Department of Water Affairs and Forestry
Directorate: National Water Resource Planning (North)

INTERNAL STRATEGIC PERSPECTIVE: LUVUVHU/LETABA WATER MANAGEMENT AREA

December 2004

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DEPARTMENT OF WATER AFFAIRS AND FORESTRY
DIRECTORATE NATIONAL WATER RESOURCE PLANNING: NORTH

INTERNAL STRATEGIC PERSPECTIVE

LUVUVHU/LETABA WATER MANAGEMENT AREA

APPROVAL

Title:	Internal Strategic Perspective: Luvuvhu/Letaba WMA
DWAF Report No:	P WMA 02/000/00/0304
Consultants:	Goba Moahloli Keeve Steyn (Pty) Ltd in association with Tlou & Matji Engineering & Management Services (Pty) Ltd, Golder Associates Africa and BKS Group (Pty) Ltd.
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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This report will be updated on a regular basis until it is eventually superceded by the Catchment Management Strategy.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 Levuvhu/Letaba 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:
  - Intranet: http://dwaf-www.pwv.gov.za/documents/
  - Internet: http://www.dwaf.gov.za/documents/
- On CD which can be obtained from DWAF Map Office at:
  157 Schoeman Street, Pretoria (Emanzini Building)
  +27 12 336 7813
  mailto:apm@dwaf.gov.za

  or from the Version Controller (see box overleaf)

The CD contains the following reports (all available on DWAF website)

- Luvuvhu/Letaba WMA Internal Strategic Perspective (*This Report*) (Report No: P WMA 02/000/00/0304)
- National Water Resource Strategy, First Edition, Department of Water Affairs and Forestry, 2004
- The Levuvhu/Letaba WMA - Overview of Water Resources Availability and Utilisation (Report No: PWMA 02/000/00/0203)
- The Luvuvhu/Letaba WMA – Water Resources Situation Assessment (Report No: PO 2000/00/0301)

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VERSION CONTROL

LUVUVHU/LETABA WMA
INTERNAL STRATEGIC PERSPECTIVE

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

EXECUTIVE SUMMARY

1. INTRODUCTION

The Internal Strategic Perspective (ISP) aims to ensure synergy within the Department of Water Affairs and Forestry (DWAF) regarding water resources management. 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 Resources 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 for each Water Management Area.

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 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 appropriate and rational governance.

3. OVERVIEW OF THE LUVUVHU/LETABA WMA

The Luvuvhu/Letaba Water Management Area (WMA) is located adjacent to and shares watercourses with Zimbabwe and Mozambique, and the Limpopo River demarcates the northern boundary of the WMA. The Kruger National Park (KNP) lies along the eastern boundary, and occupies approximately 35% of the Water Management Area.

The main rivers in the WMA are the Luvuvhu, Shingwedzi and Letaba rivers, which all flow in an easterly direction through the Kruger National Park and into Mozambique before discharging into the Indian Ocean. The Shingwedzi River first flows into the Rio des Elephantes (Olifants River) in Mozambique, which then joins the Limpopo River. The two main tributaries of the Letaba River, the Klein and Groot Letaba, have their confluence on the western boundary of the Kruger National Park, whilst the Letaba River flows into the Olifants River just upstream of the border with Mozambique.

The topography of the Luvuvhu/Letaba WMA varies from a zone of high mountains in the west through low mountains and foothills in the central part of the WMA to the low lying plains in the east. The mountainous zone or Great Escarpment includes the northern portion of the Drakensberg mountain range and the eastern Southpansberg, which both extend to the western parts of the water management area, and the characteristic wide expanse of the Lowveld to the east of the escarpment. The highest peaks have an elevation of more than 2 000 m above mean sea level (msl). This zone is deeply incised by the major tributaries draining the WMA. The low lying plains cover most of the WMA and has gentle to flat slopes.

