CHAPTER 4: THE OVERBERG COMPONENT OF THE BREEDE WMA: OVERVIEW FROM A WATER RESOURCE MANAGEMENT PERSPECTIVE

4.1 INTRODUCTION

In Chapter 3, extensive reference was made to the findings of the Breede River Basin Study (BRBS), which provides a concise overview of the water resources in that area. The BRBS was even more recent than the Breede WMA Report (see next paragraph). The remainder of the Breede WMA (the Overberg) did not form part of the BRBS.

In terms of assessing water availability and requirements for the Overberg region, the figures published in Appendix D19 of the NWRS are considered the most reliable to date. These are derived from the Breede WMA Report: Overview of Water Resources Availability and Utilisation (Ref.9), hereafter referred to as the Breede WMA Report. The WMA report is one of nineteen WMA reports issued in 2003 as part of the process leading up to the publication of the first version of the NWRS, and contains additional detailed information that could not all be taken up in the NWRS itself.

In addition to the NWRS and the Breede WMA report, information on the Overberg catchments has also been sourced from the following reports:

- *Eastern Overberg Coastal Zone Water Supply* (Ref.1)
- *Western Overberg Coastal Zone Water Supply* (Ref.4)
- *Breede WMA Water Resource Situation Assessment* (Ref.5)
- *Overstrand Water Resource Investigation* (Ref.6)

The Overberg region is divided into two sub-areas in the NWRS. This division has been retained in the ISP for the purpose of describing the availability, requirements and yield balance within the Overberg. The two sub-areas shown on Figure 4.1 are:

- The ***Overberg West*** sub-area; includes the coastal catchments extending from the Palmiet River in the west to the Uilkraals River in the east. This area has been defined as secondary catchment G40.
- The ***Overberg East*** sub-area; includes the catchments of the Sout, Kars and Nuwejaars Rivers in one secondary catchment, namely G50.

In the extreme west, the Palmiet River, rises in the Hottentots Holland Mountains (G40C), flows through the fertile and intensely irrigated Elgin basin (G40C and D), the pristine Kogelberg State Forest area (G40D) and into the sea via the Palmiet estuary.

The Bot River initially flows through well developed agricultural land (G40E). The land surrounding the eastern reaches (G40F) has not been developed on account of the geology and the low surface water runoff. The river flows into the Bot River Lagoon (G40G).

The Onrus River (G40H) supports some irrigation and supplies water to the Greater Hermanus area out of De Bos Dam. The river consists of just one quaternary catchment and enters the sea via the Onrus Lagoon.

Rising in the rolling hills of the Ruensveld (G40J and K) to the north of the coastal mountain range is Klein River. It flows into a valley that cuts through the mountain range and enters the Kleinriviers Vlei to the east of Hermanus (G40L).

The Uilkraals River (G40M), recently dammed by Kraaibosch Dam, consists of one quaternary catchment only.

The Nuwejaars River catchment (G50B and C) has very low runoff. The river joins the relatively saline Kars River (G50D and E) and enters the sea as the Heuningnesvlei River between Struisbaai and Arniston (G50F).

The Sout River drains the eastern Ruensveld (G50G and H) into the De Hoopvlei (De Hoop Nature Reserve). This is an "endoeric" river (it has no outlet to the sea) and as its name suggests is highly saline (geological causes).

Figure 4.1: The Overberg Component of the Breede WMA *(ref: The Breede WMA Report)*

4.2 REGIONAL WATER SUPPLY SCHEMES IN THE OVERBERG

4.2.1 The Palmiet River Government Water Scheme

The Palmiet River Government Water Scheme transfers water from the Palmiet River in the Breede WMA (G40D) to the Berg WMA for use by the CCT. The scheme is a dual purpose water transfer and hydro-electric pumped storage scheme.

The hydro-electric components comprise the Kogelberg Dam on the Palmiet River, the power station and waterways, and the upper reservoir, known as Rockview Dam. The two dams each have a capacity of 17 million m^3. During periods of the week when there is a low demand for electricity, and when there is sufficient water in the Palmiet River (over and above the ecological water requirements), river water may be pumped from Kogelberg Dam to Rockview Dam for transfer into the Upper Steenbras Dam in the Berg WMA. From there water is released through the Steenbras Hydro-electric Power Station to a pipeline conveying it to the Faure Water Treatment Plant and to CCT consumers. Although the average quantity currently transferred is 22,5 million m^3/a, there are possibilities for a further scheme to increase the yield, should the need arise. The size of any additional scheme will depend on the ecological Reserve requirement of the Palmiet River and its estuary.

4.2.2 The Overberg Rural Water Supply Schemes

The Overberg catchments are served by two rural water supply schemes, operated by the Overberg Water Board. These schemes provide water for domestic use to about 60% of the rural population in the Overberg as well as drinking water for livestock. The schemes also supplement the supply to the towns of Caledon (G40F), Waenhuiskrans (Arniston-G50J) and Bredasdorp (G50E). Settlements at Protem and Klipdale are also dependent on the schemes. These schemes are:

- the *Ruensveld East Rural Water Supply Scheme* abstracts water from the Riviersonderend River by means of a pumpstation situated midway between the towns of Riviersonderend and Swellendam. This water is treated close to the abstraction point. The main feeder pipeline extends in a southerly direction to Bredasdorp, and further on to near Waenhuiskrans (Arniston). With branch pipelines, the scheme covers an area of some 1 750 km^2. It supplies about 65% of the rural population in its supply area, as well as providing drinking water for livestock. The scheme has a capacity of 0,85 million m^3/a, with demand and supply approximating 0,73 million m^3/a in 1995. In addition to the towns of Bredasdorp and Arniston, the settlements of Protem and Klipdale also receive water from this scheme.

- the *Ruensveld West Rural Water Supply Scheme* abstracts water from the Riviersonderend River approximately two kilometres downstream of Theewaterskloof Dam. The water is treated adjacent to the abstraction point. From there a gravity main supplies treated water to the town of Caledon (supplementing the town's groundwater source) and to farms between Caledon and Riviersonderend. Water is also piped from another reservoir near Caledon in a south-westerly direction to farms in the vicinity of Napier. All along the gravity main,

branch lines radiate to the boundaries of the scheme to supply individual farms. In addition to the town of Caledon, water is provided for domestic use, livestock, and to 370 farms. The capacity of the scheme is approximately 2,4 million m^3/a, with about 30% of the requirement being for livestock. In 1995 the scheme supplied approximately 1,7 million m^3/a.

