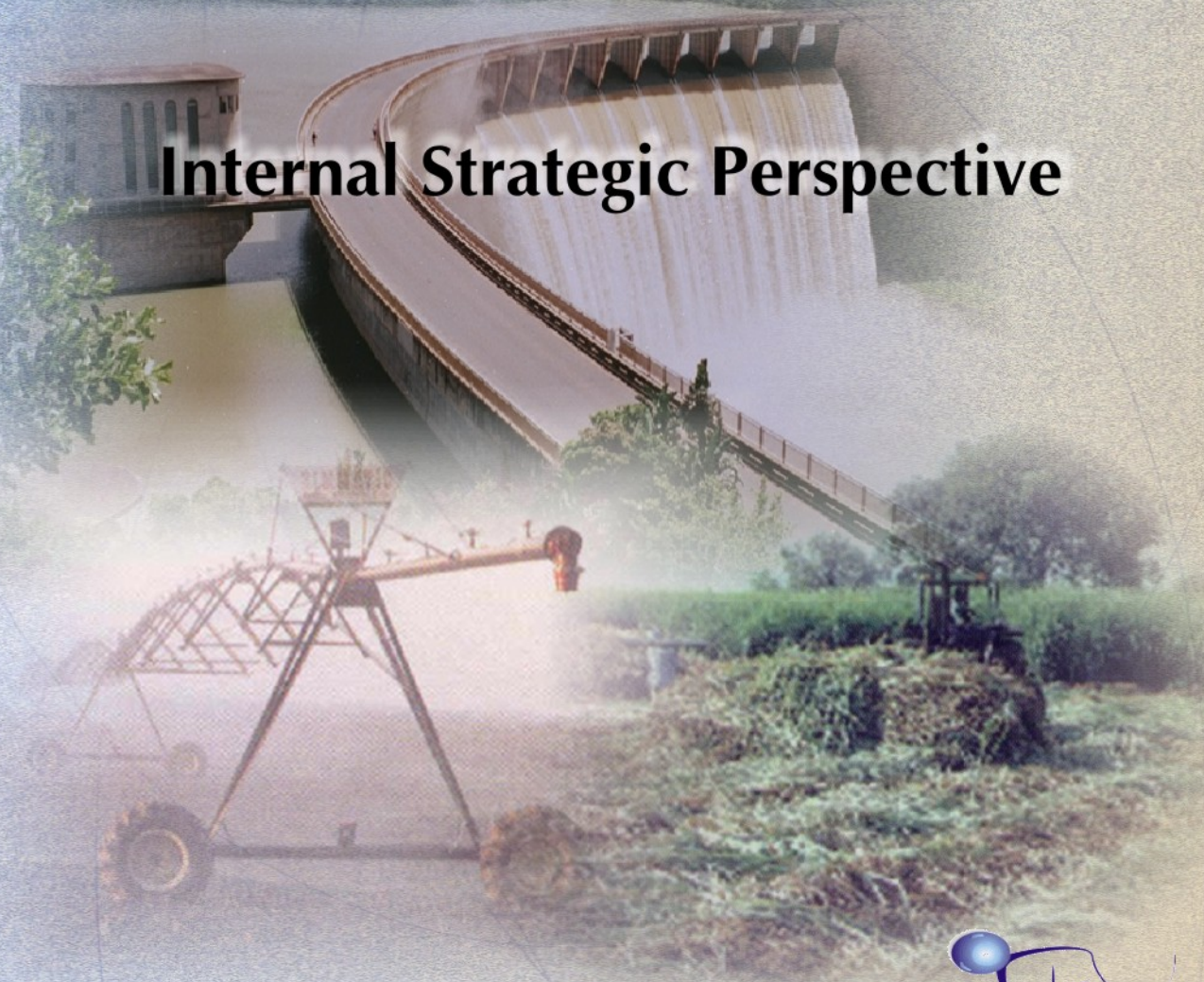
REPORT NO.: P WMA 06/000/00/0304

DEPARTMENT OF WATER AFFAIRS AND FORESTRY

USUTU TO MHLATHUZE WATER MANAGEMENT AREA



Internal Strategic Perspective

DIRK VERSFELD cc

Tlou & Matji Engineering and Management Services (Pty) Ltd

MARCH 2004

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DEPARTMENT OF WATER AFFAIRS AND FORESTRY
DIRECTORATE NATIONAL WATER RESOURCE PLANNING

INTERNAL STRATEGIC PERSPECTIVE:
USUTU TO MHLATHUZE WATER MANAGEMENT AREA

Version 1: March 2004

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
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INTERNAL STRATEGIC PERSPECTIVE

USUTU TO MHLATHUZE WATER MANAGEMENT AREA

APPROVAL

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INVITATION TO COMMENT

This report will be updated on a regular basis until it is eventually superceded by the Catchment Management Strategy. Water users and other stakeholders in the Usutu to Mhlathuze WMA and other areas are encouraged to study this report and to submit any comments they may have to the Version Controller (see box overleaf).

ELECTRONIC VERSION

This report is also available in electronic format as follows:

- DWAF website:
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  - Internet: http://www.dwaf.gov.za/documents/
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The CD contains the following reports (all available on DWAF website)

- Usutu to Mhlathuze Internal Strategic Perspective (*this report*) (Report No: P WMA 06/000/00/0304
- The National Water Resource Strategy
- The Usutu to Mhlathuze WMA – Overview of Water Resources Availability and Utilisation (Report No: P WMA 06/000/00/0203
- The Usutu to Mhlathuze WMA – Water Resources Situation Assessment (Report No: P WMA 06/000/00/0301)

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The most significant amendments included in the latest version will be indicated here.

INTERNAL STRATEGIC PERSPECTIVE

USUTU TO MHLATHUZE WATER MANAGEMENT AREA

EXECUTIVE SUMMARY

1. INTRODUCTION

This Internal Strategic Perspective (ISP) aims to ensure synergy within the Department of Water Affairs and Forestry (DWAF) regarding water resources management in the Usutu to Mhlathuze WMA. The ISP presents a common and consistent departmental approach to guide officials when addressing water management related queries and evaluating water licence applications.

2. BACKGROUND AND APPROACH

Water is one of the key and most fundamental and indispensable of all our natural resources. It is fundamental to life (and the quality of life), the environment, food production, hygiene, industry, and power generation. Water can be the limiting factor when it comes to economic growth and social development, especially in South Africa where it is a relatively scarce resource that is distributed unevenly both geographically and through time as well as socio-politically. Prosperity for South Africa depends upon sound management and utilisation of our many natural and other resources, with water playing a pivotal role.

DWAF is striving for an integrated planning and management approach, referred to as Integrated Water Resource Management (IWRM). The ultimate aim of this IWRM process is to arrive at:

- an allocation schedule that meets the requirements of the National Water Act (NWA) (Act 36 of 1998);
- water resources yield and other models that are representative of the flow regime of the river systems in the area;
- management class scenarios for the river (i.e. Reserve and Resource Quality Objectives set);
- a Catchment Management Strategy.

These deliverables can only be finalised once the Catchment Management Agencies (CMA) assume responsibility for managing the water resources of their respective Water Management Areas (WMA). In the interim, DWAF's Regional Offices will continue to manage the water resources in their area of jurisdiction until such time as they can hand over these management functions to established and fully operational CMAs. In accordance with the NWA, DWAF (the Minister) will still remain ultimately responsible for the management of the water resources.

In light of this responsibility, DWAF's corporate perspective (including all relevant Directorates in the Department) on how the water resources should be

managed needs to be formally expressed in order to manage the water resources in a consistent and predictable manner. The purpose of the ISP is to document these perspectives and offer sound motivation to demonstrate proper and reasonable governance.

3. OVERVIEW OF THE USUTU TO MHLATHUZE WMA

The Usutu to Mhlathuze WMA is situated in the northern KwaZulu-Natal province, but also occupies the south-eastern corner of the Mpumalanga province, west of Swaziland (see **Figure 1.1 and 2.1**). The WMA borders on Mozambique and Swaziland and two of its major rivers, the Usutu and the Pongola are shared with these countries.

The WMA is bordered by the Indian Ocean in the east and the Drakensberg range in the north-west. Altitude ranges from over 2 000 m to sea level. Rainfall varies from almost 1 500 mm/annum in the mountainous areas in the west to as low as 600 mm/annum on the Makhathini flats where the Lebombo mountains create a rain shadow.

The WMA consists of a number of catchments which are mostly independent of each other. As a result, separate and mostly independent strategies are required to manage each catchment. The main catchments are the Mhlathuze, Mfolozi, Mkuze, Pongola, Usutu and Lake Sibaya catchments. For reporting purposes, the catchments upstream of Swaziland are considered as a unit since they are all part of the Usutu catchment while in fact, from South Africa's perspective, they are mostly independent of each other, but do all form part of the Usutu Basin. The W11 and W13 catchments have also been grouped together for reporting purposes and are referred to in this report as the Mtunzini and Matikulu catchment. An overview of each catchment follows.

Mtunzini and Matikulu catchment (W11 and W13)
These two small coastal catchments are characterised by high rainfall, large areas of dry-land sugar cane (357 km^2), limited amounts of irrigation (13 km^2) and afforestation (59 km^2). Other than a few significant farm dams, there is no other water resources development in this catchment. There are two towns in the catchment, Eshowe and Mtunzini. Eshowe is supplied from the Goedertrouw Dam, situated in the neighbouring Mhlathuze catchment, while Mtunzini is supplied from groundwater, with limited reliability. Due to the high rainfall and limited water use it is not surprising to find surplus yield available in the catchment from run-of-river and farm dams. This surplus could be used for:

- Community garden projects
- More dryland sugarcane
- More afforestation
- Other productive uses.

There is potential for new dams in this catchment and these could be a possible source of supply to the Mhlathuze catchment (for industrial or urban use) or for use within the catchment for poverty eradication.

There are no major water quality problems in this catchment.

The strategy for this catchment is to allow the allocation of the identified surplus water in this catchment, following verification through more detailed water resources analyses. Priority is to be given to poverty eradication schemes. This area should be included with the Mhlathuze catchment as part of the compulsory licencing exercise and possible dam sites investigated for augmenting the supply to the Mhlathuze catchment and/or redressing of inequaties.

Mhlathuze catchment (W12)

The Mhlathuze catchment is the economic hub of the Usutu to Mhlathuze WMA with a large number of industries and the world's largest coal export terminal. The water requirements of the Mhlathuze catchment are substantial, with all user sectors (mining, industrial, irrigation and domestic) having large water requirements.

The area under irrigation is estimated at 131 km^2 while there are also large areas of afforestation (576 km^2) and dryland sugarcane (268 km^2).

The water resources of the Mhlathuze catchment are well developed with the large Goedertrouw Dam and transfers from the Thukela and Mfolozi rivers providing a reliable source of water for industrial and mining activities and the large irrigation use in the catchment. Although there is sufficient water in this catchment to meet all requirements at present, the resource has been over-allocated and compulsory licencing is required to rectify this situation. This process has already been initiated and will also redress inequities and finalise the Reserve in the catchment.

Future water use in the Mhlathuze catchment is uncertain since it is driven by industrial development which is difficult to predict. Plans therefore need to be developed in order to cope with sudden increases in the demand for water so as not to delay or retard development in this area. These plans must allow for possible growth scenarios and consider options such as:

- Water conservation and demand management
- Resource development in the W11 or W13 catchments
- Trading of water licences
- Additional transfers from the Thukela River
- Re-use of effluent.

Despite the major development in the Mhlathuze catchment, water quality is generally good. This is due to the fact that urban and industrial effluent is discharged to sea.

Mfolozi catchment

The Mfolozi catchment consists mostly of communal land which is used for stock farming, although there is a significant amount of irrigation (72 km^2), forestry (435 km^2) and dryland sugarcane (65 km^2) in the catchment. The majority of the water requirements are near the coast and include a transfer to the Mhlathuze catchment for Richards Bay Minerals.

Water resources development in this catchment is very limited, the Klipfontein Dam being the only major dam in the catchment. Due to the large water use and transfers out of the lower reaches of this catchment, the catchment as a whole is stressed. The *status quo* is however probably acceptable with water users having learned to cope with the situation. The stressed situation is not currently as bad as it may appear as stated in the NWRS because the ecological Reserve, as estimated for the NWRS, is not currently being supplied. However, it is probably only during extreme droughts that the Reserve will not be met. The comprehensive Reserve will need to be determined and operating rules formulated in order to ensure that it is met with the minimum reduction in allocations to existing lawful users and the minimum socio-economic impacts.

Large water resource developments, such as large dams, will be very expensive in this catchment and the focus should therefore rather be on small scale development using off-channel storage. Exploitation of the ample groundwater potential in the lower reaches of the catchment should also be investigated as an option.

The water quality of the Klipfontein Dam is poor due to urban return flows into the dam.

Mkuze/Hluhluwe catchment

The Mkuze catchment is characterised by large-scale irrigation (76 km^2) and afforestation (392 km^2)[9] while domestic requirements, mostly rural, are also significant. The water resource available to irrigators is limited, however, with the only significant dam in the catchment being the Hluhluwe Dam, with the result that irrigators currently utilise all the flow in the river. The recently completed Senekal Trust pipeline, which is authorised to transfer up to 32,6 million m^3/annum into the middle reaches of the Mkuze catchment significantly improves the situation. Nevertheless, based on desktop estimates, the ecological Reserve will have a big impact on the utilisable yield in the Mkuze River catchment. With the ecologically sensitive Lake St Lucia (which is a World Heritage site) situated in the catchment, the ecological Reserve estimates could be realistic. Detailed Reserve determination and optimisation of operating rules for the catchment are required before further allocations can be considered. It may even be necessary to reduce allocations through compulsory licencing to ensure that Reserve requirements are met.

A small portion of the yield of the Hluhluwe Dam remains unutilised. It is recommended that his be used for poverty eradication.

The water quality in the Mkuze River sub-catchment is poor due to coal mining activities and irrigation return flows.

Pongola catchment

There is a large amount of irrigation in the middle Pongola catchment (almost as much as the rest of the WMA put together) with an estimated irrigated area of 199 km^2 upstream of the Pongolapoort Dam. There are also large areas under afforestation in the upper reaches of the Pongola catchment, with an estimated

area of 480 km^2, which has reduced the assurance of supply to irrigators over the years.

The Pongolapoort Dam, one of the largest in South Africa, remains underutilised, but due to uncertainties relating to the social and ecological requirements of the flood plains downstream of the dam and international requirements, the allocable surplus from the dam is difficult to quantify accurately. This uncertainty needs to be resolved before large allocations are made from the Pongolapoort Dam. The suggested strategy is to make up to 100 million m^3/annum available for allocation now with further allocations subject to a detailed analysis of the catchment.

The Bivane Dam, situated on the Bivane River upstream of the Pongolapoort Dam, was recently constructed to improve the levels of assurance to existing irrigators. The opportunity now presents itself to increase the area under irrigation, provided irrigators are willing to accept reduced assurances, which seems to be an economically sensible strategy. This will reduce the available yield from the Pongolopoort Dam but this is part of the 100 million m^3/annum allocable yield from the system referred to in the previous paragraph. An allocation for additional afforestation is also possible.

The water quality upstream of the Pongolapoort Dam is poor due to irrigation return flows.

Usutu catchment

The Usutu catchment is characterised by large transfers out of the catchment (and out of the WMA) to the Vaal system and the Olifants WMA for cooling purposes at power stations. This represents a strategic use and falls under the control of the Minister of Water Affairs and Forestry and not the CMA. Four large dams in the Usutu support these transfers.

The only significant in-basin use is afforestation with an estimated area of 1 930 km^2, making this catchment the most afforested in the WMA. Most of this is situated downstream of the major dams in this catchment and therefore the afforestation does not have a major impact on the yield of these dams. Irrigation is limited with an area of only 27 km^2.

The water requirements of Swaziland are an important factor in this catchment, and, unlike the Pongola catchment, international agreements with Swaziland and Mozambique do not allow much, if any, scope for further development in this catchment. The joint Maputo Basin Study will however identify possible joint development opportunities which could involve developing the resource in the upper Usutu for joint utilisation with Swaziland.

While the Usutu catchment is approximately in balance when considered as a whole, the implementation of the Reserve could have serious implications on the Vaal system since the transferable yield, especially that from Heyeshope Dam, will in all likelihood reduce. However, there are no pressing ecological or water resources issues which necessitate the determination of the Reserve or the implementation thereof in this catchment. The proposed strategy is therefore not to make any changes to the existing operating rules until a comprehensive

Reserve has been determined in close consultation with Eskom. Implementation of the Reserve should be done as part of an integrated operating rule for the whole Maputo Basin, which should be forthcoming out of the Maputo Basin Study. The implications of this on the Vaal system will also have to be taken into account and mitigating strategies formulated.

No further allocations are possible from the catchment at present. However, development of the resource which could stem from the Maputo Basin study could open up opportunities for additional allocations. Priority will be given to poverty eradication projects. In this catchment, community forests would probably be the best option.

The water quality of the Usutu catchment is excellent. However, there are large coal reserves in the catchment and the potential for the water quality deteriorating are huge, the implications of which would be enormous. Pro-active management plans need to be developed urgently to prevent the situation deteriorating.

4. RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES

The water use, water resources and water balances quoted in this report are substantially the same as those that will appear in the NWRS when published. To clarify the situation further, additional information is provided in this ISP. This additional information relates to the following:

- The Mtunzini and Matikulu catchments are shown separately from the Mhlathuze catchment and separate strategies have been developed for these catchments.
- In addition to the current water balance situation of the Mhlathuze catchment, this ISP report also shows the water allocation situation. This is important since while the catchment is not stressed based on current water use practices, it is seriously over-allocated and strategies need to be developed to resolve this problem.
- Minor changes to the transfers out of the Pongola and Usutu catchments have been recommended.

The reconciliation of the water requirements/allocations and available water resources in the Usutu to Mhlathuze WMA are shown in **Table 1.**

Table 1: Reconciliation of water requirements/allocations and available water for the Year 2000 (million m³/annum)

Sector/ Sub-area	Available water			Water requirements/allocations			Balance
	Local yield	Transfers In	Total	Local requirements	Transfers out	Total	
Upper Usutu	202	0	**202**	**69**	**131**	**200**	**2**
Pongola	645	0	**645**	**255**	**38**	**293**	**352**
Mkuze	33	33	**33**	**78**	**0**	**78**	**(45)**
Mfolozi	51	0	**51**	**52**	**18**	**70**	**(19)**
Mhlathuze	178	80	**258**	**342**	**3**	**345**	**(85)**
W11& W13	49	3	**52**	**20**	**0**	**20**	**32**
TOTAL	**1 158**	**62**	**1 220**	**816**	**136**	**952**	**268**

Note: The total transfers into and out of the MWA does not necessarily equal the sum of all transfers since some of the transfers are internal to the WMA.

5. WATER RESOURCES MANAGEMENT STRATEGIES

Through existing reports, interviews and workshops, the key issues of the Usutu to Mhlathuze WMA were identified and strategies developed to resolve these issues with the overarching objective of giving effect to the NWA and the NWRS.

The strategies were divided into two broad categories; those which apply to the whole WMA (referred to as WMA Level Strategies) and those, which require more detail to resolve issues, that are specific to the catchments which make up the Usutu to Mhlathuze WMA.

WMA level strategies include:
- Reconciliation of water requirements and the available resource
- Water Quality Management
- Groundwater
- Forestry
- Water Conservation and Demand Management
- Invasive Alien Plants
- Co-operative governance
- Monitoring and information
- Implementation of the ISP

Specific strategies for each catchment were developed to deal with:
- Reconciliation of water requirements and the available resource
- Water Quality
- Water Conservation and Demand Management.

Each strategy addresses the following aspects:

- **Management Objective**
  What the strategy must aim to achieve

- **Situation assessment**
  Presents the background information and the relevant issues identified in each catchment. This provides a motivation for the strategy and actions.
- **Strategy**
  The strategy states what needs to be done to resolve the issues and give effect to the NWA and NWRS.
- **Management Action**
  Specific actions to give effect to the strategies are listed, together with the responsible Directorate/Institution and a priority rating.

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CCAW	Co-ordinating Committee for Agricultural Water
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
DM	District Municipality
DWAF	Department of Water Affairs and Forestry
EMC	Ecological Management Class
GDP	Gross Domestic Product
GGP	Gross Geographical Product
IDP	Integrated Development Plan
ISP	Internal Strategic Perspective
IWRM	Integrated Water Resource Management
MAIS	Monitoring, Assessment Information System
MAR	Mean Annual Runoff
NEMA	National Environmental Management Act
NWA	National Water Act
NWRS	National Water Resource Strategy
RBM	Richards Bay Minerals
RDM	Resource Directed Measures
RQO	Resource Quality Objective
PLC	Provincial Liaison Committee
SDI	Spatial Development Initiative
SEA	Strategic Environmental Assessment
SFRA	Stream Flow Reduction Activity
TPTC	Tripartite Permanent Technical Committee
WARMS	Water Use Authorisation and Registration Management System
WC&DM	Water Conservation and Demand Management
WIMS	Water quality information management system
WFW	Working for Water
WMA	Water Management Area
WMI	Water Management Institution
WMU	Water Management Unit
WRSA	Water Resources Situation Assessment Study
WSA	Water Services Authority
WSDP	Water Services Development Plan
WTW	Water treatment works

PART A

CHAPTER 1: BACKGROUND TO THE USUTU TO MHLATHUZE WMA INTERNAL STRATEGIC PERSPECTIVE

1.1 LOCATION OF THE USUTU TO MHLATHUZE WMA

The location of the Usutu to Mhlathuze WMA is shown in **Figure 1.1.**

Figure 1.1: Location of the Usutu to Mhlathuze WMA

1.2 WATER LEGISLATION AND MANAGEMENT

Water is one of the most fundamental and indispensable of all natural resources. It is fundamental to life and the quality of life, to the environment, food production, hygiene, industry, and power generation. The availability of affordable water can be a limiting factor for economic growth and social development, especially in South Africa where water is a relatively scarce resource that is distributed unevenly, both geographically and through time, as well as socio-politically.

Prosperity for South Africa depends upon sound management and utilisation of our many natural and other resources, with water playing a pivotal role. South Africa needs to manage its water resources optimally in order to further the aims and aspirations of its people. Current government objectives for managing

water resources in South Africa are set out in the National Water Resource Strategy (NWRS) as follows:

- **To achieve equitable access to water,** that is, equity of access to water services, to the use of water resources, and to the benefits from the use of water resources.
- **To achieve sustainable use of water**, by making progressive adjustments to water use to achieve a balance between water availability and legitimate water requirements, and by implementing measures to protect water resources and the natural environment.
- **To achieve efficient and effective water use** for optimum social and economic benefit.

The NWRS also lists important proposals to facilitate achievement of these policy objectives, such as:

- Water will be regarded as an indivisible national asset. The Government will act as the custodian of the nation's water resources, and its powers in this regard will be exercised as a public trust.
- Water required to meet basic human needs and to maintain environmental sustainability will be guaranteed as a right, whilst water use for all other purposes will be subject to a system of administrative authorisations.
- The responsibility and authority for water resource management will be progressively decentralised by the establishment of suitable regional and local institutions, with appropriate community, racial and gender representation, to enable all interested persons to participate.

1.2.1 The National Water Act (NWA)

The NWA of 1998 is the principal legal instrument relating to water resource management in South Africa. The Act is now being implemented incrementally. Other recent legislation which supports the NWA includes the Water Services Act (Act 108 of 1997) and the National Environmental Management Act (Act 107 of 1998).

1.2.2 The National Water Resource Strategy (NWRS)

The NWRS is the implementation strategy for the NWA and provides the framework within which the water resources of South Africa will be managed in the future. All authorities and institutions exercising powers or performing duties under the NWA must give effect to the NWRS. This strategy sets out policies, strategies, objectives, plans, guidelines, procedures and institutional arrangements for the protection, use, development, conservation, management and control of the country's water resources. The purpose of the NWRS is to provide the following:

- The National framework for managing water resources;
- The framework for preparation of catchment management strategies in a nationally consistent way;
- Information, in line with current legislation, regarding transparent and accountable public administration; and
- The identification of development opportunities and constraints with respect to water availability (quantity and quality).

1.2.3 Catchment Management Strategies (CMS)

The country has been divided into 19 Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level will be achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA will progressively develop a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA.

The Department's eventual aim is to hand over certain water resource management functions to CMAs. Until such time as the CMAs are established and are fully operational, the Regional Offices (ROs) of DWAF will have to continue managing the water resources in their areas of jurisdiction.

1.3 INTERNAL STRATEGIC PERSPECTIVES (ISPS)

1.3.1 The Objectives of the ISP Process

The objective of the ISP will be to provide a framework for DWAF's management of the water resources in each Water Management Area, until such time as the Regional Offices can hand over the management functions to the established CMA. This will ensure 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. Stakeholders must be made aware of the bigger picture as well as the management detail associated with each specific water resource management unit.

1.3.2 Approach Adopted in Developing the ISP

The ISP for the Usutu to Mhlathuze WMA was developed in five stages as follows:

i) Determining the current status of water resource management and relevant water resource management issues and concerns in the Usutu to Mhlathuze WMA. This was achieved through interviews with individual members of DWAF's Regional Offices in KwaZulu-Natal and by collating information from the NWRS, WMA reports, Water Resource Situation Assessment (WRSA) reports and other catchment study reports. The following topics were discussed with Regional Office staff and their issues and concerns documented:

- Water Situation
- Resource Protection
- Water Use
- Water Reconciliation
- Water Infrastructure
- Monitoring and Information
- Water Management Institutions
- Co-operative Governance
- Planning Responsibilities.

A starter document of the identified issues and concerns was produced as a discussion document for the first workshop.

ii) The first workshop was held with attendees from the Regional Office, the Integrated Water Resource Planning (IWRP) Chief Directorate of the Department as well as the consulting team. The workshop focussed on the lists of general issues in the WMA as well as area-specific issues. The issues were clarified and refined during the workshop. Strategies were discussed and developed to address the issues.

iii) The third stage involved the preparation of the second workshop document to be used for refining strategies to address the various issues and concerns, during the second workshop.

iv) The fourth stage was the second workshop. During this workshop the overall management of the water resources in the catchment was discussed along with the ISP management strategies and the relevant issues and concerns. The priorities and responsibilities for carrying out the strategies were identified. First workshop attendees were again involved, as were representatives of several DWAF Head Office directorates.

v) The fifth stage was the finalisation of the ISP document.

As can be deduced from the above, this Usutu to Mhlathuze ISP was prepared internally within the Department, and captures the Department's perspectives. Once approved by DWAF Management, it is intended that the Regional Office will make the ISP available to Water User Associations (WUAs), Water Service Providers (WSPs), Water Service Authorities (WSAs) and other forums for discussion and comment. These comments will be considered and worked into later versions of the ISP. By adopting this procedure this ISP becomes a dynamic working document, which will be progressively updated and revised by DWAF. Public participation forms part of the CMS process, for which the ISP serves as a foundation (see Paragraph 1.5).

The ISP does not formulate all the details pertaining to every strategy but provides a suggested framework for each strategy around which the details will be developed by the responsible authority. Where relevant and readily available, certain details have been included in the strategies. The responsible authority for the further development of each strategy is indicated. This is predominantly the Regional Office, which remains responsible for involving the relevant DWAF directorates.

1.3.3 Updating of the ISP Report

The ISP strategies should not lag behind national developments, become outdated or differ from related ISPs regarding trans-boundary management. There is therefore a need to have a standard process for updating strategies, and to prevent strategies becoming outdated by ensuring adequate feedback from national developments. Furthermore, the proposal and introduction of new strategies need to be accommodated. It is suggested that each strategy has a version-control system. The following is necessary:

- Keep abreast of changes in national legislation and policy changes or refinements by keeping a list of all relevant legislation and supporting documents relevant to the ISP;
- Ensure consistency between the ISP strategies and national strategies through a regular review-and-update procedure;
- Annually review and ensure consistency and agreement regarding trans-boundary ISP management issues by liaising with the responsible managers of other areas and updating relevant ISP strategies if necessary;
- Annually review the priorities of required management actions and align budgets accordingly;
- Monitor the implementation of the ISP (review actions, progress, implementation and stumbling blocks);
- Incorporate feedback from stakeholders;
- Rigorously apply ISP version control.

Updating and Version Control

The actual frequency of ISP revision will be determined by the number and extent of revisions to management approaches as reflected in Strategy amendments. All updates to this report, particularly with respect to amendment to the Strategies, need to be passed on to and vetted by the Catchment Manager for the Usutu to Mhlathuze WMA. Comments are to be sent to:

Mr N Ward
DWAF KwaZulu – Natal Office
P.O.Box 1018
DURBAN
4000

1.3.4 The Authority of Information Contained in the ISP

The NWRS is a statutory document, subject to a high level of public scrutiny and input, and signed off by the Minister. The information contained in the NWRS is the best information and knowledge available at the time. The information in Chapter 2 and Appendix D of the NWRS Strategy on water requirements, availability and reconciliation was updated with comments received from the public participation process in the second half of 2002. To enable the finalisation of the NWRS, these figures were "closed" for changes in February 2003.

Underlying the figures in Chapter 2 and Appendix D is a set of 19 reports "Overview of Water Resources Availability and Utilisation", one for each WMA. These reports contain more detailed information on each WMA than was summarised for the NWRS and are referred to, in short, as "WMA Reports". The WMA reports were also finalised with the February 2003 information.

Still deeper in the background lies another set of reports (one per WMA), the so-called Water Resource Situation Assessment Reports. These reports contain a wealth of information on each WMA, but the figures on requirements, availability and reconciliation have been superceded by the WMA report and the NWRS.

The ISPs for all WMAs used the information contained in the NWRS and WMA reports as the point of departure. However, an inevitable result of the ISP process has been that better information has emerged in some cases. The reason is that the level of study is more detailed and intense for the ISP. This included very close scrutiny of the numbers used in the NWRS, and in some cases a reworking of base data and some re-modelling. Where the ISPs contain yield balance data which differs from the NWRS, these discrepancies are carefully explained. Where other differences from the NWRS are necessary these are also detailed in the ISP, with accompanying explanations.

It is required that the Department work with the best possible data so that the best possible decisions can be taken. Where the ISPs have improved upon the NWRS then this is the data that should be used. The new data contained in the ISP will also be open to public scrutiny as the ISP reports will be published on the Internet and in hardcopy, and will be presented and discussed at WMA forums. Comments received will be considered and worked into subsequent versions of the ISP on a regular (yearly) basis. The NWRS will be updated to reflect the latest understanding in each new edition.

1.4 INTEGRATED WATER RESOURCE MANAGEMENT (IWRM)

It is imperative that the natural, social, economic, political and other environments and their various components are adequately considered when conducting water resources planning and management. Water as a strategic component also interacts with other components in all environments. For example, human activities such as the use of land, the disposal of waste, and air pollution can have major impacts on the quantity and quality of water, which is available for human use and for proper life support to natural biota.

Taking an even broader view, water must also be managed in full understanding of its importance for social and economic development. It is important to ensure that there is conformity between the water-related plans and programmes of the CMAs, and the plans and programmes of all other role players in their management areas. The CMAs must therefore establish co-operative relationships with a wide range of stakeholders, including other water management institutions, water services institutions, provincial and local government authorities, communities, water users ranging from large industries to individual irrigators, and other interested persons.

This integrated planning and management approach is intended, through co-operative governance and public participation, to enable water managers to meet the needs of all people for water, employment, and economic growth in a manner that also allows protection and, where necessary, rehabilitation of aquatic ecosystems. Above all, Integrated Water Resource Management (IWRM) will enable water managers to use our precious water resources to assist us in poverty eradication and removal of inequity.

One of the big opportunities to formally integrate a large number of actions in water resource management presents itself during the compulsory licensing process. Compulsory licensing is identified in the NWRS as a very important action for implementing the NWA. However, it is not a simple action of issuing licences

but a complex process of closely related and interdependent activities that will in itself formalise IWRM to a great extent. The process of IWRM is diagrammatically depicted in Figure 1.2.

Before an allocation schedule can be determined and the legal steps followed to finalise compulsory licensing (through the issuing of licences to all users), many other aspects must be addressed:

- Existing use and the lawfulness of that use must be verified, all users (existing and new) must apply for licences, a good understanding of future use scenarios must be developed and water required for equity purposes and rural development must be clearly understood.

- Water availability must be understood as thoroughly as possible with "best available" existing information used to model all possible reconciliation options.

- Reserve scenarios must be developed for all significant resources in the catchment, for instance, the river flow requirements for all possible classes that may be considered.

- The development of strategies for implementing the licensing (abstraction controls, for example), the Reserve and Resource Quality Objectives (i.e. incrementally over time) must go hand in hand with the rest of the processes to ensure that practical, workable solutions are found.

- The processes will then enter a very intensive, interactive phase of developing realistic reconciliation options. This would entail, for example, the selection of a specific management class to be scrutinised for its impact on the number of licences that could be issued for use, with its concomitant impacts on the social and economic structure of the catchment.

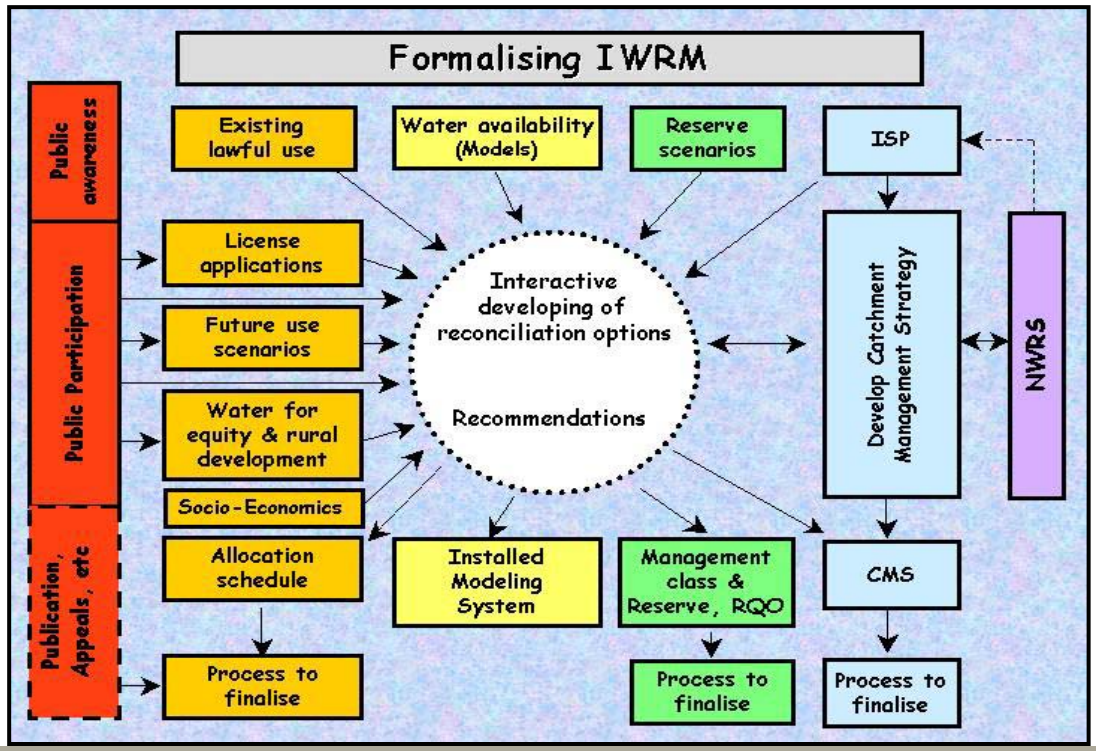

Figure 1.2: Diagram showing DWAF Integrated Water Resource Management approach

The active participation of stakeholders in this process will then hopefully crystallise clear recommendations on an allocation schedule, management classes for the various reaches of the rivers and the resultant ecological Reserve and Resource Quality Objectives, as well as strategies for the implementation.

Although the Department will play a very strong role in guiding this process, it is extremely important to have the CMA actively involved. Preferably, at least the Board of the CMA must be in place to drive the public participation for the process.

1.5 CARING FOR THE ENVIRONMENT

DWAF is responsible for water resource development and management in terms of the NWA, and within the broader framework of other environmental legislation. The Department also strongly reflects the will to make sound decisions which ensure the development of society and the economy whilst maintaining, and where possible enhancing, ecological integrity. The concept of management of the environment has evolved from the exclusivity of protection of plants and animals to balancing the complex interaction of society, the economy, and ecology. "Environmental management is the integration of social, economic and ecological factors into planning, implementation and decision-making so as to ensure that development serves present and future generations" (NEMA).

The key legislative Acts to which DWAF is required to refer are the National Environmental Management Act (NEMA, Act 107 of 1998) and the Environment Conservation Act (ECA, Act 73 of 1989). DWAF has prepared a Consolidated Environmental Implementation and Management Plan (CEIMP) as a requirement of NEMA. This describes the Department's functions, policies, plans and programmes, and states how these comply with environmental legislation. Through the CEIMP the Department has committed itself to developing and implementing an integrated Environmental Management Framework (EMF) to ensure that its approach is aligned with the principles prescribed in NEMA and the ECA. The EMF will inform the Department at a strategic decision-making level, bring about environmental legal compliance, and help in achieving environmental sustainability through the promotion of sound environmental management practices. Integrated Environmental Management is a co-operative governance effort with DWAF as a full partner in the process.

This ISP has the responsibility of raising and maintaining the environmental consciousness of the Department's water resource planners and managers. The control over water has a very broad range of influence and impact for which strategies and planning need to account. Impacts come from many different angles.

Some of these angles of impact which are considered through this ISP are noted below:

- The direct impact of physical structures (environmental constraints to construction e.g. of weirs or dams).
- The implications of allocating and licensing water for use. Forestry and irrigation are examples of uses where development based on water can mean the transformation of extensive areas of otherwise 'natural' environments.
- The allocation of water for equity. Here we can include approaches towards the application of Schedule 1 Use, General Authorisations, the revitalisation of irrigation schemes, etc.
- Failure to support equity, or appropriate development – noting the consequential impacts of poverty.
- Sanitation systems and the impacts on groundwater quality.
- The implementation of the Reserve.
- The ability to monitor and manage compliance, thus protecting the resource and with it the environment.

All decisions regarding water are critical to the environment. Decisions must be made on a balance of social, economic and ecological costs and benefits, considering both the immediate and the long-term, and always with an eye out for the unintended consequence. It is the intention of the ISP to provide the basis for integrated decision-making. The principles of environmental management underpin every strategy developed in this document.

There are a number of strategic areas with a particularly strong biophysical/ ecological emphasis. These include:

- The Reserve (groundwater, rivers, wetlands and estuaries)
- Water quality - surface and groundwater
- The approach towards the clearing of Invasive Alien Plants
- The management of wetlands
- Land degradation. Erosion and sedimentation (land care)
- Land use and especially how this is impacted by land reform and the re-allocation of water.

The roles of Co-operative Governance and the need for awareness raising and capacity building are key strategic elements of many strategies.

In reality all strategies and all aspects of management have a strong interaction with the biophysical environment. This ISP endeavours to capture all of these concerns in discussion and through a strategic approach which emphasises the will of the Department to manage the environment to the best benefit of the country and its people.

The approach set out above applies to all Water Management Areas and associated ISPs, and is not repeated within the Strategy Tables (Part B of this ISP). It reflects the way the Department views Integrated Water Resource Management and the importance of the biophysical aspects of decision-making. There may nevertheless be specific ecological and biophysical aspects of management, which require specific attention and which may not be captured in the above-mentioned or other strategies. The ISP therefore still includes an Environmental Strategy, which serves to make pertinent those issues of the environment, which might not otherwise be covered.

1.6 THE SOCIAL ENVIRONMENT

The utilisation of water resources is aimed at the benefit of society, and at society through the economy. As noted in Section 1.5 this should not be at undue cost to ecological integrity.

Impacts on society are a core element of this ISP, and decisions are often complicated by the risk of unintended consequence. As a typical example the over-zealous implementation of the ecological Reserve may benefit the river, to the intended benefit of society, but the cost of lack of use of that water to employment and to livelihoods may lead to other strains on natural resources that undo the benefits.

The implementation of the NWA requires that society be kept at the forefront of all decision-making. This principle is now deep-seated within the Department and is integral to all strategies. Water resource allocation and use has critical social impact, as does water quality management. But pivotal to the social component is the question of equity. What can be done and what is being done to redress past inequities? Within this, strategies have been developed to consider the provision of water to Resource Poor Farmers, the use of water under Schedule 1, Licensing and General Authorisations, etc. Whilst water supply and sanitation are not part of the brief of the ISP, the provision of water to meet these needs most certainly is. The urban poor, and the poor in rural villages, are as important in the consideration of the distribution and use of water resources as are the rural subsistence poor, and this should not be forgotten in the urgencies of land reform and the enthusiasm to establish a substantial class of farmers from amongst the previously disadvantaged.

This ISP aims to see water benefiting society. This can be through access to water in livelihood strategies, through small-farmer development programmes, through water supply and sanitation and especially the provision of good quality drinking water, and through the maintenance and growth of income-producing, job creating, and tax paying agricultural, commercial and industrial strategies.

Consultation and public participation are cornerstones of the social component of any strategic document. These requirements are repeatedly stressed throughout the National Water Act. This ISP has been prepared as DWAF's position statement with respect to the management of water resources and, although strategies and plans have been captured without consultation with the stakeholders, it remains an open and transparent document where the understanding of the Department, its visions and its principles are made clear for all to see and to interact with. This is amplified in the Implementation Strategy **(Part B: Strategy no G9)** of this ISP.

1.7 WATER QUALITY MANAGEMENT

Much of the emphasis in water resource management has revolved around ensuring that users have sufficient quantities of water. However, as more water gets used and re-used, as quantities get scarce and feedback loops get even tighter, it is quality that begins to take on a dominant role.

Water availability is only as good as the quality of that water. Both quantity and quality need to be considered at the correct level of detail, and this can mean that at times they should be considered with similar emphasis and with similar expenditure of resources. Too often we have failed to integrate the issues of quantity and quality – both with regard to surface water and groundwater. The concept of Available Assimilative Capacity, the ability of the water resource to absorb a level of pollution and remain 'serviceable', is as important in water resource management as is the concept of Systems Yield.

Quantity and quality can no longer be managed in isolation of each other. Not that this isolation has ever been total. The consequences of irrigation, the leaching of fertilisers, and more importantly the leaching of salts from deeper soil horizons can render both the lands themselves and the receiving rivers unsuitable for use. Diffuse agricultural 'effluent' may be less visible than direct discharges of sewage or industrial effluent, but are no less pernicious.

Surface water quality is affected by many things including sediment and erosion, the diffuse discharges from irrigated farmland (both fertilisers and salinity through leaching), domestic and urban runoff, industrial waste, and sewage discharges. Of these, industrial waste and sewage discharges are the easiest to licence and control, but this does not mean that this is problem-free. The Department has found that the situation with regard to sewage discharges often far exceeds the standards and conditions demanded by licences. There is a problem of compliance with regard to Local Authorities and private operators responsible for waste management systems. Diffuse discharges only compound the problem by reducing the assimilative capacity until the water becomes unfit for use, very expensive to purify, and a danger to human health.