The main urban areas are Tzaneen and Nkowakowa in the Groot Letaba River catchment, Giyani in the Klein Letaba River catchment, and Thohoyandou in the Luvuvhu River catchment. The rural population is scattered throughout the WMA.
The mean annual temperature ranges from about 18 °C in the mountainous areas to more than 28 °C in the northern and eastern parts of the WMA with an average of about 25,5 °C for the WMA as a whole. Maximum temperatures are experienced in January and minimum temperatures occur on average in July.

Rainfall is strongly seasonal and occurs mainly during the summer months (i.e. October to March) and is strongly influenced by the topography. The peak rainfall months are January and February. The mean annual precipitation varies from less than 450mm on the low lying plains (northern and eastern part of the WMA) to more than 2 300 mm at Entambeini in the Soutpansberg in the mountainous areas (south western and north western parts of the WMA).

The average potential mean annual gross evaporation (as measured by A-pan) ranges between 1 800mm in the extreme western mountainous region to 2 400mm in the northern and eastern areas. The highest A-pan evaporation occurs in the period October to January and the lowest is in June.

The geology is varied and complex and consists mainly of sedimentary rocks in the north and metamorphic and igneous rocks in the south. High quality coal deposits are found near Tshikondeni and in the northern part of the Kruger National Park, whilst the eastern limb of the mineral rich Bushveld Igneous Complex touches on the southern parts of the water management area. With the exception of sandy aquifers in the Limpopo River Valley, the formation is of relatively low water-bearing capacity. A wide spectrum of soils occur in the water management area, with sandy soils most common.

Intensive irrigation farming is practised in the upper parts of the Klein Letaba River catchment, upstream and downstream of the Middle Letaba Dam, and particularly along the Groot Letaba and Letsitele Rivers, as well as in the upper Luvuvhu River catchment. Vegetables (including the largest tomato production area in the country), citrus and a variety of fruits such as bananas, mangoes, avocados and nuts are grown. Large areas have been planted with commercial forests in the high rainfall parts of the Drakensberg escarpment and on the Soutpansberg.

3.1 Luvuvhu sub-catchment

The gross surface water resource in the Luvuvhu sub-area is estimated to increase from 94 million m^3/a to 156 million m^3/awith the completion of the Nandoni Dam. There is also a relatively large groundwater resource in this catchment, estimated to be about 16 million m^3/a. Large scale utilization of the groundwater resource occurs mostly downstream of the Albasini Dam where it is used by irrigators and in the vicinity of Thohoyandou where it is used to supply rural communities.

The WMA report put the impact of the ecological Reserve on the yield at about 20 million m^3/a. This is based on the storage in the catchment in the year 2000. When this storage is increased, as is the case with the construction of the Nandoni Dam, this impact will increase to 27 million m^3/a.

Alien invasive vegetation is a particular problem in the upper reaches of the Luvuvhu catchment where the area of alien vegetation is estimated to be 168 km^2 in the A91A to A91D quaternary catchments, which have a total surface area of 889 km^2. The removal of alien vegetation in this catchment will make some resources available.

The irrigation requirement in the Luvuvhu/Matale sub-area is based on an irrigated area of 124 km^2 the majority of which is in the Luvuvhu catchment downstream of the Albasini Dam. The yield of the Alabasini Dam is not sufficient to supply all the water requirements of irrigators in the Levubu Government Water Scheme. These irrigators also make use of farm dams and groundwater to supplement their supplies.

The impact of afforestation on the available resource is based on an afforested area of 167 km^2. Most of this (134 km^2) is in the Luvuvhu catchment, which has a significant impact on the available yield due to its location upstream of the Albasini and Vondo Dams. The afforestation in the Mutale catchment is all situated in the high lying area around lake Fundudzi.

Thohoyandou accounts for most of the urban water requirements in the catchment. The bulk of the rural requirements emanate from the Malamulele and Paswane areas, which are partially supplied from the Vondo Regional Water Supply scheme. With the completion of the Nandoni Dam, the rural areas of Malamulele, Paswane and Lambani will also be supplied from this dam.