4.3 LOCAL URBAN WATER SUPPLY SCHEMES IN THE OVERBERG

With the exception of some domestic water supplied through the Ruensveld East and Ruensveld West schemes, local surface and groundwater supply schemes meet all the urban requirements in the Overberg region. The urban and rural domestic water requirements constitute 12% and 5% respectively of the total current water requirements in the Overberg. With the exception of peak-season shortages (predominantly due to limited infrastructure capacity), there is sufficient water available to meet the current requirements of the urban sector. However the town of Grabouw is rapidly expanding.

Augmentation of existing urban supply schemes may be required in the future, particularly in Grabouw and in the coastal towns, where demand is still growing. All local authorities must undertake and implement more efficient water use (WC/DM, water re-use, lei-water exchange, etc) so as to make best possible use of their existing resources, before consideration is given to the development of new schemes.

Groundwater should be seriously considered for any supplementary urban water supply schemes. Desalination is another option for coastal towns. The details of current and future supply schemes to towns within the Overberg are addressed under the Supply to Local Authorities Strategy (12.1).

The only dam in the Overberg primarily supplying water to urban users in the region is the De Bos Dam. This is owned by the Overstrand Municipality, has a capacity of 6,3 million m^3 and supplies domestic water to the Greater Hermanus area. Compensation releases of approximately 0,5 million m^3/a take place to supply irrigators downstream of the dam.

Dams primarily supplying irrigation but from which some urban water requirements are supplied are described in Section 4.4.

4.4 IRRIGATION SUPPLY IN THE OVERBERG

In the Overberg, irrigation water requirements account for 77% (64 million m^3/a) of the total in-catchment water requirement. There are only two irrigation boards in the Overberg and neither has been transformed into WUA. These are the Groenland Irrigation Board in the Palmiet River catchment (G40B-D) and the Houtveld Irrigation Board in the Bot River catchment (G40E-G). Of the 11 400 ha of irrigated land in the Overberg, 11 300ha lies within the Overberg West sub-area (ref: Breede WMA Report) and 7 600 ha of that within the intensively irrigated Palmiet River catchment alone (ref: Breede WMA Water Resource Situation Assessment Report).

The larger dams in the Overberg primarily supplying irrigators include:

- *Nuweberg Dam* on the Palmiet River is owned by the Nuweberg Dam Syndicate. The dam has a capacity of 3,9 million m^3 and supplies irrigators in the syndicate.
- *Eikenhof Dam* on the Palmiet River, the spillway of which was raised in 1998 to provide a capacity of 29 million m^3. The dam is owned by the Groenland Irrigation Board and primarily supplies water for irrigation. The town of Grabouw receives approximately 0,5 million m^3/a from this dam.
- *Appelthwaite Dam*, also on the Palmiet River is owned by Elgin Orchards. It has a capacity of 3,5 million m^3 and supplies irrigation requirements only.
- *Arieskraal Dam* on the Palmiet River is owned by Arieskraal Farm. The dam supplies water for irrigation and has a capacity of 4,4 million m^3/a.
- *Grootvlei Dam* on the Palmiet River has capacity of 1,6 million m^3 and is owned by Elgin Orchards.
- *Kraaibosch Dam* on the Uilkraals River supplies water for irrigation and the town of Gansbaai.

4.5 WATER AVAILABILITY IN THE OVERBERG

The natural Mean Annual Runoff (MAR) and the preliminary ecological component of the Reserve are shown in Table 4.5.1. It is important to note that the preliminary ecological water requirements (EWRs) are based on desktop level estimates and do not take the estuarine requirements into account.

Table 4.5.1: Mean Annual Runoff and Preliminary Ecological Water Requirements (million m^3/a)

Resource Category	Overberg West	Overberg East	Total
Natural MAR (1)	480	110	**590**
Preliminary Ecological Water Requirement (1)	94	13	**107**
Impact of the Preliminary Ecological Water Requirement on Yield (Incremental)	2	0	**2**

1) Quantities are incremental.

Table 4.5.2: Water Availability in the Overberg (million m^3/a, Year 2000)

Resource Category	Overberg West	Overberg East	Total
Gross Surface Water Resource	121	3	**124**
Less Impact on Yield of			
Preliminary Ecological Reserve	2	0	**2**
Invasive Alien Plants	31	2	**33**
River Losses	0	0	**0**
Net Surface Water Resource	**88**	**1**	**89**
Groundwater	3	1	**4**
Return Flows	8	0	**8**
Total Local Yield	**99**	**2**	**101**
Transfers In	2(1)	2(1)	**4**
TOTAL	**101**	**4**	**105**

1) Transfers in from Riviersonderend River in the Breede River component via the Ruensveld Schemes.

The gross surface water resource in the Overberg is estimated to be 124 million m^3/a, of which 98% (121 million m^3/a) lies in the Overberg West sub-area. In the Palmiet catchment alone, the 1 in 50 year yield from the five larger dams (46 million m^3/a) and forty-seven other registered smaller dams (19 million m^3/a) is approximately 65 million m^3/a.

Groundwater partially supplies a number of towns on the Overberg West catchments, and in the remainder of the Overberg it is mainly utilised for rural, domestic and stockwatering supply. Return flows mainly arise from the catchments of the Palmiet and Bot Rivers in the Overberg West sub-area.

After allowing for the impact of the preliminary Ecological Water Requirements, and the impact of invasive alien plants, the resulting available surface water in the Overberg is approximately 89 million m^3/a (1 in 50 year assurance of supply).

4.5.1 Uncertainties Affecting Water Availability Estimates

In estimating water availability, the main uncertainty with regard to the availability of water is the Ecological Water Requirement associated with the Reserve. The preliminary estimates totalled for the rivers are shown in Tables 4.5.1 and 4.5.2. These are based on desktop estimates. A desktop methodology has not yet been developed to estimate estuarine Reserve requirements, so this remains an important information gap. Invasive alien plant clearing is one option through which water can be made available towards meeting Reserve requirements in the Overberg catchments, with the very large impact of invasive alien plants offering a potential large release with successful clearing.

4.6 WATER REQUIREMENTS IN THE OVERBERG

Table 4.6.1: Water Requirements in the Overberg (million m^3/a, Year 2000)

Category	Overberg West	Overberg East	Total
Irrigation	64	0	64
Urban (1)	8	2	10
Rural	2	2	4
Impact of Afforestation on yield	5	0	5
Total Requirements	**79**	**4**	**83**
Transfers Out	23(2)	0	23
TOTAL	**102**	**4**	**106**

1) Includes component of Reserve for basic human needs at 25 ℓ/c/d.
2) Comprising the average annual transfer of 22,5 million m^3/a to the Berg WMA via the Palmiet Pumped Storage Scheme.