Direct discharges to rivers are licensed and managed on the basis of assimilative capacities of those rivers, and on Receiving Water Quality. Where these limits are exceeded, often through the cumulative impact of diffuse discharges, water becomes unavailable to some, or even all, users downstream. DWAF will licence users to take water, and again to discharge it in recognition that there is generally a cost to the resource in terms of a reduction in quality and a reduction in its further assimilative capacity. It is for this reason, and in order to bring about additional management and a strong incentive, that the Waste Discharge Charge System is being developed. Discharge users will be obliged to pay, depending on the quantity and quality of their discharge.

Groundwater quality requires equal attention, and more so as we recognise the importance of groundwater in supplementing our meager resources, and providing water to remote communities. Although our groundwater resources are for the most part to be found at a relatively deep level (50-100m is quite typical) this water can easily be polluted by surface activity. The leaching of fertilisers is one such problem but of greater concern is the influx of nitrates, primarily a consequence of human habitation and sanitation. Pit latrines are on the one hand so necessary, and have the huge advantage of not requiring volumes of water, but disposal is 'on-site', and often responsible for the longer-term pollution of the underlying aquifers which feed and water the communities above.

Water quality is a very important aspect within this ISP – considered primarily

within the **Water Quality Strategy G2** and also under **Groundwater G3**. Industrial wastewater discharge, diffuse agricultural discharges, wastewater treatment works, the location and management of solid waste disposal sites, the siting of new developments, informal settlements and the impacts of sanitation systems, are all elements considered with great concern in this and other ISPs. Despite this attention it may be that Water Quality has still not taken its rightful place in the integrated management of the water resource. But the Department is moving towards IWRM and the integration of quantity and quality issues. Managers have now been given crosscutting responsibilities that will ensure a far more integrated approach in future.

Actions recommended within the Department include:

- The need to actively workshop the integration process of Resource Management, Planning and Allocations of Groundwater and Surface Water Quantity and Quality.
- The review and incorporation of knowledge from recent Water Research Commission Studies on both radioactivity and nitrates (groundwater quality issues).
- A review of all water quality literature reflecting situational knowledge and understanding within this WMA (and each and every WMA).
- Ensure that Water Quality monitoring is fully integrated into WMA water resources monitoring.

Refer particularly to **Strategy G2** in **Part B** of this ISP.

1.8 GROUNDWATER

The ISP process in all of the Water Management Areas of South Africa has highlighted the role and importance of groundwater as part of the total water resource. Although groundwater has always been important in some areas this overall vision is a significant advance on our previous understanding of the potential for groundwater use. With the surface water resources in many WMAs now fully utilised, almost the only opportunity left for further development lies in the exploitation of groundwater. More particularly it is recognised that many of the more remote towns and villages, far from surface supplies, can in fact supply or supplement existing sources through groundwater, and that this must become a priority option. So, too, many small communities and subsistence farmers can avail themselves of groundwater when it would otherwise be impossible or impractical to lay on piped supplies. This can also reduce the pressure on existing users and perhaps even circumvent the need for Compulsory Licensing. The Department will be developing its capacity to explore and encourage the use of groundwater.

Of obvious concern is the likelihood of an interaction between groundwater and surface water. If the interaction is strong then additional use of groundwater may simply be reducing the surface water resource already allocated to someone else. In some instances (such as in the case of dolomitic aquifers) this interaction can indeed be very strong, whilst across many areas of the country it is so weak as to be negligible. In these circumstances groundwater comprises a huge pool of available water which is only of benefit if it is utilised. Care must always be taken with the issuing of licenses to ensure that both the Groundwater

Reserve and other downstream users do not end up being the losers.

The realisation in this and other ISPs is that groundwater offers a huge resource of water which can be tapped, and that this can be a very significant supplement to the national water resource. This is especially the case in the Usutu to Mhlathuze catchment in which a coastal aquifer is situated with huge potential groundwater resources. See also the **Groundwater Strategy No G3**, in **Part B** of this ISP.

1.9 PUBLIC RECREATION - THE USE OF DAMS AND RIVERS

The use of water for recreational purposes is one of the 11 water uses regulated in terms of the NWA (Section 21 j). The Department is developing a national policy towards 'Recreation on Dams and Rivers' and this should, in the first instance, be adhered to. Recreational use can take many forms and only occasionally has any direct impact on the water resource. Most obvious are activities such as power-boating, sailing and swimming which can have quality / pollution impacts. Far more significant in terms of both quantity and quality is the release of water to allow for canoeing and other water sports downstream (The Berg, Dusi and Fish River canoe marathons being prime examples). These activities can bring very significant economic benefits to the WMAs concerned, and where water releases can be accommodated, particularly through alignment with the needs of the ecological Reserve or other downstream users, then so much the better.

It is noted in this ISP that water resources offer a very significant recreational outlet and that recreation is an important public and social asset necessary for national health and productivity. A central philosophy is that recreational opportunity should not be unreasonably and unnecessarily denied to users, and that the implementation of policy should ensure that disadvantaged and poor people should also be able to avail themselves of opportunities.

The Department has already transferred responsibility for the management of many public waters to Local Authorities and will continue with this process. Responsibility will therefore devolve upon these Authorities, but within the broad principles as laid down by the Department.

1.10 CO-OPERATIVE GOVERNANCE – THE PLACE OF THE ISP

The ISP is DWAF's approach to the management of water resources within the WMA. This will, in the longer term, be replaced by a fully consultative Catchment Management Agency. What is most important, in the medium term is that the ISP has a good fit with the Provincial Growth and Development Plan, with regional and other Environmental Management Plans, with plans and expectations of the Departments of Agriculture, Land Affairs, the Environment and others. It must also be aligned with the Integrated Development Plans and Water Services Development Plans now required for each District Municipality. Water is very often a constraining feature in development and co-operative governance planning and implementation is essential in matching what is wanted with what is possible.

2. GENERAL OVERVIEW OF THE WMA

2.1 LOCALITY AND PHYSICAL CHARACTERISTICS

The Usutu to Mhlathuze WMA is situated in the northern KwaZulu-Natal province, but also occupies the south-eastern corner of the Mpumalanga province, west of Swaziland (see **Figure 2.1**). The WMA borders on Mozambique and Swaziland and two of its major rivers, the Usutu and the Pongola are shared with these countries.

The WMA is bordered by the Indian Ocean in the east and the Drakensberg range in the north-west. Altitude ranges from over 2 000 m to sea level. Rainfall varies from almost 1 500 mm/annum in the mountainous areas in the west to as low as 600 mm/annum in the vicinity of the Pongolapoort Dam where the Lebombo mountains create a rain shadow (see **Figure 2.2**).

The WMA consists of a number of catchments which are mostly independent of each other. These are the Mhlathuze, Mfolozi, Mkuze, Pongola, Usutu and Lake Sibaya catchments. For reporting purposes, the catchments upstream of Swaziland are considered as a unit since they are all part of the Usutu catchment while in fact, from South Africa's perspective, they are mostly independent of each other, but do all form part of the Usutu Basin. From an international perspective, it must also be borne in mind that the Pongola and Usutu river join just before the border with Mozambique to form the Maputo River, and the combined Pongola and Usutu Basin is often referred to as the Maputo River Basin. The W11 and W13 catchments have also been grouped together for reporting purposes. A description of each catchment follows.

2.1.1 Mtunzini and Matikulu catchment (W11 and W13)

These two coastal catchments lie immediately south of the Mhlathuze catchment (see **Figure 2.3**) and have land areas of 954 and 489 km^2 respectively. Rainfall in these catchments is high by South African standards, resulting in large natural runoff. Rainfall varies from over 1 300 mm/annum to about 1 000 mm/annum while the natural mean annual runoff (MAR) of the W11 catchment is 206 million m^3/annum[14] and the W13 catchment 148 million m^3/annum.

There are large areas of dry-land sugar cane in these catchments, with an estimated 265 km^2 in the W11 catchment and a further 92 km^2 in the W13 catchment. In some quaternary catchments, more than half of the catchment is under dryland sugarcane. In addition, there is also a significant area of afforestation, estimated at 59 km^2 most of which is situated in the W13B catchment.

Irrigated crops are also a significant land use, with an estimated 12 km^2 in the W11C catchment and a further 1 km^2 in the W13A catchment.

There is little water resources infrastructure in these coastal catchments, although there are a few significant farm dams which support irrigation. Most of these dams are situated in the W11C catchment.

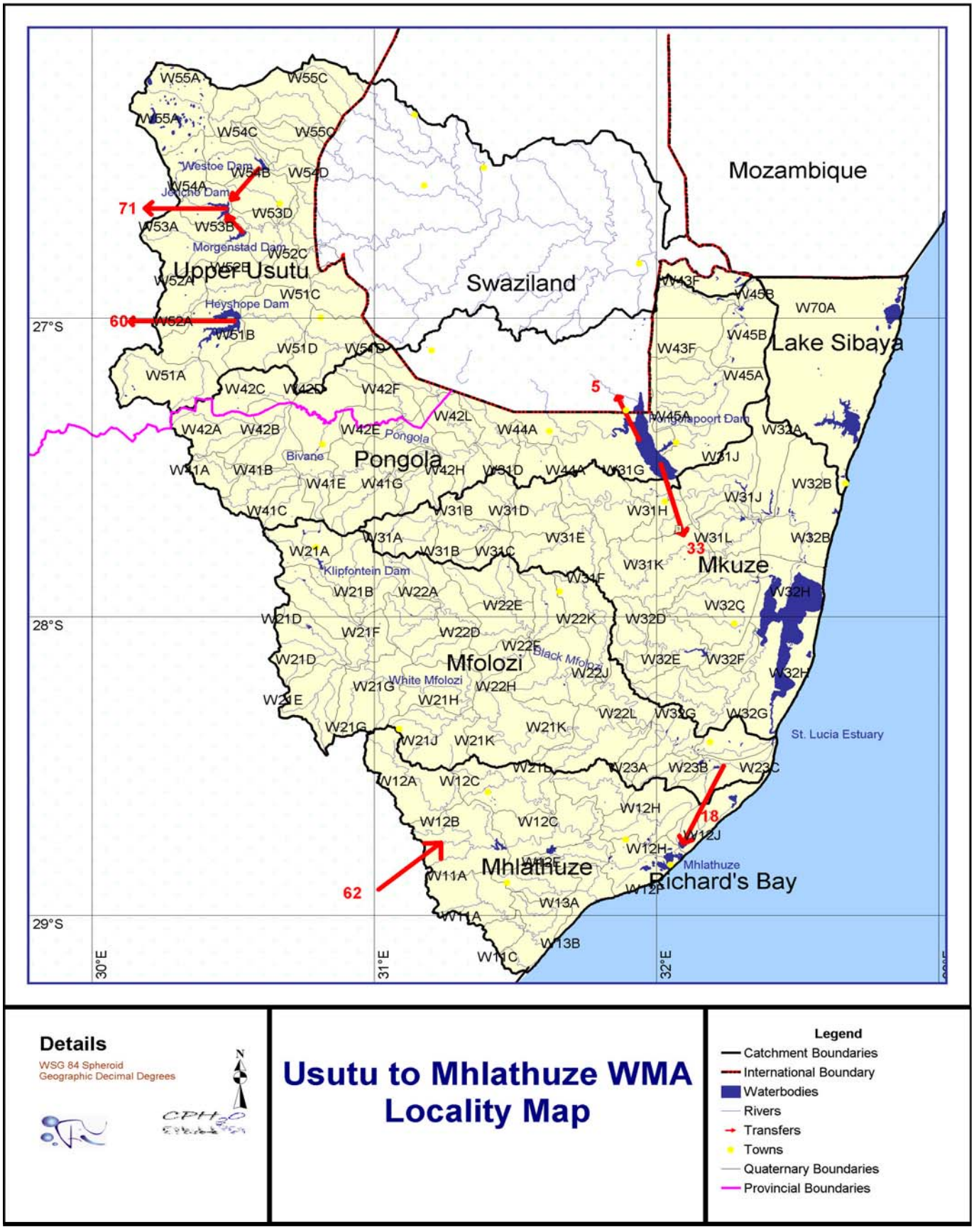

Figure 2.1: Base map of the Usutu to Mhlathuze WMA

2.1.2 Mhlathuze catchment (W12)

The Mhlathuze catchment has a land area of 4 209 km^2. The rivers of the Mhlathuze catchment rise along the escarpment of the Drakensberg mountains and flow eastwards, crossing the Zululand coastal plain and discharging into the Indian Ocean just south of Richards Bay. The natural runoff ranges from 377 mm/annum produced in quaternary W12F near the coast to 132 mm/annum produced in W12C. The MAR of the whole Mhlathuze catchment is estimated at 583 million m^3/annum[8].

The MAP averaged over the entire Mhlathuze catchment is 975 mm/annum, with a maximum value of over 1 300 mm/annum recorded along the eastern seaboard and a minimum value of 850 mm/annum recorded inland. Rainfall distributions are highly correlated to the topographic features in the area.

Landuse in the Mhlathuze catchment is, from a water resources perspective, dominated by afforestation (401 km^2) and dryland sugarcane (268 km^2). The afforestation is found in the upper reaches of the catchment as well as along the coast while the dryland sugarcane is situated mostly near the coast with smaller areas inland near Melmoth.

A significantly large area of the catchment (131 km^2) is under irrigated crops, predominantly sugarcane and citrus, which is found along the Mhlathuze River downstream of the Goedertrouw Dam. Fifty percent of the Mhlathuze catchment is communally held land (see **Figure 2.4**) which has seen relatively little agricultural or other development. The key activities in these areas are cattle and subsistence farming. The area on the left bank of the Mhlathuze River (Nkandla District) has notable forestry potential. The only urban area of note is the Richards Bay/ Empangeni complex, with large-scale industries and extensive township developments. These are major users of water. Pollution, especially of groundwater resources, is a problem. Mining is limited to the coastal dunes – primarily in the vicinity of Richards Bay - where Titanium and other heavy metals are extracted from the dune sands.

The Goedertrouw Dam, with a capacity of 304 million m^3 (1987 survey), is situated in the upper reaches of the Mhlathuze catchment. This dam was completed in the late 1970's to meet the expanding industrial and mining requirements of the Richards Bay area, but provision was also made for large scale irrigation. Water released from the dam is abstracted by irrigators, either by canal or by direct pumped abstraction from the river. Water for urban, industrial and mining use is abstracted from the Mhlathuze Weir from where, after treatment, it is distributed by Mhlathuze Water. Abstractions from a number of large natural lakes in the lower reaches of the catchment contribute significantly to the yield of the system. In 1996, an emergency scheme was implemented to transfer water from the Thukela River to the Mhlathuze system, via the Goedertrouw Dam. Water is transferred at a rate of about 1,2 m^3/s whenever the water level in the Goedertrouw Dam is below 90%, although this is an operating rule that is frequently reviewed.

2.1.3 Mfolozi catchment (W20)

The Mfolozi catchment has a land area of 10 008 km^2. The Mfolozi River consist of two main tributaries, the Black and White Mfolozi, both of which rise on the

eastern escarpment of the Drakensberg Mountain range and flow eastward across the Zululand coastal plain before discharging into the Indian Ocean (see **Figure 2.5**). The MAR from the Mfolozi River is estimated to be 962 million m^3/annum[5]. The runoff ranges from 226 mm/annum in W23D on the coast to 41 mm/annum in W21D inland along the Drakensberg mountains.

The average MAP for the Mfolozi River basin is 803 mm/annum with a maximum value of 1 150 mm/annum which occurs along the eastern seaboard and a minimum value of about 700 mm/annum which occurs inland. The general trend is that the rainfall decreases as you move inland with some high-lying areas receiving more rainfall. Rainfall distributions correlate to the topographic features in the area.

The Mfolozi catchment consists mostly of tribal land, with the main activity being cattle farming. There is a limited amount of afforestation in the catchment compared to the total area of the catchment (approximately 435 km^2). This is situated in the upper reaches of the catchment near Vryheid, in the vicinity of Nongoma and near the coast. Dryland sugarcane is also grown in the coastal area where the rainfall is high.

There is a significant area under irrigation in the catchment, estimated at about 72 km^2. The majority of this is found near the coast where there is about 50 km^2 of irrigated sugar cane.

The Mfolozi Game Reserve lies in the central part of the catchment.

Significant towns in the catchment are Vryheid, Ulundi, Babanango, Nongoma and Mtubatuba.

The water resources of the Mfolozi catchment are mostly undeveloped. The most significant development is the Klipfontein Dam (see **Section 2.7.2**), which is situated in the upper reaches of the White Mfolozi River. There is an allocation to irrigators downstream of the dam, but very little of this allocation is currently utilised.

2.1.4 Mkuze catchment (W30)

The Mkuze catchment comprises the drainage areas of both the Mkuze (W31) and Hluhluwe (W32) rivers – both reaching the sea through Lake St Lucia (see **Figure 2.6**). The land area of this catchment is 9 545 km^2. The rainfall across the Mkuze catchment is high at the coast (about 1 000 mm/annum), over 900 mm/annum in the high lying western area of the catchment, but as low as 600 mm/annum in certain inland areas. These lower rainfall areas are caused by the rain shadow of the Lebombo Mountains.

The runoff from the Mkuze catchment is relatively high, as is typical of all KwaZulu-Natal catchments. The mean annual runoff from the W31 catchment is estimated to be 207 million m^3/annum while that of the W32 catchment is estimated to be 235 million m^3/annum.

There is a significant amount of afforestation in the Mkuze catchment, estimated to be nearly 392 km^2. The other significant land use is irrigation, with an area of approximately 76 km^2 under irrigation, most of which consists of sugarcane.

Significant towns in the area are Hluhluwe, St Lucia and Mkuze. The urban water requirements of these towns is however insignificant when compared with the irrigation requirements of the catchment.

The water resources infrastructure of the Mkuze catchment is not well developed. The only significant dam in the catchment is the Hluhluwe Dam, which is situated near the town of Hluhluwe (see **Section 2.7.3**).

There are a large number of farm dams in the Mkuze catchment.

Recently, a large transfer scheme was completed by private irrigators Senekal Trust, which is licenced to transfer up to 32,6 million m^3/annum into the catchment from the Pongolapoort Dam. The details of this transfer licence are complex and the details are attached in **Appendix C.**

2.1.5 Pongola catchment (W40)

The Pongola River (see **Figure 2.7)** rises on the far eastern escarpment of the Drakensberg mountain range and flows eastwards, carving a gorge through the Lebombo Mountains before joining the Usutu River just before the Mozambique border and flowing into the Maputo basin. The runoff generated by the Pongola River is high by South African standards with an estimated MAR of 1 344 million m^3/annum[(5)] of which an estimated 1 131 million m^3/annum originates in South Africa.

The average MAP for the area is 756 mm but it ranges from 600 mm/annum in the rain shadow caused by the Lebombo Mountains on the Makhathini flats to almost 1 500 mm/annum on the eastern escarpment of the Drakensberg, which is the source of the Pongola. Topographic influences are present in the rainfall patterns but there is a general increase in the amount of rainfall as one moves westward in the Pongola catchment.

The land use in the Pongolapoort catchment is characterised by large-scale afforestation in the upper Pongola and Bivane tributaries and large-scale irrigation in the W44 catchments upstream of the Pongolapoort Dam. The area downstream of the Pongolapoort Dam is largely undeveloped although some irrigation takes place with water supplied from the Pongolapoort Dam.

The total area under afforestation in the Pongola catchment is estimated at 480 km^2, while the irrigated area is approximately 199 km^2. The main irrigated crop is sugarcane.

Two significant dams, the Bivane and the Pongolapoort are situated in the Pongola catchment. See **Section 2.7** for details of these dams.

The towns of Jozini, Pongola and Paulpietersburg are found in this catchment.

2.1.6 Usutu catchment (W51 – W56)

The Usutu River (see **Figure 2.8**) rises on the far eastern escarpment of the Drakensberg Mountains and flows eastwards through Swaziland before joining the Pongola River just before the Mozambican border. The MAR for the Usutu river is relatively high by South African standards producing approximately 2 360 million m^3/annum[14] with 901 million m^3/annum[5] estimated to originate in the upper Usutu River catchment (including its tributaries) before it flows into Swaziland.

The average MAP of the Usutu (including Swaziland) is approximately 850 mm/annum and ranges from 500 mm/annum in the eastern areas to 1 200 mm/annum in higher lying areas within Swaziland, then declining as one moves further west to between 750 and 850 mm/annum on the eastern escarpment of the Drakensberg. The topographic patterns, although present, are not as pronounced as the more southern catchments in the Usutu to Mhlathuze WMA.

The only significant land uses in the upper Usutu catchment are afforestation and irrigation. The total area under afforestation in the South African portion of the Usutu catchment is estimated at 1 930 km^2, while the irrigated area is limited to 27 km^2.

The towns of Piet Retief and Amsterdam are found in this catchment with several less formal settlements near the Swaziland border in the Eerstehoek region.

The water resources of the upper Usutu River catchment have been developed to transfer water to the Vaal River system where it is allocated for use by Eskom, and transferred directly to the power stations in the Olifants WMA. This development consists of the Heyshope Dam in the W51 catchment, the Morgenstond and Jericho dams in the W53 catchment, and the Westoe Dam in the W54 catchment (see **Section 2.7)**.

Although there is scope for development in the W52, W55 and W56 catchments, South Africa already utilises its current full share of the available developed water in terms of the Interim IncoMaputo Water Use Agreement (see **Section 2.5**). Nevertheless, the agreement does allow for development of the resource and the agreement can be adjusted if such development takes place. The developer should be entitled to utilise any increase in system yield derived from such development.

2.1.7 Lake Sibaya catchment (W70)

This coastal catchment is the W70 quaternary catchment north of Sodwana Bay. Although the rainfall in the catchment is relatively high (769 mm/annum), the surface runoff is limited due to the very flat terrain. Groundwater recharge is however high, as is the groundwater potential. The KwaZulu-Natal coastal aquifer underlies much of this catchment and the potential for groundwater use is therefore high.

2.1.8 Summary

Table 2.1 summarises the hydrology of the Usutu to Mhlathuze WMA.

Table 2.1: Summary of the hydrology of the Usutu to Mhlathuze WMA

Catchment (ISP)	Natural runoff (million m^3/annum)	Sub-area (NWRS)	Natural runoff (million m^3/annum)
Mtunzini & Matigulu	355	Mhlathuze	938
Mhlathuze	583		
Mfolozi	962	Mfolozi	962
Mkuze	635	Mkuze	635
Pongola	1 344	Pongola	1 344
Usutu	901	Usutu	901
Lake Sibaya	25	Lake Sibaya	-*
Total	**4 805**	**Total**	**4 780**

- The NWRS did not include Lake Sibaya

2.2 DEMOGRAPHY

The population of the Usutu to Mhlathuze WMA is estimated at 2 300 533, with 18% classified as urban and the remaining as leading 'rural' lives (see **Table 2.2**). Significant towns in the WMA are Richards Bay, Empangeni, Mtunzini, Ulundi, St Lucia, Vryheid, Paulpietersburg, Piet Retief and Amsterdam. Richards Bay with its large port, aluminium smelters, dune mining and wood processing industries is the economic centre of the WMA. Expectations are that little change will occur in the overall population in the water management area over the next 20 years. A decline in the rural population is expected but this will be offset by an increase in the urban population in growth centres such as Richards Bay.

Table 2.2: Population categorisation in the Usutu to Mhlathuze WMA (Year 2000)

Catchment	Urban	Rural	Total
Mtunzini & Matikulu	33 150	219 900	253 050
Mhlathuze	142 403	302 991	445 394
Mfolozi	94 348	523 175	617 523
Mkuze	5 115	417 693	422 808
Pongola	22 350	241 388	263 738
Usutu	107 948	112 872	220 820
Lake Sibaya	1 950	75 250	77 200
Total	**407 264**	**1 893 269**	**2 300 533**

Note: Data sourced from the NWRS except for Lake Sibaya and the Mtunzini/Matikulu areas which are not shown separately in the NWRS. Demographic data for these two areas was sourced from the Water Resources Situation Assessment (Reference 9).

2.3 LAND USE

Land use in the WMA, from a water resources perspective, is dominated by irrigation and afforestation. There is an estimated 530 km^2 of irrigation and 4 031 km^2 of afforestation in the WMA. Irrigation has an estimated water requirement of 464 million m^3/annum while afforestation reduces the runoff from the WMA by an estimated 279 million m^3/annum. The impact of irrigation water

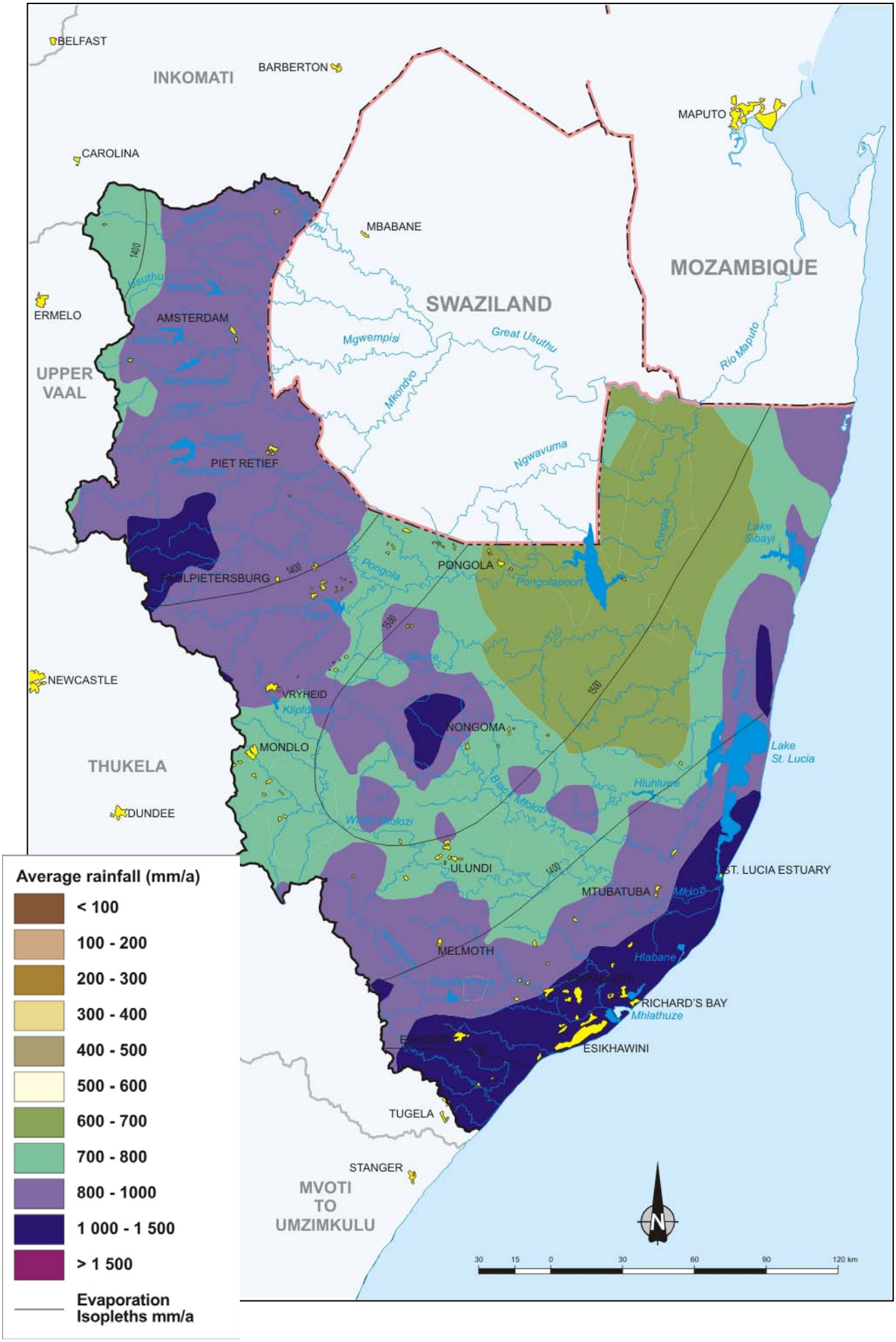

Figure 2.2: Rainfall distribution in the Usutu to Mhlathuze WMA

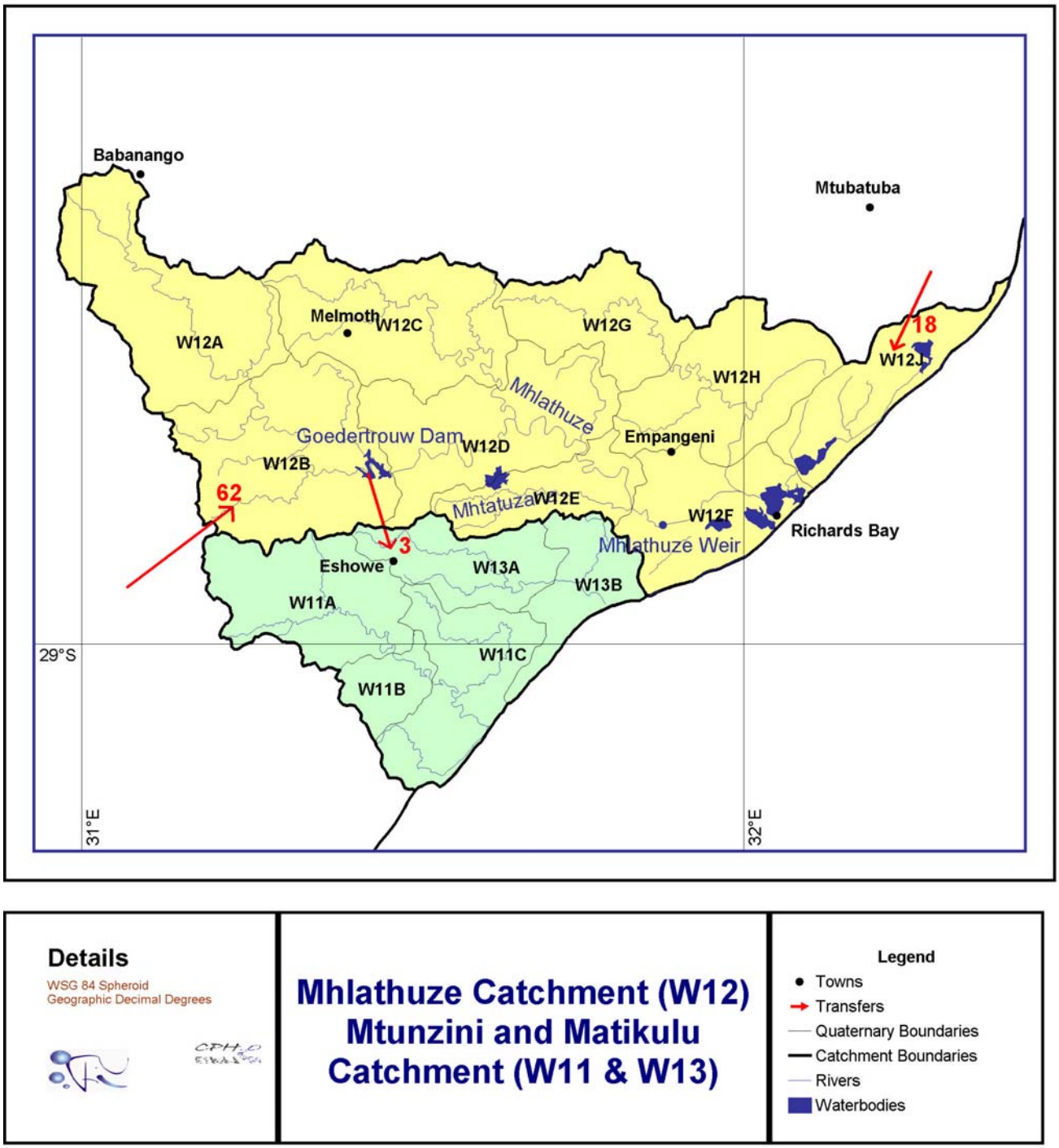

Figure 2.3: The Mhlathuze, Matikulu and Mtunzini Catchments

use on the available 1:50 year yield is estimated to be 432 million m^3/annum while the impact of afforestation on the yield is approximately 104 million m^3/annum. A large portion of the WMA is tribal land (see **Figure 2.4** and **Table 2.3)**, which is typically used for stock farming. This may result in an increased silt load in areas where overgrazing occur, but otherwise has little impact on the water resources of the catchment. The lack of forestry and/or irrigation on these communally held areas results in a *prima facie* inequity in the use of water resources.

Table 2.3: Land categorisation in the Usutu to Mhlathuze WMA

Catchment	Total Area (km^2)	% Tribal
Mtunzini & Matikulu	1 468	58.6
Mhlathuze	4 210	47.7
Mfolozi	10 007	47.7
Mkuze	9 545	33.0
Pongola	11 712	24.5
Usutu	16 700	3.6
Lake Sibaya	2 589	92.0
Total	**56 231**	**29.6**

Source: Strategic Environmental Assessment for water use – KZN. Reference 15.

2.4 INSTITUTIONS

There are four types of water-related institutions, which play a role in the Usutu to Mhlathuze WMA. These are:

- District Municipalities;
- Local Municipalities;
- Irrigation Boards (and Water User Associations);
- Water Boards, and
- DWAF's Regional Office (in lieu of the CMA).

The so-called Provincial Liaison Committee also plays a role in water matters as do its two sub-committees, the Water Resources Planning sub-committee and the Co-ordinating Committee for Agricultrual Water (formerly the Irrigation Action Committee). There is also a provincial Water and Sanitation Committee which is administered by the Department of Local Government.

District Municipalities (see **Figure 2.9**) are defined as Water Services Authorities (WSA) in terms of the Water Services Act (Act 108 of 1997), and are responsible for preparing Integrated Development Plans (IDP). It is important to bear in mind though, that a Local Municipality (see below) can also become a Water Services Authority. An IDP is a principal strategic planning instrument, which guides and informs all planning, budgeting, management and decision-making in a municipality. The Water Services Act states that a Water Services Development Plan (see Local Municipalities below) must be part of the process of developing an IDP, and this is an important link between District Municipalities and the water sector. Water Services Authorities are also responsible for sanitation services and

therefore play an important role in maintaining the water quality of the catchment at an acceptable level.

Local Municipalities (see **Figure 2.10**) are responsible for the preparation of a Water Services Development Plan (WSDP). The essential difference between an IDP and a WSDP is that a WSDP deals with water services while an IDP deals with all services. A WSDP must contain a **water balance component** which provides a point of reference for what is possible and what is not possible in terms of integrated development planning which impacts upon water resources. As the name indicates, this plan deals with water services, but in preparing a WSDP Local Municipalities must be aware of water related planning initiatives such as:

- Catchment Management Strategies
- Business plans of water boards
- Business plans of other water services providers.

After liaison with the CMA, the Local Municipality needs to include a statement as to the source of raw water and discharge of waste in its WSDP. Since this ISP is a forerunner to the CMS, Local Municipalities must be made aware of this ISP which must be used to indicate the source(s) of raw water for the Local Municipalities.

Irrigation Boards (see **Figure 2.11**) were established under the old Water Act to administer the bulk distribution of water to irrigators within a defined area. Under the National Water Act, Irrigation Boards must be transformed to form Water User Associations, which will fulfill a similar function to an irrigation board but need not necessarily be limited only to irrigation practices. The Impala Water User Association (formerly the Impala Irrigation Board) situated in the Pongola River catchment was the first Water User Association to be formed in the Usutu to Mhlathuze WMA.

Water Boards (see **Figure 2.12**) are classified in terms of the Water Services Act as Water Services Providers and in this respect fufill a similar role to Local Municipalities. The difference is that a Water Board deals only with water matters, usually bulk water distribution, and not any other services. The only Water Board in the Usutu to Mhlathuze WMA is Mhlathuze Water. Although Mhlathuze Water is focused mainly on the water supply to Richards Bay and the surrounding area, their area of influence is expanding and they are involved in projects as far away as the Mkuze catchment.

There is a **Provincial Liaison Committee (PLC),** the purpose of which is to foster communication and co-operation with Provincial Government but also with Regional Municipalities, Water Boards and important stakeholders such as the Forestry Industry Association and Sugar Association. This committee currently serves the whole of KwaZulu-Natal and is not limited to only the Usutu to Mhlathuze WMA. This committee meets about twice a year. The PLC has two sub-committees, the **Water Resources Planning sub-committee** which co-ordinates water related planning activities in the Province, the **Co-ordinating Committee for Agricultural Water** (formerly the Irrigation Action Committee) which deals with matters related to irrigation, and the Department of Local Government's Water and Sanitation sub-committee, which deals with water services matters.

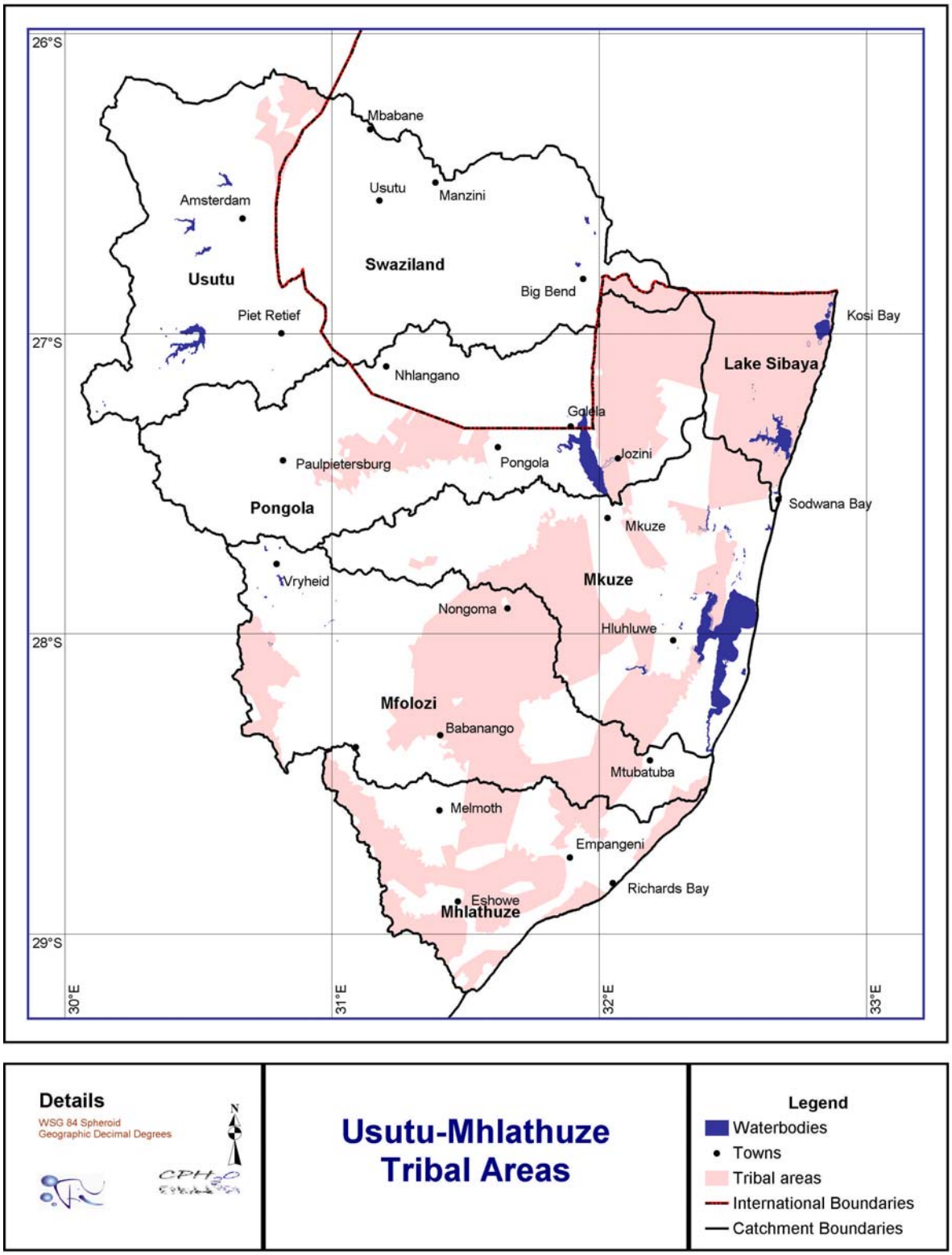

Figure 2.4: Tribal areas in the Usutu to Mhlathuze WMA

The **Department of Water Affairs and Forestry** is the custodian of the water resources of South Africa. Under the National Water Act, DWAF's Regional Office will fulfill the role of the Catchment Management Agency until such time as the CMA is in place and fully functional.

2.5 INTERNATIONAL ASPECTS

The Usutu and Pongola rivers join to form the Maputo River just before the South African/Mozambican border. These rivers are therefore part of a shared international river basin. The Interim IncoMaputo Water Use Agreement has recently been entered into with Mozambique and Swaziland and deals, *inter alia,* with water sharing in these catchments. This agreement limits water use by the three riparian states. South Africa's allowable water use, in terms of this agreement are listed below. The reader is referred to the Interim IncoMaputo Water Use Agreement on the DWAF website for more information on this agreement.

South Africa

First priority supplies:	242 million m^3/a
Irrigation supplies:	538 million m^3/a
Afforestation: area	284 600 ha
Runoff reduction	198 million m^3/a

The term 'first priority supply' refers to water for high priority and high assurance users such a rural, urban and industrial use. This includes the transfers to the Upper Vaal WMA and the Olifants WMA.

In order to interpret the implications of South Africa's allocated water use in the Pongola, it is necessary to have a clear understanding of the current water use in the area. This is summarised in **Table 2.4**.

Table 2.4: Water requirements in South Africa seen in the context of the Interim IncoMaputo Water Use Agreement

User category		Water requirement (million m^3/annum)		Potential for additional use in South Africa (million m^3/annum)
ISP definition	Equivalent IncoMaputo definition	ISP	IncoMaputo	
Irrigation	Irrigation	226	538	312
Urban	First priority supplies	9	242	69
Rural		11		
Mining and bulk industrial		1		
Transfers out		152		
Afforestation	Afforestation	181	198	17

The implications of the Interim IncoMaputo Water Use Agreement is, broadly, that South Africa may expand its water use, especially that of irrigation and to a lesser extend that of first priority supplies. These possible increases in water use

relate to the surplus yield available in the Pongolapoort Dam. There is little scope for additional afforestation in terms of the Agreement.

DWAF is establishing a Task Team to implement the terms of the agreement. The agreement also commits South Africa to maintain the water quality of cross border flows at an acceptable level.

2.6 CATCHMENT ECONOMY

(Source: Economic Information System 2000, Reference 4)

The Usutu to Mhlathuze WMA is one of the smaller contributors to the South African economy in terms of Gross Domestic Product (GDP) with a contribution of only 1.94 percent. The Gross Geographical Product (GGP) of the Usutu to Mhlathuze WMA was R9,7 billion in 1997.

The most important sectors in terms of contribution to GGP are:
- manufacturing and mining (35,5%)
- agriculture (15,2%)
- transport (12,5%)
- other (36,8%)

The agricultural sector in the Usutu to Mhlathuze WMA is well-developed and this has important upstream and downstream linkages which do not reflect in the GDP contribution. The major activities are crop farming, cattle farming, game farming, sugar plantations and forestry. The sugar cane industry has an increasing number of small cane growers. This growth was enabled through the extension of credit and administration support, principally through the South African Sugar Association's revolving credit system. Substantial growth has also occurred in the forestry industry.