The NWRS refers to a transfer out of 2 million m^3/afrom the Albasini Dam. This water is for Makhado. The water resources of the Albasini Dam are over-allocated. It is therefore proposed to supply Makhado from Nandoni Dam to meet the increasing water requirements of this town and the surrounding area.

The possibility of supplying water form the Nandoni Dam to the water-stressed Klein Letaba area is also being considered.

The following are the main issues in the Luvuvhu/Mutale sub-area:

- Water requirements in the Luvuvhu catchment, dominated by irrigation, have exceeded the available resource, while the water use in the Mutale, again mostly irrigation, is approximately in balance with the resource.
- The imminent completion of the Nandoni Dam will result in a surplus of 37 million m3/a becoming available in the Luvuvhu catchment.
- There is a high but unmonitored groundwater use in the Luvuvhu catchment and it is not certain how this groundwater use impacts on the surface water resource.
- Preliminary ecological Reserves have been carried out in the Luvuvhu catchment but these are low-confidence estimates and only add to the uncertainty with regard to the available surplus in the catchment.

The broad strategy for the Luvuvhu and Mutale catchments is that a detailed analysis is required to accurately determine the available resource. In the short term, there is surplus available following the completion of the Nandoni Dam and allocations can be made for domestic water use and to revitalise the irrigation scheme downstream of the Nandoni Dam which has fallen into disuse In the medium term, however, the water resources situation of the Luvuvhu needs to be understood better. This must include the groundwater/surface water inter-dependency and a comprehensive Reserve determination, which also considers the requirements of the Pafuri flood plain.

3.2 Groot Letaba sub-area

The gross surface water availability in the Groot Letaba sub-area is estimated at 168 million m^3/a, which is derived from the yield of the Tzaneen and Ebenezer dams as well as significant run-of-river abstractions. The Tzaneen Dam, if operated in isolation, provides a yield of approximately 60 million m^3/a. However, when operated in a systems context to supply water to irrigators downstream only when the run-of-river flows are inadequate, the total yield is much greater. Hence the large gross yield of the system. After allowing for the desk top estimate of the ecological Reserve, which reduces the gross yield by an estimated 25 million m^3/a, and alien vegetation which reduces the yield by a further 10 million m^3/a, the available surface water resource is 133 million m^3/a (at a 1:50 year assurance).

The contribution of groundwater to the available water resource in the Groot Letaba sub-area is estimated in the NWRS to be 12 million m^3/a while the recently completed registration of water use gives the groundwater use as 23 million m^3/a. This groundwater use is mostly downstream of the Tzaneen Dam where it is used to supplement irrigation supplies from surface water during times of drought. In many cases groundwater abstraction takes place close to the river and probably has a direct impact on the surface water flow. This groundwater/surface water dependency needs to be quantified.

The irrigation requirement in the Groot Letaba catchment is based on an irrigated area of 191 km^2. Approximately 28 million m^3/a of this requirement occurs upstream of the Tzaneen Dam and is supplied from the Ebenezer Dam (13.9 million m^3/a), the Magoebakloof Dam (7 million m^3/a) and run-of-river (7.1 million m^3/a). The irrigators downstream of the Tzaneen Dam generally experience a low assurance of supply with severe restrictions being placed on their water use during periods of drought.

The forestry requirement is based on an afforested area of 417 km^2, which reduces the runoff by an estimated 50 million m^3/annum. This reduces the yield of the system by an estimated 35 million m^3/annum.

There are no transfers into the Groot Letaba River sub-area. However, there is a significant transfer out of the sub-area to Polokwane. The bulk of the water for this transfer is sourced from the Ebenezer Dam while Polokwane also transfers water from Dap Naude Dam. The transfer rate to Polokwane from Ebenezer Dam was approximately 10 million m^3/a in the year 2000 but this is expected to increase to the full allocation of 12 million m^3/a in the future.