At an equivalent 1 in 50 year assurance of supply, the estimated 11 400 ha of irrigated land utilises approximately 77% of the total local water requirement in the Overberg. The irrigation requirement is essentially all within the Overberg West – less than 0,5 million m^3/a irrigation requirement (approximately 100 ha) lies within the Overberg East.

The impact on yield of forestry in the western Overberg is 5 million m^3/a from approximately 4500 ha of which 3300 ha lie within the Palmiet catchment. Much of this forestry is scheduled for clearing.

No changes are proposed to the water requirement estimates. These are based on the latest available estimates as published in the First Edition of the NWRS.

4.6.1 Uncertainties Affecting Water Requirement Estimates

In estimating water requirements in the Overberg, the following uncertainties have been identified:

Unexercised Irrigation Allocations

The irrigation water requirement estimates are based on actual allocations and not on actual current water use. The RO has provided the following estimates of the extent of allocated but unexercised allocations in the Overberg West sub-area:

- In the Palmiet catchment (G40B-D)
  - 5% summer allocations out of Eikenhof Dam
  - 20% winter allocations out of Eikenhof Dam

In the Uilkraals River catchment (G40M) a 40% increase in summer allocations out of Kraaibosch Dam, through the progressive implementation of agricultural development is anticipated.

Climate Change

As discussed in Chapter 3 increasing temperatures are likely to cause an increase in irrigation water requirements, and this should be allowed for when developing future water requirement scenarios.

Changes in Land-use

The decommissioning of commercial forestry will result in areas of State owned land becoming available for alternative land-use purposes in the Overberg West sub-area. This will be the case primarily in the Palmiet and adjacent Bot River catchments. Once cleared, existing areas of SAFCOL plantations have been earmarked for the establishment of resource poor farmers. The initial impact of any clearing is likely to be less water use, with some increased runoff. Future land-use such as irrigated agriculture may introduce new demands. Access to water where resource poor farmers may potentially be established on this land will be necessary. Soil suitability is an important criteria informing decisions as to where irrigated agriculture would be best developed. Refer also to the Changing Land-Use: Forestry Strategy (9.5).

The priority areas for clearing of invasive plants in the Overberg should be linked to the need to protect the estuaries. The highest priority lies within the Overberg East and in particular within the catchments of the Kars River (G50D) and Nuwejaars River (G50B-C). Here clearing could generate increased freshening flows into the Heuningnes Estuary, which is of particularly high ecological importance. Bio-control has proven particularly effective against *Acacia longifolia*, a common invader species in coastal lowlands, typical of the Overberg. As such there is opportunity to effectively implement bio-control in this region. The impact of invasive alien plants in the Overberg is extreme. 25% of the gross surface water resource in the western Overberg and 66% of the gross surface water resource in the eastern Overberg is lost to invasive alien plants.

The clearing of Invasive Alien Plants Strategy (9.6) discusses this in more detail.

The Impact of Implementing WC/DM

Estimates of future urban and irrigation water requirements in the Overberg do not make allowance for water savings that will be achieved through WC/DM. Future water resource planning will need to take this into account. Urban and Agricultural WC/DM are addressed under the Water Conservation and Demand Strategies in Section 10.

4.7 RECONCILIATION OF REQUIREMENTS AND AVAILABILITY IN THE OVERBERG

Table 4.7.1 provides a reconciliation of the water requirement with the available resource for the Year 2000.

Table 4.7.1: Reconciliation of Water Requirements and Availability in the Overberg (million m^3/a, Year 2000)

Description		ISP SUB-AREAS		Total
		Overberg West	Overberg East	
Available Water	Local Yield	99	2	101
	Transfers In	2	2	4
	Total	**101**	**4**	**105**
Water Requirements	Local Requirements	79	4	83
	Transfers Out	23	0	23
	Total	**102**	**4**	**106**
Balance		**-1**	**0**	**-1**

The Overberg is essentially in balance with water availability and water requirements of equal magnitude.

4.7.1 Water to Resource Poor Farmers

Based on information available from the RO, the establishment of resource poor farmers in the Overberg is centred around small groups in Caledon and Bredasdorp only. Crops cultivated by these farmers include wheat, canola, and vegetables and are primarily dryland. The extent of formally irrigated land is assumed to be very small. Based on the Year 2000 yield balance, there is no surplus yield available from existing resources for further irrigation expansion of any kind. Where new applications to develop either groundwater or storage are forthcoming, those applications supporting resource poor farmer development will be given preference.

Opportunity will present itself for establishing resource poor farmers in the Palmiet catchment on land that is to be cleared of existing forestry plantations (SAFCOL), utilising the water that becomes available by the clearing of the plantations and invasive alien plants. Not all of the land will be available or suitable for establishing irrigated agriculture. Re-establishing indigenous vegetation will occur on large tracks of land, and these should be located in those areas least suitable for irrigated commercial farming. Soil potential and access to water will need to be investigated, and viable areas for irrigated agriculture identified. Joint venture partnerships with existing commercial farmers, provides an option for establishing and supporting resource poor farmers. Through joint venture arrangements, skills transfer and technical support from existing commercial farmers is at hand. Alternatively State funded programs are another option via the CCAW.

In the higher rainfall regions of the Western Overberg (Palmiet and Bot River catchments), a potentially very viable opportunity for resource poor farmers is the farming of indigenous plants, which can be grown under natural conditions in these wet catchments.

4.8 FUTURE WATER REQUIREMENT SCENARIOS

Estimates of future water requirements in the Overberg are based on the Year 2025 scenarios used for input to the NWRS.

4.8.1 The Year 2025 Base Scenario

Within the spectrum of population and economic growth scenarios, a ***base scenario*** was selected for estimating the most likely future water requirements in the Overberg. This is built on the high scenario of population growth and more equitable distribution of wealth leading in time to higher average levels of water services.

For the base scenario the increase in projected water requirements for the Overberg is small, comprising a small increase in urban water requirements only, with a slight decrease in rural water requirements. This equates to an overall increase in the water requirement of less than 4% (3 million m^3/a). When reconciling water requirements with availability for this scenario, the Overberg would have a shortfall of 2 million m^3/a (see Table 4.8.1).

4.8.2 The Year 2025 High Scenario

A possible ***high scenario*** of future water requirements, is also given, based on the assumption of high population growth and high standard of services (socio-economic development); together with a strong increase in the economic requirements for water, where the public and business use of water would increase in direct proportion to the gross domestic product. It assumes no general increase in irrigation requirements from those in 2000 and no adjustments have been made to reflect the impacts of increased water use efficiency.

For the high scenario the projected water requirements for the Overberg for 2025 of 125 million m^3/a would result in a shortfall of 15 million m^3/a (see Table 4.8.1), when reconciled with water availability.