The importance of the manufacturing sector can be attributed to the railway infrastructure, the harbour at Richards Bay (incorporating the world's largest coal export terminal), power supplies, and water. Key industries are pulp and paper manufacturing and aluminium smelting. Timber and sugar are critical raw materials. The relatively high contribution of the transport sector can be attributed to the shipment of coal across the WMA from the Mpumalanga Highveld, as well as the transport of timber. Vryheid became an important transport centre after 1975 when the coal transport route was commissioned. The railway line has since been expanded to also carry goods other than coal, providing the timber industry with the opportunity to export through Richards Bay. Much of this timber is currently exported in the form of woodchips, reflecting very limited value addition.

The tourism industry is extremely important. The coastline is a South African playground and there are several nature reserves in the area, amongst which are Hluhluwe (famous for the black rhinoceros), Mfolozi, Mkuze, St Lucia, Sodwana and Itala. The St Lucia Estuary has recently been proclaimed a World Heritage Site.

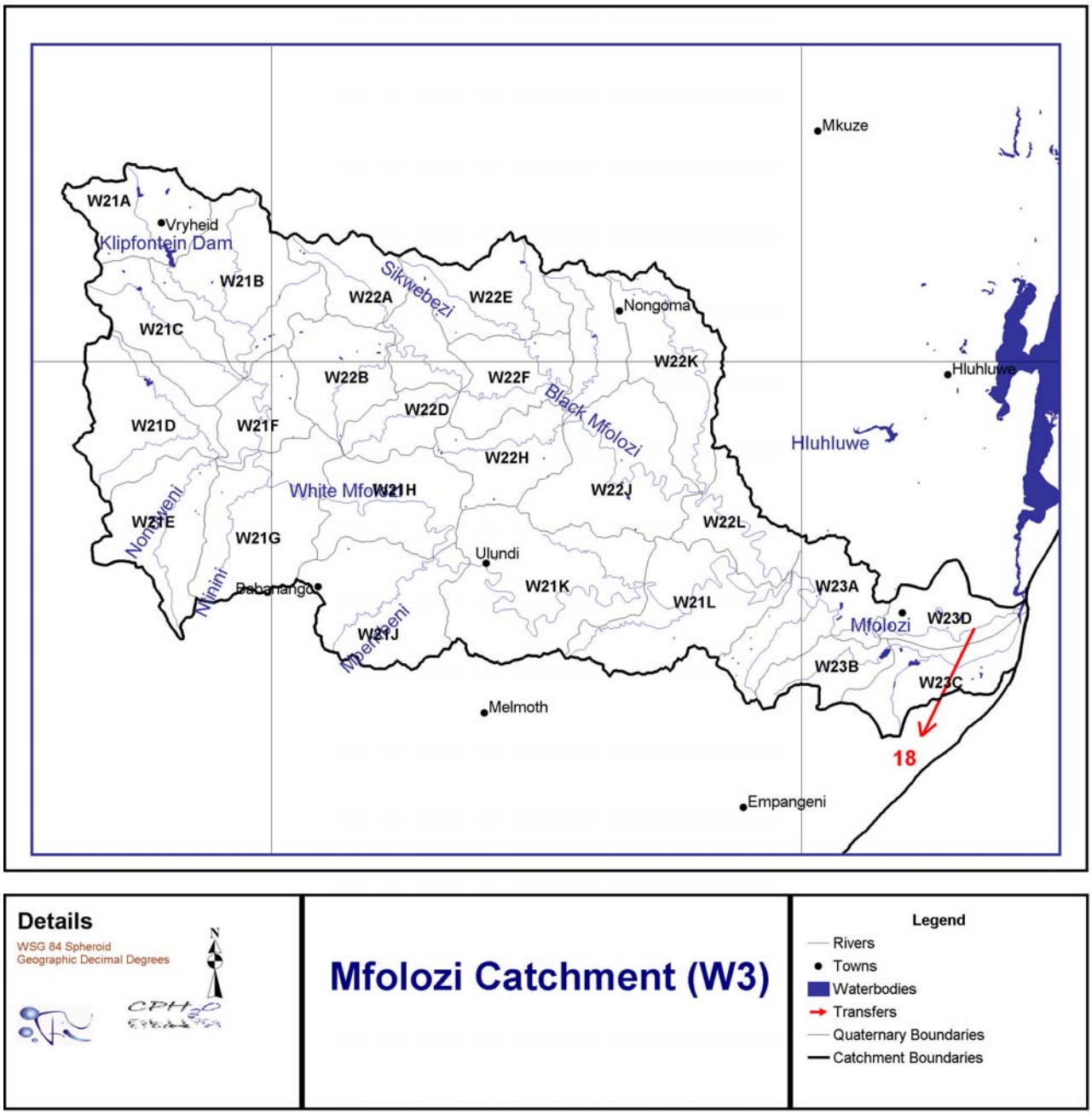

Figure 2.5: The Mfolozi Catchment

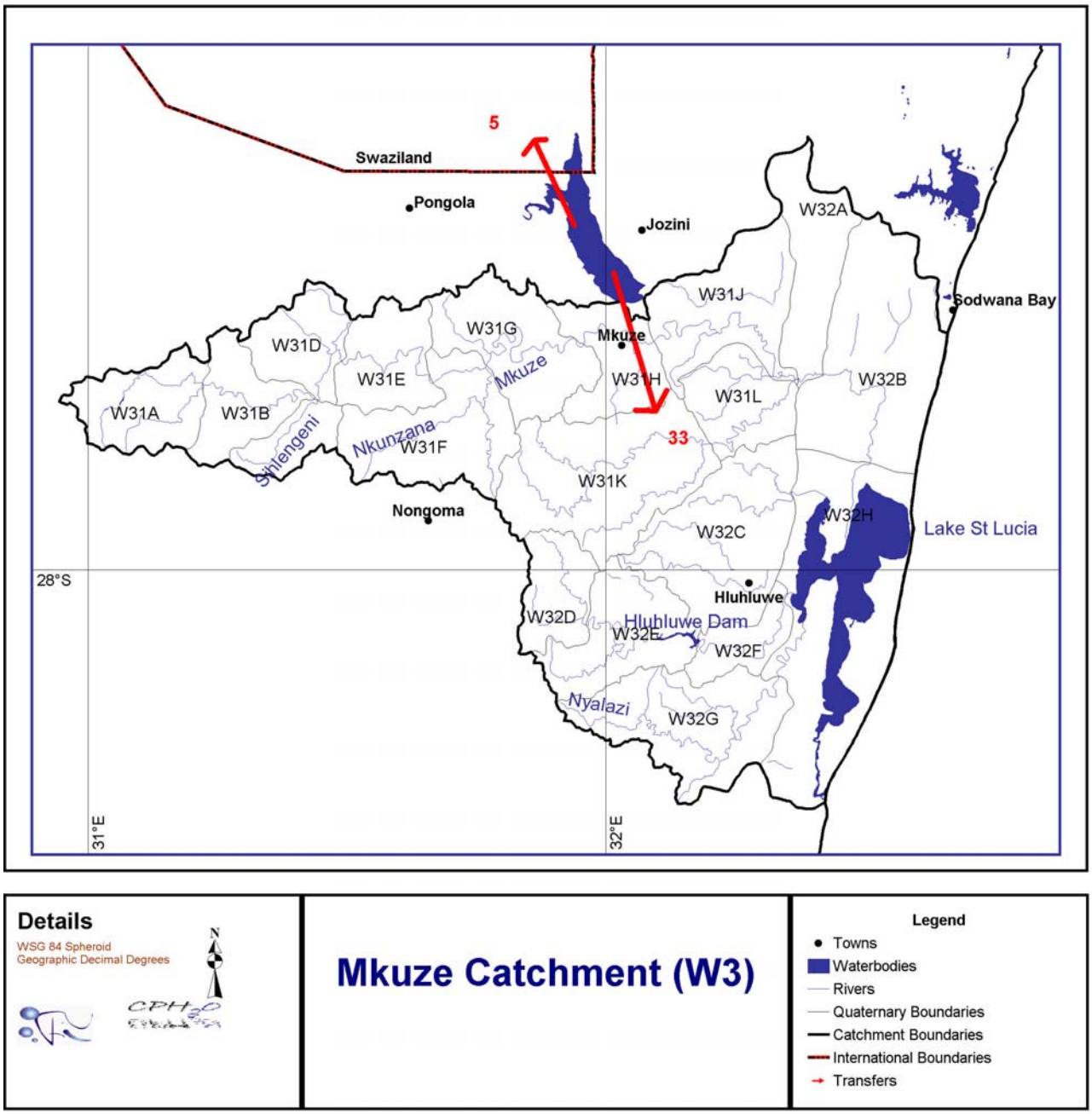

Figure 2.6: The Mkuze catchment

2.7 WATER RELATED INFRASTRUCTURE: DAMS AND TRANSFER SCHEMES

Several major dams have been constructed in the WMA. A list of all registered dams is attached as **Appendix B** and brief operating rules are documented in **Appendix D**. The most significant dams and water related schemes are described briefly below.

2.7.1 Goedertrouw Dam

The Goedertrouw Dam, with a capacity of 304 million m^3 (1987 survey), is situated in the middle reaches of the Mhlathuze catchment. The MAR into the dam is estimated at 163 million m^3/annum[8]. In terms of the MAR, the Goedertrouw Dam is considered to be a large dam (1,87 times the MAR), the implication of which is that there would be little to be gained out of raising the dam.

The dam was completed in the early 1970's and was constructed primarily to meet the rapid growth in industrial, mining and urban requirements of the Richards Bay area, but also for irrigation purposes. Water is distributed to irrigators via a canal as well as releases into the Mhlathuze River, which are abstracted by pumps along its length while water for other users is abstracted at the Mhlathuze Weir (see **Figure 2.3**).

The natural inflow into the Goedertrouw Dam is supplemented by transfers from the Thukela River (see **Section 2.7.7**)

2.7.2 Klipfontein Dam

The Klipfontein Dam, with a capacity of 19 million m^3, is situated in the upper reaches of the White Mfolozi catchment. The dam was constructed primarily to supply water to the town of Vryheid, but is also used to supplement supplies to Ulundi when necessary. The natural MAR into the dam is 47 million m^3/annum.

2.7.3 Hluhluwe Dam

The Hluhluwe Dam is situated on the Hluhluwe River. The capacity of the dam is about 25 million m^3 (based on the survey carried out in the year 2000). The natural MAR into the dam is 36 million m^3/annum[14]. Estimates of the yield of the dam vary from 8,5 million m^3/annum to 23 million m^3/annum, as quoted in various reports. As part of this ISP project, the yield of the Hluhluwe Dam was investigated and, based on the actual performance of the dam during the severe drought of the early eighties, the historic yield appears to be about 13,5 million m^3/annum.

2.7.4 Bivane Dam

The Bivane Dam (previously the Paris Dam), commissioned by the Impala Irrigation Board (now the Impala Water User Association), was completed in 1999 and was constructed to increase the assurance of supply to irrigators situated upstream of the Pongolapoort Dam. The dam has a full supply capacity of 113 million m^3 which is relatively small in relation to the natural MAR of 320 million m^3/annum[14]. Water is released from the dam to irrigators downstream of the dam when required (see also **Section 2.7.5**).

2.7.5 Pongolapoort Dam

The Pongolapoort Dam was constructed in the late 1960's with the objective of developing irrigation on the Makhathini flats, downstream of the dam. With a full supply capacity of 2 445 million m^3, this is one of the largest dams in South Africa. The natural MAR into the dam is estimated at 1 293 million m^3/annum[14] which, in terms of the MAR, make the Pongolapoort Dam unusually large (1,89 x MAR). The implication of this is that there is very little scope for increasing the yield from the Pongola catchment. Dams such as the Bivane and other proposed schemes in the upper catchment only move existing yield into the upper catchment without adding significantly to the total yield of the catchment.

Water can be released via a canal to irrigators downstream of the dam, which has not taken place on the scale envisaged and only 30 million m^3/annum is currently allocated to irrigators downstream of the dam.

The yield of the dam was originally estimated to be about 900 million m^3/annum (at a low assurance related to irrigation use), but considerable irrigation and forestry development took place upstream reducing the yield available from the Pongolapoort Dam by about one third. As part of this ISP, the current yield of the Pongolapoort Dam was evaluated and estimated to be about 600 million m^3/annum at an assurance of 80%. The historical yield was estimated at 530 million m^3/annum.

2.7.6 Usutu transfer scheme

There are a number of large dams in the upper Usutu catchment which were constructed, together with pump stations, canals and pipelines, to transfer water to the upper Vaal and Olifants WMAs. These dams are:

- Heyshope Dam, with a full supply capacity of 453 million m^3, transfers water into the upper Vaal River where it contributes about 60 million m^3/annum to the yield of the Grootdraai Dam. Eskom has an allocation from Grootdraai Dam to meet the cooling requirements of the coal-fired power stations in the upper Vaal catchment. The infrastructure exists to transfer water to the Morgenstond Dam if required. The natural MAR of the Heyshope Dam catchment is 129 million m^3 which makes the Heyshope Dam exceptionally large in terms of the MAR (3,5 times the MAR) and there is no scope for increasing the yield of this dam through raising the wall.
- Morgenstond Dam, with a full supply capacity of 101 million m^3 transfers water to the Jericho Dam.
- Westoe Dam, with a full supply capacity of 61 million m^3 also transfers water to the Jericho Dam.
- Jericho Dam has a full supply capacity of 60 million m^3. Water is pumped from Jericho Dam to the Olifants WMA to supply power stations.

The Churchill Weir, with a capacity of 0.5 million m^3, diverts run-of-river flows in the W54C quaternary catchment to the Westoe Dam.

2.7.7 Thukela – Mhlathuze transfer

In 1996, an emergency scheme was implemented to transfer water from the Thukela River to the Mhlathuze system, via the Goedertrouw Dam. Water is transferred at a rate of about 1,2 m^3/s whenever the water level in the

Goedertrouw Dam drops below 90%, although this is an operating rule that is frequently reviewed. The infrastructure related to the transfer scheme consists of a pump station situated at a small weir at Middeldrift on the Thukela River and a pipeline which crosses the catchment divide and discharges into the upper reaches of the Mhlathuze River. The capacity of the transfer can be increased relatively easily to 3,0 m^3/s by increasing the pumping capacity of the pump station.

2.7.8 Mfolozi-Mhlathuze transfer

Water is abstracted from the lower Mfolozi River and pumped across to the W12J quaternary catchment in the Mhlathuze catchment for use by Richards Bay Minerals (RBM) for their coastal mining operations. The capacity of these works is 18 million m^3/annum.

2.7.9 Senekal Trust transfer

A large pipeline was recently (2001) constructed by the sugar company Senekal Trust to transfer water from the Pongolapoort Dam to the Mkuze catchment, mainly for irrigation purposes and domestic water supply to rural communities. A floating pump station abstracts water from the Pongolapoort Dam basin. The capacity of the pipeline is reportedly 90 million m^3/annum but the Senekal Trust licence is limited to 32,6 million m^3/annum (see **Appendix C**).

2.8 TRANSFERS AND RESERVATION OF WATER

The transfer of water between WMAs and arrangements with neighbouring countries resort under national control. The following reservations are made in the National Water Resource Strategy with regard to the Usutu to Mhlathuze WMA:

- Existing transfers from the upper Usutu catchment to the Upper Vaal and Olifants WMAs up to the installed capacity of the works. The NWRS states this capacity as being 114 million m^3/annum while it is in fact 131 million m^3/annum.
- The existing transfers from the Thukela River to the Mhlathuze are reserved and may be increased if necessary up to 94 million m^3/annum with increases beyond this up to 252 million m^3/annum subject to the provision of storage in the Thukela WMA.
- The construction of dams in the upper Pongola River and the upper Usutu catchment for transferring additional water to the Vaal system is an option for augmenting supplies to the Vaal system. Construction of dams in these area is therefore subject to approval at National level.

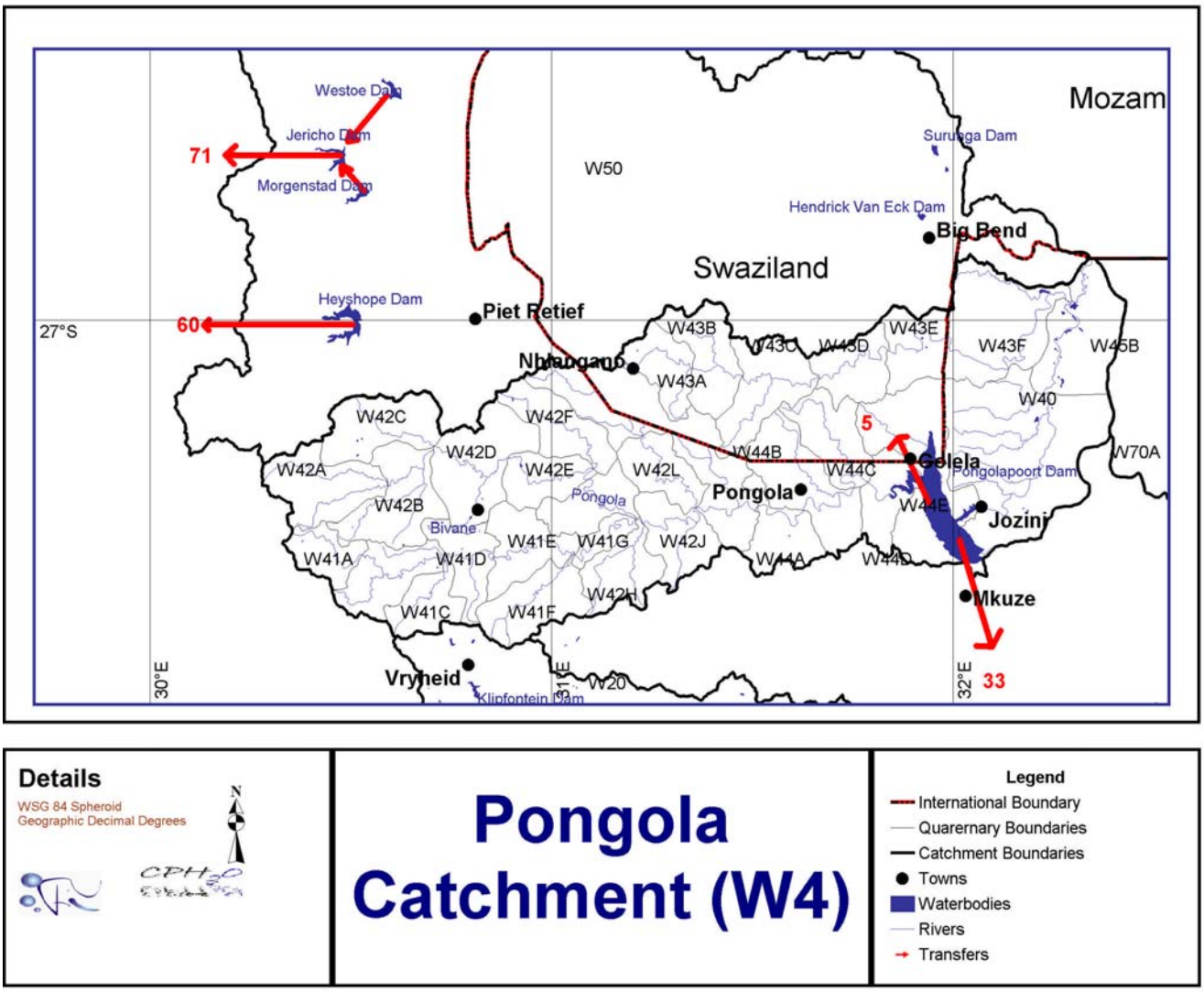

Figure 2.7: The Pongola Catchment

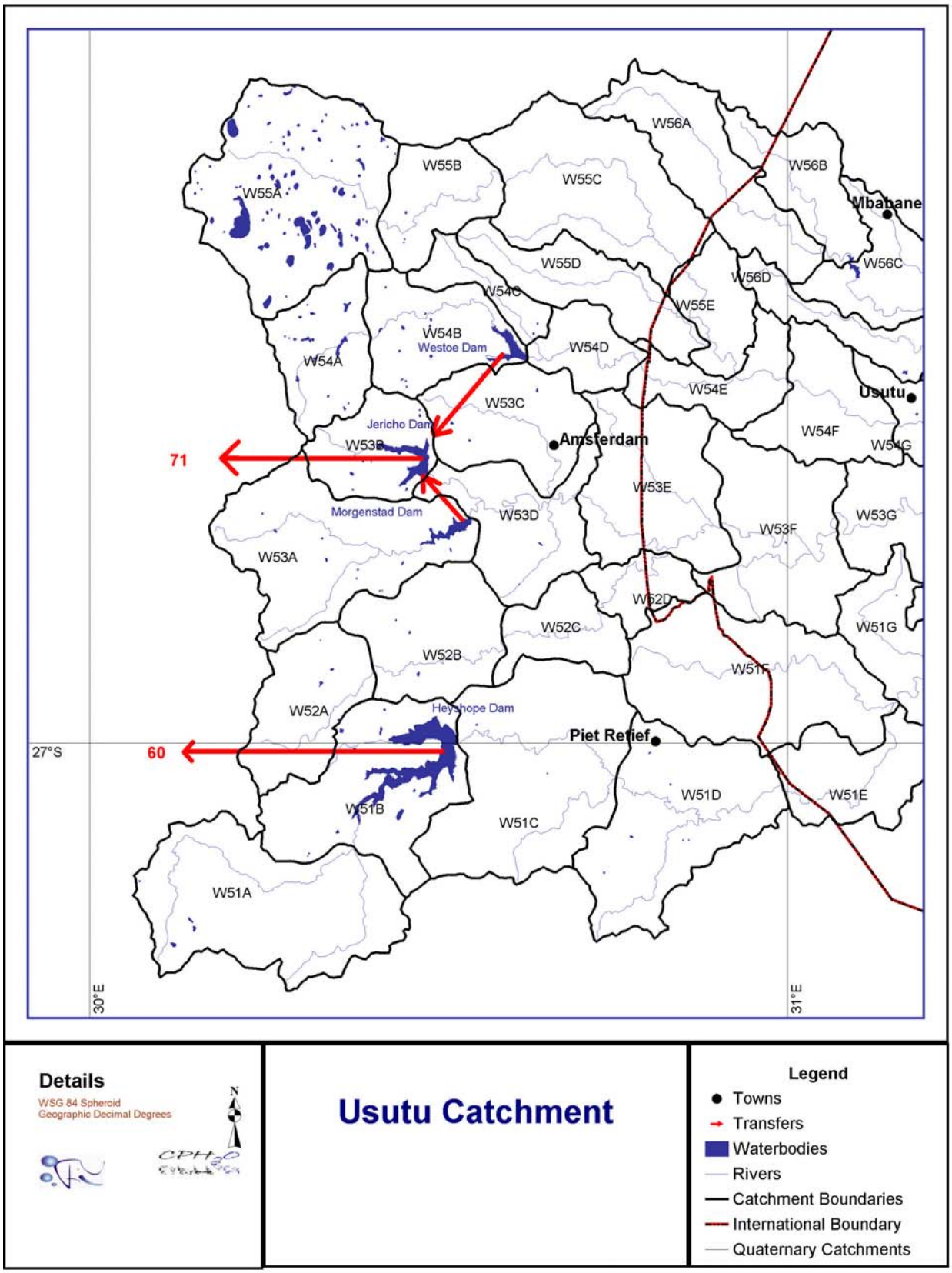

Figure 2.8: Usutu Catchment

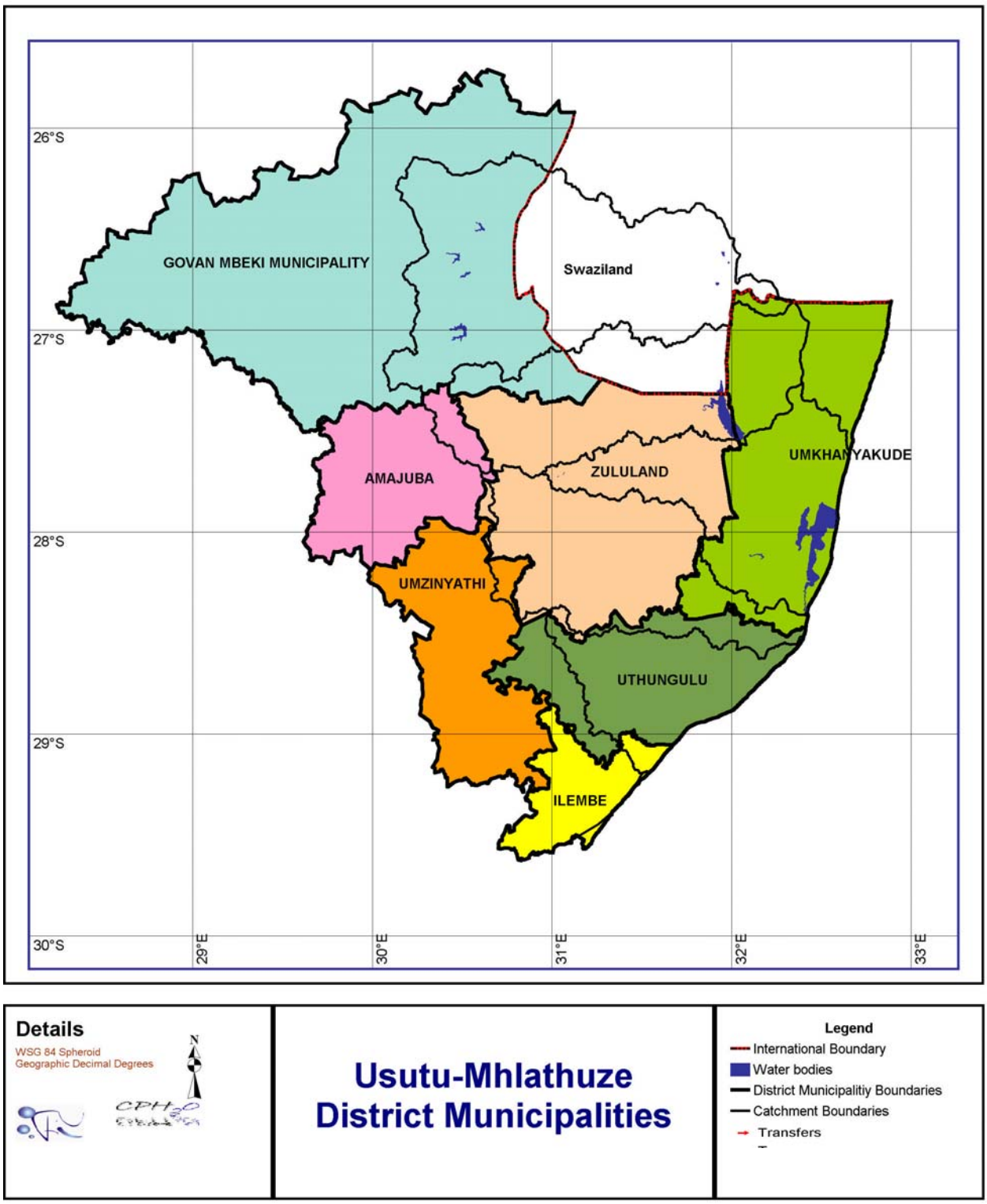

Figure 2.9: District Municipalities

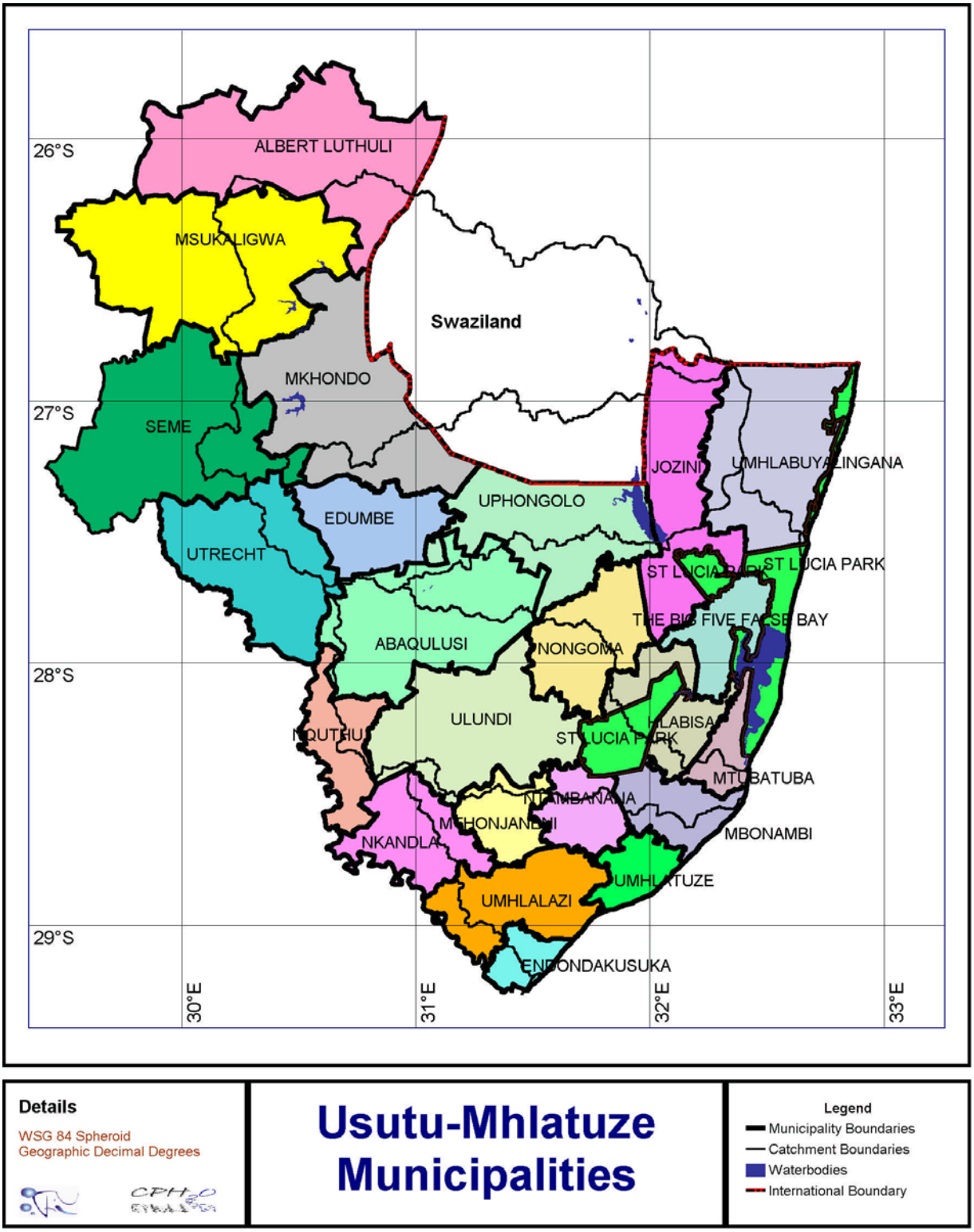

Figure 2.10: Local Municipalities

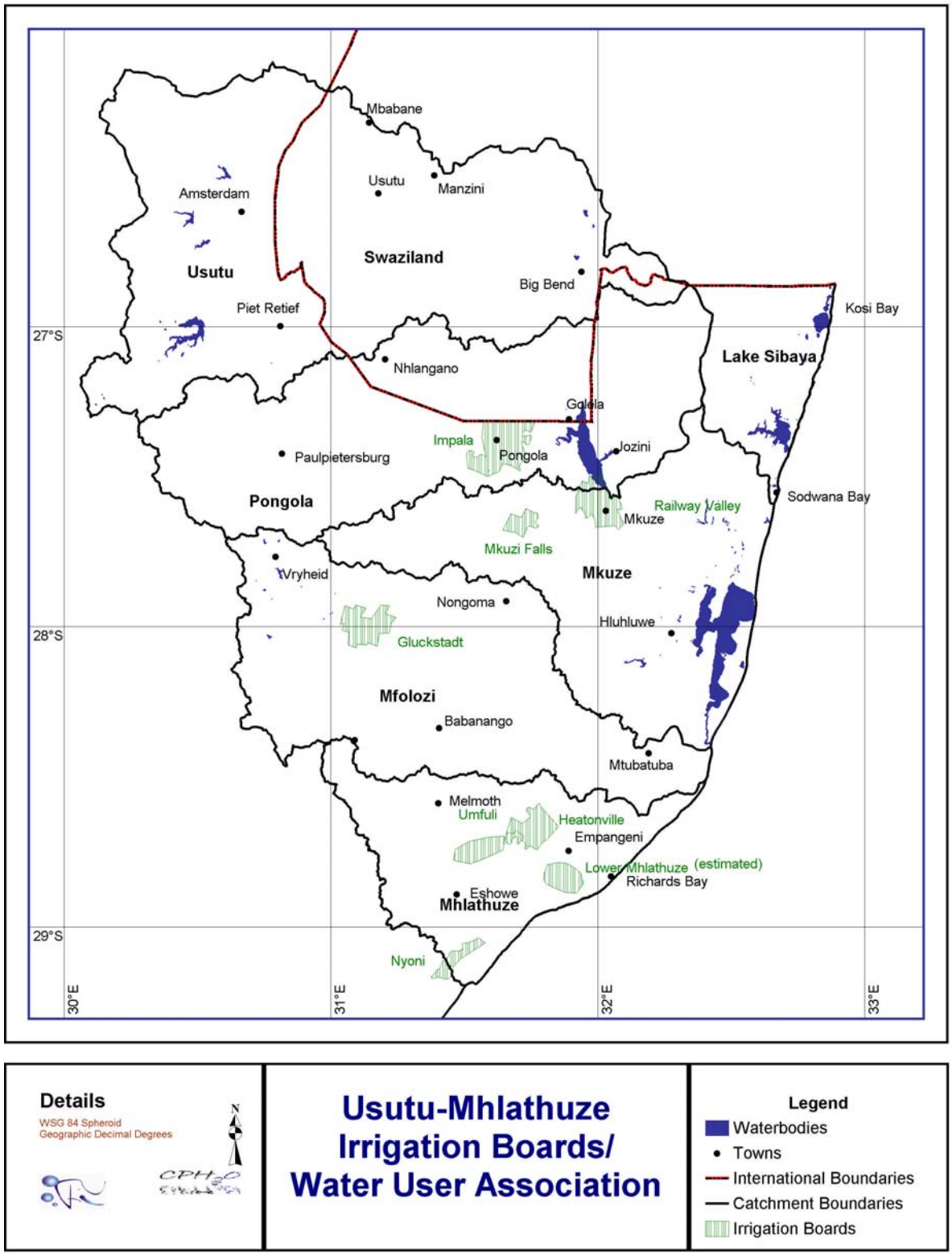

Figure 2.11: Irrigation Boards (and Water User Associations)

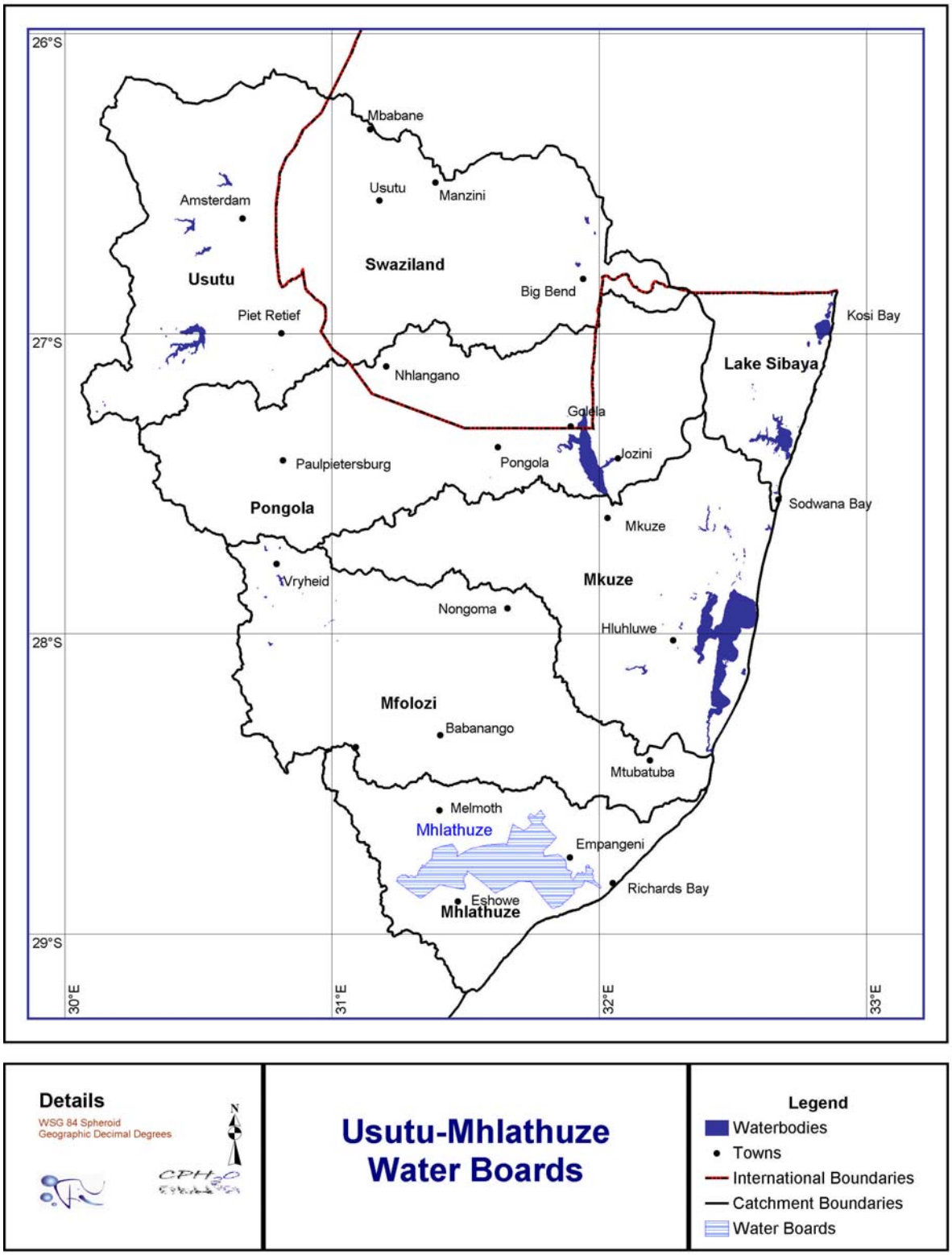

Figure 2.12: Water Boards

3. GROUNDWATER

3.1 SITUATION ASSESSMENT

The western or inland portion of the WMA and its limited portion south of the southern end of the Zululand Coastal Plain at Mtunzini, that involves the catchments of the smaller Mlalalazi and Matikulu Rivers, comprises 'hard rock' secondary porosity aquifers of the 'weathered and fractured' and 'fractured' classes. Faults, joints, and intrusive Karoo dolerite sheet and dyke contacts particularly in the Karoo sedimentary and volcanic rocks, in the regional 'hard-rocks', are zones of significant groundwater presence. Of the 'hard-rocks', the deeply weathered granite and granite-gneiss rocks, and the rocks of the Vryheid Formation, as well as those of the Natal Group in the southern portion of the region, are best groundwater aquifers generally, the Dwyka Tillite Formation, where present, being the poorest.

By contrast, the aquifers of the Zululand Coastal Plain portion of the WMA are of the primary porosity or intergranular type. The Cretaceous siltstones which underlie the coastal plain at depth are an extremely poor groundwater aquifer, such minimal groundwater as may be found to occur therein also being generally highly saline.

Two primary porosity aquifers (not a single one), underlie portions of the coastal plain. Immediately overlying the Cretaceous sediments, but subject to variable thickness and erratic areal distribution, are the karst-weathered shelly coquina and calcarenites of the Mio-Pliocene age Uloa and Umkwelane Formations, which constitute the 'deep' coastal plain aquifer, which generally occurs at a depth of about 30 to 40m below levels over the coastal plain. Where present, the sandy lower portion of the overlying Kosi Bay Formation can contribute materially to this aquifer. By contrast, the 'shallow' coastal plain aquifer comprises a saturated fine sand at the base of the surficial Kwambonambi Formation, that occurs at 1 to 6m depth below ground levels, which is perched on the surface of the much less permeable and more clayey Kosi Bay and Port Durnford Formations, the latter where this ordinarily deeply occurring formation occurs at shallow depth. This shallow aquifer is of extensive occurrence over the higher rainfall (800mm+) eastern and southern portions of the coastal plain where seepage from it is the source of the numerous lakes, pans, streams and shallow peat swamps which characterise the surface of the coastal plain here. It is not present over the western drier portions of the coastal plain. The nature of the hydraulic continuity between the 'deep' and 'shallow' aquifers is uncertain.

In the hard rock western portion of the WMA, groundwater abstraction is entirely by 60 to 120m deep 'normal' rotary-percussion drilled 'hard-rock' boreholes in the secondary porosity aquifers that are present here. Springs and seepages, although their flows are very markedly seasonally affected are extensively exploited as a domestic water supply source in the rural residential and agricultural 'hard rock' portion of the WMA. On the Zululand Coastal Plain, the deep aquifer is exploited by appropriately installed fully cased and basally screened boreholes, while the shallow aquifer is exploited by the local population as a source of domestic water supply by shallow unlined open wells, shallow concrete ring-supported open wells, and more recently shallow hand

pump-equipped screened tube wells, the latter two forms of well being installed by relevant Governmental authorities. A very few deep (20 to 25m) screen-well boreholes have been installed in a few places within the southern portion of the WMA to exploit the primary porosity aquifer present in the near-coastal portions of the WMA here that is represented by sandy alluvium beneath the beds of the larger rivers.

Groundwater yields from 'hard rock' boreholes in the WMA are generally low and ordinarily in the range 0,15 to 0,65 l/s, although higher yields in the order of 2,5 l/s and can be obtained from boreholes located in hydrogeologically favourable situations. Median depth to the water table in the western 'hard rock' portion of the WMA is about 20m. Yields from cased and screened boreholes installed into the 'deep aquifer' of the Zululand Coastal Plain, where it is present, are generally high, and in the order of 15 to 25 l/s, the aquifer having also high storativity and transmissivity values. By contrast, yields from the 'shallow aquifer' on the coastal plain are generally low and generally in the order of 0,3 l/s, due to the low transmissivity of the fine sand that comprises this aquifer. Occasionally, higher yields are obtained. Deep large-diameter screen-well boreholes installed into sandy alluvium in the lower coastal portions of rivers in the south of the WMA can have high yields depending on the sand size of the alluvium involved and thus its transmissivity. Such screen-well boreholes installed into coarse and medium grain-sized sand in such situations can have yields of up to about 25 l/s, and even more in some situations.