The following are the main issues in the Groot Letaba sub-area:

- The catchment as a whole is in deficit although users upstream of the Tzaneen Dam enjoy a relatively high level of assurance while users downstream experience shortages.
- Irrigation has developed and expanded to fully utilise the water resources (prior to any allowance for the ecological Reserve). These are mostly perennial high-value crops. Financial losses during droughts have resulted in high efficient water use by irrigators. Current schemes are reportedly very efficient and well managed. There might be limited scope for further improvements.
- Large-scale afforestation in the upper catchments has a large impact on the water resources.
- The implementation of the Reserve could result in serious socio-economic disruption in the catchment. This needs to be taken into account when setting and implementing the Reserve.

The broad longer-term strategy is to implement compulsory licencing. The Reserve determination is already under way in anticipation of licensing. In order to mitigate the negative impacts of this, further development of the resource must be considered such as the construction of Nwamwitwa Dam and the raising of Tzaneen Dam.

3.3 Klein Letaba sub-area

The gross surface water availability in the Klein Letaba sub-area is estimated at 27 million m^3/a, most of which is derived from the yield of the Middle Letaba Dam and the smaller dams upstream. There is also a relatively large groundwater resource in this catchment, estimated to be about 30% of the current utilisation in the sub-area. After allowing for the ecological Reserve, which reduces the gross yield by an estimated 4 million m^3/a, and alien vegetation which reduces the yield by a further 2 million m^3/a, the available surface water is 32 million m^3/annum (at a 1:50 year assurance).

The contribution of groundwater to the available water in the Klein Letaba sub-area is estimated to be about 9 million m^3/a. This groundwater use is mostly upstream of the Middle Letaba dam where it is used to supplement surface water supplies for irrigation. Groundwater was also used to supply most of the rural population in the sub-area, but much of this has now been replaced by reticulated supply from the Middle Letaba Dam.

The irrigation requirement in the Klein Letaba catchment is based on an irrigated area of 51 km^2. Most of the irrigation water use occurs upstream of the Middle Letaba Dam and is sourced from small dams and from groundwater. Irrigation downstream of the Middle Letaba Dam has fallen into disuse apparently due to decreasing assurance of supply as more and more of the yield of the Middle Letaba Dam is supplied to Giyani and other towns for domestic use.

The following are the main issues in the Klein Letaba sub-area:

- Original estimates of the yield of the Middle Letaba dam were much higher than is now believed to be the case. This, together with rapidly increasing supply from this dam to meet domestic requirements has resulted in irrigators downstream of the dam experiencing serious deficits, to the extent that they have ceased operating. These irrigation schemes are the target of the irrigation revitalisation project, but there is no water available for this purpose.
- Water use in Giyani is very inefficient and wasteful. Water conservation and demand management measures are soon to be implemented in this area.

The broad strategy for the Klein Letaba sub-area is to urgently implement water conservation and demand management measures in the Giyani area. These interventions are already in progress. Compulsory licencing will not solve the problem of deficits downstream of the Middle Letaba Dam and this is therefore not recommended as an urgent action. In the longer term, a better understanding of water use, and especially the sources of supply, is required in this sub-area, for which a detailed water resource and utilisation assessment is recommended.

3.4 Lower Letaba sub-area

The Lower Letaba sub-area is situated downstream of the Groot Letaba and Klein Letaba sub-area and falls entirely within the Kruger National Park. This sub-area therefore receives all the water flowing out of the Groot Letaba and Klein Letaba sub-areas. For all practical purposes, no sustainable yield is derived from runoff in the Lower Letaba sub-area. Water use in the catchment is negligible. The groundwater resource is given in the NWRS as zero, but this is based on actual groundwater use and is not an indication of the actual potential resource. There are undoubtedly groundwater resources in the sub-area, but these have not been reliably quantified.