Table 4.8.1: Reconciliation of Water Requirements and Availability for the 2025 Scenarios (million m^3/a)

Description		2025 BASE SCENARIO			2025 HIGH SCENARIO		
		Overberg West	Overberg East	Total	Overberg West	Overberg East	Total
Available Water	Local Yield	100	3	**103**	103	3	106
	Transfers In	2	2	**4**	2	2	4
	Total	**102**	**5**	**107**	**105**	**5**	**110**
Water Requirements	Local Requirements	83	3	**86**	95	7	102
	Transfers Out	23	0	**23**	23	0	23
	Total	**106**	**3**	**109**	**118**	**7**	**125**
Balance		**-4**	**2**	**-2**	**-13**	**-2**	**-15**

4.9 RECONCILIATION INTERVENTIONS

4.9.1 Water Re-use

The current urban water requirement (10 million m^3/a) represents only 12% of the total local water requirement in the Overberg (83 million m^3/a). Nevertheless, the use of treated effluent from WWTWs offers potential for re-use, particularly in the larger towns. Exchange with nearby irrigation users is one option, as is the irrigation of local sports fields and parks. Water re-use is further addressed under the Water Services WC/DM Strategy (10.1).

4.9.2 Water Conservation and Demand Management (WC/DM)

Urban Sector

The opportunity to use water more efficiently in the urban sector offers local authorities a cost effective means of taking full advantage of their available water resources. In contrast to the situation in the adjacent Breede River component, certain local authorities in the Overberg have already made significant strides in this direction. Hermanus (Overstrand Municipality) for example, has received international acclaim for its successful implementation of a WC/DM strategy. Water use was reduced by 20% in one year. Ongoing efforts at Caledon to use water more efficiently are also recognised. Following suit have been the towns of Bredasdorp, Arniston (Waenhuiskraans), Kleinmond and Betty's Bay, all of which have a strategy in place for WC/DM. The effort made at these Overberg towns is recognised, encouraged and should serve as an example to other towns of what can be achieved.

DWAF can achieve a great deal by promoting the principles of WC/DM and lending technical support to those local authorities that are most in need. WC/DM is an intervention that the Department not only encourages but also sees as a prerequisite for the licensing of any new schemes by local authorities. Realistic WC/DM targets need to be identified in the WSDPs of

local authorities and progress needs to be closely monitored to establish its implementation success. According to national estimates provided in the draft WC/DM Strategy for the Water Services Sector, potential savings of as much as 40% can be realised in urban areas through the implementation of WC/DM measures.

Urban WC/DM is further addressed under the WC/DM: Water Services Strategy (10.1).

Agricultural Sector

In the absence of large conveyance systems (pipelines and canals) in the Overberg and limited irrigation development (outside of the Palmiet catchment), there is little opportunity to use water more efficiently in the irrigation sector. The most intensive irrigation takes place in the Palmiet River catchment where efficient irrigation systems are already in place.

4.9.3 Exploiting Groundwater Resources

The estimate of current developed groundwater yield (i.e. yield from boreholes currently in place), as quoted in the NWRS, is only about 4 million m^3/a for the entire Overberg. Yields from the TMG hold further potential for supply to the coastal towns such as Hermanus, and a recently installed borehole has provided good yield.

Regional groundwater studies undertaken in the Overberg indicate that groundwater is a cost effective option for development in the coastal and selected inland zones. In the Overberg East sub-area in particular, surface water schemes would be generally be more expensive to develop, due to the large distances over which water would need to be conveyed. Groundwater schemes would be more affordable although the quality could be problematic. In some parts of the Overberg, particularly where the Bokkeveld Shales occur, groundwater quality is poor (in some areas unfit for use). In the sandstone to the south, the groundwater quality is generally good.

Where the Bokkeveld shales overlay the TMG in the eastern Overberg, the feasibility of using TMG resources at depth needs to be explored. An alternative is to desalinate the saline groundwater abstracted out of shallower aquifers. The groundwater resource of the Potberg (TMG outcrop, 20 km west of Witsand) is underdeveloped and should be considered for potentially meeting seasonal shortages at Witsand and other coastal resorts in that area.

4.9.4 Clearing of Invasive Alien Plants

An estimated 172 000 ha of the Overberg catchment land area has been invaded by invasive alien plant species. This is most severe between Hermanus (G40H) and the Breede River mouth (H70K). Estimates in the NWRS indicate that the net impact on the 1 in 50 year yield in the Overberg is 33 million m^3/a. Of this some 31 million m^3/a lies within the Overberg West, despite the fact that more than 60% (109 000 ha) of the total infestation occurs in the Overberg East. This is due to the fact that the higher rainfall areas (notably occurring in the west) are far more significantly impacted than the drier regions. During a 1 in 50 year drought, the rivers in the drier regions will have virtually zero flow in them, regardless of whether there is riparian alien

infestation present or not. Consequently from a water resource perspective the highest priority for removing invasive alien plants lies in the Overberg West catchments. Clearing in the catchments of the Nuwejaars and Kars Rivers (Overberg East) could provide for increased freshening flows into the ecologically important Heuningnes Estuary at De Mond.

4.10 DEVELOPMENT OF NEW SURFACE WATER SUPPLY SCHEMES

4.10.1 Developing Yield for In-catchment Use

In view of the relatively small growth anticipated in future urban water requirements, WC/DM is the first step that must be implemented by local authorities. Outside of the Palmiet River catchment (Overberg West) there is little opportunity to further develop surface water yield for high assurance urban water use in the Overberg. Groundwater currently plays an important role in supplying urban water users and will continue to do so in the future.

It is not anticipated that there will be any significant expansion of irrigated agriculture as the available surface water resource is fully allocated. However in the Palmiet catchment there are unexercised allocations from Eikenhof Dam and Arieskraal Dam. Despite this some farmers have expressed intention to develop more cost effective storage on their farms as an alternative to the use of these dams. The RO has indicated that one farmer has a 4,5million m^3/a allocation from Eikenhof Dam that has yet to be exercised. Applications to develop cheaper storage as an alternative to the use of existing but unexercised allocations should not be authorised. Efficient use must first be made of existing available water.

Abstraction of surplus winter water to off-channel storage remains an option that can be considered from certain rivers in the Overberg. This could support limited irrigation expansion. The Klein River (Overberg West) and Nuwejaars River (Overberg East) are possibilities.