Groundwater quality in the WMA is variable, it being best in its higher rainfall portions and poorest in its lower rainfall portions, as in the major river basins of its interior and in the 'rain shadow' or 'Lowveld' area immediately inland of the Lebombo range. In the higher rainfall portions of the WMA the groundwater generally has a TDS of 200 mg/l or less. In the lower rainfall portions, however, as in the Lebombo 'Lowveld' underlain as it is by the Letaba Basalt and Vryheid Formations to the south, TDS are much higher and generally in the order of 1000mg/l, it being even much higher locally in places (up to 1500mg/l). The quality of the groundwater in both the 'deep' and 'shallow' aquifers of the Zululand Coastal Plain is generally very good, with a TDS value of 200mg/l or less. On account of its shallowness and the ease of infiltration thereto by rainfall and other sources, the 'shallow' aquifer is very susceptible to pollution. However, except possibly locally in portions of the industrial areas of Richards Bay, the possible sources and extent of any such pollution is of negligible proportions. This situation is also prevalent in the western 'hard rock' portion of the WMA. Saline intrusion by seawater of the very few screen-wells located in the sandy alluvium of the coastal river beds in the southern portion of the region similarly does not present any problem.

Groundwater recharge over the main 'hard rock' portion of the WMA averages about 2,5 per cent of mean annual rainfall (MAR) it varying from 5 to 10 per cent of MAR in the higher rainfall portions underlain by deeply weathered granite and granite-gneiss to less than 1 per cent in the low rainfall portions that are underlain by Karoo sediments or volcanic rocks. In the Zululand Coastal Plain portion of the WMA recharge varies in the range 5 to 15 per cent of MAR, there being a marked gradient over the width of the plain from about 15 per cent in the high rainfall coastal portion of the plain to about 5 per cent on its much drier inland margin. The relatively high average recharge value of 10 per cent of MAR of the

coastal plain is entirely due to the high rainfall infiltration rate and permeability of the very sandy surface soil of the Kwambonambi Formation which covers much of the plain. Over the western 'hard rock' portion of the WMA where rainfall averages some 900 mm annually, average annual groundwater recharge is thus in the order of 22 500 m³/km², while on the Zululand Coastal Plain, where rainfall also averages some 900 mm annually, it is in the order of 90 000 m³/km² on average.

The available data from the Water Use Allocation and Registration Management System (WARMS) indicates a groundwater use of only 5,0 million m³/annum in the whole WMA. Other available information indicates that existing groundwater usage in the western 'hard rock' portion of the WMA is an estimated 2 per cent of average annual recharge, it varying in the range 0,25 to 5 per cent thereof. In the Zululand Coastal Plain portion of the WMA, annual groundwater usage has been estimated to be about 3,5 million m³/annum. This amount represents only about 0,6 per cent of the average annual groundwater recharge by rainfall over the area as a whole. Thus existing groundwater usage in the WMA is very low in terms of the sustainably available resource.

In stark contrast to the WARMS groundwater use figure of 5,0 million m³/annum is the estimate of 39 million m³/annum of the NWRS. While it is clear that groundwater users have not registered all their water use (and bearing in mind that Schedule 1 users do not have to) it appears to be unrealistically low when compared with the NWRS groundwater use estimates. For the purposes of this ISP report the NWRS figures have been accepted as correct. The large difference between these estimates highlights the need for better information and monitoring of groundwater use. The actual use from groundwater probably lies somewhere between these estimates.

In the western 'hard rock' portion of the area, groundwater is used almost exclusively for domestic usage in the very extensive rural agricultural and pastoral portion of this area, although some groundwater is used for the same domestic purpose in the very limited urban portions of the region in question. In the Zululand Coastal Plain portion of the WMA groundwater is used for domestic, agricultural and industrial purposes.

3.2 CONCLUSION

From the foregoing it is evident that the current exploitation of the groundwater resource available in the WMA is at a very low level in terms of its sustainable potential. This potential can undoubtedly most usefully and effectively be exploited in the provision of domestic water supply to the relatively sparsely inhabited rural residential and minor urban portions of the WMA, where the nature of the groundwater aquifers is generally appropriate for this type of small quantity water supply, with no long-term depletion of the sustainable groundwater resource occurring as a result thereof. This includes the higher rainfall eastern portion of the Zululand Coastal Plain part of the WMA where 'deep' aquifer borehole-sourced groundwater can be used for reticulated domestic water supply in areas of denser population, and where the 'shallow' aquifer can be exploited by tube wells at points of individual habitation in the low density population, truly rural portions of the area. The utilisation of the groundwater resource for this purpose, unlike what has been attempted on a

very limited basis unsuccessfully in the past, has to be on an operationally continuously sustainable basis. This can now, in terms of recent legislation, be most satisfactorily achieved by the involvement in this situation of the relevant Local Authorities, the involvement of local communities in the decision-making relating thereto also being imperative. Except very locally where the most favourable hydrogeological conditions occur and boreholes or screen-wells are scientifically sited and appropriately constructed and installed, groundwater yields in the WMA are usually inadequate to sustain agricultural and industrial usage on any large-scale basis.

A detailed background document of groundwater is attached as **Appendix G.**

4. STRATEGIC WATER RESOURCES/WATER QUALITY PERSPECTIVE OF THE WMA

4.1 INTRODUCTION

This chapter documents the details of the water resources, water requirements and water quality of the catchment as obtained through this ISP process. These are broadly the same as those of the NWRS, but where deviations from the NWRS are recommended, these are carefully motivated and will be incorporated into updates of the NWRS at some stage in the future. From this the key issues are identified and broad strategies developed to address these issues. Detailed strategies are attached in **Part B** of this report.

The estimates of the water availability and water requirements that are available in the Usutu to Mhlathuze WMA are based mostly on the NWRS. Analyses were however carried out using the Rapid Simulation Model[11] and where major discrepancies with the NWRS were found, revisions to the NWRS are motivated. In the case of the Mhlathuze catchment, a comprehensive water resources study has recently been completed and the results from this study are used in this ISP rather than those of the NWRS.

4.2 MANAGEMENT OBJECTIVES

There are a number of generic objectives relating to the management of the water resources of the Usutu to Mhlathuze WMA. These are:

- Effective and sustainable use and management of the water resources in the catchment, which recognises International requirements, the ecological Reserve and the value of water as an asset for economic and socio-economic benefit.

- Equitable allocation of the available water resources to encourage the development of the rural economy to contribute to poverty eradication.

- To make more efficient use of the existing available water resources by all water user sectors. This will enable the CMA to free up additional water, which can be put to beneficial use.

- Achieving water quality that is fit for its intended purpose, with the negative externalities being borne by the responsible institutions (polluter pays principle) and maintaining aquatic ecosystem health on a sustainable basis.

- To ensure availability of reliable data and information on all aspects of integrated water resources management and potential development in the catchment.

In many cases there are more detailed objectives relating to specific issues or problems. These are provided in the strategies attached as **Part B**.

4.3 METHODOLOGY

As mentioned in Chapter 1, the NWRS will soon be published, making details on the water use and availability in the whole of South Africa available to the public. It is important therefore that this ISP should not contradict the NWRS. Nevertheless, the NWRS was based on reconnaissance level evaluations of the water availability and use while through more intensive investigations, some additional information has come to light in the course of this ISP project. Where this new information differs significantly from the NWRS, it is carefully motivated in this report with the intention that it will be used to update the NWRS in due course.

The methodologies used to present the water availability, water use and yield balance in this ISP are essentially the same as in the NWRS. While these are well documented in the WMA report[5], some of the more important points are highlighted here for convenience.

Afforestation, dryland sugarcane and invasive alien plants all reduce the natural runoff from a catchment through increased rainfall interception and increased transpiration and hence decrease the yield available in the catchment. However, from a legal and economic point of view, afforestation, dryland sugar cane and invasive alien plants are different and need to be treated differently from a water resources perspective.

- Afforestation is a declared streamflow reduction activity (SFRA) and hence subject to control by DWAF. The estimated impact of afforestation on available yield is therefore listed as a water use.
- Dryland sugarcane is not an SFRA although steps are being taken to declare it as such. Until such time, and for the purposes of this report (and the NWRS), it is incorporated into the water resource and reflected as a reduction in yield rather than a water use.
- Invasive alien plants are dealt with in the same way as dryland sugarcane. The difference is that DWAF is actively trying to reduce this impact through the Working for Water programme while dryland sugar is a legal activity with large economic benefits. The impact of dryland sugar cane on the yield is unlikely to change, therefore, while that of the removal of invasive alien plants represents a possible opportunity to make more utilisable water available for productive use.

Water for the ecological Reserve is water that must remain in the river and may not be abstracted. This is expressed as an estimated reduction in available yield and shown as part of the resource. The total resource available under natural conditions has been estimated and the utilisable resource reduced by the impact that the ecological Reserve has on this resource.

The categories used to define water use are the same as those used in the NWRS. Urban use in this context includes domestic and industrial use within the urban area. Large industries which have their own source of water are listed under *mining and bulk*. Rural use includes domestic use in small settlements and farms as well as stock watering.

4.4 THE MTUNZINI AND MATIKULU CATCHMENTS (W11 & W13)

4.4.1 Introduction

The NWRS includes the W11 and W13 catchments in the Mhlathuze sub-area. This has led to some confusion since a detailed water resources analysis has recently been completed for the Mhlathuze catchment[8] (in this case the W12 catchment) with the result that comparisons are unwittingly made between the NWRS figures for the Mhlathuze sub-area and the detailed study. These results are not comparable since they do not cover the same catchments. To overcome this problem, this ISP report has considered the W11 and W13 catchments separately.

The other motivation for considering these catchments separately, is that the Mhlathuze catchment (W12) is highly developed and regulated and very different to the W11 and W13 catchments which are under-developed and largely unregulated.

There are two towns in the catchment, Eshowe and Mtunzini. Eshowe is supplied from Goedertrouw Dam, situated in the neighbouring Mhlathuze catchment, while Mtunzini is supplied from groundwater, with limited reliability.

4.4.2 Water availability

No recent water resources analyses have been done for the W11 and W13 catchments. The results quoted here are based on analyses carried out as part of this ISP project. The total surface water resource of the W11 and W13 catchments is estimated to be 59 million m^3/annum. This includes run-of-river and the yield of farm dams in the catchment. There are no major dams or government water schemes in this area but there are a few significant farm dams, which contribute half of the water resources of the area.

Return flows and transfers into the catchment also contribute to the available yield. These are shown in **Table 4.1**. The transfers into the catchment are for the town of Eshowe and are sourced from the Goedertrouw Dam.

The ecological requirements have been estimated to be 36 million m^3/annum for the W11 and W13 catchments. The impact of this requirement on the yield available under natural condition is estimated to be in the order of 8 million m^3/annum.

The contribution of groundwater to the water resource is estimated at 1 million m^3/annum.

Table 4.1: Water availability in the Mtunzini and Matikulu catchments (at 1:50 year assurance)

Resource category	Available/impact (million m³/annum)
Gross surface water resource	59
Subtract:	
- Ecological Reserve	8
- Invasive alien plants	2
- Dryland sugarcane	4
Net surface water resource	45
Groundwater	1
Return flows	3
Total local yield	**49**
Transfer In	3
Grand Total	**52**

4.4.3 Water Use

The major water users in the W11 and W13 catchment are the irrigation sector with smaller amounts used by the urban and rural sectors. There is also a small industrial use which is the water use by the aMatikulu sugar mill situated in this area. The impact of afforestation on the catchment is small.

The small towns of Eshowe and Mtunzini are situated in this area.

Table 4.2 lists all the known current (year 2000) water uses in the W11 and W13 catchment.

Table 4.2: Major water users/requirements in the Mtunzini and Matikulu catchments (at 1:50 year assurance)

User sector	Water requirement/ Impact on yield (million m³/annum)
Irrigation	10
Urban	3
Rural	4
Industrial (sugar mill)	2
Afforestation	1
Total local requirements	**20**
Transfer out	0
Grand total	**20**

4.4.4 Reconciliation of requirements and available water

A reconciliation of the available water resource and the water requirements is given in **Table 4.3.** A number of assumptions were made in this reconciliation, the most crucial of which is the source of water supply to the various users in the area. For example, it was stated that the farm dams in this area make a significant contribution to the yield, but it is not known which users, if any, actually make use of this water. The assumption that has been made is that irrigators are using the farm dams to irrigate their crops, since this is usually the case. It has been assumed that rural users make use of groundwater as a first priority supply, thereafter run-of-river and farms dams.

Table 4.3: Reconciliation of the water requirement and the water resource in the Mtunzini and Matikulu catchments (all units are million m³/annum)

Available Water	Local yield	49
	Transfer In	3
	Total	52
Water requirements	Local requirements	20
	Transfers out	0
	Total	20
Balance		**32**
Surplus in farm dams		**16**
Surplus available for allocation		**16**

Based on the figures shown in **Table 4.3** it would appear as if there is a substantial surplus in the catchment. However, the surface water resource consists of both run-of-river yield and the yield of farm dams in the catchment. The W11C and W13A catchments contain some significant farm dams which, based on the assumptions made for this ISP (relating to the size of the catchments of the dams which have not been determined accurately), have a yield of 26 million m³/annum. Assuming that this yield is only available for irrigation, there could still be an estimated 16 million m³/annum available in these farm dams.

It is debatable, however, as to whether or not surplus water in privately owned dams could be allocated to the other users. The surplus from other sources is estimated at 16 million m³/annum and this would be available for allocation, as indicated in **Table 4.3.**

Based on the above assumptions, it can be concluded that there is a significant allocable surplus available within the catchment (16 million m³/annum) but with possible surpluses currently locked up in farm dams (a further 16 million m³/annum), which appear to be under-utilised. If this water could be made available it would radically impact on the catchment water balance and the volume of available water. This requires urgent investigation and forms an important part of the Water Allocation Strategy suggested for this catchment area (see **Strategy 1.1 in Part B2**).

Significant areas within these catchments (approximately 29,6%) are communally held. An analysis of water allocation by sector (see Chapter 6)

suggests that only a small percentage of the water resource is actually used by the communal sector, most of this being through the cultivation of dryland sugarcane. This inequitable distribution in the use of water suggests that future allocations should be aimed first at meeting community needs. Opportunities for additional dryland sugarcane and development forestry, and for irrigation on communal land should be evaluated as a matter of priority so that applications for additional water use can be processed.

4.4.5 Water Quality

There are currently few water quality problems in this area, but the potential for water quality problems developing in future exists, and the situation must be monitored to ensure that this does not happen. Probably the biggest threat to water quality is the increased utilisation of the water resource. This will result in decreased river flows and hence increased concentrations of pollutants. Increased sedimentation is also recognised as a threat.

Effluent from the aMatikulu sugar mill was noted as a specific water quality issue. This effluent is disposed of by irrigating pastures and while this has as yet not caused any noticable water quality problem, the situation should be monitored.

Potential for water quality problems are the prawn farming in the estuaries of both the Mtunzini and the Matikulu rivers, sand mining for heavy metals, increased sediment loads due to the increased agricultural development, and possible impacts of increased dryland sugarcane.

4.4.6 Future scenarios

The water requirements in the catchment are unlikely to grow significantly without direct political intervention, for example, through promoting the use of surplus water for poverty eradication or supply to the Mhlathuze catchment from future possible infrastructure development.

While the water quality in this catchment is currently good, the potential for it to deteriorate in future is high due to pressures for development.

4.4.7 Summary, key issues and broad strategy

These two small coastal catchments are characterised by high rainfall, large areas of dry-land sugar cane (357 km^2), and limited amounts of irrigation (13 km^2) and afforestation (59 km^2). Other than a few significant farm dams, there is no other water resources development in this catchment. There are two towns in the catchment, Eshowe and Mtunzini. Eshowe is supplied from Goedertrouw Dam, situated in the neighbouring Mhlathuze catchment, while Mtunzini is supplied from groundwater, with limited reliability. Due to the high rainfall and limited water use it is not surprising to find surplus yield available in the catchment from run-of-river and farms dams. This surplus could be used for:

- Community garden projects
- More dryland sugarcane
- More afforestation
- Other productive uses.

There is potential for new dams in this catchment and these could be a possible source of supply to the Mhlathuze catchment (for industrial or urban use) or for use within the catchment for poverty eradication.

There are no major water quality problems in this catchment.

The strategy for this catchment is to allow the allocation of the identified surplus water in this catchment, following verification through more detailed water resources analyses. Priority is to be given to poverty eradication schemes. This area should be included with the Mhlathuze catchment as part of the compulsory licencing exercise and possible dam sites investigated for augmenting the supply to Mhlathuze and/or redressing of inequaties.

4.5 THE MHLATHUZE CATCHMENT (W12)

4.5.1 Introduction

The Mhlathuze catchment is by far the most developed in the Usutu to Mhlathuze WMA. The towns of Richards Bay and Empangeni are situated in this catchment and obtain their water from Mhlathuze Water who abstract their water supplies from the Mhlathuze Weir, situated on the lower Mhlathuze River (see **Figure 2.3)**. Abstractions at this point are supplemented by releases from the Goedertrouw Dam which in turn is supplemented by transfers from the Thukela River. Richards Bay and Richards Bay Minerals (RBM) also make use of water from a number of natural lakes in the vicinity of Richards Bay. RBM also transfers about 18 million m^3/annum from the Mfolozi catchment. The town of Melmoth obtain its water from local surface resources. It is assumed that diffuse rural use is sourced from groundwater and local surface water.

4.5.2 Water availability

The water resources of the Mhlathuze catchment is complex since it consists of numerous inter-related components, namely, a large dam (Goedertrouw), transfers in from the Thukela and Mfolozi Rivers, natural lakes and run-of-river abstractions. The yield of the Mhlathuze system was determined during a recent detailed water resources study[8] taking into account the complexity of the operating rules of the catchment. For the purposes of the NWRS as well as this ISP report, it is necessary to simplify the picture in order to produce an easy to comprehend water balance. The total yield of the Mhlathuze system (excluding groundwater) is given in this ISP as 247 million m^3/annum which relates approximately to the 1:50 year yield of the Mhlathuze system. The reader is referred to the report **Mhlathuze Operating Rules and Future Phasing** [8] for more detail, and specifically **Figure D5** of this report (attached as **Appendix E**). **Table 4.4** gives an indication of the contribution of the various sources to the system yield.

Return flows, included in the yield quoted in **Table 4.4**, contribute to the available resource. These are estimated to be as follows:

Irrigation return flows:	7 million m³/annum
Urban return flows:	3 million m³/annum
Industrial/mining return flows:	0 million m³/annum
Total	**10 million m³/annum**

Note that while there are substantial return flows from the industrial and mining sector, it is not economically viable to reuse these effluents because of their poor quality and they are discharged to the sea.

Table 4.4: Breakdown of the Mhlathuze system yield into its various components

Source	Estimated contribution to the system yield (million m³/annum)
Transfers from the Thukela	62(1)
Transfers from the Mfolozi	18
Yield of the natural lakes	50
Return flow	10
Goedertrouw dam plus run-of-river yield at the Mhlathuze weir	107
Total (Surface water)	247
Groundwater	11
Total (all sources)	**258**

Notes
1. While the volume of water that can be transferred from the Thukela River is 34 million m³/annum, the impact of this transfer on the system yield is estimated at 62 million m³/annum(8). This is because the transfers, together with the Goedertrouw Dam, only supplement the supply, the priority source of which is run-of-river out of the Mhlathuze River. This allows users in the Mhlathuze to target much higher abstractions than would otherwise be the case, in the knowledge that the transfers from the Thukela River will supply their needs during periods of low flows.
2. The yield quoted above includes an allowance for the Reserve, invasive alien plants and dryland sugarcane.

The groundwater use within the Mhlathuze sub-area is given in the WMA report(5) as 12 m³/annum and it is estimated that of this, 11 million m³/annum is within the Mhlathuze (W12) catchment, the other 1 million m³/annum being in the W11 & W13 catchments. It is assumed that this is used mostly to supply rural requirements. According to the WARMS database, the registered groundwater use within the Mhlathuze (W12) catchment is only 0,7 million m³/annum. This is listed as use for irrigation. It appears therefore that the rural water use supplied from groundwater has not been registered, but this could also be because it is mostly schedule 1 use, which does not need to be registered. The figure of 11-million m³/annum groundwater supply has been used in this ISP report to be consistent with the NWRS, but will need to be verified in follow-up studies. There is potential for increased groundwater use but it is not clear how this will impact on the surface water resource. It appears as if the natural lakes in the area are fed by groundwater so any groundwater use in the proximity of the lakes will not add to the available resource.

The reduction in runoff due to dryland sugarcane is estimated to be 19 million m^3/annum while the impact of this on the available yield is estimated to be only 4 million m^3/annum. The reason for the low impact of dryland sugarcane is that most of the dryland sugarcane is along the coast where it uses water which does not affect available yield.

In the past there was a lot of uncertainty regarding the impact of invasive alien plants on the available yield and this has not yet been fully resolved. The figures quoted in this ISP report have mostly been sourced from the WRSA studies but it is important to note that these are preliminary estimates based on some very broad assumptions. In the case of the Mhlathuze catchment, however, a detailed investigation was carried out as part of a WC&DM study of the catchment[6] and the figure of 7 million m^3/annum quoted is considered to be the best available. By comparison, the WRSA study quotes a figure of 30 million m^3/annum while the report by Le Maitre et al[10] quotes a figure on 90 million m^3/annum. The figures quoted in this ISP report on the impacts of invasive alien plants on available yield therefore need to be treated with some caution. Refer also to **Strategy 2.2 in Part B2.**

A Reserve determination has been carried out in the lower reaches of the Mhlathuze catchment and the impact of the ecological Reserve on the system yield is estimated to be 16 million m^3/annum[8]. Although a participatory and 'comprehensive' Reserve determination was carried out, this Reserve determination is still only considered to be a 'Preliminary Reserve' estimate because the river classification methodology was not finalised at the time of carrying out the Reserve determination.

Table 4.5 summarises the available resource in the Mhlathuze catchment. In order to provide an easy comparison with the NWRS figures, the W11&W13 figures are included in the table below (the NWRS included these areas in the Mhlathuze sub-area).

The difference between the water availability in the Mhlathuze sub-area (which includes the W11and W13 catchments) according to this ISP and the NWRS are motivated as follows:

- The impact of invasive alien plants on the Mhlathuze catchment has been determined by means of a detailed analysis[6] and due to the large discrepancy with previous estimates, this more accurate estimate has been accepted for the purposes of this report.
- The surface water resources for the Mhlathuze sub-area has been determined through a detailed study of the water resources of the Mhlathuze catchment[8] and secondly through a reconnaissance level analysis of the W11 and W13 catchments carried out as part of this ISP study. These estimates are an improvement on the NWRS estimates.

Transfers into the Mhlathuze sub-area are given in the NWRS as annual volumes and not as impact on the yield of the catchment. The transfer from the Thukela River has a much larger impact on the yield than indicated in the NWRS. This impact of 62 million m^3/annum was determined through detailed systems analyses[8] while the WMA report quotes a figure of 40 million m^3/annum.

Together with the transfer of 18 million m^3/annum from the Mfolozi catchment, the total transfer into the Mhlathuze catchment is 80 million m^3/annum.

Table 4.5: Water availability in the Mhlathuze River Catchment

Resource category	Available/impact (million m^3/annum)			
	Mhlathuze	W11&W13	ISP Total	NWRS (Mhlathuze sub-area)
Gross surface water resource	171	59	230	236
Subtract:				
- Ecological Reserve	23	8	31	31
- Invasive alien plants	7	2	9	41
- Dryland sugarcane	4	4	8	8
Net surface water resource	157	45	202	156
Groundwater	11	1	12	12
Return flows	10	1	11	11
Total local yield	**178**	**49**	**227**	**179**
Transfer In	80	3	80*	58
Grand Total	**258**	**52**	**307**	**237**

*The total transfer in refers only to transfers into the catchment and is not necessarily the sum of all the transfers. The 3 million m^3/annum to Eshowe is within the catchment.

4.5.3 Water requirements

The estimated current water use in the Mhlathuze catchment is listed in **Table 4.6.** The major water users in the catchment are the irrigation and mining/industrial sectors, making up an estimated 50% and 23% of the total water use in this catchment respectively.

The water requirements of the Mhlathuze sub-area, as published in the WMA report[5] and the NWRS were accepted for this ISP report. They have however been disaggregated into the Mhlathuze and W11&W13 catchments as shown in **Table 4.6.** However, this water use is considerably less than the water which has been allocated within the catchment, as shown in **Table 4.7**. This in itself would not be problem, except that subsequent to making these large allocations, updated hydrology and yield estimates put the available resource at considerably less than the allocated resource. For this reason, the Mhlathuze catchment has been targeted for compulsory licencing to reduce the allocations to within the supply capability of the available resource.

The actual water use in the Mhlathuze catchment, as indicated in **Table 4.6,** is fortunately considerably less than the allocated amount. The reason for this is that irrigators do not make full use of their allocation. This is discussed in more detail in **section 4.5.4**.

Table 4.6: Major water users/requirements by sector in the Mhlathuze River catchment (at 1:50 year assurance)

User Sector	Available/impact (million m³/annum)			
	Mhlathuze	W11&W13	ISP Total	NWRS (Mhlathuze sub-area)
Irrigation	84	10	94	94
Urban	25	3	28	28
Rural	4	4	8	8
Industrial	84	2	86	86
Afforestation	18	1	19	19
Total local requirement	**215**	**20**	**235**	**235**
Transfers out	3	0	0	0
Grand Total	**218**	**20**	**235**	**235**

Table 4.7: Water allocations in the Mhlathuze catchment

Consumer	Water source	Allocation (million m³/annum)
Richards Bay (domestic)	Lake Msingazi Mhlathuze system	16.4 8.5
Eshowe (domestic)	Mhlathuze system	0.4
Esikhaweni (domestic)	Lake Cubhu Mhlathuze system	3.4 5.8
Nseleni (domestic)	Mhlathuze system	1.9
Vulindlela (domestic)	Lake Mangeza Mhlathuze system	0.2 1.3
Empangeni & Ngwelezane (domestic)	Lake Nsezi and Mhlathuze system	4.4 1.4
Mtunzini (domestic)	Mtuze River	0
Melmoth (domestic)	Mfule River (tributary of the Mhlathuze)	0
Richards Bay Minerals	Lake Nhlabane and Mfolozi River Mhlathuze system	40.2 15.0
Alusaf	Lake Mzingazi	2.3
Mondi Richards Bay	Mhlathuze system	28.5
Mondi Felixton	Mhlathuze system	1.8
Tongaat Hulett	Mhlathuze system	1.8
Irrigation	Mhlathuze system	187
Rural communities	Uncertain	3*
Afforestation	Mhlathuze system	18
TOTAL		**340.3**

Source: Derived from Strategic Environmental Assessment for Water: Usutu to Mhlathuze Water Management Area [16]

The reduction in runoff due to afforestation is estimated to be 37 million m^3/annum while the impacts of this on the available yield is estimated to be 18 million m^3/annum [6].

4.5.4 Reconciliation of requirements and availability

The reconciliation of the available water resource and the water requirements has been done on the basis of, firstly, actual water use (**Table 4.8**), and secondly on the basis of the allocated resource (**Table 4.9**).

Table 4.8: Reconciliation of the water use and the water resource in the Mhlathuze catchment (all units are million m^3/annum)

		Mhlathuze Catchment	W11&W13 Catchment	ISP Total	NWRS Mhlathuze Sub-area
Available Water	Local yield	178	49	227	179
	Transfer In	80	3	80	58
	Total	258	52	307	237
Water requirements	Local requirements	215	17	232	232
	Transfers out	3	0	0	0
	Total	218	17	232	232
Balance		**40**	**35**	**75**	**5**

Table 4.9: Reconciliation of water allocations and the water resource in the Mhlathuze catchment (all units are million m^3/annum)

		Mhlathuze Catchment	W11&W13 Catchment	ISP Total
Available Water	Local yield	178	49	227
	Transfer In	80	3	80
	Total	258	52	307
Water allocations	Water allocations	340	17	357
	Transfers out	0	0	0
	Total	340	17	357
Balance		**(82)**	**35**	**(50)**

Based on current actual water use there is surplus water available in the Mhlathuze catchment (see **Table 4.5**). This ISP study estimates this surplus to be 40 million m^3/annum which corresponds well with the conclusion of the recent detailed water resources study[8] (see **Appendix F).** However, based on the allocations made from the system, there is a large deficit, estimated at 82 million m^3/annum. The reason for the large difference between the allocated amount and the actual use is that irrigators do not use their full allocations. The reason for this is that during normal and wet years, irrigators do not need their full quota because the rainfall is more than adequate even for dryland sugarcane in most areas of the catchment. During drought years, however, when irrigators would like to apply their full quota, restrictions are applied and irrigators only receive 50% of their allocation. Irrigators are unwilling to have their allocations reduced

because the higher the allocation, the larger the volume of water remaining after restrictions have been applied. A pricing policy on which farmers are obliged to pay for their full allocations, irrespective of volume used, might change this behaviour. A negotiated mechanism seems appropriate and this is part of the challenge facing the compulsory licencing process which is proposed for the Mhlathuze catchment (see **Strategy 2.1** in **Part 2**).

4.5.5 Water Quality

The surface water quality in the Mhlathuze catchment is generally good, despite the industrial development in and around Richards Bay. The reason for this generally acceptable state of the water quality is that all the effluent (industrial and municipal) originating from Richards Bay is discharged to the sea through a marine outfall pipeline. The water quality problems which do arise are therefore from the much smaller developments in Empangeni and from irrigation in the middle reaches of the catchment.

Current problems are the eutrophication of the coastal lakes (e.g. Lake Nsezi). This is ascribed both to agro-chemicals and to a sewerage works (still under DWAF management) which discharges effluent (indirectly) into this lake. Irrigation return flows from the substantial irrigation activities in the middle reaches of the catchment do certainly reduce the water quality, but this impact has not been assessed. Diffuse pollution from rural settlements are also definitely a problem, as made apparent by the recent Cholera outbreaks, but these are difficult to control. The provision of improved sanitation is reducing this problem.

Perceived future problems are the industrial effluent from Richards Bay, especially that of the Mondi pulp mill. As already mentioned, this effluent is discharged to the sea, but impact on the marine environment could become a problem in future. The mining of dunes for heavy minerals north of Richards Bay represents a pollution threat. This is close to the coast, limiting the threat to surface water but groundwater pollution remains a key concern to water resource managers. The Iscor processing plant and slimes dam within the Mhlathuze flood zone, just seaward of the N2 highway bridge, has raised serious concerns as to its integrity in the event of a major flood event. The Felixton sugar mill is generally considered to be well regulated and managed but does still pose a threat to eutrophication of the Mhlathuze River downstream of the mill.

Sediment loads in the Mhlathuze catchment are generally low, with the poorest quality water being that imported from the Thukela River via the Middeldrift emergency scheme. This results in some sedimentation within the Goedertrouw Dam.

4.5.6 Future scenarios

Current estimates are that water use within the Mhlathuze catchment will remain more or less constant for the next 10 years. However, water requirements in the Mhlathuze catchment are driven largely by industries and mining, the development of which is in turn dictated by the global economy. Sudden and dramatic increases in the water demand are therefore a real possibility. As an example, an application for a water use licence for 32 million m^3/annum has recently been made for the Fairbreeze mine. This water will be supplied by means of a separate transfer scheme, which will abstract up to 47 million

m^3/annum water out of the lower Thukela River (32 million m^3/annum for the mine and the balance for irrigation). This new licence and the water use related to this does not affect the water balance of the Mhlathuze catchment since they balance each other out. For the sake of completeness and clarity, a table showing this future situation is however included (see **Table 4.10**).

Table 4.10: Reconciliation of the water allocations and the water resource in the Mhlathuze sub-area, including the Fairbreeze transfer (all units are million m^3/annum)

Available Water	Local yield	227
	Transfer In	127
	Total	354
Water requirements	Local requirements/ allocations	404
	Transfers out	0
	Total	404
Balance		**(50)**

RBM is prospecting to the south of Richards Bay and is looking at dry mining as an extractive option. The Richards Bay Spatial Development Initiative (SDI) anticipates a doubling in the growth of the industrial/manufacturing complex. This does not necessarily mean a doubling in water demand, with much depending on whether further new wet industries are attracted to the zone. However, the availability of water has done much to attract the growth experienced to date and it is important to understand to what degree the availability of water impacts on future growth.

With the water allocations as they stand there is at present no room for industrial, urban or other expansion, and no water is available for further allocations to the rural areas or for equity schemes, unless there is major new infrastructure development. The reallocation of existing water resources in the Mhlathuze catchment remains a very high priority.

4.5.7 Summary, key issues and broad strategy

The Mhlathuze catchment is the economic hub of the Usutu to Mhlathuze WMA with a large number of industries and the world's largest coal export terminal. The water requirements of the Mhlathuze catchment are substantial, with all user sectors (mining, industrial, irrigation and domestic) having large water requirements.

The area under irrigation is estimated at 131 km^2 while there are also large areas of afforestation (576 km^2) and dryland sugarcane (268 km^2).

The water resources of the Mhlathuze catchment are well developed with the large Goedertrouw Dam and transfers from the Thukela and Mfolozi rivers providing a reliable source of water for industrial and mining activity and the large irrigation use in the catchment. Although there is sufficient water in this catchment to meet all requirements at present, the resource has been over-

allocated and compulsory licencing is required to rectify this situation. This process has already been initiated and will also redress inequities and finalise the Reserve in the catchment.

Future water use in the Mhlathuze catchment is uncertain since it is driven by industrial development which is difficult to predict. Plans therefore need to be developed in order to cope with sudden increases in the demand for water so as not to delay or retard development in this area. These plans must allow for possible growth scenarios and consider options such as:

- Water conservation and demand management
- Resource development in the W11 or W13 catchments
- Trading of water licences
- Additional transfers from the Thukela River
- Re-use of effluent.

Despite the major development in the Mhlathuze catchment, water quality is generally good. This is due to the fact that urban and industrial effluent is discharged to sea.

4.6 THE MFOLOZI CATCHMENT (W20)

4.6.1 Introduction

The Mfolozi catchment is largely undeveloped and hence the source of water for most users in this catchment is run-of-river abstractions. The other significant water resource is the Klipfontein Dam, with limited quantities sourced from farm dams.

4.6.2 Water availability

The water availability in the Mfolozi catchment, sourced from the WMA report[5], is given in **Table 4.11**. The yield of this catchment is sourced mostly from run-of-river yield since there are not many dams in the catchment.

Return flows in this catchment are limited but do contribute to the available resource. Return flows are estimated to be as follows:

Irrigation return flows:	5 million m^3/annum
Urban return flows:	4 million m^3/annum
Industrial return flows:	1 million m^3/annum
Total	**10 million m^3/annum**

The groundwater use from within this catchment is estimated to be only about 5 million m^3/annum. There is however large potential for increased groundwater use along the coast.

The impact of the ecological Reserve on the yield, estimated to be 19 million m^3/annum, is relatively limited due to the lack of development. The relative impact is largest at the Klipfontein Dam while the impact on the run-of-river yields in the rest of the catchment is relatively small.

The impact of invasive alien plants is thought to be very limited.

Although there is a large area of dryland sugarcane near the mouth of the Mfolozi River, the impact of this on the available yield is estimated to be only 1 million m^3/annum.

Table 4.11: Water availability in the Mfolozi catchments (at 1:50 year assurance)

Resource category	Available/impact (million m^3/annum)
Gross surface water resource	57
Subtract:	
- Ecological Reserve	19
- Invasive alien plants	1
- Dryland sugarcane	1
Net surface water resource	36
Ground water	5
Return flows	10
Total local yield	**51**
Transfer In	0
Grand Total	**51**

4.6.3 Water Use

The major water use in the Mfolozi catchment is irrigation. Other significant water users are the rural and urban sectors. A significant amount of water is transferred out of the lower Mfolozi to the Mhlathuze catchment for mining use.

Table 4.12: Major water users/requirements in the Mfolozi catchment

User sector	Water requirement/ Impact on yield (million m^3/annum)
Irrigation	51
Urban	12
Rural	11
Industrial (sugar mill)	4
Afforestation	2
Total local requirements	**80**
Transfer out	18
Total local requirements	**98**

4.6.4 Reconciliation of requirements and availability

A reconciliation of the available water resource and the water requirements is given in **Table 4.13.** This reconciliation indicates a large deficit in this catchment. What this really implies is that irrigators are not receiving water at the assumed level of assurance and that they are currently using water which should be left to meet the ecological requirement. There is also some uncertainty as to the level of assurance of the transfer out of the lower Mfolozi River. This could be lower than the 1:50 year assurance assumed.

Table 4.13: Reconciliation of the water requirement and the water resource in the Mfolozi catchment (all units are million m^3/annum)

Available Water	Local yield	51
	Transfer In	0
	Total	51
Water requirements	Local requirements	80
	Transfers out	18
	Total	98
Balance		**(47)**

4.6.5 Water Quality

The Mfolozi catchment is one of the few areas in the Usutu to Mhlathuze WMA in which there is a definite and serious water quality problem, as opposed to mostly potential problems in other catchments. This problem is due to municipal return flows from Vryheid and settlements on State land upstream of the dam which results in unacceptably poor water quality in the Klipfontein Dam. Eutrophication is a serious problem with the likelihood of toxic blooms threatening both human health and the ecology of the dam and the river. The Municipality has plans, but no funds, to build a facility to resolve this problem.

Coal mining in the upper reaches of the catchment also impacts severely on the water quality by decreasing the pH and salinity. This is a problem throughout much of the northern and north-western WMA.

4.6.6 Future scenarios

The growth in water requirements in the Mfolozi River catchment will probably be limited to domestic use, not so much from population growth, which is expected to be slow, but due to increased levels of service. Potential for new dam sites exist to meet this increased demand but the preferred development option is small off-channel dams. Larger dams have been investigated and found to be uneconomical due to high sedimentation rates in the Mfolozi catchment as well as the high ecological requirements.

It is not anticipated that the water quality problems in the Mfolozi catchment will escalate. With an upgrade of the sewage plant at Vryheid and improved sanitation, the situation could improve over time.

4.6.7 Summary, key issues and broad strategy

The Mfolozi catchment consists mostly of communal land which is used for stock farming, although there is a significant amount of irrigation (72 km^2), forestry (435 km^2) and dryland sugarcane (65 km^2) in the catchment. The majority of the water requirements are near the coast and include a transfer to the Mhlathuze catchment for Richards Bay Minerals.

Water resources development in this catchment is very limited, the Klipfontein Dam being the only significant dam in the catchment. Due to the large water use and transfers out of the lower reaches of this catchment, the catchment as a whole is stressed. The *status quo* is however probably acceptable with water users having learned to cope with the situation. The stressed situation is not currently as bad as it may appear from **Table 4.13** because the ecological Reserve, as estimated for the NWRS, is not currently being supplied. However, it is probably only during extreme droughts that the Reserve is not met. The comprehensive Reserve will need to be determined and operating rules formulated in order to ensure that it is met with the minimum reduction in allocations to existing lawful users and the minimum socio-economic impacts.

Large water resources developments, such as large dams, will be very expensive in this catchment and the focus should therefore rather be on small-scale development using off-channel storage. Exploitation of the ample groundwater potential in the lower reaches of the catchment should also be investigated.

The water quality of the Klipfontein Dam is poor due to urban return flows into the dam.

4.7 THE MKUZE/HLUHLUWE CATCHMENT (W30)

4.7.1 Introduction

Like the Mfolozi catchment, the Mkuze/Hluhluwe catchment is largely undeveloped from a water resources point of view, but there is substantial water use by irrigators, especially in the Mkuze River catchment. Lake St Lucia is situated in the catchment and the environmental significance of this lake, a World Heritage site, has to be taken into account.

4.7.2 Water availability and quality

The total utilisable surface water resources of the Mkuze/Hluhluwe catchment is estimated at 66 million m^3/annum. Note that this is slightly more than the 63 million m^3/annum given in the NWRS. The reason for this difference is that the transfer into the catchment from the Pongola River is licenced at 32,6 million m^3/annum (rounded to 33 million m^3/annum for water balance purposes) and is not 30 million m^3/annum as stated in the NWRS.

Return flows in this catchment are limited but could contribute to the available resource. Return flows are estimated to be as follows:

Irrigation return flows:	6 million m^3/annum
Urban return flows:	0 million m^3/annum
Industrial return flows:	0 million m^3/annum
Total	**6 million m^3/annum**

The groundwater use from within this catchment is estimated to be about 12 million m^3/annum. There is large potential for increased groundwater abstraction near the coast, but this needs to be investigated further.

The impact of the ecological Reserve on the available yield is estimated to be about 54 million m^3/annum. This is a very low-confidence estimate, which needs to be refined before any additional water-use licenses can be issued.

The water resources of the catchment are summarised in **Table 4.14.**

Table 4.14: Water availability in the Mkuze/Hluhluwe catchments (at 1:50 year assurance)

Resource category	Available/impact (million m^3/annum)
Gross surface water resource	71
Subtract:	
- Ecological Reserve	54
- Invasive alien plants	2
- Dryland sugarcane	0
Net surface water resource	15
Ground water	12
Return flows	6
Total local yield	**33**
Transfer In	33
Grand Total	**66**

4.7.3 Water Use

By far the largest water user in the Mkuze catchment is the irrigation sector with an estimated requirement of 61 million m^3/annum. Irrigators abstract water from run-of-river flows or from farm dams. The exception to this is the Senekal Trust which can transfer up to 32,6 million m^3/annum into the catchment from the Pongolapoort Dam. See **Appendix C** for the conditions attached to this licence. This water is not used exclusively for irrigation but also supplies rural communities.

The only other significant water users are the rural sector, with an estimated water use of 10 million m^3/annum, and afforestation. The reduction in runoff due to afforestation is estimated at 29 million m^3/annum but since a lot of this afforestation is situated in the coastal areas around Lake St Lucia, the impact on the available yield is not that large, estimated to be only 6 million m^3/annum. The impact of afforestation on ecological flows has not been investigated but is an aspect that requires further consideration, especially considering the ecological importance of Lake St Lucia.

The town of Hluhluwe, with a small requirement of only about 1 million m³/annum, obtains its water from the Hluhluwe Dam.

Table 4.15: Major water users/requirements in the Mkuze River sub-catchment (at a 1:50 year assurance)

User sector	Water requirement/ Impact on yield (million m³/annum)
Irrigation	61
Urban	1
Rural	10
Industrial	0
Afforestation	6
Total local requirements	**78**
Transfer out	0
Total local requirements	**78**

4.7.4 Reconciliation of water requirements and availability

A reconciliation of the available water resource and the water requirements is given in **Table 4.16.**

Table 4.16: Reconciliation of the water requirement and the water resource in the Mkuze catchment (all units are million m³/annum)

Available Water	Local yield	33
	Transfer In	33
	Total	66
Water requirements	Local requirements	78
	Transfers out	0
	Total	78
Balance		**(12)**

The above reconciliation of the water requirements and water resources indicates a small deficit in this catchment. Note that the NWRS indicates a deficit of 15 million m³/annum while this ISP has a slightly lower deficit of 12 million m³/annum. This is because of the discrepancy in the transfer from the Pongolapoort Dam by the Senekal Trust(see **Section 4.7.2**). This deficit is experienced in the upper and middle reaches of the Mkuze River catchment where irrigators have developed to the extent that they use all the low-flow in the river. The Senekal Trust transfer has improved this situation since part of the licence agreement under which this transfer may take place is that the Senekal Trust have relinquished some of their allocation from the Mkuze River (see **Appendix C**). This has resulted in increased flows into Lake St Lucia with obvious benefits to the ecology of this sensitive eco-system.