3.5 Shingwedzi sub-area

The Shinwedzi sub-area is a head-water catchment which drains into Mozambique. It is situated almost entirely in the Kruger National Park. For all practical purposes, no sustainable yield is derived from surface flow in the Shingwedzi catchment. Water use in the catchment is negligible.

3.6 Management objectives

There are a number of generic objectives relating to the management of the water resources of all the sub-areas of the Luvuvhu/Letaba WMA. These are:

- Effective and sustainable water resources management and development, which recognizes international requirements, the Ecological Reserve and the productive, sustainable and equitable use of water as an asset to be utilised to bring about economic and socio-economic benefit,
- To know and understand the size and availability of the water resource,
- Equitable allocation of the available water resource to encourage the development of the rural economy to contribute to poverty eradication.
- To make more efficient use of the existing available water resources to all water user sectors. This could enable the CMA to free up additional water in future, which could be put to beneficial use.

- Maintaining water quality that is fit for use for its intended purpose and maintaining aquatic ecosystem health on a sustainable basis, with the negative externalities being borne by the responsible institutions (polluter-pays principle).
- To ensure availability of reliable data and information on all aspects of integrated water resources management and potential development in the catchment.

4. RECONCILIATION OF WATER REQUIREMENTS AND AVAILABLE RESOURCES

By far the largest user of the available water resources in the WMA is irrigation, with other significant users being forestry and rural domestic water use, and transfers out of the WMA.

Table 1: Water requirements in the year 2005 (million m^3/a)

Key Area/ Sub-area	*Irrigation*	*Urban*	*Rural*	*Mining and bulk industrial*	*Power Generation*	*Afforestation*	*Total local requirements*	*Transfers out*	*Grand Total*
Mutale	24	0	2	1	0	1	28	4	32
Luvuvhu	73	4	8	0	0	6	91	7	98
Luvuvhu/ Mutale	97	4	10	1	0	7	119	2	121
Shingwedzi	0	0	3	0	0	0	3	0	3
Groot Letaba	133	3	10	0	0	35	181	15	196
Klein Letaba	25	3	8	0	0	1	37	0	37
Lower Letaba	0	0	0	0	0	0	0	0	0
TOTAL	255	10	31	1	0	43	340	17	357

Note: The shaded rows refer to sub-areas as defined in the NWRS

Due to the high rainfall on the escarpment, which forms the western boundary of this WMA, two of the sub-areas of this WMA, namely the Groot Letaba and the Luvuvhu/Mutale have relatively large resources.

Table 2: Available water in the year 2005 (million m^3/a)

ey Area / Sub-area	*Natural Resources*		*Usable return flow*	*Total local yield*	*Transfer in*	*Grand total*
	Surface Water	*Groundwater*				
Mutale	22	4	1	27	5	32
Luvuvhu	121	16	6	143	4	147
Luvuvhu/ Mutale	143	20	7	170	0	170
Shingwedzi	0	3	0	0	0	3
Groot Letaba	133	12	14	159	0	159
Klein Letaba	21	9	2	32	0	32
Lower Letaba	0	0	0	0	0	0
TOTAL	**297**	**44**	**23**	**361**	**0**	**361**

Note: The shaded rows refer to sub-areas as defined in the NWRS

The reconciliation of available water and requirements presented in **Table 3** is derived from the NWRS.

Table 3: Reconciliation of Water Requirements and Available Water for the Year 2005 (million m^3/annum).

Key Area	Available water			Water requirements/allocations			Balance
	Local yield	Transfers In	Total	Local requirements	Transfers out	Total	
Mutale	27	5	32	28	4	32	**0**
Luvuvhu	143	4	147	91	7	98	**49**
Luvuvhu/ Mutale	170	0	170	119	2	121	**49**
Shingwedzi	0	0	3	3	0	3	**0**
Groot Letaba	159	0	159	181	15	196	**(37)**
Klein Letaba	32	0	32	37	0	37	**(5)**
Lower Letaba	0	0	0	0	0	0	**0**
TOTAL	**361**	**0**	**361**	340	17	357	**4**

Note: The shaded rows refer to sub-areas as defined in the NWRS

1. Brackets around numbers indicate a negative balance.
2. Transfers into and out of sub-areas may include transfers between sub-area as well as transfers between WMAs. Addition of the transfers therefore does not necessarily correspond to the total transfer into and out of the WMA.