4.10.2 Further Development of Palmiet River Yield

The Palmiet River offers the only potential for any further significant development of the surface water resource in the Overberg. Currently 22,5 million m^3/a is transferred to the CCT and yield estimates suggest that based on current preliminary Ecological Water Requirements, a further 25 million m^3/a could potentially be developed in the Palmiet River by constructing a dam near the Upper Campanula Site. The extent of the potential will ultimately be defined by the Ecological Water Requirements for the riverine Reserve. It is of interest to note that the determining factor in terms of the Ecological Water Requirement is likely to be the requirement of the lower Palmiet River and not of the estuary. Although not undertaken to Reserve-type principles, estuary flow requirement work to date suggests that the estuary currently receives more than sufficient water to maintain it in its existing condition. This will need to be confirmed once the estuarine Reserve is determined.

4.10.3 Allocating Potential Yield From the Palmiet River

A decision will need to taken as to how potential yield developed in the Palmiet River catchment might be allocated (should it be developed).

The Allocation and Licensing Strategy (9.3) addresses some possible options which include:

- Augmenting the supply to the WCWSS (as suggested in 4.10.2);
- Provision of water to meet the growing needs of urban users in the Grabouw area;
- Supply to the coastal resort towns of the Overberg West;
- Irrigation supply to in-catchment development with high priority to resource poor farmers (potential to establish them on cleared forestry plantations);
- Some combination of the above.

4.11 WATER QUALITY

4.11.1 Salinity

The rolling hills of the Overberg consist of Bokkeveld shales and the geology has a strong effect on water quality. Whilst the water quality in most of the head waters of these rivers is good, it deteriorates when it reaches the river channels due to mixing with saline water draining from the shales occurring in the lower lying ground. In the Overberg East region there is insufficient water quality monitoring to assess the situation in any detail. The only monitoring station is at De Hoop Vlei, where salinity is high (>3400mg/*l*) and the water is classified as unacceptable for domestic or irrigation use. This can in all likelihood be attributed to naturally occurring high salinity in all the coastal rivers of the eastern Overberg. As a result poor water quality places constraints on crop selection, particularly in the east. The Monitoring Networks and Data Capture Strategy (15.2) addresses the monitoring requirements in the WMA.

The Water Quality Strategy (8.3) discusses the management of salinity in more detail, concluding that in the Overberg catchments no specific interventions be taken to address it. The riverine ecology has adapted to this situation over time. No further irrigation expansion of any significance is likely to take place, with the possible exception of some development in the Palmiet catchment, in which water quality is very good.

4.11.2 Managing Point Source Pollution

Through co-operative governance with local authorities, other pertinent water quality issues in the Overberg need to be addressed. The Water Quality Strategy (8.3) elaborates on these, the most important of which are briefly summarised as follows:

- Poorly managed and overloaded WWTWs pose a risk of discharging sub-standard effluent, particularly during peak season (Onrus being a typical example);
- Solid waste disposal sites (SWDSs) in some towns are poorly managed;
- Significant volumes of fruit waste are generated in the Grabouw area;

- Diffuse pollution from urban areas. At Grabouw, for example, the Klip River tributary of the Palmiet River receives spills from the raw sewage reticulation system servicing the RDP housing development, as well as from industrial point discharges.

CHAPTER 5: SUMMARY OF REVISED INPUTS TO THE NATIONAL WATER RESOURCE STRATEGY

In Chapter 3 (Breede River component of the Breede WMA), a number of changes were adopted for the Year 2000 water availability, water requirements and yield water balance figures, compared with those figures appearing in the First Edition of the NWRS. These changes arose primarily as a result of more updated information becoming available through the recently completed Breede River Basin Study (BRBS), which was also based on a Year 2000 level of development. The main differences between the recommended figures in this ISP and those of the First Edition of the NWRS are explained hereafter.

No changes were recommended to the Overberg component of the Breede WMA, and the water availability, water requirements and yield water balance figures remain unchanged from those appearing in the First Edition of the NWRS.

For convenience in updating the NWRS, Section 5.4 provides a summary of the water resource information for the whole Breede WMA, presented in the same format as that currently used in the NWRS.

5.1 PROPOSED CHANGES TO WATER AVAILABILITY ESTIMATES IN THE BREEDE RIVER COMPONENT OF THE BREEDE WMA

The main changes proposed to the water availability estimates in the First Edition of the NWRS are shown in Tables 5.1.2 and 5.1.3, and are briefly described below:

Surface Water Resource

The yield from major dams determined through the BRBS is 443 million m^3/a, a more detailed assessment and therefore more reliable than the 419 million m^3/a used in the NWRS. The BRBS further assumes that the available yield from farms dams and run-of-river is in balance with the irrigation requirement outside of the controlled irrigation schemes. Taking these changes into account equates to a total surface water resource of 749 million m^3/a, as opposed to the 684 million m^3/a of the NWRS.

Invasive Alien Plants

The impact on yield of invasive alien plants in the Breede River component was modelled using advanced simulation and modelling techniques during the BRBS. Although the condensed areas of infestation and the natural MARs compare reasonably well with those of the NWRS, the BRBS determined an overall impact of 45 million m^3/a as opposed to the desktop level estimate of 24 million m^3/a of the NWRS. The BRBS result is considered to be of greater confidence.

River Channel Losses

The 20 million m^3/a provided for losses in the Upper Breede by the NWRS is considered to be an overestimate. There is a strong interaction between the river channel and the alluvium. A mass balance was conducted during the Breede River Hydrosalinity Modelling project (Ninham Shand 1992). For the reach of river between Greater Brandvlei Dam and the Cogmanskloof confluence,

the lateral inflow into the river and the flow out of the river were found to be close to being in balance. A net loss from the Upper Breede sub-area of 5 million m^3/a is considered to be more reasonable.

Water Transfers

In terms of transfers, the major discrepancy between the NWRS and the BRBS is in the transfer of water into the Lower Breede sub-area from the Upper Breede sub-area. This has been estimated in the BRBS to be 14 million m^3/a and not 33 million m^3/a as per the NWRS. Table 5.1.1 shows the comparative figures out of each information source and is followed by an explanation.

Table 5.1.1: Transfers Into the Lower Breede Sub-area (million m^3/a, Year 2000)

Transfer In	ISP	NWRS
From Upper Breede	10	24
From Riviersonderend	3	8
From Gouritz WMA	1	1
TOTAL	**14**	**33**

The NWRS assumes that all of the freshening releases made out of Greater Brandvlei Dam become available in the Lower Breede sub-area. However this is not the case. The BRBS indicates an average annual freshening release of 22 million m^3/a, of which approximately 12 million m^3/a is abstracted opportunistically in the Upper Breede sub-area, downstream of the lowest salinity control point on the river. As such only the remaining 10 million m^3/a therefore becomes available in the Lower Breede sub-area.