4.7.5 Water Quality

The coal mines referred to in the Mfolozi catchment also impact on the water quality of the Mkuze catchment. This is due to mine-water decant into the upper

reaches of the Mkuze which results in low pH and high TDS river flows. Irrigation adds to the problem, firstly by abstracting water from the river and hence reducing the dilution of the mine water decant and also by adding saline and nutrient enriched return flows to the river. The various contributions to the water quality problems need to be quantified in order that appropriate preventative measures can be applied.

Poor water quality affects not only irrigators, but also Lake St Lucia. This makes it doubly important that water quality objectives are set, and strategies put in place to ensure that these are met.

Sedimentation rates in the Mkuze catchments are high, but it is uncertain if this is due to natural causes or poor landuse practices.

The coastal aquifer is very vulnerable to contamination due to its high permeability. This is a problem that is not unique to this catchment, but to the whole coastal aquifer. This is not an immediate problem in the Mkuze/Hluhluwe catchment, however, since there is little development on the coastal aquifer. The situation needs to be carefully monitored, however, and development plans must take this risk into consideration.

4.7.6 Future scenarios

The future situation of the Mkuze catchment is very similar to that of the Mfolozi, with low growth rates but increased water requirements stemming from increased levels of service to domestic users. Major new dams are not envisaged in the Mkuze catchment due to the high cost.

With the recent implementation of the Senekal Trust transfer, the water quality situation should improve due to the reduction in abstractions from the Mkuze River.

4.7.7 Summary, key issues and broad strategy

The Mkuze catchment is characterised by large-scale irrigation (76 km^2) and afforestation (392 km^2) while domestic requirements, mostly rural, are also significant. The water resource available to irrigators is limited with the only significant dam in the catchment being the Hluhluwe Dam, with the result that irrigators currently utilise all the flow in the river. The recently completed Senekal Trust pipeline, which is authorised to transfer up to 32,6 million m^3/annum into the middle reaches of the Mkuze, significantly improves the situation. Nevertheless, based on desktop estimates, the ecological Reserve will have a big impact on the utilisable yield in the Mkuze River catchment. With the ecologically sensitive Lake St Lucia (which is a World Heritage site) situated in the catchment, the ecological Reserve estimates could be realistic. Detailed Reserve determination and optimisation of operating rules for the catchment are required before further allocation can be considered. It may even be necessary to reduce allocations through compulsory licencing to ensure that Reserve requirements are met.

A small portion of the yield of the Hluhluwe Dam remains unutilised. It is recommended that this be used for poverty eradication.

The water quality in the Mkuze River sub-catchment is poor due to mining activities and irrigation return flows.

4.8 THE PONGOLA CATCHMENT (W40)

4.8.1 Introduction

This catchment is dominated by the Pongolapoort Dam, the fifth largest dam in South Africa. There is a large amount of irrigation in the catchment, which, situated upstream of the Pongolapoort Dam does not utilise the substantial yield of this dam. There is also substantial afforestation in the catchment, which competes with irrigators for the water resource. The Pongola catchment forms part of the Maputo Basin, which is an international river basin. This needs to be taken into account when formulating strategies as to how this catchment should be managed.

4.8.2 Water availability

The total utilisable surface water resources of the Pongola catchment system is estimated at 616 million m^3/annum[5].

Return flows from the large areas of irrigation upstream of the Pongolapoort Dam contribute significantly to the available resource. The return flows are estimated to be about 10% of the irrigation demand, or 21 million m^3/annum.

The groundwater use from within this catchment is estimated to be only 8 million m^3/annum. The groundwater potential in this catchment is limited.

The impact of the ecological Reserve on the yield is estimated to be about 172 million m^3/annum using the accepted desktop methodologies. However, the Pongola system is complicated by the Makhatini floodplains situated downstream of the dam where social and ecological requirements have led to flood releases amounting to about 250 million m^3/annum. The ecological Reserve stated above is, at present, independent of these flood releases, although there should be a substantial overlap of the two.

The WMA report[5] gives the impact of invasive alien plants on the Pongolapoort catchment as 30 million m^3/annum. This seems very high, but since there is no other information available, this value has been used in this ISP report. A more detailed assessment will probably indicate that the impact of invasive alien plants is less that the 30 million m^3/annum given in the WMA report in which case the benefit of removing the aliens will be less. This benefit needs to be carefully assessed before investing large sums of money on removing invasive alien plants in the Pongolapoort catchment.

4.8.3 Water use/requirements

The largest water user in the Pongola catchment is the irrigation sector, with an estimated requirement of 213 million m^3/annum (at a 1:50 year level of assurance). These irrigators are mostly situated upstream of the Pongolapoort Dam and until the recent completion of the Bivane Dam, made use of run-of-river yield. The estimate of the irrigation requirement is based on the scheduled

area in 1995, but unauthorised expansion of the irrigated area has taken place and continues to do so.

The few irrigators upstream of the Bivane Dam and in the upper reaches of the Pongola River catchment abstract water from run-of-river flows or from farm dams.

Table 4.17: Water availability in the Pongolapoort catchment (at 1:50 year assurance)

Resource category	Available/impact (million m^3/annum)
Gross surface water resource	818
Subtract:	
- Ecological Reserve	172
- Invasive alien plants	30
- Dryland sugarcane	0
Net surface water resource	616
Ground water	8
Return flows	21
Total local yield	**645**
Transfer In	0
Grand Total	**645**

Irrigators who are part of the Impala Water User Association mostly draw water from a canal system which is fed from releases from the Bivane Dam and from run-of-river diversions out of the Pongola River at the Grootdraai Weir. Approximately 3 000 ha of irrigated land does not have access to canal water, and these irrigators abstract directly from the Pongola River downstream of the Grootdraai Weir.

The other significant water use is afforestation, which reduces runoff by an estimated 47 million m^3/annum. The impact of this reduction in runoff depends on where in the catchment the yield is utilised. The impact on the yield of the Bivane Dam is about 8 million m^3/annum while the impact on the yield available to the Impala Water User Association is about 26 million m^3/annum. Cumulatively, the impact on the yield of the Pongolapoort Dam is about 34 million m^3/annum.

The town of Pongola abstracts water from the canal system but more recently is also supplied from the Bivane Dam.

There is some uncertainty as to how Mozambique's current water requirement of 66 million m^3/annum as given in the Interim IncoMaputo Water Use Agreement impact on the balance of the Pongolapoort catchment. This requirement is not included in **Table 4.18** since ample allowance has already been made for downstream releases for the ecological Reserve and, in **Table 4.20,** floodplain maintenance. This issue will need to be clarified through a detailed study of the Maputo Basin, the scoping phase of which is currently in progress.

There are two transfers out of the Pongola River catchment, both sourced from the Pongolapoort Dam. These are the transfer of 33 million m³/annum to the Mkuze catchment as discussed in **Section 4.7.2** and the transfer of 5 million m³/annum to the town of Lavumisa in Swaziland.

Table 4.18: Major water users/requirements in the Pongolapoort catchment (at a 1:50 year assurance)

User sector	Water requirement/ Impact on yield (million m³/annum)
Irrigation	213
Urban	1
Rural	6
Industrial	1
Afforestation	34
Total local requirements	**255**
Transfer out	38*
Grand Total	**293**

*Transfers consist of:

1. 33 million m³/annum to Senekal Trust
2. 5 million m³/annum to Lavumisa in Swaziland
3. The NWRS gives a transfer of 30 million m³/annum which was derived from the Senekal Trust transfer (rounded off). The NWRS did not include the transfer to Lavumisa

4.8.4 Reconciliation of water requirements and availability

A reconciliation of the available water resource and the water requirements has been carried out for two scenarios. The first is essentially that upon which the NWRS is based and conforms closely to the balance given in the NWRS, the small difference being in the transfers out of the Pongolapoort Dam. In the second scenario, the impact of the floodplain releases are included.

Table 4.19: Reconciliation of the water requirement and the water resource in the Pongola catchment (all units are million m³/annum): NWRS scenario

Available Water	Local yield	645
	Transfer In	0
	Total	645
Water requirements	Local requirements	255
	Transfers out	38
	Total	293
Balance		**352**

Table 4.20: Reconciliation of the water requirement and the water resource in the Pongola catchment (all units are million m³/annum): With floodplain releases

Available Water	Local yield	645
	Transfer In	0
	Total	645
Water requirements	Local requirements	255
	Transfers out	38
	Flood plain releases	250
	Total	543
Balance		**102**

The above reconciliation of the water requirements and water resources indicates that while large surpluses are available from the Pongolapoort Dam, the allocation of these must be treated with some caution until the allocable resource has been determined to a higher level of confidence. The reason for this uncertainty is that there is probably some measures of double accounting in the ecological Reserve and the flood plain releases. The proposed strategy (see **Strategy 5.1**) is to allow allocations of up to 102 million m³/annum now but no more until the situation has been assessed in more detail and is better understood.

4.8.5 Water Quality

The water quality in the Pongola catchment is naturally good. However, the large-scale irrigation upstream of the Pongolapoort Dam results in saline and nutrient enriched return flows into the Pongola River. Although these return flows occur throughout the year, the water quality is worst in winter when the natural flow in the river is low and hence dilution is less. There is as yet no indication of eutrophication in the Pongolapoort Dam, but this remains a threat.

Unlike other catchments in this WMA, the quality of the groundwater is a problem in the lower reaches of the catchment. The Makhathini Flats are formed from an old sea-bed which is the reason for this high salinity.

4.8.6 Future scenarios

An important factor which has not been taken into account in the reconciliation of water requirements with availability shown in **Table 4.19** and **Table 4.20** is Mozambique's possible future water requirements, as stipulated in the Interim IncoMaputo Water Use Agreement. South Africa's current commitment to Mozambique in terms of this agreement is 66 million m³/annum while in future an *additional* 87 million m³/annum has been provisionally reserved for the city of Maputo. It is not stated in the agreement where this water is to be sourced but the Pongolapoort Dam is an option. The other possible source of this possible future requirement is the Inkomati WMA. The Inkomati catchment is better positioned to supply Maputo but is already stressed. A detailed technical investigation will be required to establish which option, or a combination of both, is the best option.

Only limited growth in domestic water use is expected in the Pongola River catchment, but there is scope for development of irrigation and/or afforestation

to utilise the surplus yield from the Pongolapoort Dam. A number of applications for water use licences in this catchment have been received recently. This is dealt with in some detail in **Strategy 5.1** in **Part B** of this report.

Although new dams in the Pongola River catchment are technically feasible, they will add very little to the available yield since the Pongolapoort Dam already harnesses the yield close to the catchment's full potential.

The expansion of the irrigation upstream of the Pongolapoort Dam is a strong possibility (see **Strategy 5.1).** Should this take place there will be a further decline in the water quality upstream of the dam. If irrigation development downstream of the dam does eventually take off, the water quality downstream of the dam can also be expected to deteriorate.

4.8.7 Summary, key issues and broad strategy

There is a large amount of irrigation in the middle Pongola catchment (almost as much as in the rest of the WMA put together) with an estimated irrigated area of 199 km^2 upstream of the Pongolapoort Dam. There are also large areas under afforestation in the upper reaches of the Pongola catchment, with an estimated area of 480 km^2, which has reduced the assurance of supply to irrigators over the years.

The Pongolapoort Dam, one of the largest in South Africa, remains underutilised, but due to uncertainties relating to the social and ecological requirements of the flood plains downstream of the dam and international requirements, the allocable surplus from the dam is difficult to quantify accurately. This uncertainty needs to be resolved before large allocations are made from the Pongolapoort Dam. The suggested strategy is to allow allocations of up to 102 million m^3/annum now with further allocations subject to a detailed analysis of the Maputo Basin.

The Bivane Dam, situated on the Bivane River upstream of the Pongolapoort Dam, was constructed recently to improve the levels of assurance to irrigators. The opportunity now presents itself to increase the area under irrigation, provided irrigators are willing to accept reduced assurances, which seems to be an economically sensible strategy. This will reduce the available yield from the Pongalapoort Dam but this is part of the 100 million m^3/annum allocable yield from the system referred to in the previous paragraph. An allocation for additional afforestation is also possible.

The water quality upstream of the Pongolapoort Dam is poor due to irrigation return flows.

4.9 THE USUTU CATCHMENT (W51 –W56)

4.9.1 Introduction

The Usutu catchment is of strategic importance because water for the cooling of coal-fired power generation plants, situated in the Vaal and Olifants systems, is sourced from this catchment, with the Heyshope, Morgenstond, Westoe and Jericho dams providing the transferable yield for these power stations. These dams are all situated upstream of Swaziland and the catchment forms part of

the Maputo River Basin which is an international river basin. This has a major influence on how the catchment is managed.

4.9.2 Water availability

The total utilisable surface water resources of the South African portion of the Usutu catchment is estimated at 196 million m^3/annum. Return flows from the irrigation in the catchment is limited and estimated to be only about 4 million m^3/annum. Groundwater use within the catchment is estimated to be only about 2 million m^3/annum. It is assumed that this is used mostly for rural domestic use and limited irrigation.

The impact of the ecological Reserve on the yield is estimated to be about 52 million m^3/annum. This includes the impacts on the yields of the Heyshope, Morgensond, Jericho and Westoe dams, the impact on the run-of-river yield downstream of these dams as well as in the undeveloped W52, W55 and W56 catchments. The impact of the ecological Reserve as quoted in the Eastern Vaal sub-system Analysis report[7] was considered as part of this ISP report, but the NWRS estimate appears to be the better estimate.

Invasive alien plants are not thought to have a large influence on the available water resources in the Usutu catchment.

Table 4.21: Water availability in the Usutu catchment (at 1:50 year assurance)

Resource category	Available/impact (million m^3/annum)
Gross surface water resource	249
Subtract:	
- Ecological Reserve	52
- Invasive alien plants	1
- Dryland sugarcane	0
Net surface water resource	196
Ground water	2
Return flows	4
Total local yield	**202**
Transfer In	0
Grand Total	**202**

4.9.3 Water use

The largest water user in the Usutu catchment is the transfer of water out of the catchment to the Vaal system and to power stations in the Olifants WMA (see **Table 4.22**). The transfer amount of 131 million m^3/annum is the amount that can currently be transferred as opposed to the 114 million m^3/annum given in the NWRS, which is an estimate of the amount that was transferred in 1995. The larger

amount of 131 million m³/annum should be used for planning purposes since this is the amount allocated to Eskom.

Water for domestic purposes as well as for irrigation is abstracted from run-of-river flows or from small farm dams. These users are not supplied by the major dams in the catchment, which are only used for transferring water to the Upper Vaal and Olifants WMAs.

Table 4.22: Major water users/requirements in the upper Usutu catchment (at a 1:50 year assurance)

User sector	Water requirement/ Impact on yield (million m³/annum)
Irrigation	13
Urban	5
Rural	8
Industrial	0
Afforestation	43
Total local requirements	**69**
Transfer out	131
Grand Total	**200**

4.9.4 Reconciliation of water requirements and availability

The reconciliation of the water requirements and water resources of the Usutu catchment is indicated in **Table 4.23**.

Table 4.23: Reconciliation of the water requirement and the water resource in the Usutu (all units are million m³/annum)

Available Water	Local yield	202
	Transfer In	0
	Total	202
Water requirements	Local requirements	69
	Transfers out	131
	Total	200
Balance		**2**

The reconciliation of the water requirements and water resources indicates a small surplus in the upper Usutu catchment. However, due to the impact of the Reserve requirements on the major dams in this catchment, a deficit occurs at these dams while the undeveloped catchments and the catchments downstream of the dams are in surplus. In order to get a better perspective of how the ecological Reserve will impact on the available yield of the Heyshope Dam and Usutu system, consisting of the Morgenstond, Jericho and Westoe dams, an analysis was carried out as part of the Mhlathuze SEA study[16], which

makes it possible to consider the Usutu catchment at a finer resolution than given in the NWRS.

It is clear from the above more detailed analysis of the Usutu catchment that while the Usutu as a whole may be in balance, this broad perspective is misleading. A closer look at each individual transfer scheme reveals that taking into account the ecological Reserve, as determined using the desktop method, transferring the currently allocated amount could be problematical, especially in the case of Heyshope Dam.

Table 4.24: Reconciliation of the water requirement and the water resource in the Usutu catchment (all units are million m³/annum)

		Heyshope	Morgen-stond	Westoe	Jericho	Downsteam catchments	Total
Available Water	Local yield	42	26	20	16	98	202
	Transfer In	0	0	0	55	0	0
	Total	42	26	20	71	98	202
Water requirements	Local requirements	7	2	1	2	57	69
	Transfers out	61	24	24	70	7	131
	Total	68	26	25	72	64	200
Balance		**(26)**	**0**	**(5)**	**(1)**	**34**	**2**

Although this ISP does not address the Swaziland situation, it should be noted that due to very limited opportunities for building dams in Swaziland, they make almost exclusive use of run-of-river abstractions which are supplied at low assurance. As a result, much of Swaziland is water stressed and this needs to be taken into account when developing catchment management strategies for the upper Usutu catchment. The surplus that occurs downstream of the dams in the Usutu catchment is therefore not allocable at present. The Maputo Basin Study, of which the scoping phase is already in progress, will consider development options in conjunction with the other basin states, (Swaziland and Mozambique) and until such time, this surplus, as perceived when considering South Africa's situation in isolation, should not be allocated.

Another important perspective on this is that compliance with the ecological Reserve improves in a downstream direction due to the surpluses from the undeveloped tributaries making up for the deficit in others as they flow together. This is another good motivation not to allocate the surpluses in the undeveloped tributaries.

4.9.5 Water quality

The water quality in the upper Usutu catchment is excellent, which is why Eskom source their water for the cooling of coal-powered power stations from this catchment. However, there is a huge risk of coal mining activities polluting the resource and this risk must be carefully managed through the formulation of pro-active catchment management plans.

The only current water quality problem that was identified in the Usutu catchment is due to industrial effluent from the tannery in Piet Retief. This has resulted in pollution of the Assegaai River. The effluent from the tannery is currently irrigated onto fields as a disposal measure but a longer-term solution must be found.

4.9.6 Future scenarios

It is uncertain what the future holds for the transfers out of the four major dams in this catchment. Some reduction in transfer can be expected to allow for the ecological Reserve. This could theoretically be replaced by constructing more dams. The potential for this exists and in terms of the Interim IncoMaputo Water Use Agreement South Africa may transfer up to 197 million m^3/annum out of the catchment. Any new dams in the catchment would however have to be developed in close co-operation with Swaziland and Mozambique and take the requirements of these countries into account.

The irrigation and domestic use in this catchment is unlikely to increase significantly.

4.9.7 Summary, key issues and broad strategy

The Usutu catchment is characterised by large transfers out of the catchment (and out of the WMA) to the Vaal system and the Olifants WMA for cooling purposes at power stations. This represents a strategic use and falls under the control of the Minister of Water Affairs and Forestry and not the CMA. Four large dams in the Usutu support these transfers.

The only significant in-basin use is afforestation with an estimated area of 1 930 km^2, making this catchment the most afforested in the WMA. Most of this is situated downstream of the major dams in this catchment and therefore the afforestation does not have a major impact on the yield of these dams. Irrigation is limited with an area of only 27 km^2.

The water requirements of Swaziland are an important factor in this catchment, and, unlike the Pongola catchment, international agreements with Swaziland and Mozambique do not allow much, if any, scope for further development in this catchment. The joint Maputo Basin Study will however identify possible joint development opportunities which could involve developing the resource in the upper Usutu for joint utilisation with Swaziland.

While the Usutu catchment is approximately in balance when considered as a whole, the implementation of the Reserve could have serious implications on the Vaal system since the transferable yield, especially that from Heyshope Dam, will in all likelihood reduce. However, there are no pressing ecological or water resources issues which necessitate the determination of the Reserve or the implementation thereof in this catchment. The proposed strategy is therefore not to make any changes to the existing operating rules until a comprehensive Reserve has been determined in close consultation with Eskom. Implementation of the Reserve should be done as part of an integrated operating rule for the whole Maputo Basin, which should be forthcoming out of the Maputo Basin Study. The implications of this on the Vaal system will also have to be taken into account and mitigating strategies formulated.

No further allocations are possible from the catchment at present. However, development of the resource which could stem from the Maputo Basin study could open up opportunities for additional allocations. Priority will be given to poverty eradication projects. In this catchment, community forests would probably be the best option.

The water quality of the Usutu catchment is excellent. However, there are large coal reserves in the catchment and the potential for the water quality deteriorating is huge, the implications of which would be enormous. Pro-active management plans need to be developed urgently to prevent the situation deteriorating.

4.10 LAKE SIBAYA CATCHMENT (W70)

4.10.1 Introduction

The Lake Sibaya catchment consists of a very flat area with limited surface runoff, despite the high rainfall. The area is sparsely populated and undeveloped. The area is ecologically sensitive and there are a number of nature conservation areas and game parks in the catchment.

The NWRS does not report specifically on this catchment.

4.10.2 Water availability

Based on the WR90 hydrology of the Lake Sibaya catchment, the run-of-river yield of the catchment is 25,5 million m^3/annum. It appears, however, that the surface water hydrology of this catchment has never been studied in any detail and it is suspected that the above interpretation using WR90 is probably far from correct. The surface runoff is probably insignificant due to the very flat terrain and high permeability of the underlying geology. There are, however, substantial groundwater resources in this catchment, estimated to be 98 million m^3/annum. This is due to the presence of the Zululand coastal aquifer.

The determination of the impact of the ecological water requirement in this catchment would require a new approach since the surface runoff is probably not significant. Of more importance would be the groundwater Reserve, ie how much water can be safely abstracted from groundwater without reducing the health of the ecology to below an acceptable limit. The methodologies to carry out such an evaluation have not been established.

4.10.3 Water use

The only significant water user in the Lake Sibaya catchment is rural water use, estimated to be only 2 million m^3/annum. This is probably supplied from the ample groundwater resources of the area since the surface water resource is very limited.

There is a significant area (158 km^2) of afforestation in the catchment with a theoretical reduction in runoff of 3,3 million m^3/annum[15]. However, since there is probably no surface runoff in the catchment, the impact of the forestry on the surface runoff is not an issue. Of more importance is how the afforestation could

be impacting on the groundwater Reserve and concerns have been raised as to how these forests impact on Lake Sibaya.

4.10.4 Water Quality

There are no known water quality problems in the Lake Sibaya catchment, but as mentioned previously, the coastal aquifer which underlies much of this catchment is very susceptible to contamination. Any development plans must therefore take this into account.

4.10.5 Future Scenarios

Although there are large groundwater reserves in the Lake Sibaya catchment, there are no factors driving the development and use of this resource. The area will probably remain as a conservation area, although some further afforestation is a possibility.

4.10.6 Summary, key issues and broad strategy

The Lake Sibaya catchment is of limited significance from a water resources point of view. The surface water resources are limited but there is huge groundwater potential. The area is however ecologically very sensitive and the exploitation of the groundwater would require careful consideration. There is no immediate or anticipated future pressure to develop the water resources of this catchment, with the possible exception of forestry. Should the need ever arise to extensively exploit the groundwater resources of this area; the ecological impacts of this would need to be carefully considered.

4.11 SECTORAL BREAKDOWN OF WATER REQUIREMENTS

Table 4.25 provides a summary of the water requirements in the Usutu to Mhlathuze WMA, expressed as a sectoral breakdown. From this it is clear that the irrigation sector is by far the largest water user in the catchment.

Table 4.25: Summary of water requirements in the Usutu to Mhlathuze WMA (per user sector)

Catchment	Water requirement (expressed as impact on the 1:50 year yield)	
	million m^3/annum	% of Total Requirement
Irrigation	507	54
Urban	69	7
Rural	41	4
Industrial/mining	97	10
Afforestation	104	11
Transfers out	136	14
Total	**954**	**100**

5. COMPARISON BETWEEN THE NWRS AND THIS ISP

5.1 INTRODUCTION

Based on the detailed analysis given in Chapter 4, the following changes to the NWRS strategy are recommended:-

- The W11&W13 catchments to be presented separately to the Mhlathuze catchment.
- The current situation in the Mhlathuze to be revised to be consistent with the latest water resources studies carried out in the catchment.
- The future situation to include the allocation to the Fairbreeze mine from the Thukela River.
- The transfers into the Mkuze catchment to be adjusted to reflect the authorised transferable yield.
- The transfers from the Pongolapoort catchment to include the correct transfer to Mkuze and the transfer to Swaziland.
- The transfer out of the Usutu catchment to be adjusted up to the allocated transferable yield.

5.2 REVISED WATER REQUIREMENTS

Table 5.1 provides the proposed revision to the water requirements as given in the NWRS. The requirements themselves remain unchanged while there are some minor adjustments to transfers out of the catchment. These proposed changes are small and do not change the overall perspective of the catchment but are important so as to be consistent with allocations that have been made.

The W11&W13 catchments are shown separately in **Table 5.1.** The motivation for this is that these two catchments are very different from the Mhlathuze catchment in many respects and therefore need separate management strategies.

Table 5.1: Water requirements/allocations for the Usutu to Mhlathuze WMA in the year 2000 (million m^3/a)

Sector/ Sub-area	Irrigation	Urban	Rural	Mining And bulk industrial	Power generation	Afforestation	Total local requirements	Transfers Out (1)	Grand Total
Upper Usutu	13	8	5	0	0	43	**69**	**131**	**200**
Pongola	213	1	6	1	0	34	**255**	**38**	**293**
Mkuze	61	1	10	0	0	6	**78**	**0**	**78**
Mfolozi	23	12	11	4	0	2	**52**	**18**	**70**
Mhlathuze	187	44	3	90	0	18	**342**	**3**	**345**
W11& W13	10	3	4	2	0	1	**20**	**0**	**20**
Lake Sibaya	0	0	2	0	0	0	**2**	**0**	**2**
Total	**507**	**69**	**41**	**97**	**0**	**104**	**818**	**136**	**954**

Notes:
1. The total transfer out of the WMA (136 million m^3/a) is the transfers out of the WMA and is not the sum of the transfers out of each sub-area since many of the transfers are internal to the WMA. The transfers out of the WMA are those out of the upper Usutu to the Upper Vaal and Olifants WMAs (131 million m^3/a) and the transfer of 5 million m^3/a to Swaziland from the Pongolapoort Dam.

5.3 REVISED WATER RESOURCES

Table 5.2 provides the proposed revision to the water resources published in the NWRS. As with the requirements, the changes relate to the recommendation that the W11&W13 catchments are presented separately and proposed changes to the impact that transfers into the WMA have on the yield. These proposed changes are small and do not change the overall perspective of the catchment but are important so as to be consistent with allocations that have been made.

Table 5.2: Water resources for the Usutu to Mhlathuze WMA in the year 2000 (million m^3/a)

Sector/ Sub-area	Natural resource		Usable return flow			Total local yield	Transfers in	Grand Total
	Surface water	Ground water	Irrigation	Urban	Mining and bulk			
Upper Usutu	196	2	1	3	0	202	0	**202**
Pongola	616	8	21	0	0	645	0	**645**
Mkuze	15	12	6	0	0	33	33	**33**
Mfolozi	36	5	5	4	1	51	0	**51**
Mhlathuze	156	11	9	2	0	178	80	**258**
W11& W13	45	1	10	3	2	49	3	**52**
Lake Sibaya	26	2	0	0	0	28	0	**28**
Total	**1 090**	**41**	**52**	**12**	**3**	**1 186**	**62**	**1 248**

5.4 RECONCILIATION OF REQUIREMENTS AND AVAILABILITY

Table 5.3 provides the proposed revised reconciliation of the water requirements and availability based on the proposed changes to the NWRS indicated in **Table 5.1** and **Table 5.2.**

5.5 KEY ISSUES AND STRATEGIC PERSPECTIVE STEMMING FROM THE NWRS

The NWRS lists a number of key issues and strategies for the Usutu to Mhlathuze WMA. These are listed below in italics and comment is made on these issues, given the more thorough evaluation made as part of this ISP.

Table 5.3: Reconciliation of allocations and available water for the Usutu to Mhlathuze WMA for year 2000 (million m^3/a)

Sector/ Sub-area	Available water			Water requirements/allocations			Balance
	Local yield	Transfers In	Total	Local requirements	Transfers out	Total	
Upper Usutu	202	0	**202**	**69**	**131**	**200**	**2**
Pongola	645	0	**645**	**255**	**38**	**293**	**352**
Mkuze	33	33	**33**	**78**	**0**	**78**	**(45)**
Mfolozi	51	0	**51**	**52**	**18**	**70**	**(19)**
Mhlathuze	178	80	**258**	**342**	**3**	**345**	**(85)**
W11& W13	49	3	**52**	**20**	**0**	**20**	**32**
Lake Sibaya	28	0	**28**	**2**	**0**	**2**	**26**
Total	**1 186**	**62**	**1 248**	**818**	**136**	**954**	**294**

5.5.1 Mhlathuze and W11/W13 catchments

Water resources in the Mhlathuze River catchment are fully developed and utilised, and are being augmented by transfers from the Thukela River. Continued urban and industrial growth is expected to occur in the Richards Bay area, which will result in increased requirements for water. The main options for ensuring the sufficient future supply of water to the area are: the implementation of water demand management; re-allocation of irrigation water to urban and industrial use and conversion to dry land production of sugar cane. Compulsory licencing is required to re-assess the water use allowances for irrigation from the Mhlathuze River.

Comment: The over-allocated situation alluded to in the NWRS is not reflected in the reconciliation of water requirements and available water as provided in the NWRS. This has been rectified in **Table 5.3**, which provides strong motivation for compulsory licencing. The NWRS has lumped the Mhlathuze catchment with the smaller W11&W13 coastal catchments with the result that the undeveloped nature of the W11&W13 catchments is not apparent. The more detailed analysis carried out as part of this ISP indicates that there is surplus available for allocation in the W11&W13 catchments which represents an opportunity for poverty eradication.

5.5.2 Mfolozi

Potential for additional utilisation of water exists in the catchments of both the Black Mfolozi and White Mfolozi Rivers. The main options are for the expansion of commercial forests and possible construction of dams for the settlement of emerging farmers.

Comment: This point of there being *potential for additional utlisaltion* needs to be clarified to state that the potential only exist if new dams are constructed. There is no potential from run-of-river. Possible dams on the Mfolozi have been investigated, for example, the Embiane Dam, and found to be uneconomical. Small off-channel dams appear to be a more viable option in this catchment. There is no potential for the expansion of commercial forests except if the

reduction in yield that would result from additional forestry is replaced by the construction of dams.

5.5.3 Mkuze

The protection of Lake St Lucia and other conservation areas is of prime importance in this sub-area. It is not advisable that any further development of water resources be allowed, except for human needs.

Comment: In addition to the above, it should be made clear that the Reserve requirements in the Mkuze catchment will be difficult to meet and that compulsory licencing needs to be considered as an option to reduce allocations if necessary. A small portion of the yield of the Hluhluwe Dam remains unutilised. It is recommended that this be used for poverty eradication.

5.5.4 Pongola

A large surplus exists in the Pongola River catchment, downstream of Pongolapoort Dam, and several options exist for the utilisation of the water, such as poverty eradication. Potential also exists for further water resources development and/or utilisation in the upper reaches of the catchment, such as the expansion of afforestation and the possible construction of new dams for transfers to the Upper Vaal water management area.

Comment: This ISP report has highlighted the large uncertainties relating to the surplus yield which might be available in the Pongolapoort Dam. The uncertainties relate to the social and ecological requirements of the flood plains downstream of the dam and international requirements. As a result, the allocable surplus from the dam is difficult to quantify accurately. This uncertainty needs to be resolved before large allocations are made from the Pongolapoort Dam. The suggested strategy is to allocate up to 102 million m^3/annum now with further allocations subject to a detailed analysis of the Maputo Basin. These allocations could include additional allocations to irrigators and the forestry sector upstream of the dam. Although the possible construction of an additional dam on the upper Pongola River has long been considered an option for possible augmentation of the Vaal system, it must be borne in mind that such a scheme will make very little additional yield available but merely shift the utilisable yield which is currently available in the Pongolapoort Dam to the proposed new dam and allocations from such a development would from part of the 102 million m^3/annum that can be allocated.

5.5.5 Upper Usutu

Water resources in the upper Usutu River catchment are already highly developed and utilised, with most of the available water being transferred to other water management areas where it is mainly used for power generation. Serious deficits are expected to result when the ecological component of the Reserve is implemented, and significant remedial measures will be required. Careful assessment and judicious implementation of the Reserve is therefore required. No large scale development of the water resources should be allowed pending the joint Maputo River basin study agreed to by South Africa, Swaziland and Mozambique, and agreement on water use by the three basin countries.

Comment: In addition to this position published in the NWRS, it should be noted that while the catchment as a whole is highly utilised, surplus resources exist in the undeveloped tributaries of the Usutu and the areas downstream of the major dams areas, as seen from a South African perspective. However, in line with the NWRS statement regarding international requirements, these surpluses should not be allocated for use in South Africa due to water shortages in Swaziland.

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PART B

STRATEGIES

Through existing reports, interviews and workshops, the key issues of the Usutu to Mhlathuze WMA were identified and strategies developed to resolve these issues with the overarching objective of giving effect to the NWA and the NWRS.

The strategies have been developed within two broad categories; those which apply to the whole WMA (referred to as WMA Level Strategies), along with those strategies which also need to be considered at the level of each of the seven discrete catchments which make up the Usutu to Mhlathuze WMA (Catchment Level Strategies).

WMA Level Strategies include:

- The Reconciliation of Water Requirements and Resources. This includes a broad strategic approach to water availability, the requirements for this water (including the Reserve) and its allocation.
- Water Quality Management
- Groundwater
- Forestry
- Water Conservation and Demand Management
- Invasive Alien Plants
- Co-operative governance
- Monitoring and information
- Implementation of the ISP

Specific strategies for each catchment were developed to deal with:

- Water Allocations (based on a reconciliation of requirements and resources)
- Water Quality
- Water Conservation and Demand Management

It can be noted that a number of the above strategies are aimed at reconciling the availability of the resource with the demand. So, typically, water conservation and demand management is aimed at reducing demand and thus supplementing the resource. The clearing of Invasive Alien Plants can in itself be seen as a Water Conservation strategy and is certainly aimed at increasing resource availability. Utilization of groundwater and the construction of infrastructure both supplement availability.

Each strategy addresses the following aspects:

- **Management Objective**
  What the strategy aims to achieve
- **Situation assessment**
  The background information and the relevant issues identified in each catchment. This provides a motivation for the strategy and actions.
- **Strategy**
  The approach required to resolve the issues and give effect to the NWA and NWRS.
- **Management Actions**

Specific actions to give effect to the strategic approach are listed, together with the responsible Directorate/Institution and a priority rating.

PART B1

WMA LEVEL STRATEGIES (APPLICABLE TO THE WHOLE WMA)

Strategy No.:	G1

WMA LEVEL STRATEGY: RECONCILATION OF REQUIREMENTS AND RESOURCES This strategy applies to the WMA as a whole, while more detailed catchment-specific strategies are given in part B2.	
MANAGEMENT OBJECTIVE:	The Usutu to Mhlathuze WMA is relatively well off in terms of water resources. This asset needs to be put to optimal use to the benefit of the people and the economy of the WMA, and also of the country and our international neighbours, whilst meeting the needs of the ecological Reserve. Within the context of these wider obligations the objective of this water allocation strategy is to bring about greater equity in the distribution of the water resource, thus developing the rural economy and contributing to poverty eradication. This must be achieved with minimum negative impact on existing users and without unduly restricting future economic development.
SITUATION ANALYSIS/ MOTIVATION	The Usutu to Mhlathuze WMA is one of the most well watered in the country. There is an estimated total water availability of 1 186 million m^3/annum, after allowing for the ecological Reserve (see **Table 5.2)**. Most of this has, however, already been allocated and some catchments, notably the Mhlathuze, are seriously over-allocated (see **Table 5.3)**. Although at Water Management Area level the Usutu to Mhlathuze is in a situation of apparent surplus there is water available for allocation only within some catchments. Most notably there is a significant surplus in the Pongola River catchment, a consequence of the Pongolapoort Dam. But the actual volume of surplus yield that can safely be derived from this dam remains very uncertain, with unknowns relating to the ecological and social requirements of the flood plains downstream of the dam (see **Part B2, Strategy 5.1**). A breakdown of the water requirements in the catchment is presented in **Table 4.25** in Chapter 4 of Part A of this report. The largest water user by far is the irrigation sector, with an allocation of 54% of the total water requirement, including the transfer requirement. This WMA has particular responsibilities with regard to supplying Eskom power stations on the Highveld through the Morgenstond, Heyshope, Jericho and Westoe dams on the Upper Usutu River (second largest water use), and towards the requirements of Swaziland (Usutu Basin) and Mozambique (Pongola Basin). The WMA is one of the most deeply rural in the national economy with the Richards Bay/Empangeni complex providing the only counterpoint. More than 30% of the WMA comprises communally held land. Allocations of water to rural users range from 3-7% within each of the constituent catchment areas – suggesting a singular inequity in allocation. There is very little forestry or irrigation within these lands. In some instances allocations for emerging farmers were made 20-30 years ago for rural irrigation development (typically from Goedertrouw Dam in the Mhlathuze and Hluhluwe Dam in the Mfolozi/Hluhluwe system) but these have never been taken up. The Mjinji scheme, which is supplied from the Pongolapoort Dam has also functioned

	with only limited success. Forestry is a water user, reducing runoff and thus also the availability of water which could otherwise be taken up by other users. This reduction in availability as a consequence of forestry is estimated at 104 million m^3/annum. Dryland sugarcane, like forestry, uses significant volumes of water and can significantly impact on the resource. One example is provided by the Matikulu and Mtunzini catchments where up to 50% of the total land area of some quaternary catchments is under dryland sugarcane. The impact of dryland sugar on the available yield of the whole WMA is estimated at 10 million m^3/annum. Although it must be recognised as a water user, the requirements of dryland sugarcane can hardly be compared to those of the irrigated crop. The production and value of dryland crops (typically forestry and sugar) need to be considered carefully when restricting them in favour of the production of irrigation water. Invasive alien plants present some uncertainty in this WMA. Large impacts on the available resource are indicated in the report 'Usutu to Mhlathuze WMA: Overview of water resources and utilisation'(5), referred to in this ISP report as the WMA report. The implication is that if the invasive alien plants are removed, large amounts of water could become available. The accuracy of these figures is questioned, with the likely gains from the clearing of woody plant invasives dealt with in more detail in **Strategy G6 – Invasive Alien Plants**. Although the water resources situation is presented with confidence in this ISP report, there is room for improvement. Some catchments, for example the Mfolozi and Mkuze, have never been studied in detail, while the modelling requirement for compulsory licensing is uncertain. Since the Mhlathuze is one of the first catchments in which compulsory licensing is likely to be applied, modelling requirements need to be formulated with this in mind. The broad picture of the WMA suggests the following: • Water can still be made available in and/or from the Matikulu and Mtunzini catchments. • The Mhlathuze catchment is seriously over-allocated (see **Table 4.9**) but this may be more of a problem on paper than in reality as the total allocation has never been used (see section 4.5.4 for a full explanation of this conundrum). The over-allocation makes the Mhlathuze a strong candidate for Compulsory Licensing. • The Mkuze and the Mfolozi catchments are both fully or over-allocated catchments. • A significant volume of water can still be allocated out of the Pongolapoort Dam but decisions on the nature of this allocation require very careful social, ecological and international consideration.
STRATEGY	• All catchments need to be brought into balance as a priority within this WMA. The first need is to fully understand the resource in terms of availability – the flow in rivers, and the capacity of dams and their ability to deliver. Balancing the supply against the water requirements requires a careful evaluation of existing allocations and of the legality of use (with all unlawful use terminated), an improved assessment of the Reserve and commitment to supply the Reserve, an assessment of equity needs both current and future, the optimisation of use (efficiency in systems operation

	and in application), the management of demand, consideration of new sources such as groundwater and of infrastructure such as dams, and finally a reduction in allocations where these cannot be supported. • This is an important WMA for the redress of past inequities as there are large areas of communally held land with little resource provision. Priority and preference must be given to allocations, which support the rural poor and provide for poverty eradication at the widest possible scale. Where possible existing irrigation water can be used for this purpose, and trading out of the existing sector for this purpose can be encouraged. The opportunity costs of new irrigation allocations, in terms of alternative possible wider distributed use to a far larger number of people, must be very carefully evaluated. The expansion of irrigation using previously unallocated water is not seen as the way of shifting the water balance in favour of the poor and, in some catchments, will only increase the pressures experienced by the manufacturing industries, which support all segments of the population. Any new irrigation allocations in the Mhlathuze, Mfolozi or Usutu catchments will reduce the capacity of the WMA to meet industrial demands and could therefore hinder growth. The core strategy should be to seek ways of reallocation, distribution and use, which can bring improvements to rural livelihoods at a wide scale. This would typically be through significant allowance for schedule 1 and other small-scale users, distribution schemes which allow for some household gardening, and the supply of additional water to communities which may then be applied in 'productive uses at household level'. Small forestry plots, woodlots, and dryland sugarcane are other ways in which larger numbers of the rural poor can use relatively small volumes of water to greatest effect. These land uses can be promoted in areas where the impact on other users is acceptable. • Users need to take up existing allocations, which have been on the books for years but never utilised. This applies most particularly to allocations for 'small farmer schemes', notably in the Hluhluwe and Mhlathuze catchments. New allocations of irrigation water aimed at redressing inequity will not be contemplated until existing opportunities have been productively utilised. In addition to the general caution expressed towards new schemes (above), currently unused water should first be considered for uses other than irrigation – provided that its use targets poverty eradication and better serves to reduce inequities. Typically this water could be traded out to other parts of the catchment to allow for afforestation, or distributed more widely to provide for water for small gardening or other forms of livelihood. • The Mhlathuze catchment is a prime example of the competition between the agricultural sector and a growing industrial water requirement. Any re-allocation of water must seek to minimise the disruption of the labour and economic base dependent on agriculture. The costs and benefits of reallocation need to be assessed on the basis of jobs and benefit to the economy at both national and regional level. • Dryland sugarcane should not be unnecessarily restricted, and certainly not in favour of the protection of irrigation water supplies. From a water resources perspective dryland sugarcane is a far more effective user of water than its irrigated counterpart and, where possible, the conversion of irrigated sugar to dryland production should be encouraged. • There are few opportunities for further infrastructure development to

	improve supply within this WMA. One prospect is the construction of a dam in the Matikulu catchment, which could be used to supply Richards Bay. Additional water could also be transferred from the Thukela River. The Mfolozi is a relatively unregulated river but high natural silt loads do not favour large dam construction. The construction of small farm dams and off-channel storage by individual users offers one form of further resource development. • Additional ways of managing availability and demand include strategies such as Water Conservation and Demand Management, and the clearing of invasive alien plants. These are covered as independent strategies (see **Strategies G5 and G7**).

