people of the Olifants/Doorn WMA. Whilst the approach to date in developing this ISP may seem non-participatory, it must be remembered that this is not a Catchment Management Strategy - but DWAF setting out how it sees the situation, and the steps which it views as most appropriate in dealing with that situation. Interactions with the public have been an important influence in developing the approaches adopted.

This ISP is not a closed document but is to be made available to the wider public for comment and input. This makes the ISP an inherently transparent document – opening out the thinking and planning of the Department. Although DWAF makes no commitment to adopt every comment made, these will be taken seriously and the ISP will be updated and improved as newer and better perspectives are formed. Once the CMA has been established it will be required to develop a CMS, and this will require full public participation. It is to be hoped that the ISP will be taken as useful baseline information and, indeed, that the approaches adopted here are found to be acceptable to, and adaptable by, the new dispensation.

Delegation of overall responsibility for the implementation of the ISP to a responsible official with the required level of authority is a critical factor to successfully implement the ISP. Organisational restructuring was undertaken during 2002-2004 and the new structure is due to be implemented in April 2005 in the Southern Cluster (previously the Western and Eastern Cape Regional Offices). The need to implement the ISP according to strategies must be reflected in the revised structure.

An important factor in this WMA is the fact that approximately 95% of the water use is by the agricultural sector. Agriculture is the highest single contributor to the economy of the area. The WMA presents a growing tourism industry particularly in its coastal resorts and the natural conservation areas in the Cederberg. These aspects are strengths of the area. The "weaknesses" of the area are in the knowledge of the EWR, the use of water resources and poverty in the area. The "threats" to developing water resources in the WMA are IAPs and high EWR. The "opportunities" for water resource development can be found in the WODRIS study with a possible off-channel dam on the Doring River and further development of the TMG Deep Aquifers.

Some issues and concerns that have been identified are:

- Internal DWAF liaison must be strengthened, as Head Office and Regional Office Cluster co-ordination is currently inefficient;
- There is a shortage of trained, experienced personnel at DWAF, specifically staff with scientific and local knowledge. Specific departments suffering severe shortages are "Water Quality" and "Water Services";
- The budget for Water Resource Management is generally inadequate;
- Personnel language and gender challenges. Afrikaans speakers are able to collect field information better in this WMA due to the community profile;
- It is estimated that 16 people will be required to undertake all the CMA tasks. This estimated required staff complement might however prove insufficient, considering the extent of the WMA responsibilities. Funding additional staff may prove to be a challenge.
- The future CMA may be unable to perform the hydrology services adequately with the staff they are able to afford. Hydrology services should stay with DWAF as a service/utility;
- In the past, the West Coast District Municipality performed all the water services duties in some towns in the area. Now that the local municipalities are taking over they require more relevant and applicable training in this regard, e.g. water services development plans (WSDP) (refer to the **Capacity Building Strategy**);
- Capacity within Municipality – needs support and capacity building, e.g. good reporting, IDPs, water service development plans (refer to the **Capacity Building Strategy**).

Strategic Approach:

ISPs for each WMA are guided by the NWRS and decisions affecting national resource distribution and use, as presented in the NWRS, are binding on each ISP. This ISP does, however, make a number of corrections and improvements which serve as knowledge updates to the NWRS, particularly as regards catchment water balances and the availability of water for purposes of allocation. The ISP is signed off by the Director responsible for the NWRS and approved by the Department's Water Resources Functional Management Committee. It is also published on the Departmental website. It therefore has the status of an official document containing current best available knowledge with regard to water resource use and availability.

The ISP should be updated as and when new information becomes available and will serve as the primary source document for decision-making, within the framework provided by the NWRS. The implementation of the ISP is an enormous task and will have to be tackled in a stepwise fashion. Much of what is in this document describes the day-to-day functions of the Department – but there are many new tasks, functions, and actions set out in response to DWAF's visions for the future.

It is recognised that it is quite impossible to immediately launch into, and achieve, all that is required by this ISP. Funds and capacity are real constraints. The approach is to take the ISP and to use it as instruction, guidance, and motivation in the development of yet clearer management and action plans. These must be built into Departmental Business Plans, and budgeted for as part of Departmental operating costs.

This will necessarily be in a phased manner as dictated by available resources, but it is important that the ISP be used to leverage maximum funds, maximum capacity, and to bring optimum management to the WMA. The position with regard to the 'Authority of Information Contained in the ISP' is further set out in **Section 1.3.4** of **Chapter 1** of this ISP document.

The major focus in the short-term will be the focus on making water available for RPFs. This must be achieved through the implementation of many strategies, which must complement each other and avoid serious water shortages.

Management Actions:

The following actions are required:

- Publish the ISP to be accessible for public input and comment (consider hard-copy and web-based options). Copies will be presented to key stakeholders on request. It is not the intention to have a major drive for public input, but merely to create the opportunity for input;
- Develop materials which help to take the ISP to Provincial, District and Local Government Authorities. Also to support the Water Services Development Plans, organised agriculture, emerging farmers, and others. Materials should be useful in preparation of the Provincial Growth and Development Strategy and other regional and provincial planning activities;
- There are many actions in the ISP which do require public involvement – and it is important that the thinking with regard to, for example, the use of groundwater, and the importance of WC&DM, is delivered forcefully to local authorities, other direct water users such as agriculture, and the wider public;
- Collate and consider all comments in revising and improving the ISP;
- The ISP should be open to continuous improvement, with updating on a regular basis;
- All Regional Office water resource management staff, Working-for-Water, and other major stakeholders should have access to, or copies of, the ISP;
- Approaches set out in the ISP need to be accepted and adopted by both national and regional staff. Where there is resistance to ideas then this needs to be resolved in an open climate of debate and understanding. Modification of the ISP is not ruled out;
- The practicalities of implementation demands must always be considered;
- Most actions in this ISP have been assigned to the Regional Office. It is critically important that the tasks outlined are prioritised, budgeted for, and built into regional and national business plans and budgets;
- Assign a senior official in the Regional Office to the implementation of the ISP;
- Identify and delegate responsibility for the successful implementation of individual ISP strategies to specific officials in the responsible regional and head office functional groups/Directorates;
- Identify champions or contact persons in the Regional Office for more specialised functions (refer to **Table 14.1**).

Responsibility: The Regional Office is responsible for implementing this strategy.

Priority: This strategy has very high priority. The implementation is to be ongoing until the Olifants/Doorn CMA is established and the ISP is superseded by a CMS.

Table 14.1: Responsibilities/champions for the strategies

Strategies	Regional Office Responsibility	Head Office Champions (1)
YIELD BALANCE AND RECONCILIATION	**Gerrit van Zyl**	**NWRP / OA/WRPS**
Reliability of Water Availability and Use	Gerrit van Zyl	NWRP: F. Stoffberg/ OA: A. Brown
Groundwater	Mike Smart/ Paul Seaward	WRPS: Fanie Botha
Reconciliation	Gerrit van Zyl	NWRP: F. Stoffberg
WATER RESOURCES PROTECTION	**Gareth McConkey**	**RDM / WDD**
Reserve and Resource Quality Objectives	Toni Belcher	RDM / WDD: Barbara Weston
Water Quality Management	Gareth McConkey	WDD
Wastewater Treatment and Solid Waste Management	Abdulla Parker/ Francois van Harden	WDD
WATER USE MANAGEMENT	**Willie Enright**	**WA&IU / WUE**
Water Allocation and Licensing	Abdulla Parker	WA&IU: Francois van der Merwe
Verification of Existing Lawful Use	Abdulla Parker/ Francois van Harden	WA&IU: Francois van der Merwe
Management of Non-compliant Use	Abdulla Parker/ Francois van Harden	WA&IU: Francois van der Merwe
Compulsory Licensing	Willie Enright/ Abdulla Parker	WA: Ashwin Seetal
General Authorisations	Abdulla Parker	WA&IU: Francois van der Merwe / WDD
Invasive Alien Plants	Lies Bezuidenhout	WfW
Support to local authorities	Zolile Basholo	NWRP: F Stoffberg / OA: A Brown
WATER CONSERVATION AND WATER DEMAND MANAGEMENT	**Zolile Basholo / Mary Rahube**	**WA&IU / WUE**
Urban/Industrial/Agricultural WC&DM/ Water Use efficiency	Mary Rahube	WUE: Nigel Adams
INSTITUTIONAL DEVELOPMENT AND CO-OPERATIVE GOVERNANCE	**Willie Enright**	**WMIG**
Institutional development (CMA, WUA and Forums)	Abdulla Parker/ Francois van Heerden	WMIG: Eustathia Bofilatos
Co-operative Governance	Abdulla Parker/ Francois van Heerden	WMIG
Capacity Building and Communication	Abdulla Parker/ Francois van Heerden	WMIG: Eustathia Bofilatos / WA&IU : Jean Msiza

Strategies	Regional Office Responsibility	Head Office Champions (1)
SOCIAL AND ENVIRONMENTAL	**Willie Enright**	**WMIG / WA&IU**
Integrated Environmental Management	Toni Belcher	WA&IU: Valerie du Plessis
Poverty Eradication (Resource-poor Farmers)	Abdulla Parker	WA&IU
WATERWORKS DEVELOPMENT AND MANAGEMENT	**Southern Cluster: Dewald Coetzee/ Tyl Willems**	**None**
Waterworks Management, Operation and Ownership	Erwin Weidemann/ De Wet Oosthuizen	Southern Cluster: Dewald Coetzee
Waterworks Development	Abdulla Parker/ Francois van Heerden	Southern Cluster: Dewald Coetzee
Public Health and Safety /Disaster Management	Abdulla Parker/ Francois van Heerden	WRPS: Chris Swiegers
Recreation	Abdulla Parker/ Francois van Heerden	Environment and Recreation: Lorraine Fick
MONITORING AND INFORMATION MANAGEMENT	**Gerrit van Zyl**	**M: IM**
Monitoring and Data Management	Gerrit van Zyl	D: IP : Elias Nel
Information Management	Gerrit van Zyl	CD: IM: A. Muller
IMPLEMENTATION	**M: Southern Cluster**	**None**
Implementation	M: Southern Cluster	None

1. The abbreviations for the various DWAF Directorates, related organisations and designations are:

Chief Director	:	CD
National Water Resource Planning	:	NWRP
National Working-for-Water	:	NWfW
Options Analysis	:	OA
Scientific Services	:	SS
Social and Ecological Studies	:	WA&IU
Waste Discharge and Disposal	:	WDD
Water abstraction and Instream Use	:	WA&IU
Water Use Efficiency	:	WUE
Water Resource Planning Systems	:	WRPS
Water Allocation		WA
WMI Governance	:	WMIG
Working for Wetlands	:	WfWetlands
Working-for-Water		WfW