The BRBS also estimates that the surplus water flowing from the Riviersonderend sub-area into the Lower Breede sub-area is only 3 million m^3/a and not as much as 8 million m^3/a. This volume represents inefficiencies in the releases from Theewaterskloof Dam during summer, and is considered to be relatively small. The Agricultural WC/DM Strategy (10.2) addresses the timing of releases from dams as a potential water saving.

Table 5.1.2: Mean Annual Runoff and Preliminary Ecological Water Requirements in the Breede River Component of the Breede WMA (million m^3/a)

Resource Category	Upper Breede		Riviersonderend		Lower Breede		Total	
	ISP	*NWRS*	ISP	*NWRS*	ISP	*NWRS*	ISP	*NWRS*
Natural MAR (1)	1092	*1212*	439	*460*	272	*210*	1803	*1882*
Preliminary Ecological Water Requirement (1)	612	*178*	170	*65*	193	*34*	975	*277*
Impact of Preliminary Ecological Water Requirement on Yield (Incremental)	16	*12*	0	*30*	0	*0*	16	*42*

1) Quantities given are incremental

Table 5.1.3: Water Availability in the Breede River Component of the Breede WMA (million m^3/a, Year 2000)

Resource Category	Upper Breede		Riviersonderend		Lower Breede		Total	
	ISP	*NWRS*	**ISP**	*NWRS*	**ISP**	*NWRS*	**ISP**	*NWRS*
Gross Surface Water Resource	428	*386*	262	*267*	59	*31*	749	*684*
Less Impact on Yield of:								
Preliminary Ecological Reserve	16	*12*	0	*30*	0	*0*	16	*42*
Invasive Alien Plants	25	*6*	13	*17*	7	*1*	45	*24*
River Losses	5	*20*	0	*0*	0	*0*	5	*20*
Net Surface Water Resource	**382**	***348***	**249**	***220***	**52**	***30***	**683**	***598***
Plus Groundwater	94	*97*	5	*4*	4	*4*	103	*105*
Plus Return Flows	85	*56*	10	*2*	7	*2*	102	*60*
Total Local Yield	**561**	***501***	**264**	***226***	**63**	***36***	**888**	***763***
Transfers In [(1)]	0	*0*	0	*0*	14[(2)]	*33*	1	*1*
TOTAL	**561**	***501***	**264**	***226***	**77**	***69***	**889**	***764***

1) 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.
2) Made up as follows: **10** million m^3/a from the Upper Breede sub-area, approximately **3** million m^3/a from the Riviersonderend sub-area and about **1** million m^3/a inter-basin transfer from the Gouritz WMA.

5.2 PROPOSED CHANGES TO WATER REQUIREMENT ESTIMATES IN THE BREEDE RIVER COMPONENT OF THE BREEDE WMA

The main changes proposed to the water requirement estimates in the First Edition of the NWRS are shown in Table 5.2.1 and described below:

Irrigation Water Requirements

The BRBS investigated the extent of actual irrigation water use in the Breede River component, making use of aerial photography and reconciling this against actual water use figures available through the various government controlled schemes and WUAs. The requirement of 658 million m^3/a is at an equivalent 1 in 50 year assurance of supply. It is important to note that within the Breede River component there is very little allocated water that is not being used. Estimates from the RO suggest that less than 5% (summer abstraction) of allocated water on some government schemes may as yet not have been taken up.

Transfers Out of Upper Breede

Refer to Section 5.1, which describes the transfers into the Lower Breede sub-area out of the Upper Breede sub-area.

Table 5.2.1: Water Requirements in the Breede River Component of the Breede WMA (million m^3/a, Year 2000)

Resource Category	Upper Breede		Riviersonderend		Lower Breede		Total	
	ISP	*NWRS*	**ISP**	*NWRS*	**ISP**	*NWRS*	**ISP**	*NWRS*
Irrigation	495	*435*	91	*49*	72	*28*	658	*512*
Urban [(1)]	23	*26*	2	*1*	1	*2*	26	*29*
Rural	4	*4*	2	*2*	1	*1*	7	*7*
Impact on Yield of Afforestation	0	*0*	1	*1*	0	*0*	1	*1*
Total Requirements	**522**	***465***	**96**	***53***	**74**	***31***	**692**	***549***
Transfers Out [(2)]	22[(3)]	*35*	168[(4)]	*174*	0	*0*	177[(5)]	*177*
TOTAL	**544**	***500***	**264**	***227***	**74**	***31***	**869**	***726***

1) Includes component of Reserve for basic human needs at 25 l/c/d.
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) Made up as follows: **4** million m^3/a IBT to Berg WMA via Artois Canal, plus **5** million m^3/a IBT from "Gawie-se-water" to Berg WMA, plus **2,5** million m^3/a IBT to Olifants/Doorn WMA (via the Inverdoorn Canal), plus **10** million m^3/a surplus water from freshening releases.
4) Made up as follows: **161** million m^3/a from Theewaterskloof to Berg WMA, plus **0,6** million m^3/a to Franschhoek (Berg WMA), plus **4** million m^3/a to Overberg, plus **2,5** million m^3/a to Lower Breede.
5) Made up as follows: **161** million m^3/a IBT from Theewaterskloof to Berg WMA, plus **4** million m^3/a IBT to Berg WMA via Artois Canal, plus **5** million m^3/a IBT from "Gawie-se-water" to Berg WMA, plus **0,6** million m^3/a IBT to Franschhoek, plus **2,5** million m^3/a IBT to Olifants/Doorn WMA (Inverdoorn Canal), plus **4** million m^3/a to Overberg region.

5.3 RECONCILIATION OF REQUIREMENTS AND AVAILABILITY IN THE BREEDE RIVER COMPONENT OF THE BREEDE WMA

A reconciliation of the proposed Year 2000 water availability and water requirement figures in the Breede River component of the Breede WMA, is given in Table 5.3.1.

Table 5.3.1: Reconciliation of Water Requirements and Availability in the Breede River Component of the Breede WMA (million m^3/a, Year 2000)

Description		Upper Breede		Riviersonderend		Lower Breede		Total	
		ISP	*NWRS*	**ISP**	*NWRS*	**ISP**	*NWRS*	**ISP**	*NWRS*
Available Water	Local Yield	561	*501*	264	*226*	63	*36*	**888**	***763***
	Transfers In	0	*0*	0	*0*	14 [(1)]	*33*	**1[(1)]**	***1***
	Total	**561**	***501***	**264**	***226***	**77**	***69***	**889**	***764***
Water Requirements	Local Requirements	522	*465*	96	*53*	74	*31*	**692**	***549***
	Transfers Out	22	*35*	168	*174*	0	*0*	**177**	***177***
	Total	**544**	***500***	**264**	***227***	**74**	***31***	**869**	***726***
Balance		**17**	***1***	**0**	***(1)***	**3**	***38***	**20**	***38***

1) Transfers into the Lower Breede sub-area include transfers between sub-areas as well as the IBT from the Gouritz WMA. The net transfer into the Breede River component being the IBT from the Gouritz WMA (0,7 million m^3/a).