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
1. Verification of existing lawful water use 2. Improved levels of Reserve determination	**Responsibility** DWAF Directorate: Water Allocation **Priority** High
3. Initiate compulsory licensing in the Mhlathuze catchment as planned. Include the Matikulu and Mtunzini catchments in this process.	**Responsibility** DWAF Directorate: Water Allocation **Priority** Medium
4. Assess the extent of allocation inequity within each catchment. Assess the potential for water use by the disadvantaged sector and the implications (costs and benefits to society both within the catchment and more broadly) of reallocations.	**Responsibility** DWAF Directorate: NWRP **Priority** High
5. Formulate proposals for improved modelling and monitoring of the water resource (see also **Monitoring and Information Strategy G8)**. For more detailed actions refer to Part B2 – Catchment-level strategies.	**Responsibility** DWAF Directorate: NWRP **Priority** High

Strategy No.:	G2

WATER QUALITY MANAGEMENT STRATEGY

Refer also to more detailed strategies in Part B2, which are specific to each catchment unit.

MANAGEMENT OBJECTIVE:	At Water Management Area scale the required strategy is to get the resources and especially the people in place to put water quality management within the WMA onto a **proactive** footing. It is necessary to tackle the serious quality issues experienced as a consequence of coal mining activity, and particularly where mines have already been closed. The strategy also seeks to ensure that an adequate quality is maintained throughout the WMA both **for** irrigation use, and to control the quality of return flows **from** that irrigation, and so to meet the requirements of the environmental Reserve. All stakeholders need to be fully aware of the water quality issues at stake and how these drive decision-making. The overall situation and approach with regard to Water Quality is provided for the WMA under this general strategy. In section B2 the seven logical catchment units, into which the WMA is naturally divided, are used in describing the issues relating to water quality and in developing the management strategies and consequent actions considered necessary.
SITUATION ASSESSMENT	The status of water quality within the WMA varies from catchment to catchment. The WMA is almost overwhelmingly rural but mining still plays an important role in its economy. Coal mines (both existing and abandoned) in the northern and northwest regions have left a legacy of pollution, particularly acidification caused through the leaching of sulphur-bearing rock. The rehabilitation approach has been to try and cover and revegetate these sites. Non-point sources of pollution remain the most problematic and the hardest to control. Saline irrigation water and increasing salinity through return flows is one such problem and one, which has not received enough attention. Salinity is particularly a problem in the upper Mkuze catchment, and this has been a strong argument favouring the importation of fresh water from the Pongola catchment. Lake St Lucia was seriously threatened by salinity during the last drought cycle (and again in 2004), and the lack of a sufficient fresh water inflow was an important contributory factor. The salinisation of soils is experienced by irrigators on the Makhathini Flats and greatly reduced crop yields can be observed in some places. Salt-water intrusions into the groundwater table are a real concern along the coast where abstraction can tilt the gradient of flow in this extremely flat environment. The growth of the Richards Bay urban/industrial complex increases the threat, which all industry poses to water quality - both in the light of the heavy 'wet' industries in place but also in terms of waste discharge. Mining for heavy metals in this region impacts on groundwater and on the local surface resources (including the lakes). Soil erosion does not feature heavily as a water quality issue in this WMA, although there is significant movement of sand, especially in the upper Mfolozi River, which counts against the construction of dams and complicates the management of

	abstraction weirs. On the plus side is the fact that rural populations are rarely concentrated into dense settlements and pollution from pit latrines, poor sanitation and badly managed sewage works, although there are local issues, is not the major concern noted in some other WMAs. Water quality is monitored on a regular basis at particular sites. This forms the basis of the Water Quality Information Management System (WIMS) base data and helps alert the Department to problems or trends, and to inform preventative or precautionary action. See also the **Monitoring and Information Strategy (Strategy G8).** DWAF also relies on reports of water quality problems, contamination, or spills, and does its best to resolve or ameliorate problems reported. The key management problem in the WMA lies in the lack of experienced human resource capacity. The Department of Water Affairs and Forestry finds what little capacity it has tied up in dealing with the inevitable crises which occur, in a reactive manner ('fire-fighting'). Most of the skilled staff base has been lost and a strategy to rebuild this capacity is imperative if management is to shift from being reactive to proactive, and to dealing with prevention rather than cure.
STRATEGY	The management of water quality in this WMA must be moved from a reactive to a proactive state. This requires the appointment and maintenance of a strong team of water quality scientists and engineers in order to ensure adequate monitoring and management, and funding must be secured to achieve this. The powers and effective operation of this team must be facilitated – with the development of supportive policies being a key requirement (see also the **ISP Implementation Strategy, G9).** The Water Quality Management Team should operate in terms of a number of core principles and approaches: • Water quality problems are generally addressed through a strategy of negotiation and co-operation with the polluting parties. Historically this has been to seek mutual solutions through responsibility and co-operation – and this stance should be maintained. • The approach, where mines could be abandoned if the water quality management problems become too great for the owner to deal with, has in the past been to test the limits of resources and to maintain pressure at levels which will not drive the owner out of business or off the site, which would then leave DWAF with the whole problem. This is despite the fact that DWAF has the legal right to instruct institutions or individuals as to the actions demanded of them by law. Again it is recommended to take a careful line, which maximises the possible and reasonable inputs, by the owners without saddling DWAF with the entire problem through business closures. • There is, and must remain, a focus on local authorities in identifying water quality problems and threats, and in managing the issues which come to light. This includes ensuring that inappropriate land-use zoning / rezoning does not take place, and increasing the understanding within local authorities of water pollution sources and threats to quality (salt-water intrusions into groundwater sources due to over abstraction would be one good example). • Funding is necessary to ensure that clean-up operations can be effected quickly and efficiently. Discretionary funding is particularly important given that

	so many polluters are quite unable to take on the responsibility required of them in the event of spillage or disaster. In order to motivate for this an 'incidents and risks' document should be compiled with urgency. • Monitoring remains a key requirement (see also the **Monitoring and Information Strategy, G8**). Steps must be taken to provide for improved monitoring, analysis and assessment, and an integrated database, which is made accessible to all stakeholders. To achieve this a detailed water quality-monitoring strategy needs to be developed and submitted as a matter of both urgency and high priority. This should assess the size of the team and the level of resources required to monitor and then also to enforce corrective management where problems are identified within the WMA.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Secure a committed water quality management team within the Region, and to support work required in this WMA. Conditions of appointment must be such that this team can be functional and sustainable. Staff procurement and remuneration must be revisited in the light of scarcity and demand.	**Responsibility:** Regional Office **Priority:** High
• Set water quality objectives for the resources in the WMA.	**Priority:** High
• Point and diffuse source polluters need to be identified as a matter of urgency. Water quality management charges must, as soon as possible, be brought to bear. A strategy to deal with this is being developed nationally. It is expected that these 'discharge water use charges', through which users will pay for their impacts on water quality, will raise more than enough revenue to finance a Water Quality Management team to support the CMA in the Usutu-Mhlathuze WMA.	**Priority:** High
• A detailed water quality **management** strategy must be developed. This should highlight the main issues, the areas of priority, and the abilities of the management structures (DWAF, but later the CMA) to deal with the issues. This ISP offers a set of issues and approaches upon which such a strategy could be built.	**Priority:** High
• Prepare a detailed water quality **monitoring** strategy.	**Priority:** Medium
• Prepare an 'incidents and risk' dossier as motivation for additional state funding.	**Priority:** Medium
• Establish pricing and payment for effluent discharges as the *modus operandi* within the province. (Implementation will be dependent on the national policy and protocols). Develop a business plan based on expected incomes from these discharges.	**Priority:** Medium
Refer also to the strategies and actions developed for each of the seven catchment management units within the WMA.	

Strategy No.	G3

GROUNDWATER

MANAGEMENT OBJECTIVE:	To better understand the current use of groundwater within the WMA, to determine the potential for further use, particularly: • in bringing water to the rural poor • in harnessing the potential of the Zululand coastal aquifer whilst ensuring that use is sustainable and does not threaten surface water systems or the ecology of the Zululand Coastal Plain.
SITUATION ANALYSIS/ MOTIVATION	The Usutu to Mhlathuze WMA is home to the largest primary groundwater aquifer in all of South Africa. This aquifer underlies the 7 000 km^2 Zululand Coastal Plain. Compared to the volume of water stored in the aquifer, current abstraction is negligible. The area is environmentally very sensitive and there are real concerns that heavy draw-down would radically affect the ecology of the region. Forestry in the vicinity of Lake Sibaya is one such user raising these concerns. The groundwater harvest potential on the coastal plain is particularly high, but the potential declines steadily as one moves inland onto different geologies. In reality very little use has been made of groundwater anywhere within the WMA – except through the coastal lakes and by the mining sector in the lower Mhlathuze catchment. Although most of this potential lies in the coastal plain the opportunities upstream need to be pursued, particularly as a means of bringing water to the rural poor. The depth to ground water on the coastal plain is often within 3-6 metres (6 m being the limits of the treadle pump) - offering easy access to rural users. Water quality is generally good but the coastal aquifer is particularly susceptible to pollution - calling for care in the siting of both human settlement and industrial users. The most authoritative work on the ground water resources of this area has been conducted by the CSIR with reports by Meyer and Godfrey (1995) and Meyer, et al (2002).
STRATEGY	Groundwater in the Usutu to Mhlathuze WMA is an under-explored and under-utilised resource. This points to a definite opportunity, particularly in the support of supply to rural communities. In catchments under stress the licensing of groundwater use may still be permitted provided this is not seen to impact on surface flow or on other users. The utilisation of groundwater from the primary aquifer of the Zululand Coastal Plain is more complex, given its shallow depth, uncertainties about direction of flow, the direct dependency of vegetation, relationships with freshwater lakes and the impact of forestry. This is a system which can

	support the small user (at the scale of household and Schedule 1) but from which any further exploitation by commercial users should not be licensed without careful research and conditional monitoring. Implementing agencies currently responsible for bringing water supplies and sanitation services to communities within the WMA (ranging from NGO's such as 'Partners in Development' to the Uthungulu DM) have gained a useful knowledge of the coastal aquifer and its use, and this experience should be actively drawn upon.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Implement an audit of all groundwater use within the WMA. This should include the extent and purpose of use, and an evaluation of the impacts of use on the total resource, on water availability, the environment and other users.	**Responsibility:** KZN: Regional Office **Priority**: Medium
• Commission detailed maps providing a spatial quantification of the groundwater resource across the WMA. Most particularly seek to define the boundaries of groundwater catchments and the directions of flow.	**Priority**: Medium
• Gather together all available expert knowledge on the functioning of the Zululand Coastal Aquifer and commission further research should this knowledge prove inadequate. The impact of forestry, and the potential for further exploitation by all users must be fully understood. Critical elements are the relationships between the groundwater aquifer and both the vegetation and the recharge of the surface lakes (typically Lake Sibaya). The nature of underground flows, and especially the loss of fresh water directly to the sea must be fully understood.	**Priority**: Medium
• Gain an understanding of the volumes of water which can sustainably be drawn from the Zululand coastal aquifer without impacting on the vegetation ecology and without affecting other users. The approach should be to assess the sustainable levels of abstraction, and the impacts of such use.	**Priority**: Medium
• Estimate the likely growth and extent of Schedule 1 and other small-scale water users from the Zululand coastal aquifer.	**Priority**: Medium
• Opportunities for towns and mining operations (very limited though these might be using current knowledge), farmers and rural communities to abstract and use water in all upland areas of the WMA need to be assessed. This knowledge and experience needs to be made part of the public knowledge base so that the inhabitants of the WMA can make use of the opportunities provided to them through groundwater. The licensing of groundwater use needs to be in accord with this strategy.	**Priority**: Medium

Strategy No.:	G4

FORESTRY

MANAGEMENT OBJECTIVE	To allocate further water to forestry where this allows for a realisation of potential without unduly impacting on the current and future availability of water to supply basic human needs, the ecological Reserve, and other more beneficial users. The priority in allocation should be the redressing of past inequities in terms of forestry opportunity.

SITUATION ASSESSMENT	Forestry is a very important land use activity in the WMA, occupying over 4 000 km^2. The industry supports several sawmills, a board mill in Piet Retief, and a pulp and paper mill in Richards Bay. In addition a vast quantity of wood chips from timber across South Africa is exported via a special facility at Richards Bay. Most of the timber in the WMA is grown by large-scale commercial growers (Sappi, Mondi and Syiaqubekha) but there are a large number of small growers, most growing trees on very small plots (typically 1-2 ha) on the Zululand Coastal Plain down the coast from Lake Sibaya, and significant community plantations in the vicinity of Mbazwane. The larger forestry companies generally support the community developments through funded small-grower schemes. Although much of the land suited to forestry has already been afforested, there is pressure for expansion. There is also some suitable land in most catchments, much of this communally held – although this does not mean that there is water available. The best potential lies in the Matikulu, Mtunzini, Mhlathuze (Eshowe to Nkandla), Bivane (in the Pongola), and Upper Usutu catchments. Given that forestry licences have in the past been regulated on the basis of an allowed water resource impact of 20% of MAR, most of the WMA has been considered fully allocated for a number of years and no further licences have been issued. This has put a cap on forestry development. Although this limitation is no longer applied and all applications for water use licenses are evaluated in the light of availability, on merit and not on the basis of pre-defined limitation, in practice the total available water resource in some catchments is now fully allocated to a range of users, and water for further forestry would have to be found through reallocation, or from other new sources. The Usutu to Mhlathuze WMA is one of the most water rich WMAs in South Africa, and surpluses offer significant opportunity for equity allocations through forestry. In an interesting negotiated arrangement, farmers in the over-allocated Mhlathuze catchment have, through the Mhlathuze Catchment Forum, offered to give up sufficient water from their existing allocations to allow for a further 1000 ha of community-based forestry within the catchment. This agreement would need to be formalised, with irrigation allocations reduced accordingly. It is probably more practical that the Compulsory Licensing process should take account of, and make allowance for, this stance. Far greater areas of land are suited to afforestation in the vicinity of Nkandla but this would require either the allocation of water not yet taken up by KwaZulu farmers lower in the

	catchment or a reallocation of a greater share of existing resources through compulsory licensing. The potential for new forestry in other catchments is poorly known and each application would need to be considered on its merits.
STRATEGY	Forestry is recognised as a land use which should be allowed to compete with irrigated agriculture and with other users on an equal footing. This means that available water may be allocated to any users who can demonstrate that they offer commensurate benefit to society and the economy, weighed against a possible environmental impact. With this approach there are no limitations based on the area of a catchment or percentage of the resource, which may have been taken up by forestry. Forestry is nevertheless often an upstream user, it does have a high assurance of supply in that its use cannot be restricted in times of shortage affecting all users, and it is a long-term land use activity from which it is not that easy to disinvest. These factors suggest certain conservatism is required when evaluating a water use licence for forestry or when considering a water use trade out of agriculture and into forestry. At the same time forestry is a distributed water user which makes no demands on infrastructure for water provision, and which is easily accessible as a land and water use to remote rural communities. In this it is a beneficial and efficient equity tool. There are strong market-driven demands for additional afforestation, and the granting of licences for additional plantations should be made with all of the above considerations in mind. More specific considerations, on a catchment-by-catchment basis, can be found under the Reconciliation and Allocations strategies in Part B2. It is also recommended that the Forestry Industry be requested to provide a forestry development plan for the catchments of the Usutu-Mhlathuze WMA, expressing the area of potential, area considered seriously for forestry development, ownership, and expected water use. This would allow DWAF to plan proactively, and other landowners to consider options with regard to the trading of water into forestry. Strategies on how to deal with illegal forestry are: 1. If the trees are still young, and especially if this is a first rotation, they should be removed immediately. 2. If a catchment has water available, or if the forest owner can find water to trade for his trees or perhaps build a dam, then maybe a licence could be considered especially if the ecological environment has already been destroyed. 3. If the catchment is under stress then the trees must be removed - but there may be some accommodation to allow them to reach a level of commercial viability (provided this does not further harm the biodiversity environment). 4. At all times this remains a co-operative governance decision.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Assess the potential for new forestry in each catchment. Determine how much of this would be commercial and how much communal. Consider the likelihood of possible licensing in view of water resource availability, international obligations and impact on biodiversity. Announce what prospects there currently appear to be for additional forestry in each of the secondary catchments making up the WMA. In practice much of this preparatory work could be handed over to the Forestry Industry, with the suggestion that proactive mapping could lead to pro-active assessment of licensing opportunity. Based on this ISP, areas in which additional forestry is a possibility based on the availability of water are: • Mtunzini and Matikulu catchments • Mhlathuze (provided water is reallocated for this purpose) • Upstream of Pongolapoort Dam • Lake Sibaya catchment • Mfolozi, provided the reduction in yield is compensated for through the provision of storage.	**Responsibility** 1.DWAF Directorate: Abstraction and Instream Use 2. Forestry Industry **Priority** Medium
• Develop a policy or set of principles against which water use licences (for forestry) can be awarded in the quest for equity in allocations. **See also discussions on forestry opportunity with the Reconciliation and Allocations plans within the catchment strategies in part B2 of this document**	**Responsibility** DWAF Directorates: Abstraction and Instream Use & Water Allocations **Priority** High

Strategy No.:	G5

WMA-LEVEL STRATGEY: WATER CONSERVATION AND WATER DEMAND MANAGEMENT

This strategy applies to the WMA as a whole, while more detailed catchment-specific strategies are given in Part B2.

MANAGEMENT OBJECTIVE	To make **more efficient use** of the existing available water resources to all water user sectors. This will free up additional water, which can be put to beneficial use.
SITUATION ANALYSIS/ MOTIVATION	The Usutu to Mhlathuze WMA is one of the best watered in the country. This means that it has more water than most and, while some of this is transferred into the Vaal and Olifants systems to the north to support power generation, it also uses more than most, both in absolute terms and in terms of per capita usage. This in turn suggests that the WMA probably offers more opportunity than most to save water and 'create' additional volume through water conservation and demand management. At the same time most of the catchments making up the Usutu to Mhlathuze WMA are either in balance or in deficit – so there is a real need to use the resource effectively. The Mhlathuze is one of the most seriously over-allocated catchments in the country and the lack of additional allocable water constrains future development of all sectors. WC&DM is a first 'line of attack' in seeking to remedy the situation, and one of the most significant ways in which local users can make a real difference – with the prospect of staving off, and certainly reducing the impact of, compulsory licensing. As indicated in section 4.11 of the main body of this report, the irrigation sector is, at 54%, the largest water user in the Usutu to Mhlathuze WMA. Irrigation is often, and justifiably, accused of inefficient use of water and this can provide major opportunity for conservation and demand management. Core land-use activities in the WMA which use the most significant volumes of water are sugarcane (irrigated and dryland) and forestry. Of these irrigated sugar has a water allocation and forestry is subject to legislative control as a declared Stream Flow Reduction Activity (SFRA). Dryland sugarcane is also acknowledged to use significant amounts of water (a rule of thumb about 50 to 75% that of forestry) but there is no legislative control over expansion of the crop. One WC&DM measure would be to highlight the impact which dryland sugarcane has on the water resource and to move for its declaration as a SFRA. Irrigated sugarcane, in turn, uses far more water than when the crop is not irrigated, and also ties up a water allocation. There are some areas where the irrigated crop could be converted to dryland with limited impact on production. One of the other key areas of water use where the reduction of inefficiencies can make a very big difference lies in operating rules. This refers to the releases both to meet downstream irrigation demands, and releases to meet the needs of the ecological Reserve. This applies particularly to releases out of the Goedertrouw Dam to supply downstream irrigators, but also to the management of the Pongolapoort Dam and other dams in the WMA. Whilst releases for the Reserve are of a fixed volume the degree to which these fulfil the needs of the Reserve will depend primarily on the accuracy of the original requirement determination, but

	also on the timing of the release. It is essential that this be optimised. Releases to meet irrigation demands depend on the demand, the timing, the distance from the site of release to the site of use, and to the extent to which the volume of water released is eventually used. The only catchment which has received any attention to date with regard to WC&DM, is the Mhlathuze catchment, which was the target of a recent comprehensive study (DWAF, 2001). These outcomes are summarised in the strategies below.
STRATEGY	• Water Conservation and Demand Management must be entrenched in the WMA as critical to success and profitability. The relevance to success applies both to individual users and to the entire WMA. The highest level strategy is to entrench the culture of water conservation in the Mhlathuze catchment through a vision, whereby "Water conservation is a way of life for all users in the Mhlathuze catchment". • Taking note of the various strategies offered below it remains necessary to implement a suitably structured and systematic WC&DM plan for each catchment and for the whole WMA. The key task is to develop this strategy. • Encourage voluntary compliance with the principles and strategies expounded in the National WC&DM Strategy. Take particular note of the strategy for WC&DM in Agriculture. • All new licence applications should be accompanied by a water demand management plan in accordance with the Implementation Guidelines for Water Conservation and Demand Management for the various sectors. • Compulsory licensing is soon to be implemented in the Mhlathuze Catchment and, with time, will be applied across the whole WMA. The approach should be to introduce and encourage WC&DM alongside the implementation of Compulsory Licensing. The important principle here is that the savings which users achieve through WC&DM need to be passed back to the collective and not immediately taken up by the individual users as an opportunity to expand their holdings (e.g. area under irrigation) through use of the water saved. Users will have allocations reduced with Compulsory Licensing and, if they are operating to maximum efficiency and utilising their entire allocation, this will mean that they will have to reduce the size of their operation. The message and the strategy which can be drawn from this is that WC&DM can and must be implemented, that it can reduce or even avoid reductions in production – but that any WC&DM measures which are implemented now should be used to bring water back into the collective. Planning measures should make this very clear – and most particularly where incentives are used to try and save water. • Licences should be granted to convert irrigated sugar to forestry, provided that this trade does not in any way compromise the water resource, and provided that the trade does not unreasonably disrupt the social, economic and environmental balances within the region. Saved water may either be returned to the common pool, or traded. • The declaration of dryland sugarcane as a SFRA will improve management and control of the resource and this legislative step should be encouraged. • DWAF should work very closely with the SA Sugar Association to see that all sugarcane (irrigated and dryland) is grown and managed within the constraints

imposed by the environmental guidelines now approved by the Association. This will mean significant withdrawal of the crop from riparian zones and wetlands, with potential benefits to the resource. In the case of irrigated sugar, farmers withdrawing from hydrologically sensitive areas but with additional land may choose to use the allocation saved on new plantings. Alternatively the unused allocation could be returned to the Authority so as to avoid water use charges. It could also become a tradable commodity. Where the clearing of environmentally sensitive areas means a reduction in the area under dryland sugarcane there will be a definite saving in water. Given that sugarcane is not a licensed water user the sugar farmer has no legal claim to the water saved and this will automatically revert to the system. Of course such a farmer could expand to new areas (if these were available) and, until sugar is declared to be a SFRA, such expansion would be uncontrolled in terms of water use. But then there is nothing to stop such expansion at any time anyway. Under all circumstances reductions in area should be noted and the benefits quantified.

- Illegal forestry should be handled in the same light as any other form of illegal water use. This will require the removal of all illegal plantations.

- Forestry management, as in the case of sugarcane, offers significant opportunity to increase the available water resource. In order to acquire and maintain certification as environmentally sustainable growers, forest owners are fast removing plantations from wetlands, riparian zones and other sensitive areas. This is of undoubted and immediate benefit to the water resource. Where the plantations removed are licensed and legal the growers are also effectively giving up part of their water allocation. This could be traded with other users – but is also the subject to requests for 'water use exchanges' whereby a new area of plantation may be permitted (i.e. licensed) in exchange for the area cleared of forestry. These exchanges would be in line with developing departmental policy and dependent on co-operative governance decision-making, but the one clear principle is that the water resource should not be compromised. In general we can expect an overall benefit to the water resource.

- Although the treatment of effluent is noted in the WC&DM report for the Mhlathuze as being 'prohibitively expensive', the maximum recycling of water must be encouraged. In the longer term, further development of Richards Bay could depend on recycled water. This could be achieved through trades of recycled or treated water, from primary to secondary users, and policies and pricing should facilitate this.

- Research into water use efficiency measures such as trading, water banking etc, should be viewed positively and encouraged.

- Systems Operations: The operation of the system, and the Systems Operating Rules need to be executed with the greatest consideration and care, recognising the volumes of water that are at stake.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Declare dryland sugarcane a SFRA.	**Responsibility:** DWAF: D: Water Abstraction and Instream Use. **Priority:** High
• Develop and implement a detailed WC&DM plan for each catchment in the WMA.	**Responsibility:** Regional Office **Priority:** Medium
• Assess how much sugar cane could be converted from irrigated to dryland cane and work with the SA Sugar Association to try and maximise this.	**Priority:** Medium
• Encourage the implementation of water-conservative management guidelines for both sugarcane and forestry. Develop principles to guide the way in which water saved through these actions may be taken up and used.	**Priority:** Medium
• Through the verification of water use, identify and eradicate illegal afforestation in the WMA according to accepted principles. Ensure that these are developed and in place.	**Priority:** Medium
• Update operating rules. A first step is to review the risk and causes of possible losses between storage and use. This could lead to recommendations to build additional weirs, especially on the Mhlathuze.	**Priority:** Medium
Catchment specific strategies have been developed for WC&DM for each of the catchments in the WMA. See Part B2.	

Strategy No.:	G6

WMA-LEVEL STRATEGY: INVASIVE ALIEN PLANTS

MANAGEMENT OBJECTIVE	To make **more efficient use** of the existing available water resources to all water user sectors by reducing unproductive water use by Invasive Alien Plants.
SITUATION ANALYSIS/ MOTIVATION	The situation with regard to invasive alien plants in the Mhlathuze catchment has been set out in the WMA report[5], as well as in more detailed reports such as the water conservation and demand management study carried out for the Mhlathuze catchment[6]. The WC&DM study information available for the Mhlathuze catchment is based on detailed surveys and is probably fairly accurate, whilst the original estimates (Versfeld et al 1998) seem to have significantly over-estimated the problem. The information for the remainder of the WMA may be somewhat speculative. Other than in the Pongola River catchment, the impact of invasive alien plants appears to be relatively limited in the Usutu to Mhlathuze WMA, at least from a water resources perspective, and of no great concern. The impact in the Pongola River catchment is given in the WMA report[5], as 30 million m^3/annum. Large-scale and fast spreading infestations of Chromolaena are reported on the Zululand Coastal Plain (including Mkuze and Hluhluwe Game Reserves) with serious consequences for the biodiversity.
STRATEGY	The strategy in the Usutu to Mhlathuze WMA should focus first on containment and secondly on eradication. The fact that infestation is, to date, relatively limited offers an opportunity for successful management but does not nullify the threat of future invasion. It is vitally important that this relatively favourable position of limited invasion be maintained. There are a number of possible approaches to the clearing of invasive alien plants. • In the first instance landowners should be held responsible for invasions on their own land and should be strongly encouraged to see to their removal. Landowners should also be held fully accountable for all invasions after 1998. However it is also recognised that the task of clearing all land is not always either possible or economically feasible and that either incentives or intervention by Working for Water or others may be required. • In all catchments that are stressed or likely to move into deficit in the foreseeable future to move into deficit the approach should, first and foremost, be to encourage and make full use of Working for Water in the clearing of invasives. These are catchments that cannot afford to lose any more water and any water that can be reclaimed through the clearing of invasives will be welcomed in providing for the Reserve and in reducing the pressure on reallocations through Compulsory Licensing. • Where catchments are in surplus, investment in the clearing of invasive alien plant by individuals and organisations in exchange for a water use licence may be considered and even encouraged. This would need to be on the basis of the principles of Water Use Exchange, which are currently being developed within the Department.
MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**

• Investigate the real extent of invasive alien plants in the WMA, determine their impact on the resource, and develop a programme for removal. Priorities for removal include: (i) The limited but dispersed invasions of *Acacia mearnsii* in the upper reaches of the Mhlathuze catchment. These must first be contained and ultimately eliminated. This should go hand in hand with the community afforestation strategy to ensure that valuable firewood resources (e.g. the invasive *Acacia*) are not eliminated without other woodlots being established. (ii) The clearing of the main stem of the Mhlathuze. The main objective here is riverbed and riverbank stabilisation. • The impact of invasive alien plants in the Pongola River catchment needs to be investigated and a plan to address this put in place. In the Pongola, with its relative surplus, the approach of Water Use Exchanges could be considered. • Prioritise further action based on the WMA survey.	**Responsibility:** DWAF Directorate: Business information/Working for Water **Priority:** High

Strategy No.:	G7

WMA-LEVEL STRATEGY: CO-OPERATIVE GOVERNANCE

MANAGEMENT OBJECTIVE	Co-operative governance is required to ensure that all regulating authorities involved in the management of the WMA take cognisance of the impact which their functions, decisions and planning have on the water resources of the WMA. All authorities need to work together for water.
SITUATION ANALYSIS/ MOTIVATION	A Catchment Management Strategy decentralises the management of water resources making it largely a regional or catchment responsibility through the establishment of Catchment Management Agencies (CMAs). Responsibility for operation of the system is further delegated to Water User Associations (WUA), which operate at a restricted local level as a co-operative association of individual users. A WUA is formed by a group of water users who undertake related water activities with the aim of obtaining mutual benefit through co-operation. A third institution which is of relevance to catchment management is the catchment forum, which is established to involve stakeholders, which could be other government departments and local government which have a stake in the efficient and effective management of the water resources of a catchment. The above three institutions (CMAs, WUAs and water forums) all require input from various local authorities and government departments. As a result, good co-operative governance is essential to ensure that the objectives of these institutions can be realised. Co-operative governance structures already in place in the Usutu to Mhlathuze WMA include the following committees and sub-committees set up by the Regional Office: • the Provincial Liaison Committee, which provides a forum for liaison with other government departments, water boards and district municipalities; • the Water Resources Planning sub-committee which co-ordinates water-related planning activities in the Province; • the Co-ordinating Committee for Agricultural Water (formerly the Irrigation Action Committee); • the Water and Sanitation Committee which deals with water services matters; and • the Stream Flow Reduction Activity Licensing Assessment Advisory Committee, which considers licence applications for forestry jointly with the provincial Department of Agriculture, the Environment and Tourism. • The Mhlathuze Catchment Forum is the likely forerunner to similar forums within each of the very distinct catchment units which make up the WMA.
STRATEGY	DWAF recognises the importance of co-operative governance and has adopted an approach of co-operation and negotiation to ensure the effective and efficient management of the water resources of the WMA. This can only be achieved through information sharing and reaching a common understanding with all institutions with an interest in water. The Department will work closely with all district and Local Authorities with regards to water resource supply, demand and management issues. Typically the Department will support and advise on groundwater exploration although it will not undertake such exploration directly on behalf of another Authority. DWAF will advise on WC&DM options and opportunities. The Department will also advise all Authorities on the state of the water resource and what this holds for expansion and future use. It will advise on news sources and their exploitability. The issue of lack of compliance by some local authorities, particularly with regard to discharges from waste water treatment works is not as serious as in most other WMAs.

	There is nevertheless a problem and it is the Department's strategy to address this through co-operative governance.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Advise all District and Local Authorities as to the extent, reliability and expandability of the water resource. Where this is not known or is uncertain then the Department should do its utmost to firm up on the figures. Co-operative Governance partners are expected to support DWAF by managing their constituencies within the constraints imposed by the water resource.	**Responsibility:** DWAF Regional Office/CMA **Priority:** High
• Develop closer ties between local municipalities and DWAF (and later the CMA) in order to pro-actively address water quality problems.	**Responsibility:** DWAF Regional Office/CMA **Priority:** High

Strategy No.:	G8

WMA-LEVEL STRATEGY: MONITORING AND INFORMATION

MANAGEMENT OBJECTIVE	To collect, collate and maintain sufficient and appropriate information to manage the water resources of the Usutu to Mhlathuze WMA efficiently and effectively.
SITUATION ASESSMENT/ MOTIVATION	South Africa no longer has much water to spare and many catchments are now stressed – with more water allocated to users than is reliably available. There is intense and growing competition for water. The true cost of supply and value of water as resource is now being recognised, and users are starting to pay realistic, rather than nominal charges. There are considerable inequities in the way water has been allocated in the past both in terms of people and the environment, requiring that some reallocation will have to take place. In order to license, allocate and manage this increasingly scarce and increasingly valuable resource requires reliable data on volumes available and volumes used. This demands accurate monitoring of rainfall, streamflow, water use and water quality. The raingauging and streamflow monitoring networks in most catchments are inadequate for the accurate estimation of resource availability and use. This strategy is required to ensure that systems are put in place at national, Water Management Area, and catchment level to allow for the effective and efficient management of the resource. Monitoring is an activity usually undertaken by the institution most requiring the information. With different institutions requiring a lot of varied information we end up with a lot of monitoring. This results in a wide range of data gathered, differing standards, and often inaccessibility to other interested parties. Information needs to be correctly processed, brought to a widely acceptable standard, and stored in databases which provide security to the owner but which can also be shared both in terms of input and access. The importance of accurate information for management has been stressed in the National Water Resource Strategy. It is apparent from the NWRS that both National and Departmental monitoring systems are spatially inadequate and often operate largely in isolation of each other. Whilst the Department is actively working to structure its systems into a single 'Monitoring, Assessment and Information System' (MAIS) it is clear that **this** strategy will need to address networks and funding, staff capacity, and co-operative relationships with other organizations. This strategy will also need to ensure that all activities are compatible with the national information system.

	Monitoring the water resource Monitoring, for the purposes of this strategy, applies to all aspects of the water resource, particularly: • hydrology - rainfall, climate, and streamflow • geohydrology – groundwater • inflows and outflows (transfers) • abstraction (water users, dam levels, operational releases, losses etc) • water quality (surface water, groundwater) • waste water outflows • river health (function and impact of the ecological Reserve) • sedimentation **Supporting information includes:** • Small farm dams (numbers, capacity, use, location) – this will also require monitoring • Land use change (agricultural cropping, forestry, invasive alien plants) – data available from other sources, but this needs monitoring • Return flows Monitoring problems that are specific to the Usutu to Mhlathuze WMA are the following: • There are reports that the Matikulu river has run dry on occasions. This is not consistent with the hydrology and land use information available. Improved streamflow monitoring is required. • The flow gauges in the Mhlathuze catchment are unreliable, with only two out of the nine gauges producing data of reasonable value. Rainfall gauging is also not adequate for accurate streamflow modelling. This puts question marks against the hydrological and yield analysis of this catchment. • The hydrology upon which the water resources of the Pongola catchment is based was last updated in 1984 and at that stage it was described as unreliable due to poor flow gauging. Information on actual water use is also sketchy with widely varying estimates of irrigation requirements in the upper Pongola catchments. There is no central information database available. This makes information sharing, which is required in terms of the Interim IncoMaputo Water Use Agreement, difficult.
STRATEGY	It is recognised that improved data gathering and dissemination is essential to efficient resource management. The Department of Water Affairs and Forestry is committed to ensuring that the utilisation and protection of the resource is optimised through information. In doing so the Department will endeavour to: • improve monitoring networks so that the resource can be accurately quantified for allocations and management accounting purposes; • improve on efficiencies in the gathering of information, particularly through institutional co-operation in data capture and management; • set and maintain standards for the capture, processing and management of information and • ensure that data is accessible to stakeholders without compromising data security. Key elements of the strategy: • To motivate **nationally** regarding the importance of monitoring and the essential need for better monitoring networks at national, WMA, and catchment level. The strategy is to ensure that those responsible for the allocation of funding fully understand that to allocate, manage and sell the water resource means that local managers need to know **what and**

	how much they have to allocate, manage and sell. • Co-ordination and co-operation across agencies at a **regional** level. • Organisational co-operation and efficiency. As an organisation the Department can only operate at optimum efficiency through close co-operation and sharing of relevant data capture and information management with its partners.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Assessment of information requirements (surface water, groundwater etc) at the scale of decisions (WMA and at catchment scale). • Design a monitoring system to meet the needs of the WMA as well as national requirements. This design should offer phased implementation, based on priorities. Priorities should be broken down to critical monitoring points within specific fields of concern, so that the most urgent areas can be attended to first. • Meetings and negotiations with cooperating partners. Assess what information is gathered, how it is processed and stored. Prepare a set of standards for data capture and the processing of information. Develop a plan for sharing both the capture and the use of mutually useful information. • Implement the monitoring strategy. At regional level the implementation of this monitoring strategy will be tasked to a small team drawn from across the traditional hydrological disciplines in the region. • Motivate and seek funding to meet requirements. • Develop and train staff.	**Responsibility:** DWAF: Regional Office **Priority:** High
• The Tripartite Permanent Technical Committee (TPTC) is to establish a Working Group to implement the information sharing protocols, which form part of the Interim IncoMaputo Water Use Agreement.	**Responsibility:** DWAF: D: International Development Co-operation **Priority:** High

Strategy No.:	G9

IMPLEMENTATION OF THE ISP

MANAGEMENT OBJECTIVE	To ensure that the approaches put forward by the Department through this ISP are adopted and implemented in the Usutu to Mhlathuze WMA. This will require willpower, funding and capacity.
SITUATION ASSESSMENT	The ISP is an internal document, developed almost exclusively by and on behalf of the Department of Water Affairs and Forestry. The ISP sets out the approaches which the Department is taking towards water management in the Usutu to Mhlathuze WMA – and lists suggested actions towards achieving good management of the water resource. The wider public has had no direct input into this ISP – yet it is recognised that the approaches adopted have a significant impact on the populace of the Usutu to Mhlathuze 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 **DWAF** itself sees the situation, and the steps which **DWAF** views as most appropriate in dealing with the situation. Years of interaction with the public have had an important influence. The 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 – exposing the thinking and planning of the Department in a way that has never been done before. 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.

STRATEGIC APPROACH	The ISP is subject to the approach set out in the NWRS – and details this approach for the Usutu to Mhlathuze WMA. It carries significant weight in expressing HOW water resource planning and management will be carried out in the WMA. It is not, however, an inflexible document, nor is it without its flaws. As such the ISP may be adjusted and adapted when new and better ideas are presented. Despite this the approaches and requirements of this ISP may not be ignored. The Implementation of the ISP is an enormous task. The hopes and expectations of the Department have all been gathered together into one document. 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, and will always be, barriers to success. 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.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
The following actions are required: • Publish the ISP in hardcopy, on CD, and perhaps even on the Web, for public input and comment. Copies will only be presented to key stakeholders, and on request. It is not the intention to have a major drive for public input, but merely to create accessibility for input. • 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, are taken out forcefully both to local authorities, other direct water users such as agriculture, and the wider public. • Collate comment and consider this in revising and improving the ISP. • The ISP should, in any event, be open to continuous improvement, with possible updating on a bi-annual basis. • All Regional staff, District and Local Municipalities, Working for Water, Mhlathuze Water, Water Boards and/or WUEs, 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 Region. It is critically important that the tasks outlined are prioritised, budgeted for, and built into regional and national business plans and budgets.	**Responsibility:** Regional Office **Priority:** High

PART B2

CATCHMENT SPECIFIC STRATEGIES

Strategy No.: 1.1	RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES W11& W13: MATIKULU AND MTUNZINI CATCHMENTS

This strategy is specific to the Matikulu/Mtunzini catchments. Refer also to WMA General Strategy G1, which gives a broad reconciliation and allocation strategy for the whole WMA.

MANAGEMENT OBJECTIVE:	To ensure that the water resources of these catchments, which have limited storage capacity, are utilised optimally whilst ensuring that the ecological Reserve requirements are met.
SITUATION	A water balance for these catchments and a tabulation of use by the different sectors is provided in section 4.4. The water requirements are found to be less than the available resource, meaning that these catchments are in surplus. Key land-uses of importance are dryland sugarcane, forestry, and irrigated agriculture (much of which is also sugar) based on direct river abstraction or storage in farm dams. Based on the figures provided in section 4.4 it would appear as if there is a substantial surplus in these catchments, mostly as a result of farm dam storage. The W11C and W13A catchments contain some significant farm dams which, based on analyses carried out for this ISP have a surprisingly large yield. Assuming that this yield is only available for irrigation, there could be an additional 16 million m^3/annum available in these farm dams which is not currently accessible to other users. In practice the currently 'available' surplus in the catchment therefore remains limited to the estimated run-of-river surplus, also estimated to be 16 million m^3/annum (see **Table 4.3** in the main body of the report). Significant areas within these catchments are communally held. An analysis of water allocation by sectors suggests that only a small percentage of the water resource is actually used by the communal sector, most of this being through the cultivation of dryland sugarcane.
STRATEGY	• There are no urgent problems within these catchments. Care must however be taken that the Reserve requirements are met (particularly low flows and estuarine requirements). • Target the use of any surplus water for poverty eradication and equity programmes. Opportunities include licences for forestry and further expansion of sugar on communal areas. These opportunities must first be evaluated and licence requests met before allocations are made into the established sector. • Water which would become available through the construction of dams (there is opportunity for at least one dam yielding an estimated 25 million m^3/annum) should be considered both for local supply and/or for transfer to the Mhlathuze catchment. The sectoral water allocation strategy for these catchments, is prioritized as follows: • *Water for poverty eradication/rural supply* Surplus water in these catchments should in the first instance be used for poverty eradication. Detailed analyses are required in order to refine estimates and the best opportunities for utilising this water to best

	effect (reaching and benefiting the largest number of people). Suggested best options are dryland sugarcane[1], forestry, then irrigation. • *Urban* Urban demands are limited. Sources of supply are, in order of priority, surplus from farm dams, groundwater, the Fairbreeze pipeline, and finally development of the resource. • *Industrial/mining* Large industrial or mining users are to source their water from the Thukela River, e.g. Fairbreeze mine. Smaller users as for urban. • *Irrigation* Water for additional commercial irrigation can only be considered once the requirements of poverty eradication and equity have been met. Water can be sourced from existing farm dams, which appear to be underutilised, or from the construction of new dams. • *Forestry/dryland sugarcane* To be assessed on the same basis as irrigation, except as a 100% assurance impact on yield. Note that forestry and dryland sugarcane are very suitable ways of providing 'agricultural' water to the rural poor and have a high priority for this purpose.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Include the Matikulu and Mtunzini catchments (i.e. both W11 and W13) in the compulsory licensing process, as these relatively small and independent catchments are otherwise likely to 'fall between the cracks' and will not see compulsory licensing for many years.	**Responsibility:** DWAF Directorate: NWRP **Priority** High
• Determine the ecological Reserve requirement with a higher degree of certainty, and account for any impact on further allocations for forestry, dryland sugarcane or irrigation.	**Priority** Medium
• Investigate the availability of additional water through the utilisation of farm dams in the catchments. Consider also ways of bringing unused water, which is 'locked up' in these dams, into use for the public good (this may well be a licensing issue). This can be done in conjunction with a study to identify possible large-scale developments.	**Priority** Medium
• Determine the amount of forestry and/or dryland sugarcane[1] that could be licensed in the catchment and inform the Forestry and Sugar industries. The potential for equity allocations to small forestry growers must first be evaluated and this requirement met before other allocations are made. Forestry licensing procedures must be adhered to. An ideal relaxation would be to issue a General Authorisation for a maximum area of small grower forestry, on the basis of certain strict conditions.	**Priority** Medium
• Assess prospects for the construction of a major dam in W11B or C to meet the growth in water requirements. This can be done as part of the Compulsory Licensing process in the Mhlathuze, W11 and W13 catchments.	**Priority:** Medium

[1] Dryland sugarcane is not, at present, a declared stream flow reduction activity and DWAF is therefore in no position to restrict the planting of this crop. Nevertheless it is a recognised user of water, and this use need not be discouraged provided it is for equity purposes.