This ISP concludes that the net effect of the proposed changes to the water availability and water requirement estimates is that the current surplus in the Breede River component of this WMA is 20 million m^3/a. This is considered more reliable than the NWRS estimate of 38 million m^3/a and the former will be adopted for interim strategic water resource planning purposes, updated and revised as more reliable information becomes available.

5.4 A SUMMARY OF THE WATER RESOURCE FIGURES FOR THE BREEDE WMA AS PER THE FORMAT USED IN THE NWRS

The following summary tables of the recommended revised inputs to the NWRS provide a quick reference for updating the NWRS tables for the Breede WMA as a whole. This information is drawn entirely from Chapters 3 and 4 of this ISP and no new information is presented here. Tables 5.4.1 to 5.4.4 are presented in the same format as those currently used in the NWRS, for convenience when updating the NWRS.

For completeness all water resource figures are shown, not only those requiring change.

Table 5.4.1: Natural Mean Annual Runoff and Ecological Reserve (million m^3/a)

Sub-area	Natural MAR (1)	Ecological Water Requirement (1)
Upper Breede	1092	612
Riviersonderend	439	170
Lower Breede	272	193
Overberg East	110	13
Overberg West	480	94
Total	**2393**	**1082**

1) Quantities given are incremental.

Table 5.4.2: Available Water in Year 2000 (million m^3/a)

Sub-area	Natural Resource		Useable Return Flow		Total local Yield (1)	Transfers In	Grand Total
	Surface water	Ground-water	Irrigation	Urban			
Upper Breede	382	94	74	11	**561**	0	**561**
Riviersonderend	249	5	9	1	**264**	0	**264**
Lower Breede	52	4	7	0	**63**	14	**77**
Overberg East	1	1	0	0	**2**	2	**4**
Overberg West	88	3	6	2	**99**	2	**101**
Total	**772**	**107**	**96**	**14**	**989**	**1**	**990**

1) After allowance for the impacts on yield of: ecological component of the Reserve, river losses, invasive alien vegetation, rain-fed agriculture (excluding forestry), and urban runoff.

Table 5.4.3: Year 2000 Water Requirements (million m^3/a)

Sub-area	Irrigation	Urban (1)	Rural (1)	Affore-station (2)	Total Local Requirements	Transfers Out	Grand Total
Upper Breede	495	23	4	0	**522**	22	**544**
Riviersonderend	91	2	2	1	**96**	168	**264**
Lower Breede	72	1	1	0	**74**	0	**74**
Overberg East	0	2	2	0	**4**	0	**4**
Overberg West	64	8	2	5	**79**	23	**102**
Total	**722**	**36**	**11**	**6**	**775**	**196** (3)	**971**

1) Includes component of Reserve for basic human need at 25l/c/d.
2) Quantities given refer to impact on yield only.
3) Transfers into and out of sub-areas may include transfers between sub-areas as well as transfers between WMAs. Addition of transfers per sub-area therefore does not necessarily correspond to the total transfers into and out of the WMA.

Table 5.4.4: Reconciliation of Requirements and Available Water for the Year 2000 (million m^3/a)

Sub-area	Available Water			Water Requirements			Balance (1)
	Local Yield	Transfers In (2)	Total	Local Require-ments	Transfers Out (2)	Total	
Upper Breede	561	0	561	522	**22**	544	**17**
Riviersonderend	264	0	264	96	**168**	264	**0**
Lower Breede	63	14	77	74	**0**	74	**3**
Overberg East	2	2	4	4	**0**	4	**0**
Overberg West	99	2	101	79	**23**	102	**(1)**
Total	**989**	**1**	**990**	**775**	**196**	**971**	**19**

1) Brackets around numbers indicate negative balance.
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.

No reconciliation is provided for the Year 2025 on account of the uncertainties about the yields of potential additional schemes, and the allocation of such yield between the Breede and Berg WMAs. These uncertainties should be clarified by the Western Cape Reconciliation Strategy Study.

CHAPTER 6: INTRODUCTION TO THE STRATEGIES

Strategies to address issues and concerns in the Breede WMA are presented in Chapters 7 to 16. Whilst the overview of water resources in this WMA has been at the regional scale, the Regional Office (RO) bases its day-to-day management of the WMA on smaller incremental management units, and strategies often need to take this into account.

In certain of the strategies that follow, reference is made to eight sub-areas within the Breede River component and six sub-areas within the Overberg. These smaller management units are shown on Figures 6.1 and 6.2.

Ten themes have been used in which to develop the strategies in Chapters 7 to 16 of this ISP. These are:

- Water Balance and Reconciliation (Chapter 7)
- Water Resource Protection (Chapter 8)
- Water Use Management (Chapter 9)
- Water Conservation and Demand Management (Chapter 10)
- Integration and Co-operative Governance (Chapter 11)
- Institutional Development and Support (Chapter 12)
- Social (Chapter 13)
- Waterworks Development and Support (Chapter 14)
- Monitoring and Information (Chapter 15)
- ISP Implementation (Chapter 16)

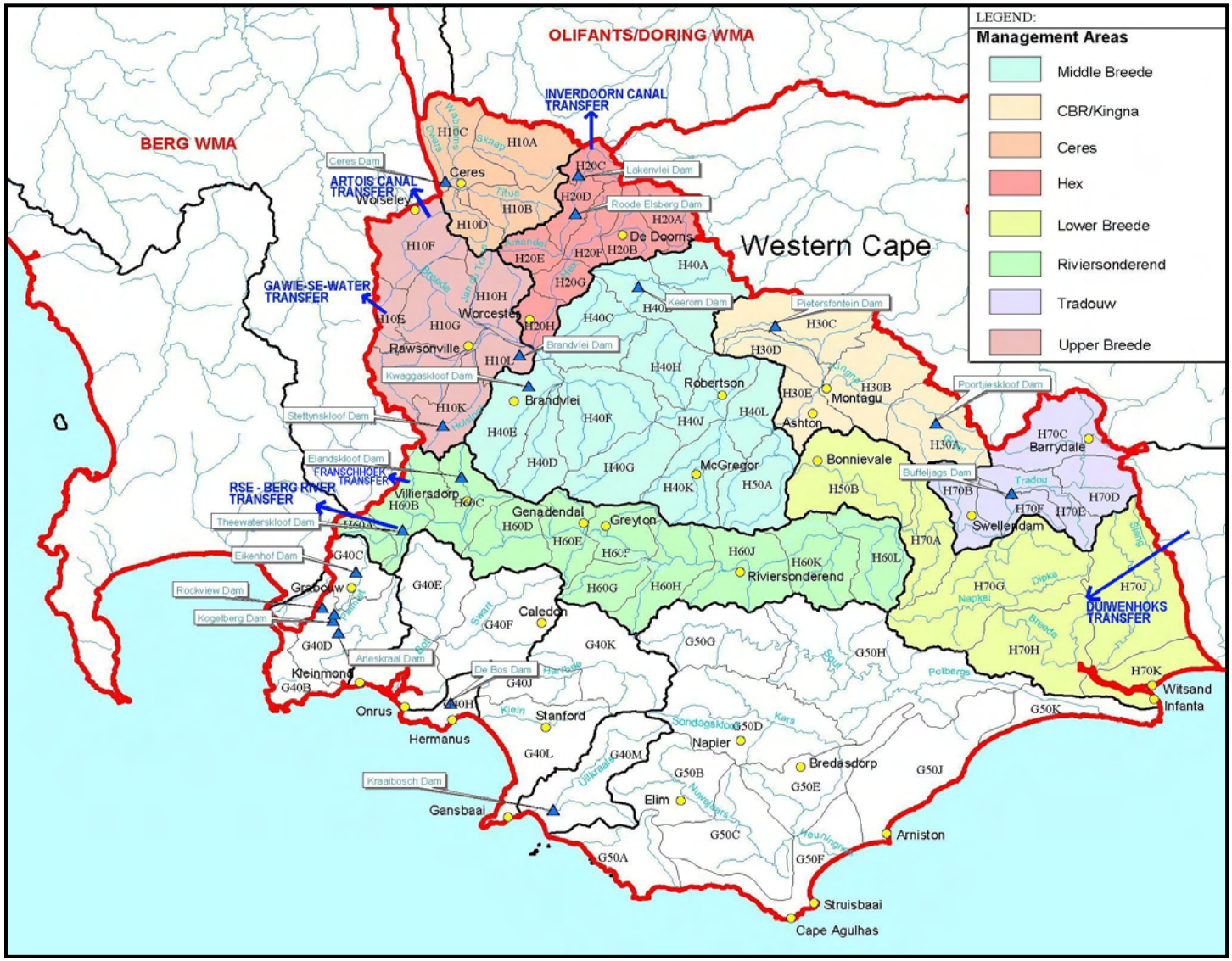

Figure 6.1: Water Resource Management Units within the Breede River Component

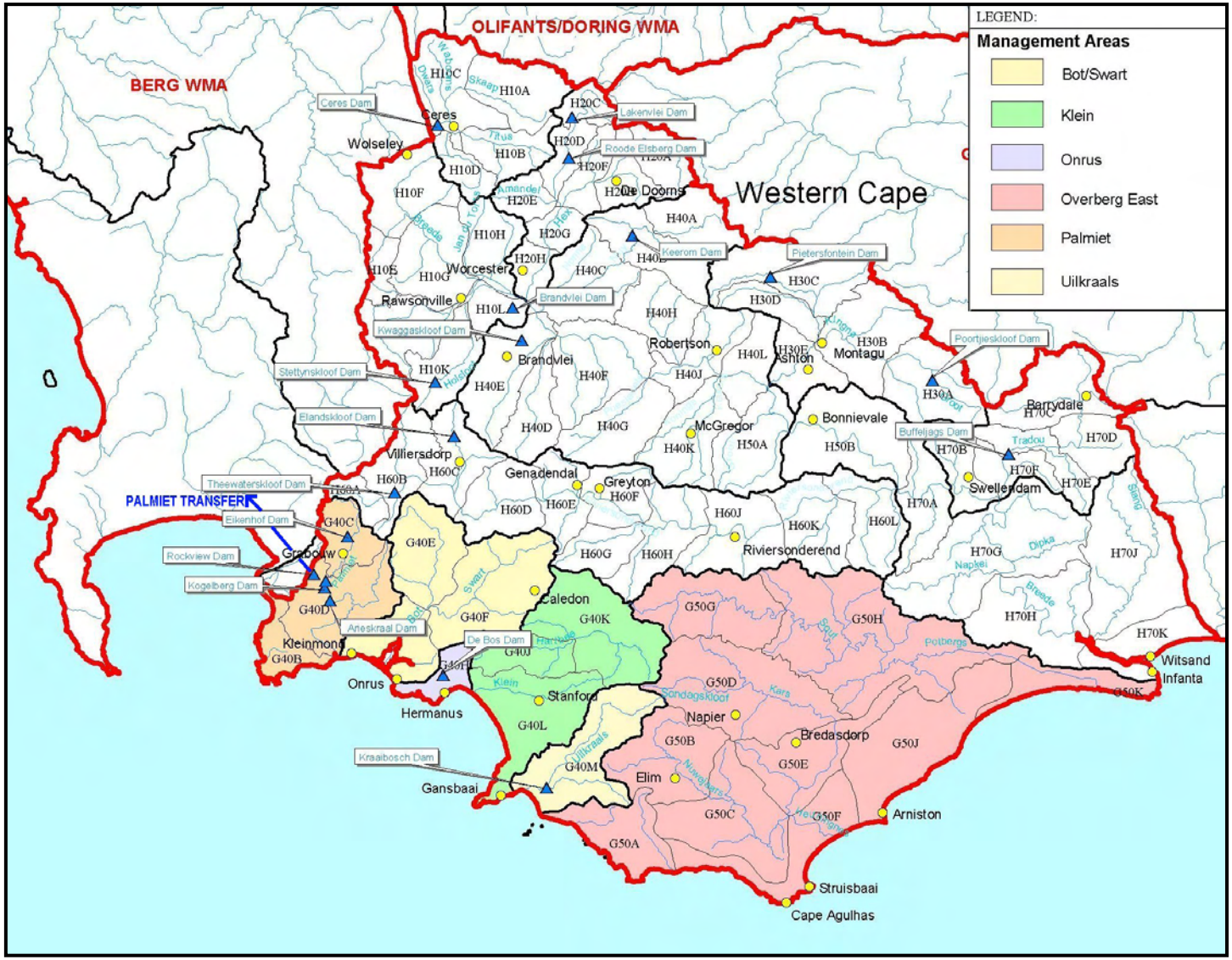

Figure 6.2: Water Resource Management Units within the Overberg Region