Strategy No.:1.2	**WATER CONSERVATION AND DEMAND MANAGEMENT** **W11 and W13: THE MATIKULU AND MTUNZINI CATCHMENTS**

MANAGEMENT OBJECTIVE:	To maximise flow in these river systems, and particularly low flows, through improved land-use practices. Close co-operation with the SA Sugar Association is essential to achieve success.
SITUATION ANALYSIS/ MOTIVATION	Few of the standard ways of implementing WC&DM are available in these catchments – but some opportunities nevertheless present themselves. The catchments are largely given over to sugarcane farming and some forestry. One such opportunity is to encourage a shift from irrigated to dryland sugarcane production, and another to convert from irrigated sugarcane to forestry. So too from forestry to dryland sugar. Sugarcane farming has historically been lax in the setting of environmental guidelines. New guidelines are now in place, which provide for the maintenance of riparian zones, the rehabilitation of wetlands and other similar measures. The aMatikulu sugar mill utilises old and inefficient technology. The water requirement of this mill is 2 million m^3/annum. The clearing of invasive alien plants offers some opportunity in every catchment. Extensive invasions have not been reported for these densely cultivated catchments and clearing would probably have a relatively limited impact - and thus receive a low priority as a WC&DM measure.
STRATEGY	• Work closely with the Sugar Association of South Africa in seeking to minimise water use in sugarcane farming. The following approaches should be examined: (a) Seek efficiencies in irrigation methods and in volumes applied, irrespective of the allocations. Both pricing and the right to trade water conserved, could act as profit incentives (b) Seek conversion from irrigated to dryland sugarcane farming where rainfall is sufficient and the increased production through irrigation hard to justify (water pricing would be one mechanism to encourage this) (c) Encourage and enforce (where appropriate) the implementation of the environmental guidelines adopted by the Sugar Association (d) Conversions from irrigated sugar to forestry should be licensed where this will lead to an overall improvement in the catchment water balance without increasing management risk due to changes in assurance of supply.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Encourage the aMatikulu sugar mill to update its technology to reduce the water requirement. One way of doing this would be to suggest that a proportion of the water saved could be allocated to additional sugarcane growers. • Manage in accordance with best principles of WC&DM and in line with the WMA strategy and the strategic approach outlined above. The Regional Office/CMA is responsible for implementing the strategy for this catchment.	**Responsibility:** Regional Office **Priority:** Medium

Strategy No.: 1.3	**WATER QUALITY MANAGEMENT** **W11 & 13: THE MATIKULU AND MTUNZINI CATCHMENTS**

MANAGEMENT OBJECTIVE	To manage threats and reduce the amount of sediment carried by the Matikulu and Mtunzini rivers, thus improving the condition and health of the estuaries.
SITUATION ANALYSIS	There are a number of water quality problems, current and potential, in the W11 & W13 catchments. These threats include: • Effluent from the aMatikulu sugar mill. This is used to irrigate pasture, but there may be unknown or unrecognised impacts, especially in the longer term. • Prawn farming in the estuaries of both the Mtunzini and the Matikulu rivers could have water quality implications for these estuaries. • Sand mining for heavy metals in the lower catchments. The Fairbreeze mine, although in the Mhlathuze River catchment, poses an additional threat in this regard in that there will be increased pressure to mine the dunes in the W11&W13 catchments. • Intensive agricultural land-use, and especially sugarcane farming, results in high sediment loads. Improved land-use management would be an important consideration when planning new dams in the catchment. As it is this siltation is not good for river or estuary health. • Sugar is one of the major water users in the catchment, and this water use is computed for the catchment water balance and water-use reconciliation. But dryland sugarcane is not a declared SFRA and does not require licensing. This means that there is little or no control over the planting of new areas of sugarcane under dryland conditions. • Probably the biggest threat to water quality is the further expansion of land-use in the catchment, along with increased utilisation of the water resource – the scenario being increased sedimentation and less water with which to dilute flows and flush the system. At the same time a number of opportunities for such expansion are promoted through this ISP.
STRATEGY	• The position with regard to water quality is as important as that of available quantity, when considering both prospects for further allocations and also for infrastructure development. • The situation with regard to water quality in these catchments needs to be more fully described so that any further planning or licensing can take this into account. The role (positive or negative) which any major new dam(s) might play must be considered. • Given that a primary problem appears to be surface flow and consequent erosion, good land management practices (for sugarcane and for grazing) must be prescribed and enforced. • Actions to be within the framework of the WMA strategy for water quality.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Determine resource quality objectives for the catchments.	**Responsibility:** Regional Office **Priority:** Medium
• Develop a water quality management plan for these catchments.	**Responsibility:** Regional Office **Priority:** Low
• Encourage the Sugar Association to prioritise the implementation of its own environmental guidelines, notably the management of the riparian strip as a buffer filter zone.	**Responsibility:** Regional Office **Priority:** Medium
• Investigate effluent irrigation from the aMatikulu sugar mill and develop ameliorating actions if necessary.	**Responsibility:** Regional Office **Priority:** Medium
• Review licence conditions for prawn farming in the relevant estuaries and other coastal waters.	**Responsibility:** Regional Office **Priority:** Low
• Review water quality monitoring in the catchments to ensure that it is sufficient to meet quality objectives (see also monitoring).	**Responsibility:** Regional Office **Priority:** Low
• Monitor the water quality situation in the catchment and implement all necessary measures to reduce agricultural impacts.	**Responsibility:** Regional Office **Priority:** Medium

Strategy No.: 2.1	RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES: MHLATHUZE CATCHMENT

This strategy is specific to the Mhlathuze catchment. Refer also to Strategy G1, which gives a broad reconciliation and allocation strategy for the whole WMA.	
MANAGEMENT OBJECTIVE:	To resolve the issue of over-allocation within the catchment and to manage the competition in demands between community, irrigated agriculture and the growing industrial/ manufacturing sector, so that the best use can be made of water to benefit the overall economy of the catchment and the country. Inequities in historical allocations are particularly clear in this catchment and need to be redressed to the best benefit of the largest possible number of people.
SITUATION ANALYSIS	The water balance for the catchment and a tabulation of the use by the different sectors in the Mhlathuze WMA is provided in section 4.5. Paradoxically, in terms of actual current water use, there is surplus water available in the catchment while in terms of allocations the catchment is seriously stressed. The Mhlathuze catchment is the economic 'powerhouse' of the Usutu to Mhlathuze WMA and the use and sales of water within this catchment are critical both for its own good management and for the management of the rest of the WMA. The Richards Bay/ Empangeni industrial complex is a national growth point still developing on the basis of national investment in port, rail and road infrastructure. At the same time the available water within the catchment has been over-allocated to users, and water accounting indicates severe stress conditions. In practice irrigated agriculture does not use its full allocation during normal years, and restrictions prevent this use during drought conditions. It is also recognised that the inequities in water allocation within the catchment are very large. Although not as dramatic as expressed in the original Strategic Environmental Assessment for the Mhlathuze (DWAF 2000), where it was stated that 85% of the people living on 50% of the land get 1% of the water, the inequities are of a high order and redress is urgent. There is an allocation of 10 million m^3/annum long earmarked for emerging farmers. This is for water out of the Goedertrouw Dam, and intended for the irrigation of 950 ha. This water remains unused. Land-use, from a water resources perspective, is dominated by afforestation (401 km^2), dryland sugarcane (268 km^2), and irrigation. A relatively large area (131 km^2) of the catchment is under irrigation with the dominant crops being sugarcane and citrus. Commercial farmers, in a semi-formal arrangement brokered through the Mhlathuze Catchment Forum, have offered to collectively 'give up' a portion of their irrigation allocation to allow small grower forestry on the communal holdings to the extent of 1000 hectares (this could amount to as much as 1 million m^3 of water) available annually. The most significant water-related infrastructure is the Goedertrouw Dam, with a capacity of 304 million m^3. This is situated in the upper catchment. Water can also be transferred into the Goedertrouw Dam from the Thukela via the Middeldrift transfer scheme at a maximum rate of 34 million m^3/annum. 18 million m^3 of water is also imported into the Mhlathuze catchment from the Mfolozi catchment for use in mining operations by Richards Bay Minerals each year.

STRATEGY	• Regional Development Plans (KwaZulu-Natal Provincial Cabinet, 2002) predict substantial growth in and around Richards Bay. It is not in the country's interest, nor that of the WMA, that this development should be curtailed through a lack of available water, and various strategies need to be developed so as not to retard growth. The foremost of these is that of Compulsory Licensing, to bring the allocations situation under control. • The Regional Office requires a 'development plan' so as to be able to deal with requests for large water use licences, notably for Richards Bay. This needs to be part of the public record so that stakeholders are aware of the provisions made. Stakeholders requiring water must be made to realise the need to announce intentions not currently in the planning framework. It is important for DWAF to have a realistic perception of the likely development demands and the time span over which these are expected to realise. Further water can be made available from alternative sources such as the Thukela and Mfolozi Rivers but this must be planned for and these options reserved. Neither the Regional Office nor the future CMA can be expected to manage and provide water on the basis of speculation. • It is necessary to direct the 'redressing of inequities' without severely disadvantaging the very population which the economy of the catchment and the country is required to support, so the implications of reducing supply to any one sector (e.g. agriculture) to provide for another, need to be carefully weighed. • The reason for commercial irrigators not using their full allocation during the 'good' years needs to be better understood so that this can be taken into account in the compulsory licensing process. • Different options need to be considered with regard to the use of the 10 million m^3/annum of water which was allocated to emerging farmers ('KwaZulu Farmers') for irrigation but which has not yet been put to use. It is important to consider the possible distribution of this water to a wider range of beneficiaries than the original irrigation users for whom this water was intended (typically as water to home-owners for 'productive use purposes' which are not necessarily commercial). DWAF supports the Department of Agriculture in the establishment of emerging farmers but also has a mandate to see that the water is put to its best and most efficient use to the benefit of as many people as possible. • Water Trading offers a significant means of shifting water out of the irrigation sector - particularly towards urban and industrial use. One important consideration is that the ability to respond to the need for equity allocations should not be dulled by the fact that water may have been traded and thus prove to be all the more difficult to reallocate into equity. So, although trading may well be allowed before Compulsory Licensing, it is a privilege that should be exercised with great caution. Trading between sectors needs to take account of the different levels of assurance between the two trading parties, and also their location within the catchment. A specific strategy for trading in the Mhlathuze catchment needs to be developed as a matter of urgency. • Water Conservation and Demand Management measures are particularly important in the urban/ industrial sector within this catchment (see also strategy 2.2). The following approaches are suggested in seeking to provide and allocate water to the various sectors within the Mhlathuze catchment. These are

	listed in order of priority: *Water for poverty eradication/rural supply* • Source from groundwater as a first option • Reallocation through compulsory licensing • Development of the resource, i.e. additional transfers from the Thukela or from a new dam in the Mtunzini or Matikulu catchment. *Urban / Industrial and Mining* • Water Conservation and Demand Management • Water trading out of the irrigation sector • Development of the resource, i.e. additional transfers from the Thukela or from a new dam in the Mtunzini or Matikulu catchment. *Irrigation* No further allocations to irrigators in this catchment – apart from the allocation of 16 million m^3/annum allocated to irrigators from the Fairbreeze pipeline, but this is supplied from the Thukela River. The unused 10 million m^3 allocated to emerging farmers may be taken up, but ways of utilizing this water to maximize the spread of benefit should be considered. *Forestry/dryland sugarcane* To be assessed on the same basis as irrigation, except that forestry be considered to have a 100% assurance impact on yield (see National Reconciliation and Allocation Strategy – Strategy G1). Water should be allocated to small growers / woodlots as part of the poverty eradication programme but water will first have to be found through the compulsory licensing process or other negotiation with existing licence holders. In the immediate term development of 1000 ha could be allowed if the agreement of commercial farmers through the Mhlathuze Catchment Forum can be implemented.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Initiate a study to determine the real water requirements of irrigators in the catchment. This could be done as an early phase of the proposed Compulsory Licensing process. • Compulsory licensing is to be implemented in the Mhlathuze catchment, but also including the Matikulu and Mtunzini (W11 and W13) catchments. Allocations to be reduced in line with actual requirements and the available resource, and also in consideration of other legitimate users – notably demands for equity and the requirements of the Reserve. Allowance must be made under Compulsory Licensing for allocations to emerging farmers, whether this be for irrigation, forestry or dryland sugarcane. These needs must be carefully and fully evaluated as a guide to the extent to which compulsory licensing needs to be exercised. • An allocation of water has been 'informally traded as a grant' by irrigators through the Mhlathuze Catchment Forum, to allow for 1 000 ha of small grower forestry. This forms part of the current water balance scenario. In the absence of a general authorization allowing conditional small grower forestry, applications for this water should be dealt with on merit by the Licence Assessment Advisory Committee, in parallel with studies to explore and indicate the maximum extent of potential development to communities. • Seek the use of water allocated to emerging farmers (10 million m^3). Research the benefits of such use and consider alternative ways of using	**Responsibility** DWAF Directorate: NWRP/CMA **Priority** High **Priority:** High **Priority:** Medium

this water to provide benefit to a larger number of beneficiaries.	
• Prepare a long-term water development plan to ensure the availability of water to the Richards Bay area to industries which could materialise in future.	**Priority:** Medium
• Develop a customized approach to water trading for the Mhlathuze catchment – with the bounds of a national strategy for trading.	**Priority:** Medium
• The recycling of both industrial and municipal effluent should be considered as part of a detailed water resources study.	**Priority:** Medium

Strategy No.: 2.2	WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY MHLATHUZE CATCHMENT

MANAGEMENT OBJECTIVE	To maximise the availability of water for the further development of the Richards Bay industrial zone.
SITUATION ANALYSIS	A detailed WC&DM study of the Mhlathuze catchment was completed in 2001[6]. The summarised findings of this study are: • By far the largest potential water saving can be achieved from the irrigation sector. Although the capital investment to achieve this would be large, the cost per m^3 of water saved would be one of the lowest. This can be achieved by installing more efficient irrigation systems (i.e. drip irrigation) and improved scheduling of irrigation. • The next largest saving that could be made is through the recycling of wastewater. Very large volumes of water are piped to the ocean as industrial waste out of Richards Bay. Typically some 21 million m^3/annum is lost from the Mondi Pulp facility. It is argued in the Mhlathuze WC&DM report that the reclamation (recycling) of this waste is 'prohibitively expensive'. • Savings are achievable from improved system operation, at an affordable price. • Savings are achievable in both the urban and industrial sector at relatively low unit costs but in absolute terms, the water savings are small. • The Mhlathuze catchment was estimated to be heavily infested with invasive alien plants in a CSIR study (Versfeld et al., 1999). These estimates were based on the mapping of 'expert-knowledge' but it has since become apparent that invasions are not as serious as were estimated and that far less water could ultimately be redeemed through the clearing process. Nevertheless some 7 million m^3/annum is estimated to be tied up through invasives. • The WRC is funding a study on Water Banking, with the Goedertrouw Dam as the research case. The argument is that irrigators will be far more careful and consequent in their use of water if any water saved may be carried over from one year to the next, and could be traded to any other user (notably into industry) in times of shortage.
STRATEGY	The strategy which emanates from the WC&DM study in the Mhlathuze WMA is to entrench water conservation in the Mhlathuze catchment through the following vision and mission: **Vision:** Water as a way of life for all users in the Mhlathuze catchment **Mission:** To implement a suitably structured and systematic WC&DM plan in the Mhlathuze catchment. • The key strategy is to implement Compulsory Licensing in order to bring allocations into line with reasonable water use. • The operating rules for the Goedertrouw System require continual adjustment. Efficiencies require tighter management – and particularly that farmers should pay for the water they order and not only the water they use. It should not be possible for farmers to order a release and then to decide that they no longer need this water. The strategy must however also guard against the wasteful use of this water by farmers who may irrigate even if the water is not needed, simply because they have paid for it. It would be far better, both in terms of water quality impacts (return flows) and for the ecosystem if unneeded water were allowed to continue down the water course and the system of releases, charges for water, and possible compensation (reduced charges) for unused water, should be designed with this in mind.

	• Given the levels of water scarcity in the catchment, and the extreme importance of maximising water availability to the Richards Bay industrial complex the strategy with regard to invasive alien plants would be to seek for their clearance through the state-funded Working for Water programme, with the water thus released being returned to the common pool. This water use by Invasive Alien Plants should not be made available to other users through Water use Exchange agreements. • Despite the costs of recycling industrial waste this could be a key to the future development of Richards Bay and strategies must be developed to maximise recycling and reuse of effluent. One option could be to facilitate the resale (trade) of recycled water between users through a review of legislation and current blockages to this process. Water pricing, and particularly the cost of effluent discharges, could also be used to encourage recycling.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Review and consolidate the findings and recommendations of the Mhlathuze WC&DM report, determine responsibilities and resources requirements, and develop a programme to roll out the strategy.	**Responsibility:** Regional Office & DWAF's Directorate of Water use Efficiency supported by Mhlathuze Water **Priority:** High
• Encourage the Forestry Industry role-players to continue with the clearing of Invasive Alien Plants in their quest for certification. Negotiate further with Working for Water to clear all invasives, especially on communal land, so that this water can be used to the benefit of all stakeholders in the catchment	**Responsibility**: Regional Office, WfW. Priority: Medium
• Support the WRC study into system optimisation through water banking.	**Responsibility:** DWAF: D: NWRP, WRC

Strategy No.: 2.3	**WATER QUALITY MANAGEMENT** **MHLATHUZE CATCHMENT**

MANAGEMENT OBJECTIVE	To ensure best practice management in the Mhlathuze catchment, managing land-use practices and especially irrigation and irrigation return flows to bring high quality water to Richard's Bay, which until now has required minimum levels of treatment for industrial and/or domestic use. Also to manage wastewater produced at Richards Bay to minimise the impact on the environment.
SITUATION ANALYSIS	• The surface water quality in the Mhlathuze catchment is generally good. At present water quality management takes place mainly on a reactive basis with the pollution control officers generally responding to pollution threat situations instead of proactively addressing the problems. There is a clear need for better water quality monitoring, the housing of information, and a more proactive management role where pollution is prevented rather then cleaned up after events have occurred. *Some specific problems are:* • Diffuse upstream pollution (irrigation and rural settlements), although fairly limited, poses a risk of eutrophication of Goedertrouw Dam. • The industrial nature of Richards Bay is resulting in increasing levels of waste which must be managed. • A significant producer of effluent is the Mondi pulp mill. Discharges to the ocean are significant (> 20 million m^3/annum), bringing concomitant pollution to the marine environment. • The mining of dunes for heavy minerals north of Richards Bay represents a pollution threat. This is close to the coast, limiting the threat to surface water but groundwater pollution remains a key concern. • The Iscor processing plant and slimes dam within the Mhlathuze flood zone, just seaward of the N2 highway bridge, has raised serious concerns as to its integrity in the event of a major flood event. This has, however, been discounted as a hazard. • The coastal lakes (e.g. Lake Nsezi) are experiencing eutrophication. This is ascribed both to agro-chemicals and to a sewerage works still under DWAF management. • Silt loads are generally low, with the poorest quality water being that imported from the Thukela via the Middeldrift emergency scheme. This results in some sedimentation within the Goedertrouw Dam. • Waste discharge from Felixton sugar mill could cause pollution problems. This is generally considered well-regulated and managed but there is some eutrophication of the Mhlathuze River downstream. • Irrigation return flows are of undetermined quality. Impacts of irrigation have not been assessed.
	• The position with regard to water quality in these catchments needs to be more fully described so that any further planning or licensing for use can bring this into the considerations. The role (positive or negative) which any major dam(s) might play must be considered. Given that a

STRATEGY	primary problem appears to be surface flow and consequent erosion, land management practices (for sugarcane and for grazing) need to be prescribed and implemented. • Monitor the water quality situation in the catchment and implement all necessary measures to reduce agricultural impacts. The first step may be to get the Sugar Association to prioritise the implementation of its environmental guidelines, which includes the management of the riparian strip as a buffer filter zone. • Infrastructure development and further allocations need to consider quality at least as seriously as the questions of available quantity. • Actions to be within the framework of the WMA strategy for water quality.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Determine resource quality objectives for the catchment.	**Responsibility:** Regional Office
• Review water quality monitoring activities and provide for a formal water quality monitoring programme. The focus should be on industrial/mining users and on irrigation return flows.	**Priority:** High **Priority:** High
• Implement all necessary measures to reduce agricultural impacts. A first step would be to get the Sugar Association to prioritise the implementation of its environmental guidelines, which includes the management of the riparian strip as a buffer filter zone – of particular importance in the management of both silt and nutrient flows into rivers.	**Priority:** High
• List and prioritise sources and risks caused through industrial development. Develop a strategic management plan for the handling of industrial waste.	**Priority:** High
• Maximize the recycling of industrial and urban effluent, particularly where this is currently discharged to sea. Pricing and trading both offer incentives.	**Priority:** Medium
• Evaluate upstream causes and sources of pollution and support implementation activities to reduce risks (typically this may include poverty eradication programmes, land-care activity to reduce siltation, improved sanitation, etc)	**Priority:** High
• Isolate the problems resulting in unacceptable discharges from sewerage works. Where these are DWAF-owned and managed they should be rectified with great urgency. In the case of poor management by Local Authorities the necessary information of costs and consequences, along with technical support, must be brought to bear. Refer to the National Approach on this issue (National Water Resource Management Issues, DWAF 2004).	**Priority:** High

Strategy No.: 3.1	**RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES: MFOLOZI CATCHMENT**

This strategy is specific to the Mfolozi catchment. Refer also to Strategy G1, which gives a broad reconciliation and allocation strategy for the whole WMA.

MANAGEMENT OBJECTIVE:	To optimise the use of the limited water within the Mfolozi catchment, taking cognisance of environmental requirements.
SITUATION ANALYSIS	The water balance for the Mfolozi catchment is presented in section 4.6. The water requirements of the catchment exceed the available resource by a substantial margin and the catchment is in deficit. This is because of the limited storage in the catchment. A large proportion of the Mfolozi catchment (47,7%) is communally-held land, with the main activity being cattle farming. Its water resources are largely undeveloped. At present the total available water resource, at a 1:50 year level of assurance, is estimated at 51 million m^3/annum. The total current requirement is in the order of 98 million m^3/annum. This requirement includes the 18 million m^3/annum of water transferred out of the lower Mfolozi to the Mhlathuze catchment for mining use and also allows for the ecological Reserve. The extent of the deficit means that the catchment is severely stressed from a resource provision point of view. There is some uncertainty with regard to these figures given that no recent detailed assessment has been undertaken, but the deficit cannot be wished away. There is significant forestry (approximately 435 km^2) in the catchment, situated both in the upper reaches of the catchment and near the coast. Dryland sugarcane is also grown close to the coast. Irrigation, mostly also near the coast, is significant and the major water user. The irrigated area is estimated at about 72 km^2, including 50 km^2 of irrigated sugarcane. Significant towns in the catchment are Vryheid, Ulundi, Babanango, Nongoma and Mtubatuba. The most significant water resource development is the Klipfontein Dam (capacity 19 million m^3), which is situated in the upper reaches of the White Mfolozi River. This was constructed to supply water to the town of Vryheid but can also be used to supplement supplies to Ulundi if necessary. Downstream irrigators have been granted an allocation from Klipfontein Dam but this is only partially utilised due to its high cost. There is therefore some surplus yield available from this dam. Because of the lack of storage in the system there is still significant wet-season flow, which could be utilised as a seasonal run of river allocation to irrigators, or alternatively harnessed through the provision of storage and all year use. The crunch in this catchment is not that there is not enough water but that lack of storage (i.e. dams), results in low firm yields, which are less than the water requirements. Hence water shortages occur during severe drought events. In general there appears to be enough water in the upper reaches of the catchment. However, the deficit in the lower reaches of the catchment constrains further upstream use, as this flow is required downstream. The only way to remove the constraint would be to further develop the resource through the construction of dams. Shortages are often reported at Ulundi but these appear to be due to operational problems since water is available in Klipfontein Dam to supplement the supply should this be necessary. The ecological Reserve for the rivers have only been determined at a Desktop

	level of confidence while that for the estuary has not been determined. The water situation described above assumes the Desktop estimate of the Reserve.

STRATEGY	• An accurate assessment of the water resources is required to gain a better understanding of the catchment and identify development opportunities. This is however not a priority.
	
	• With much of the land communally held, but the bulk of the resource allocated to forestry and irrigation, a strategy is required to address inequities. Possible options are:
	  • Allocate surplus water from the Klipfontein Dam to community users and resource poor farmers.
	  • Forestry on communal land, in conjunction with the provision of additional storage to offset the reduction in yield.
	  • Develop off-channel storage and small dams for community irrigation projects.
	  • Develop the groundwater resources.
	
	• The deficits experienced in the lower catchment must be resolved either through the development of additional supply infrastructure upstream, a re-allocation of resources to reduce in-catchment use, or a renegotiation of the transfer of water to Richards Bay Minerals.
	
	The sectoral water allocation strategy for the Mfolozi catchment, listed in order of priority are as follows:
	Water for poverty eradication/rural supply and urban use
	Assess and make better use of opportunities offered by groundwater
	Allocate available water out of Klipfontein Dam
	Licences for community forestry (see '*forestry*' below)
	Development of the resource, preferably off-channel storage
	
	Industrial/mining
	• Water from Klipfontein Dam - noting that this could compete with equity demands
	• Development of the resource, preferably off-channel storage
	
	Irrigation
	There is some scope for irrigation allocations from the Klipfontein Dam, with first call given to equity demands. A detailed investigation is required to ascertain the amount of water available and the level of assurance in more detail. (Note that this is available water, which is currently not being used. Utilising this stored water will not affect the dry-season deficit problems experienced downstream).
	
	Forestry/dryland sugarcane
	The Mfolozi catchment as a whole is stressed and there is little scope for additional forestry and/or dryland sugarcane, although dryland cane cannot currently be controlled on the basis of water use, as it is a *de facto* but not a declared SFRA. The area upstream of the Klipfontein Dam could possibly be considered for additional forestry because the dam is not fully utilized, with the volume of water allocated to forestry released from the dam during the dry season in compensation for forestry water use. Further forestry could be considered should additional replacement storage be provided.
	
	General Authorisations
	Publish general authorisation for the construction of farm dams up to 10 000 m^3 and the associated abstraction of water not exceeding 5 l/s. The construction of larger dams, and the associated abstraction, can be permitted if it can be shown that they contribute to the system yield and will

	not be to the detriment of downstream users. Off-channel dams will be the preferred option in this catchment due to the high silt load of the Mfolozi river.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY

• Initiate a study into the water resources of the Mfolozi catchment. Specific issues to be addressed include:
  • water supply to Ulundi (operations);
  • water for poverty eradication, including seasonal water use by irrigators; and
  • the requirements of the ecological Reserve and the estuary.
	Responsibility: DWAF
	Directorate: NWRP/CMA
	Priority: Medium

• The apparent water shortages experienced by Ulundi need to be resolved through the preparation and implementation of an Operations Management Plan. This must be put in place through a co-operative planning process between regional office engineers and the Local Authority responsible for operations management.	**Priority:** Medium
• Develop an allocation plan to redress inequities, stemming from the results of the detailed water resource study. Implement through compulsory licensing if necessary.	**Priority:** Medium
• Review General Authorisations.	**Priority:** Medium
• Prepare a forestry licensing strategy.	**Priority:** Medium

Strategy No.: 3.2	WATER CONSERVATION AND DEMAND MANAGEMENT: MFOLOZI CATCHMENT

MANAGEMENT OBJECTIVE	To reduce upstream wastage especially in the vicinity of Vryheid (invasive alien plants and forestry). To improve the demand situation at Ulundi, which draws and uses water from the Klipfontein Dam.
SITUATION ANALYSIS	There are limited opportunities for WC&DM in this catchment, however …. • Water released from Klipfontein Dam to Ulundi is subject to large river losses. Water losses at Ulundi are reported to be high, and the cause given as 'inefficient systems operations and use by Ulundi'. Although this does not entail large quantities of water, it has a wide impact and influences the operation of the Klipfontein Dam. • Significant invasions of alien plants are noted in the upper portion of the catchment. • The forestry areas above Vryheid also show signs of poor management – with encroachment of trees and infestation by alien invasives in the riparian zones of forestry areas.
STRATEGY	• A water resources study of the whole catchment is an important requirement. A solution to Ulundi's reliance on releases from Klipfontein Dam must be found. The distribution and system operation losses in Ulundi, including the operation of Ulundi's water supply network, must also be investigated – and this could form a part of the catchment water resources study. Water made available through increased efficiencies in the use of the Klipfontein Dam should be allocated to poverty eradication programmes as first priority. • The clearing of invasive alien plants should be undertaken by Working for Water, with any water released being returned to the system to ease downstream deficits. There is little scope for 'water use exchanges' whereby the water released through clearing can be allocated to other users. • Negotiate with the forestry sector regarding both environmental management and the problem of illegal forestry.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Develop a Terms of Reference for a WC&DM study of Ulundi, including the Klipfontein Dam and initiate a WC&DM study of the Klipfontein/Ulundi system. Implement this WC&DM study in conjunction with the Local Authority.	**Responsibility:** Regional Office & DWAF's Directorate Water use Efficiency. **Priority:** High
• A priority plan to clear invasive alien plants should be drawn up and negotiated with Working for Water.	**Responsibility:** Regional Office/CMA.
• Work with the Forestry Sector to prioritise the clearing of their riparian areas, and to implement the environmental guidelines developed by the sector in the quest for the international	**Priority:** Medium **Responsibility:** Regional

certification of timber produced.	Office/CMA. **Priority:** Medium
• Source the extent of illegal afforestation and identify reasons. Further illegal plantings must be immediately identified and stopped, and existing illegal plantations removed. Address the root causes of illegal forestry – which could range from frustrations at the licensing procedure, to poverty and desperation, to encouragement by timber buyers.	**Responsibility:** Regional Office/CMA. **Priority:** High

Strategy No.: 3.3	WATER QUALITY MANAGEMENT: MFOLOZI CATCHMENT

MANAGEMENT OBJECTIVE	To resolve the problems relating to the polluted drainage of coal mine workings, the pollution of the Klipfontein Dam on the White Mfolozi near Vryheid, and the diffuse pollution from downstream agricultural activities.
SITUATION ANALYSIS	There are a number of water quality problems, current and potential, in the Mfolozi catchment. • Pollution emanating from Vryheid results in unacceptably poor water quality in the Klipfontein Dam. Eutrophication is a serious problem due to settlements on State land next to the dam, and the presence of a sewage plant - with the likelihood of toxic blooms threatening both human health and the ecology of the dam and the river. The Municipality has plans, but no funds, to build a facility to address this problem. • Coal mining in the upper catchment impacts severely on the water quality. This is a problem throughout much of the northern and north-western WMA. • Downstream concerns of high ammonia, nitrate and phosphate levels. This is attributed to diffuse pollution from both agriculture and human settlements.
STRATEGY	Water Quality Management is a serious issue in the Mfolozi catchment and should be allocated additional resources. The problems span urban pollution (sewage), mining (acid leaching from the mostly-abandoned coal mines) and agricultural pollution. • Non-point source pollution needs to be assessed and strategies developed to curb this. This requires national, WMA and catchment level approaches to over-irrigation and excessive fertilisation. • Mine licensing, operation and closure policies need to be very carefully considered and tightly managed. Staff and resources need to be allocated to achieve this.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
• Determine resource quality objectives for the catchment	**Responsibility:** Regional Office **Priority:** High
• Closely monitor the water quality of the Klipfontein Dam and develop a plan of action to improve the situation. Water management standards must be rigorously applied in Vryheid to improve the quality of water flowing into Klipfontein Dam. This includes a strategy supporting the Local Authority in managing the upstream settlement / waste management problem. A special operating rule for the dam needs to be devised to flush out the phosphates.	**Priority:** Medium
• Note and review existing Departmental approaches to mine water management. Develop capacity to ensure implementation.	**Priority:** Medium
• Implement Departmental strategies for dealing with decant and surface runoff from mines. The key technique is to seal off abandoned mines, covering them with soil and vegetation – the aim being to minimise water ingress into the workings.	**Priority:** Medium

Strategy No.: 4.1	**RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES: MKUZE CATCHMENT**

This strategy is specific to the Mkuze catchment. Refer also to Strategy G1, which gives a broad allocation strategy for the whole WMA.	
MANAGEMENT OBJECTIVE:	To optimise the use of the limited water within the Mkuze catchment, taking cognisance of riverine environmental requirements as well as those of Lake St Lucia.
SITUATION ANALYSIS/ MOTIVATION	The water balance for the catchment and a tabulation of use by the different sectors in the Mkuze WMA is provided in section 4.7. At present the total available water resource, at a 1:50 year level of assurance, is estimated at 66 million m^3/annum while the total current requirement is in the order of 78 million m^3/annum (including provision for the ecological Reserve). Based on these figures it would appear as if the catchment is approximately in balance. However, the resources and the water use within the catchment are not evenly distributed. There are water surpluses in the W32 catchment but significant deficits in the middle reaches of the Mkuze river catchment, and it is reported that during droughts the river has dried up completely. These deficits indicate low assurance use by irrigators and these irrigators are almost certainly abstracting water that will in future need to be left in the river for the Reserve. Management of the system to ensure that the Reserve is met will be problematical because the infrastructure is very limited. The W30 catchment has two main rivers, the Mkuze and the Hluhluwe, both of which flow into Lake St Lucia. This is an ecologically sensitive area and World Heritage Site, the importance of which places strong pressure on the need to ensure that the ecological requirements of the whole catchment are met. By far the largest water user in the Mkuze catchment is the irrigation sector, with an estimated area of 76 km^2 under irrigation and an estimated water requirement of 61 million m^3/annum (including losses). The only other significant water use is the rural sector, with an estimated water use of 10 million m^3/annum. The only significant dam in the Mkuze catchment is the Hluhluwe Dam, situated near the town of Hluhluwe. The capacity of this dam was recently surveyed at 25 million m^3. Estimates of the historic yield vary from 8,5 million m^3/annum to 23 million m^3/annum, but based on a review of the past yield analyses and on the actual performance of the dam, the historical firm yield appears to be about 13,5 million m^3/annum. There are a large number of farm dams in the Mkuze catchment and it is assumed that these are used for irrigation purposes. In order to supplement the water resources of the Mkuze River and utilise irrigation opportunities in the upper catchment above the town of Mkuze, a privately financed scheme which transfers water from the Pongolapoort Dam to the Mkuze was recently completed. The licensed transfer rate is 32,6 million m^3/annum but the use of this water and the conditions attached to it in the Mkuze catchment are complex. (See Appendix G). This pipeline was built with excess capacity and could transfer 90 million m^3/annum if additional pumps were installed. There is a long-standing allocation of 1 million m^3/annum to emerging farmers on the south bank of the Hluhluwe River which has never been taken up. There are other applicants for this allocation.

STRATEGY	• The over-riding strategy in this catchment is to ensure that, beyond providing basic human needs, adequate resources are provided to the lower Mkuze / Lake St Lucia System for its maintenance as a World Heritage Site. The entire system needs to be reviewed and managed with this in mind. The Reserve needs to be determined and implemented in the catchment as a high priority. This will need to be coupled with compulsory licensing in order to limit abstractions from the system. • A more accurate understanding of resource availability in the Mkuze is essential if it is to be satisfactorily managed. • Priority should be given to emerging farmers when allocating available resources from Hluhluwe Dam. Options and alternative ways of utilising this water to bring benefit to the largest number of people need to be assessed. (These might include distribution to households for 'Water for productive uses', or additional allocations to small-grower forestry in exchange for releases of 'irrigation' water into St Lucia). Provincial authorities need to be informed about these poverty eradication opportunities. The sectoral water allocation strategy for the Mkuze catchment, listed in order of priority, is as follows: *Water for poverty eradication/rural supply to be sourced from:* • Groundwater • Hluhluwe Dam • The Senekal Trust transfer • Development of the resource • Reallocation through compulsory licencing *Industrial/mining water requirements to be source from:* • Hluhluwe Dam • The Senekal Trust transfer • Development of the resource *Irrigation* There is scope for a small allocation from the Hluhluwe Dam but this will be offered for poverty eradication as a first priority, which could entail irrigation. *Forestry/dryland sugarcane* The Mkuze catchment is over-allocated, but there may be scope for additional forestry along the coastal areas of this catchment. Careful consideration must be given to the groundwater Reserve. The catchment is not climatically suitable for dryland sugarcane. In the Mkuze catchment farm dams can only be considered if they can be shown to add to the system yield and not have a negative impact on downstream users.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
Initiate a comprehensive study of the catchment. Specific tasks to include: • update of the hydrology; • carry out a water resources analysis; • determine the Reserve requirements; • determine the estuarine requirements; and • investigate the potential for additional dams in the catchment.	**Responsibility:** DWAF Directorate: NWRP/CMA **Priority:** Medium

Strategy No.: 4.2	WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY THE MKUZE/HLUHLUWE CATCHMENT

MANAGEMENT OBJECTIVE	To maximise flows in the Mkuze and especially into the St Lucia estuary, in order to meet the treaty requirements for the maintenance of the Lake St Lucia system.
SITUATION ANALYSIS/ MOTIVATION	There is no specific evidence of inefficient use in the Mkuze catchment but the largest water use sector by far is irrigation - which always offers opportunities for improvement.
STRATEGY	No specific strategy required. The approach to the Mkuze catchment can be drawn from the WMA's overall WC&DM strategy. Drip irrigation is one obvious approach to encourage. As noted in the WMA strategy the implementation of a WC&DM programme should be linked to compulsory licensing. Alternatively water saved through WC&DM should be reserved for future allocations and not immediately redeployed by users. Users may seek concessions for their WC&DM efforts (and expenditure). One suggestion is that they be granted licences for a longer period, rather than allowed to take up the additional water.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Initiate a WC&DM programme in the irrigation sector in the Mkuze catchment, with the necessary safeguards in place.	**Responsibility:** Regional Office & DWAF's Directorate Water use Efficiency **Priority:** Low

Strategy No.: 4.3	WATER QUALITY MANAGEMENT STRATEGY: THE MKUZE CATCHMENT

MANAGEMENT OBJECTIVE	To gain a better understanding of the three fundamental problems within the catchment – mine water decant, sources of salinity, and sedimentation - and apply this understanding in the development and implementation of strategies to improve qualities – ultimately resulting in water of satisfactory quality being delivered to Lake St Lucia.
SITUATION ANALYSIS/ MOTIVATION	There are a number of water quality problems, current and potential, in both the Mkuze (W31) and the Hluhluwe catchments (W32), the Mkuze being the priority in this regard. • Coal mining is the number one water quality impact in the catchment with low pH and high TDS, decanting into the upper reaches of the catchment. Irrigation with water with a high electrical conductivity adds to the problems. • High salinity is experienced in the lower Mkuze, probably due to irrigation return flows but this could also be a natural phenomenon. • Large abstractions by irrigators reduce the natural dilution capacity of the river. • Sedimentation rates are high. • Poor water quality affects not only irrigators, but also Lake St Lucia. South Africa has an international legal obligation to provide adequate water both in quantity and quality to St Lucia. This makes it doubly important that water quality objectives are set, and strategies put in place to ensure that these are met. • The water quality of the Hluhluwe catchment (W32) is generally good. Nevertheless it is noted that Hluhluwe Dam is silting up fairly rapidly, with capacity declining from 32 million m^3 to 25 million m^3 over 35 years. Sedimentation rates in the Mkuze/Hluhluwe system are naturally high but also increased by people, grazing, etc. • The coastal aquifer is very vulnerable to contamination due to its high permeability.
STRATEGY	• A water quality study is required in order to obtain a better understanding of the various mines as pollution sources, and most particularly where these sources are causing problems. • An appropriate strategy **must** be developed to deal with the problem of mine decant, especially from closed and abandoned mines. This could help to form a national strategy. Strategies for dealing with decant and surface runoff from mines do exist in KZN. The approach at the moment in the Mkuze catchment is aimed at preventing the decommissioning of certain mines unable to handle the cleanup and unable to implement the pollution prevention requirements of closure. Whilst pollution from abandoned mines, and the issue of closure certificates, is a national issue it can be noted here that what is really wanted is proper decommissioning, and any strategy, national or local, should be aimed at this objective. • The uncertainty as to the sources of salinity (irrigation or 'natural causes') argues for a study to assess the possible geological nature of the observed salinity and also to monitor the impacts of irrigation. If irrigation is a key cause then it becomes important to understand the process of salinisation so that this can be addressed (e.g. over-irrigation, over-fertilisation, irrigation of

	particular soil types, etc). A study of this nature, resulting in recommendations and a management strategy, should be commissioned. • It is important that the causes of high silt loads be considered and addressed. A strategy/ action plan needs to be developed to achieve this. This study must include the question of the role of silt in the Mkuze swamps (capacity of the swamps to absorb this silt) and the impacts of phosphates associated with the silt.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Determine resource quality objectives for the catchment	**Responsibility:** Regional Office **Priority:** High
• The D: Waste Discharge & Disposal is initiating a study of the Mkuze, and the first step is to ensure that the Regional Office is fully informed at all stages of this work.	**Responsibility:** D: Waste Discharge & Disposal and Regional Office **Priority:** Medium
• Develop a strategy to deal with the decommissioning of mines and mine water decant.	**Responsibility:** D: Waste Discharge & Disposal and Regional Office **Priority:** Medium
• Investigate sedimentation rates and causes.	**Responsibility:** D: NWRP and Regional Office **Priority:** Low

Strategy No.: 5.1	**RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES STRATEGY : PONGOLA CATCHMENT**

This strategy is specific to the Pongola catchment. Refer also to Strategy G1, which gives a broad allocation strategy for the whole WMA.	
MANAGEMENT OBJECTIVE:	To optimise the use of the water resources upstream of the Pongolapoort Dam and plan for the long-term beneficial use of the surplus resource in the Pongolapoort Dam, while taking cognisance of international, ecological and socio-economic constraints.
SITUATION ANALYSIS/ MOTIVATION	The water balance for the catchment and a tabulation of use by the different sectors in the Pongola River catchment is provided in section 4.8. This indicates a substantial surplus of 352 million m^3/annum in the catchment. However, there are many uncertainties relating to the quantification of this surplus and the strategies given in this ISP try and address these uncertainties. By far the largest water use in the Pongola River catchment is irrigation, with an estimated requirement of 213 million m^3/annum. Most of the irrigation in the Pongola River catchment takes place upstream of the Pongolapoort Dam in the vicinity of the town of Pongola, with an estimated area of 15 180 ha currently listed. The dominant crop is sugarcane. The irrigated area, and hence water requirement has increased over the years, and this, coupled with afforestation in the upper catchment, reduced the level of assurance to irrigators to unacceptably low levels. As a result the Bivane Dam was recently constructed on the Bivane River, using private finance and considerable assistance from DWAF. This substantially increased the assurance of supply to irrigators and the option of increasing the irrigation areas by reducing assurance is now on the table. The water resources of the Pongola River System are dominated by the existence of the large Pongolapoort Dam (capacity 2 445 million m^3) situated where the river breaks through the Lebombo mountains just above the Makhathini Flats. The dam was originally constructed in the 1060's with the irrigation potential of the Makhathini Flats in mind. The historic firm yield is now estimated at 530 million m^3/annum. This is substantially less than original estimates of about 900 million m^3/annum. This reduction is largely due to the substantial irrigation and forestry development upstream of the dam which has taken place since the dam's construction. Although only 67 million m^3/annum of the yield of the Pongolapoort Dam has been formally allocated, there are many competing uses for the surplus of 352 million m^3/annum referred to above, some of which are difficult to quantify. These are as follows: Flood plain releases: Current operating philosophy results in an impact of about 250 million m^3/annum Increasing upstream use by irrigators and possible additional licences for forestry International requirements. Taking flood plain releases into account, the available surplus is only 102 million m^3/annum. The flood plain releases could be a conjunctive use with the ecological requirement, and hence have a lower impact than indicated here. It is assumed that the substantial ecological and flood plain releases will be more than adequate to meet international requirements. Various requests for water use licences have been received, some in a more advanced stage of assessment than others. There is a licence application for 3 000 ha of cotton, an application for fish farming – amount of water required not specified, and numerous applications for forestry licences which have been on hold for a number of years. Tongaat Hulett have also shown an interest in establishing a sugar mill and irrigating sugarcane downstream of the

	Pongolapoort Dam. The afforested areas in the upper Pongola and Bivane River catchments are substantial, estimated at 480 km^2, which impact on the availability of water to irrigators as well as reducing the yield available from the Pongolapoort Dam. There is pressure from the forestry sector for additional forestry licences in the catchment.
STRATEGY	The allocable yield available in the Pongolapoort/Bivane system is uncertain, but there is great pressure for allocations from this source. The core strategy of this catchment is therefore: 1. Make a conservative amount of water available for immediate allocation, which is well within the available yield of the dam. An amount of 102 million m^3/annum has been assumed which takes into account the possible impact of flood plain release. 2. Embark on a comprehensive study to develop and implement a long-term allocation strategy, taking all environmental, socio-economic and political factors into account. **Strategy 1**, above, can be unpacked as follows (based on discussions in the second ISP workshop) • Additional allocation to the Impala Water user Association: 27 million m^3/annum for small growers • Additional allocation to forestry: 110 km^2 of afforestation upstream of the Bivane or 190 km^2 in the Upper Pongola, or a *pro-rata* combination of the above (equivalent to an allocation to irrigators of about 15 million m^3/annum) • Allocation of 30 million m^3/annum for the irrigation of cotton downstream of Pongolapoort Dam. This leaves 30 million m^3/annum which can still be allocated before completing a detailed water resources analysis. **Strategy 2** could piggy back on the Maputo Basin Study, which is a joint South African, Mozambican and Swaziland study, the scoping phase of which has commenced. However, an allocation strategy for the catchment within South Africa's borders is an internal issue which will require a parallel study. The sectoral water allocation strategy for the Pongola catchment, listed in order of priority, is as follows: *Water for poverty eradication/rural supply to be sourced from:* • Groundwater • Bivane Dam • Pongolapoort Dam *Urban, to be sourced from* • Bivane Dam • Pongolapoort Dam • Groundwater

STRATEGY	*Industrial/mining water requirements to be source from:* • Bivane Dam • Pongolapoort Dam *Irrigation* There is scope for additional irrigation allocations throughout most of this catchment but detailed modelling is required to determine the amounts available in more detail. Refer to strategies 1 and 2 above. *Forestry* There is scope for additional afforestation in the upper Pongola and Bivane catchments (see recommended areas above).

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Provide the necessary support (technical, institutional and political) to the Maputo Basin Study so that this study produces the management solution required for this basin.	**Responsibility:** DWAF Directorate: NWRP **Priority:** High
• Initiate a comprehensive water resources study of the upper Pongola and Bivane catchment in order to unlock the potential of the Bivane Dam for poverty eradication projects.	**Priority:** High
• Carry out a Strategic Environmental Assessment (SEA) of the Makhathini flood plain in order to determine the environmental and social requirements of this system. This could be done as part of the Joint Maputo Basin Study or, if too slow, a dedicated study initiated by DWAF.	**Priority:** High

Strategy No.: 5.2	**WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY THE PONGOLA CATCHMENT**

MANAGEMENT OBJECTIVE	To improve efficiencies in the water use in the Pongola catchment.
SITUATION ANALYSIS/ MOTIVATION	• Water losses on the Impala Water user Association irrigation scheme are cause for concern. Current estimates put the losses from the canal system at 33% of total use. There are also losses associated with releases made from the Bivane Dam to the irrigators downstream. These have been assumed to be 25% of the release but also that this loss becomes available for riparian irrigators downstream of the Grootdraai weir and to meet ecological requirements. There is 160 km of canal and a reported very slow reaction to cancellations of orders for water. The tertiary canals are being improved (relined etc). • Large volumes of water are released from Pongolapoort Dam for the maintenance of the Makhathini flood plains. These releases currently utilise nearly half of the yield available from the Pongolapoort Dam and more efficient methods of maintaining the flood plains in an acceptable state (the goal of these releases) need to be investigated. • Inefficient water use in the WMA must be dealt with, making the development of a WC&DM strategy in the Pongola catchment an important need. Given the nature of the demand, water freed up through WC&DM could be put to productive use for poverty eradication projects.
STRATEGY	• DWAF needs to understand and quantify the losses, which occur in the Impala WUA irrigation area. This requires a WC&DM study. • It is clear that Operating Procedures can be fine-tuned (e.g. to improve on cancellation reaction times) and this must be given urgent attention through the implementation of WC&DM measures. The leverage to be applied is that allocations beyond the 100 million m^3/annum recommended in Strategy 5.1 should not be made until these losses have been quantified and, if recommended by the WC&DM study, steps taken to reduce them. • Irrigated sugarcane is a major user. In line with the WMA strategy a focus should be on improved environmental management on sugar estates (e.g. the rehabilitation of wetlands and riparian zones). This also applies to forestry. • The flood plain releases from the Pongolapoort Dam need to be investigated from a WC&DM point of view to see if the objective of these releases can be met with less impact on the yield available to others.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Develop a Terms of Reference for a WC&DM study of the Impala Water user Association irrigation scheme. Together with the Impala WUA initiate a WC&DM into irrigation in the WUA irrigated area. Implement as indicated.	**Responsibility:** Regional Office & DWAF's Directorate Water use Efficiency **Priority:** High
• Initiate a study into the flood plain releases made from the Pongolapoort Dam. This could be carried out as part of the Maputo Basin Study. Steps are: 1. Develop a Terms of Reference for a WC&DM study of the Pongola flood plains. 2. Implement as part of the broader SEA study referred to in Strategy 5.1.	**Responsibility:** Regional Office & DWAF's Directorates Water use Efficiency & NWRP **Priority:** High

Strategy No.: 5.3	WATER QUALITY MANAGEMENT STRATEGY: THE PONGOLA CATCHMENT

MANAGEMENT OBJECTIVE	To keep the quality of water in the Pongola Catchment at its naturally high level, thus ensuring the continued good quality of the water in the Pongolapoort Dam, and guaranteeing standards to downstream users.
SITUATION ANALYSIS/ MOTIVATION	• The water quality in the Pongola catchment is naturally good. The quality of the resource upstream of the Pongolapoort Dam is, however, significantly affected through saline and nutrient enriched return flows from large irrigation areas. (Return flows are estimated to be about 21 million m^3/annum, or 10% of the irrigation demand). This is a seasonal problem and is worst in the low-flow months when dilution from natural flows is less. • There is limited scope for groundwater use in the catchment. The quality of groundwater from the Makhathini Flats is poor (saline – the Flats are an old sea-bed) and this can be observed in the growth of some irrigated crops. Use of this water should be avoided especially given the availability of water from the Pongolapoort Dam.
STRATEGY	• The Impala Water user Association must deal with the problem of irrigation return flows, with the proviso that Water Quality Objectives set by the CMA are met. This is argued on the basis that the water quality problem identified here currently affects only the Impala Water user Association and, since their irrigators are the cause of the problem, the responsibility of dealing with the problem should be assigned to them. Releases from the Bivane Dam could be used to dilute poor quality downstream flows in the dry season. • Limit the use of groundwater off the Makhathini Flats for irrigation. This restriction should be taken into account when considering licence applications for water from Pongolapoort Dam. • The water quality of the Pongolapoort Dam must be monitored and, if necessary, steps taken to ensure that it does not become eutrophic. This suggests that upstream use may well have downstream impacts and that the Impala WUA has a wider responsibility than to its own users alone.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Determine resource quality objectives for the catchment	**Responsibility:** Regional Office **Priority:** High
• Review water quality monitoring in the catchment to ensure that this is sufficient to meet receiving water quality objectives (see also Monitoring Strategy)	**Responsibility:** D: Waste Discharge and Disposal **Priority:** Medium

Strategy No.: 6.1	RECONCILATION OF WATER REQUIREMENTS AND AVAILABLE WATER RESOURCES USUTU CATCHMENT

This strategy is specific to the Usutu catchment. Refer also to Strategy G1, which gives a broad allocation strategy for the whole WMA.	
MANAGEMENT OBJECTIVE:	To optimise the use of the water resources of the upper Usutu catchment, while taking cognisance of the strategic requirements of the Vaal and Olifants WMAs as well as international requirements.
SITUATION ANALYSIS/ MOTIVATION	The water balance for the catchment and a tabulation of use by the different sectors in the Usutu River catchment is provided in section 4.9. When considered as a whole, the catchment is in balance. The largest water use in the Usutu catchment is the transfer of water out of the WMA to the Vaal system and to power stations in the Olifants WMA. Four large dams have been constructed in the upper reaches of the catchment to provide the yield for these transfers. These are the Heyshope, Morgenstond, Jericho and Westoe dams. The Morgenstond, Jericho and Westoe dams operate as part of a system from which about 71 million m^3/annum (historical firm yield) can be transferred to the Olifants WMA. The Interim IncoMaputo Water Use Agreement allows for a transfer of 93 million m^3/annum which is the transferable amount quoted in the White Paper WP J-82. The Heyshope Dam operates independently of the other dams and can supply about 60 million m^3/annum (historical firm yield) while The Interim IncoMaputo Water Use Agreement allows for a transfer of 105 million m^3/annum, which is the transferable amount quoted in the White Paper WP F-81. The substantial amount of afforestation in the catchment reduces the available yield by an estimated 43 million m^3/annum. Other significant water users are irrigation (13 million m^3/annum) and rural water use (8 million m^3/annum). The impact of the ecological Reserve, based on a desktop analysis, is estimated at 52 million m^3/annum. Once this Reserve is implemented, it will not be possible to transfer as much water out of this catchment as is currently the case. The water resources of downstream users in Swaziland are fully utilised but there are a few opportunities for infrastructure development.
STRATEGY	Maintain the *status quo* in this catchment. Requests for additional water use licences to be dealt with strictly in terms of the Interim IncoMaputo Water use Agreement. The sectoral water allocation strategy for the Usutu catchment, listed in order of priority, is as follows: *Water for poverty eradication/rural supply to be sourced from:* • Run-of-river flows • Groundwater • Development of the resource *Strategic water use* Water allocations to Eskom will have to be reviewed once the Reserve has been determined. No additional allocations for strategic use could be considered without close consultation with Swaziland and Mozambique.

	Additional allocations are however theoretically possible in terms of the Interim IncoMaputo Water use Agreement but the resource would have to be developed. *Urban, to be sourced from* • Run-of-river flows • Development of the resource *Industrial/mining water requirements to be source from:* • Development of the resource *Irrigation* No further allocations to irrigation, because of the stressed nature of the downstream catchments in Swaziland. *Forestry* There is no scope for additional afforestation in the Usutu catchment. This is because all available water in the Heyshope, Morgenstond, Jericho and Westoe dams has been allocated to Eskom for strategic use. Although from a South African perspective there is surplus water available in the catchments downstream of the above dams, if the situation of the downstream catchments in Swaziland are taken into consideration, then additional forestry cannot be permitted. In terms of the Interim IncoMaputo Water use Agreement (which allows Swaziland a fair share of the joint water resource), the maximum extent of forestry is limited. A detailed inventory of actual forestry already in place is required to reconcile with the areas stated in the agreement.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Prepare a detailed verified inventory (sourced from WARMS) of water use in the Usutu catchment. • Based on the above inventory, and taking cognisance of the Interim IncoMaputo Water use Agreement, the water allocation strategy listed above is to be reviewed.	**Responsibility:** DWAF Directorate: NWRP **Priority:** Medium

Strategy No.: 6.2	WATER CONSERVATION AND DEMAND MANAGEMENT STRATEGY: THE USUTU CATCHMENT

MANAGEMENT OBJECTIVE	To ensure that Eskom's supplies are met whilst also delivering adequate water to Swaziland. At the same time sufficient pressure should be maintained on Eskom so that the Utility constantly strives for maximum efficiency and reduced demand.
SITUATION ANALYSIS/ MOTIVATION	• Much of the water from this catchment is exported into the Vaal and Olifants catchments for use by Eskom. The power utility appears to operate the transfer schemes efficiently and there is very little scope for WC&DM in this area. • The forestry riparian zones are for the most part well maintained in this catchment and invasive alien plants do not seem to be a significant problem.
STRATEGY	Eskom operate water-cooled power stations and, although with new technology dry-cooled stations are now being built, it is deemed too costly to upgrade the existing stations. Power generation remain a strategic high priority use. It is important to note the opportunity costs of the use of this water by Eskom so that action can be taken should break-even ever be reached. For the most part WC&DM efforts should be focussed elsewhere in the WMA.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
None required at this stage.	

Strategy No.: 6.3	WATER QUALITY MANAGEMENT STRATEGY: THE USUTU CATCHMENT

MANAGEMENT OBJECTIVE	To maintain the pristine nature and very high quality of water in the upper Usutu so that this remains suitable for cooling requirements of Eskom's power stations.
SITUATION ANALYSIS/ MOTIVATION	• The water quality in the upper Usutu catchment is excellent which is why Eskom source their water for the cooling of coal-powered power stations from this catchment. However, there is a risk of coal mining activities polluting the resource. Maintaining the high quality of water in the upper Usutu catchment is of national importance. • No problems with groundwater quality have been reported. There are potential problems if coal mining is further developed. • Industrial development is very limited with the only identified threat being a tannery in Piet Retief. This has resulted in pollution of the Assegaai River. Tannery waste is irrigated onto fields as a disposal measure.
STRATEGY	Strategies are in place to deal with the water quality aspects of mines and, provided these are understood and implemented, no problems are foreseen. The irrigation use of tannery waste water is seen as a medium-term solution and a long-term alternative approach is required. This business should be required to provide a long-term strategy for waste water management, along with an implementation framework, which is acceptable to DWAF. Assess the mining potential (especially for coal) in the upper Usutu catchment. There should be no further coal mining within this catchment, although a long-term plan for the possible development of these reserves should be considered in the light of future demand.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Determine resource quality objectives for the catchment	**Responsibility:** Regional Office **Priority:** High
• Set and maintain the highest possible water quality objectives. The strategies for limiting pollution from active, closed and possible future mines in the areas must be rigorously applied.	**Responsibility:** Regional Office **Priority:** High
• Request a long-term effluent management strategy from the Piet Retief tannery. This may require facilitation and the input of ideas and DWAF should be willing to make these inputs.	**Responsibility:** Regional Office **Priority:** High
• Provide a detailed map of coal reserves and the likely implications of exploitation to the quality of water currently supplied to Eskom.	**Responsibility:** Regional Office **Priority:** High

Strategy No.: 7.1	**RECONCILATION OF WATER REQUIREMENTS AND THE AVAILABLE WATER RESOURCES: LAKE SIBAYA CATCHMENT**

This strategy is specific to the Lake Sibaya catchment. Refer also to **Strategy G1**, which gives a broad allocation strategy for the whole WMA.	
MANAGEMENT OBJECTIVE:	To optimise the use of the water resources of the Lake Sibaya catchment, while taking cognisance of the groundwater reserve of the catchment.
SITUATION ANALYSIS/ MOTIVATION	A discussion of the water balance for the catchment is provided in section 4.10. Large parts of this catchment fall within the Ndumo Game Reserve and is hence in a pristine state. The only significant direct water use in this catchment is rural water use, which includes both domestic and stock watering, estimated to be about 2 million m^3/annum. The catchment is very flat and although the rainfall is relatively high (769 mm/annum), the surface runoff is limited. Groundwater recharge is, however, high. There is a significant amount of afforestation in the catchment, with an estimated area of 158 km^2, and an estimated reduction in surface runoff of 3,3 million m^3/annum. The impact of the ecological Reserve, based on the Hughes' Desktop Model, is 27 million m^3/annum, ie the ecological Reserve requires the total low-flow. This is clearly erroneous and highlights the need for better information in this catchment. There are abstractions from Lake Sibaya for domestic use, but these are probably negligible in comparison with the inflow into the lake.
STRATEGY	This catchment should be preserved in it current near-pristine state and development limited as far as possible. This is due to its environmental significance as an area of very high faunal bio-diversity. This catchment does however offer opportunities for poverty eradication projects, provided that these can be integrated into a broader environmental plan. These are to be investigated in more detail. Great care must be taken to protect the potential groundwater resource of this catchment from over-exploitation (see **Groundwater strategy G1)** as this could have a devastating impact on the sensitive environment of this area. The sectoral water allocation strategy for the Mkuze catchment, listed in order of priority, is as follows: *Water for poverty eradication/rural supply to be sourced from:* • Run-of-river flows (if present) • Groundwater *Urban* Urban development should not be encouraged in this catchment. *Tourism requirements to be source from:* • Development of the groundwater resource

	Industry and Mining • The development of industry and mining to be discourage in this area. *Irrigation* No allocations to irrigation. *Forestry* There is scope for additional afforestation in this catchment, but priority is to be given to poverty eradication projects, e.g. woodlots. Care must be taken, however, that afforestation does not impact detrimentally on the groundwater Reserve.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**

• Initiate a water resources study of the catchment with the goal of determining the potential for poverty eradication projects. The study is to focus on:
  • Determining the Reserve (surface and groundwater)
  • Determining potential for additional forestry
	Responsibility:
	DWAF Directorate: NWRP/CMA
	Priority:
	Medium

APPENDIX A

Source of water for urban use

Cities/Towns	Raw Water Source	Urban Population supplied
Eshowe	Goedertrouw Dam	16 250
Mtunzini	Run-of-river abstractions from the Mtunzini River and groundwater	3 750
Empangeni	Goedertrouw Dam	29 900
Richards Bay	Goedetrouw Dam, natural lakes	72 750
Vryheid	Bloemveld, Grootgewaagd and Klipfontein Dams	26 650
Ulundi	White Mfolozi River. Supplemented by Klipfontein Dam and groundwater	17 100
Mondlo	Mondlo Dam	27 100
Hluhluwe	Hluhluwe Dam	900
Pongola	Impala WUA canal and Bivane Dam	12 650
Piet Retief	Local Rivers	25 550
Paulpietersburg	Local rivers	6 750
Amsterdam	Local rivers	7 700
Lothair	Local rivers	4 350
TOTAL		251 400

APPENDIX B

Dams and natural lakes in the WMA

Dam Name	Catchment	Live Storage Capacity ($10^6 m^3$)
Goedertrouw	W12B	304
Lake Cubu	W12F	6.5
Lake Nsezi	W12H	2.9
Lake Msingazi	W12J	38
Lake Nhlabane	W12J	39.7
Lake Sokhule	W12J	2.2
Bloemveld	W21A	2.3
Grootfontein	W21A	0.7
Grootgewaagd	W21A	1.1
Klipfontein	W21A	19.0
Sokhulu	W23C	4
Boulder	W31A	1.5
Kranskop	W31B	2.1
Mhlabinyati	W31H	2.6
River side	W32B	1.2
Silver Sands	W32C	3
Siver Sands No 2	W32C	2.5
Hluhluwe	W32E	25
Pongolapoort	W44E	2 445
Heyshope	W51B	453
Morgenstond	W53A	101
Jericho	W53B	60
CJ van Rooyen	W54A	3.7
Westoe	W54B	61
Burgers	W55C	1.4

APPENDIX C

WATER USE LICENCE OF THE CHARL SENEKAL SUIKER TRUST

The licence entitles the Charl Senekal Suiker Trust to abstract 32,6 million m^3/annum from the Pongolapoort Dam for urban, industrial and irrigation purposes. However, the conditions attached to this are:

- The existing allocation of 21 million m^3/annum to the Charl Senekal Suiker Trust from the Mkuze River is reduced to 5 million m^3/annum.
- Of the additional water transferred into the Mkuze catchment, 3,6 million m^3/annum is to be made available to emerging farmers and 2,6 million m^3/annum to the Mkuze and Ubombo townships.
- The licence has been issued for 20 years, but can be reviewed every 5 years.

APPENDIX D

OPERATING RULES OF THE MAJOR DAMS IN THE WMA

The operating rules below give a brief indication of how dams in the WMA are operated. It is recommended that these notes be expanded into a comprehensive operations manual.

Goedertrouw Dam
Water is released from the Goedertrouw Dam on request to meet the requirement of Mhlathuze Water and the various irrigators downstream of the dam. Both irrigators and Mhlathuze Water first make use of run-of-river flows from the W12C and downstream catchments before requesting releases from the dam.

Water can be transferred from the Thukela in the Goedertrouw Dam at a rate of 1,2 m^3/s. The current operating rule of this transfer scheme is to transfer if the water level in the Goedertrouw Dam drops below 90% of the full supply capacity.

Pongolapoort Dam
A minimum flow of 5 m^3/s is continuously released from the dam.

Flood releases for the maintenance of the flood plain are made at least once a year after consultation with stakeholders. This involves a release at a rate of about 800 m^3/s for a period of 3 to 4 days. When the dam level is below about 60% of the full supply capacity, an effective flood release is not possible because the required discharge rate cannot be achieved.

No water is currently released specifically for Mozambique but the 5 m^3/s minimum release is more than sufficient to also meet Mozambique's present requirements.

Klipfontein Dam
Water is abstracted from the dam by Vryheid when required. Vryheid does not require continuous access to this water because they also have a supply from small dams upstream of the town which are used preferentially.

Water is released to registered irrigators on request and in the past releases have been made to supply Ulundi.

Hluhluwe Dam
Water is released from Hluhluwe Dam to irrigators on request. Based on the current allocation of 7,2 million m^3/annum, if the water level drops to below 50% of the full supply capacity, then the release to irrigators must be reduced by 50%. If the water level in the dam drops below 10%, then the

irrigation release is to be reduced to 10% of the normal release. The release for urban requirements of Hluhluwe is to be reduced to 80% of the normal release when the dam drops to below 20% of the full supply capacity.

Heyshope Dam
The Heyshope Dam is operated by DWAF's Gauteng Regional Office as part of the Vaal River System. Water is transferred from the Heyshope Dam to the Vaal system. Pumping only takes place when the water level in Grootdraai Dam drops below 75% of the full supply capacity.

Via the Balmoral canal and a short gravity pipeline, there is a link from the Heyshope Dam to the Morgenstond Dam.

Morgenstond, Westoe and Jericho Dams
These three dam are operated by DWAF's Gauteng Regional Office as part of the Vaal River System. They are interlinked and operated as a system.

Water is released from Westoe to Jericho under gravity through a tunnel and pipeline. The yield of Westoe Dam is supplemented by gravity diversion from the Churchill weir in the neighbouring W54C catchment.

Water from the Morgenstond Dam is pumped to the Jericho Dam.

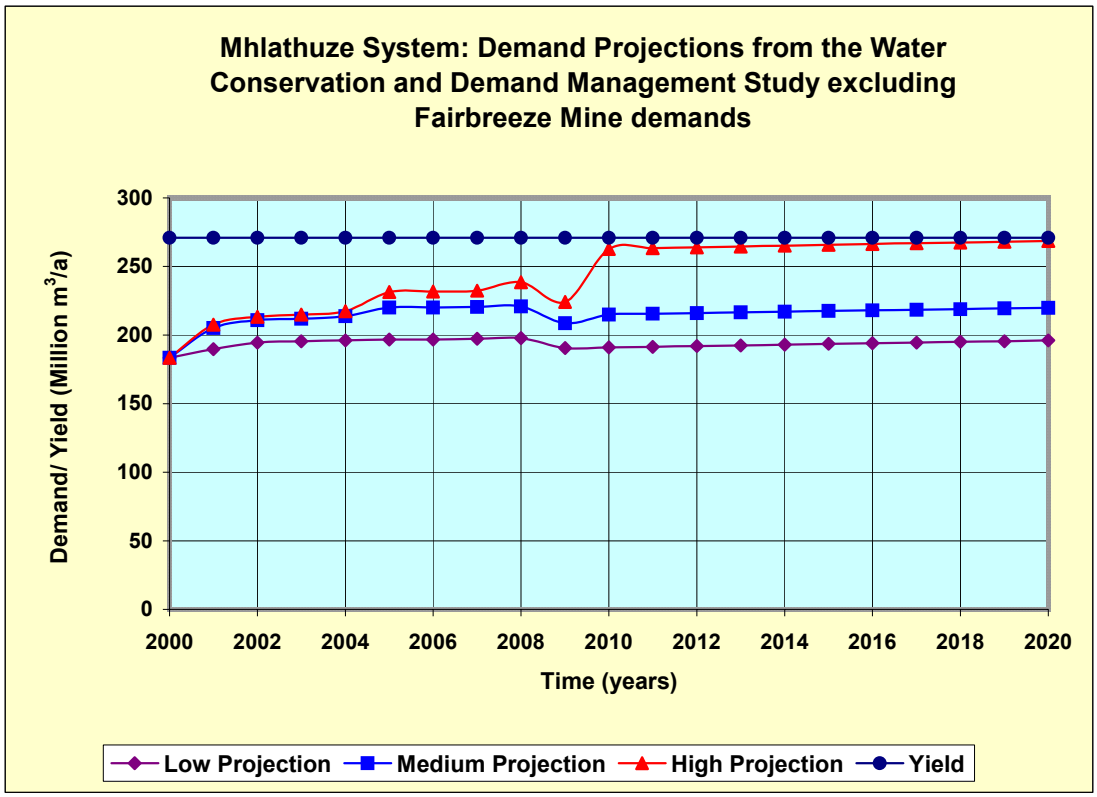
From Jericho Dam, water is pumped out of the catchment for use by Eskom on the Highveld.

APPENDIX E

LONG-TERM YIELD CURVE OF THE MHLATHUZE SYSTEM

APPENDIX F

WATER DEMAND PROJECTIONS OF THE MHLATHUZE SYSTEM



Source: Mhlathuze Operating Rules and Future Phasing (Reference 6).

APPENDIX G

USUTU-MHLATHUZE WMA 6 GROUNDWATER SITUATION ASSESSMENT: COMPILED BY PROF R. MAUD

1. INTRODUCTION

This WMA is of very considerable extent, it being some 400 km in length from the upper catchment of the Usutu river system west of Swaziland in Mpumalanga Province to the north, to the catchment of the Matikulu River on the coast of KwaZulu-Natal Province in the south. It includes the southwards tapering, low level physiographic feature of the Zululand Coastal Plain in the east, that extends from the Usutu River and the Mocambique border in the north to Mtunzini in the south, a distance of some 200 kms, and a deeply dissected east to southeast trending major river valley and elevated interfluve hinterland portion that rises inland to the 'Great Escarpment' over its northwestern extent.

For the most part the WMA is rural with agriculture and forestry being widely practised therein where rainfall for these activities is adequate, including the Zululand Coastal Plain portion of the WMA. Extensive irrigation of sugarcane takes place in the Pongola and Mkuze areas. Included in the WMA, much of it in its drier portions, are extensive traditional rural areas wherein subsistence agriculture and pastoral activities are practised. Also scattered throughout the WMA are a number of significant towns such as Piet Retief, Vryheid, Pongola, Nongoma, Ulundi, Mtubatuba and Eshowe, on the coast in the southeast of the WMA there being present the major urban, industrial and harbour conurbation of Empangeni-Richards Bay. Extensive dredge-pond dune mining for heavy minerals takes place in the Richards Bay area.

Because of the general ready availability of adequate surface water resources in the region covered by this WMA, groundwater has been, and is, used to a very limited extent in terms of the availability of this resource, mainly in the low rainfall rural low population density portion of the area for domestic water supply and stock watering purposes. As elsewhere, such usage has in the past suffered from the lack of provision of operational sustainability. Groundwater was formerly used for domestic water supply in the town of Piet Retief, while on an emergency basis it has, and is, used to augment urban water supplies to the towns of Mkuze, Mtubatuba, Ulundi Nkandla and Gingindhlovu within the WMA. Of note is the extensive use within the WMA on the eastern higher rainfall portion of the sandy Zululand coastal plain of groundwater by means of shallow unlined wells, and more recently tube-wells, for rural individual domestic water supply.

2. GROUNDWATER OVERVIEW

2.1 Geology and Geomorphology

The hydrogeological conditions prevailing in this WMA south of the catchment of the Usutu River are very well and reliably known as a result of the DWAF KwaZulu-Natal Groundwater Resources Mapping and Characterisation Project. The relevant portion of this WMA is covered by the reports and maps of Mapping Units m's 1,3,5,6,7 and 11. Hydrogeological conditions in the southern portion of the Usutu catchment west of Swaziland (south of Piet Retief) have been characterised in a draft report 1996 of the Directorate Geohydrology DWAF entitled 'Groundwater Characterisation of the Northern Section of the 1:250 000 Vryheid (2730) Hydrogeological Mapsheet. Hydrogeological conditions in the region have not changed to any significant extent since the publication of these reports nearly 10 years ago. The entire WMA is also covered by the DWAF 1:500 000 Hydrogeological Map Series 2530 Nelspruit, 2730 Vryheid, and 2928 Durban map sheets, the latter two map sheets being accompanied by explanatory brochures. Groundwater conditions in the southern portion of the WMA are also described in the publication 'Ground-Water Studies in Northern Natal, Zululand and Surrounding Areas by W.L. van Wyk (1963) Memoir 52, Geol.Surv.Pretoria.

This very extensive WMA is some 45 000 km² in total area. Of this some 6000 km² comprises the Zululand Coastal Plain.

Elevation in the area varies from sea level in the east to an average of some 100 m over the width of the Zululand Coastal Plain inland of which the meridionally-trending Lebombo range rises to some 700 m, inland of which again it falls abruptly to only some 250 m in the similarly trending 'Lowveld' farther inland of which it rises progressively to a maximum elevation of some 2000 m on the Great Escarpment on the north-western boundary of the WMA. Physiographically, the inland portion of the WMA comprises a number of low standing generally east or southeast trending basins of the major rivers that are separated by elevated interfluve ridges. The coastal portion of the area in the south, and the inland portion of the area west of the Zululand Coastal Plain, are generally characterised by steep and strongly dissected topography.

Rainfall over the WMA varies from about 1000 to 1200 mm annually along the coast and on the elevated ridges and escarpments in the interior of the area to about 600 to 700 mm in the drier interior major river basins and valleys. It is of the same amount on the inner margin of the Zululand Coastal Plain and in the 'Lowveld' inland of the Lebombo range, but on the elevated crest of the Lebombo it increases to somewhat over 800 mm annually.

Geologically the WMA comprises three structurally different portions. In the east, the Zululand Coastal Plain is underlain mainly be an eastward-thickening wedge of unfaulted Cretaceous marine sediments that carries

on its surface a relatively thin veneer of unconsolidated mainly aeolian sandy sediments of Neogene age. Inland of the Zululand Coastal Plain and to the south of it, the structure comprises fault blocks that are tilted increasingly steeply between major strike faults in a general easterly to southeasterly or seaward direction. This includes the major seaward-dipping Lebombo structure which is a faulted 'monocline'. In this portion of the WMA the geology is complex due to the faulting that is Gondwana-breakup related Late-Jurassic age. In the western portion of the WMA, generally gently westward-dipping and unfaulted Karoo Supergroup sedimentary rocks unconformably overlie Archaean and Proterozoic rocks of various types of the Kaap-Vaal cration that are structurally complex and granite-intruded.

In this western portion of the area the Karoo Supergroup rocks have at their base the Dwyka Tillite Formation, here mostly terrestrially-deposited, this being overlain by a thick assemblage of subhorizontal shales, sandstones and mudstones, in places coal-bearing, of the Ecca and Beaufort Groups. These rocks are much intruded by sheets, and to a lesser extent by dykes, of Karoo dolerite. Beneath, the Karoo Supergroup sediments occur 'Basement' granites, granite-gneisses, schists and amphibolites, quartzites and various other meta-volcanic rocks, that are all strongly deformed, of the Swaziland and Pongola Supergroups.

In the central and southern faulted portion of the region unconformably overlying the 'Basement' diverse rock-type assemblage of the Nama-Natal Structural and Metamorphic Province, as well as the Pongola Supergroup to the north thereof, are the sandstones of the Natal Group in the south, and the full down faulted sedimentary and Karoo dolerite-intruded succession of the Karoo Supergroup, that is overlain in the Lebombo structure, by the very thick faulted and Karoo dolerite dyke intruded volcanic Letaba basalt and Jozini rhyolite-dacite succession.

In the eastern Zululand Coastal Plain portion of the area, the unfaulted wedge of Cretaceous sediments comprises depositionally gently seaward-dipping marine siltstones of the Makatini, Mzinene and St Lucia Formations, that are unconformably overlain by younger unconsolidated mainly unconsolidated sandy aeolian sediments of Miocene to Holocene age (Uloa, Umkwelane, Port Durnford, Kosi Bay, Kwambonambi and Sibayi Formations) that rest as a thin veneer of a few tens of metres thickness thereon. In places, as along the inner margin of the coastal plain, and in places as longitudinal cordons on these formations are deeply weathered to form Berea-type red sand. In proximity to the coastline, the lower courses of the major rivers, as well as the coastal Kosi and Lake Sibayi drainage systems of the northern Zululand Coastal Plain, are underlain by a considerable thickness of alluvial and estuarine sediments, the former being characteristically sandy and the latter clayey as in the Richard's Bay estuary and the St Lucia Lake system. Such sediments also underlie the course of the Pongola and Usutu Rivers on the inner margin of the northern part of the plain. A characteristic of all the lower courses of the rivers as described above is the association therewith of shallow marginal lakes,

some of considerable extent, which represent incompletely alluvium-infilled marginal tributary valleys.

2.2 Hydrogeology

The western or inland portion of the WMA and its limited portion south of the southern end of the Zululand Coastal Plain at Mtunzini, that involves the catchments of smaller Mlalalazi and Matikulu Rivers, comprises 'hard rock' secondary porosity aquifers of the 'weathered and fractured' and 'fractured' classes. Faults, joints, and intrusive Karoo dolerite sheet and dyke contacts particularly in the Karoo sedimentary and volcanic rocks, in the regional 'hard-rocks', are zones of significant groundwater presence. Of the 'hard-rocks', the deeply weathered granite and granite-gneiss rocks, and the rocks of the Vryheid Formation, as well as those of the Natal Group in the southern portion of the region, are best groundwater aquifers generally, the Dwyka Tillite Formation, where present, being the poorest.

By contrast, the aquifers of the Zululand Coastal Plain portion of the WMA are of the primary porosity or intergranular type. The Cretaceous siltstones which underlie the coastal plain at depth are an extremely poor groundwater aquifer, such minimal groundwater as may be found to occur therein also being generally highly saline.

Two primary porosity aquifers (not a single one), underlie portions of the coastal plain. Immediately overlying the Cretaceous sediments, but subject to variable thickness and erratic areal distribution, are the karst-weathered shelly coquina and calcarenites of the Mio-Pliocene age Uloa and Umkwelane Formations, which constitute the 'deep' coastal plain aquifer, which generally occurs at a depth of about 30 to 40 m below levels over the coastal plain. Where present, the sandy lower portion of the overlying Kosi Bay Formation can contribute materially to this aquifer. By contrast, the 'shallow' coastal plain aquifer comprises a saturated fine sand at the base of the surficial Kwambonambi Formation, that occurs at 1 to 6 m depth below ground levels, which is perched on the surface of the much less permeable and more clayey Kosi Bay and Port Durnford Formations, the latter where this ordinarily deeply occurring formation occurs at shallow depth. This shallow aquifer is of extensive occurrence over the higher rainfall (800 mm+) eastern and southern portions of the coastal plain where seepage from it is the source of the numerous lakes, pans, streams and shallow peat swamps which characterise the surface of the coastal plain here. It is not present over the western drier portions of the coastal plain. The nature of the hydraulic continuity between the 'deep' and 'shallow' aquifers is uncertain.

In the hard rock western portion of the WMA, groundwater abstraction is entirely by normal 60 to 120 m deep 'normal' rotary-percussion drilled 'hard-rock' boreholes in the secondary porosity aquifers that are present here. Springs and seepages, although their flows are very markedly seasonally affected are extensively exploited as a domestic water supply source in the rural residential and agricultural 'hard rock' portion of the WMA. On the Zululand Coastal Plain, the deep aquifer is exploited by

appropriately installed fully cased and basally screened boreholes, while the shallow aquifer is exploited by the local population as a source of domestic water supply by shallow unlined open wells, shallow concrete ring-supported open wells, and more recently shallow hand pump-equipped screened tube wells, the latter two forms of well being installed by relevant Governmental authorities. A very few deep (20 to 25m) screen well boreholes have been installed in a few places within the southern portion of the WMA to exploit the primary porosity aquifer present in the near-coastal portions of the WMA here that is represented by sandy alluvium beneath the beds of the larger rivers.

Groundwater yields from 'hard rock' boreholes in the WMA are generally low and ordinarily in the range 0,15 to 0,65 ℓ/s, although higher yields in the order of 2,5 ℓ/s and can be obtained from boreholes located in hydrogeologically favourable situations. Median depth to the water table in the western 'hard rock' portion of the WMA is about 20 m. Yields from cased and screened boreholes installed into the 'deep aquifer' of the Zululand Coastal Plain, where it is present, are generally high, and in the order of 15 to 25 ℓ/s, the aquifer having also high storativity and transmissivity values. By contrast, yields from the 'shallow aquifer' on the coastal plain are generally low and generally in the order of 0,3 ℓ/s, due to the low transmissivity of the fine sand that comprises this aquifer. Occasionally, higher yields are obtained. Deep large-diameter screen well boreholes installed into sandy alluvium in the lower coastal portions of rivers in the south of the WMA can have high yields depending on the sand size of the alluvium involved and thus its transmissivity. Such screen well boreholes installed into coarse and medium grain-sized sand in such situations can have yields of up to about 25 ℓ/s, and even more in some situations.

Groundwater quality in the WMA is variable, it being best in its higher rainfall portions and poorest in its lower rainfall portions, as in the major river basins of its interior and in the 'rain shadow'. 'Lowveld' area immediately inland of the Lebombo range. In the higher rainfall portions of the WMA the groundwater generally has a TDS of 200 mg/ℓ or less. In the lower rainfall portions, however, as in the Lebombo 'Lowveld' underlain as it is by the Letaba Basalt and Vryheid Formations to the south, TDS are much higher and generally in the order of 1000mg/ℓ, it being even much higher locally in places (up to 1500 mg/ℓ). The quality of the groundwater in both the 'deep' and 'shallow' aquifers of the Zululand Coastal Plain is generally very good, with a TDS value of 200 mg/ℓ or less. On account of its shallowness and the ease of infiltration thereto by rainfall and other sources, the 'shallow' aquifer is very susceptible to pollution. However, except possibly locally in portions of the industrial areas of Richards Bay, the possible sources and extent of any such pollution is of negligible proportions. This situation is also prevalent in the western 'hard rock' portion of the WMA. Saline intrusion by seawater of the very few screenwells located in the sandy alluvium of the coastal river beds in the southern portion of the region similarly does not present any problem.

Groundwater recharge over the main 'hard rock' portion of the WMA averages about 2,5 per cent of mean annual rainfall (MAR) it varying from 5 to 10 per cent of MAR in the higher rainfall portions underlain by deeply weathered granite and granite-gneiss to less than 1 per cent in the low rainfall portions that are underlain by Karoo sediments or volcanic rocks. In the Zululand Coastal Plain portion of the WMA recharge varies in the range 5 to 15 per cent of MAR, there being a marked gradient over the width of the plain from about 15 per cent in the high rainfall coastal portion of the plain to about 5 per cent on its much drier inland margin. The relatively high average recharge value of 10 per cent of MAR of the coastal plain is entirely due to the high rainfall infiltration rate and permeability of the very sandy surface soil of the Kwambonambi Formation which covers much of the plain. Over the western 'hard rock' portion of the WMA where rainfall averages some 900 mm annually, average annual groundwater recharge is thus in the order of 22500 m^3/km^2, while on the Zululand Coastal Plain, where rainfall also averages some 900 mm annually, it is in the order of 90 000m^3/km^2 on average.

The available WARMS data in respect of total groundwater usage in the WMA indicates that it is 5.04 million m^3/annum. Other available information indicates that existing groundwater usage in the western 'hard rock' portion of the WMA is an estimated 2 per cent of average annual recharge, it varying in the range 0,25 to 5 per cent thereof. In the Zululand Coastal Plain portion of the WMA, annual groundwater usage has been estimated to be about 3,5 million m^3/annum. This amount represents only about 0,6 per cent of the average annual groundwater recharge by rainfall over the area as a whole. Thus existing groundwater usage in the WMA is very low in terms of the sustainably available resource.

In the western 'hard rock' portion of the area, groundwater is used almost exclusively for domestic usage in the very extensive rural agricultural and pastoral portion of this area, although some groundwater is used for the same domestic purpose in the very limited urban portions of the region in question. In the Zululand Coastal Plain portion of the WMA groundwater is used for domestic, agricultural and industrial purposes.

3. CONCLUSION

From the foregoing it is evident that the current exploitation of the groundwater resource available in the WMA is at a very low level in terms of its sustainable potential. This potential can undoubtedly most usefully and effectively be exploited in the provision of domestic water supply to the relatively sparsely inhabited rural residential and minor urban portions of the WMA, where the nature of the groundwater aquifers is generally appropriate for this type of small quantity water supply, with no long term depletion of the sustainable groundwater resource occurring as a result thereof. This includes the higher rainfall eastern portion of the Zululand Coastal Plain part of the WMA where 'deep' aquifer borehole-sourced groundwater can be used for reticulated domestic water supply in areas of denser population, and where the 'shallow' aquifer can be exploited by

tube wells at points of individual habitation in the low density population, truly rural portions of the area. The utilisation of the groundwater resource for this purpose, unlike what has been attempted on a very limited basis unsuccessfully in the past, has to be on an operationally continuously sustainable basis. This can now, in terms of recent legislation, be most satisfactorily achieved by the involvement in this situation of the relevant Local Authorities, the involvement of local communities in the decision-making relating thereto also being imperative. Except very locally where the most favourable hydrogeological conditions obtain and boreholes or screenwells are scientifically sited and appropriately constructed and installed, groundwater yields in the WMA are usually inadequate to sustain agricultural and industrial usage thereof on any large-scale basis.

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