5. WATER RESOURCE MANAGEMENT ISSUES AND STRATEGIES

Key considerations listed in the NWRS are:

- The water resources, which occur within the water management area, are nearly fully developed or being developed, with the available water being highly utilised. Limited options for further resource development exist.
- The requirements for and availability of water are approximately in balance at present and although no significant change in the requirements for water is foreseen, implementation of the Reserve will result in serious deficits in some catchments.
- It is likely that additional water will have to be transferred to Makhado in future, for which provision has already been made in the planning of Nandoni Dam.
- The potential exists for new mines to be developed and possible future power generation from the coalfields in the north, which have not specifically been provided for in the projected future water requirements.
- Ensuring the adequate availability of water of appropriate quality with respect to the ecological requirements of the Kruger National Park.
- The over-exploitation of groundwater is not sustainable, whilst there is insufficient knowledge on the long-term sustainable yield from groundwater and inter-dependencies with surface water.
- Possible impacts of water resource management in the Luvuvhu and Letaba water management area and honouring of all obligations with respect to Mozambique.

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CCAW	-	Co-ordinating Committee for Agricultural Water
CEIMP	-	Consolidated Environmental Implementation and Management Plan
CMA	-	Catchment Management Agency
CMS	-	Catchment Management Strategy
DWAF	-	Department of Water Affairs and Forestry
ECA	-	Environment Conservation Act
GDP	-	Gross Domestic Product
GGP	-	Gross Geographic Product
IDP	-	Integrated Development Plan
EMF	-	Environmental Management Framework
IAC	-	Irrigation action committee
ISP	-	Internal Strategic Perspective
IWRP	-	Integrated Water Resources Planning
LDA	-	Limpopo Provincial Department of Agriculture
LWC	-	Limpopo Watercourse Commission
NEMA	-	National Environmental Management Act
NWA	-	National Water Act
NWRS	-	National Water Resources Strategy
PLC	-	Provincial Liaison Committee
RO	-	Regional Office
RWSS	-	Regional Water Supply Scheme
SFRA	-	Stream Flow Reduction Activities
STP	-	Sewage Treatment Plant
WCP	-	Water Care Programme
WMA	-	Water Management Area
WRSA	-	Water Resource Situation Assessment
WSA	-	Water Services Authority
WSDP	-	Water Services Development Plan
WSP	-	Water Services Provider
WUA	-	Water User Association
WATSAN	-	Water and Sanitation

GLOSSARY OF TERMS

ASSURANCE OF SUPPLY	The reliability of which a specified quantity of water can be provided, usually expressed either as a percentage or as a risk. For example “98% reliability” means that, over a long period of time, the specified quantity of water can be supplied for 98% of the time, and less for the remaining 2%. Alternatively, this situation may be described as a “1 in 50 year risk of failure” meaning that, on average, the specified quantity of water will fail to be provided in 1 year in 50 years, or 2% of the time.
BASIN	The area of land that is drained by a large river, or river system.
CATCHMENT	The area of land drained by a river. The term can be applied to a stream, a tributary of a larger river or a whole river system.
COMMERCIAL FARMING	Large scale farming, the products of which are normally sold for profit.
COMMERCIAL FORESTS	Forests that are cultivated for the commercial production of wood or paper products.
DAM	The wall across a valley that retains water, but also used in the colloquial sense to denote the lake behind the wall.
DEFICIT	Describes the situation where the availability of water at a particular assurance of supply is less than the unrestricted water requirement.
DRAINAGE REGION	The drainage regions referred to in this document are either single large river basins, or groups of contiguous catchments or smaller catchments with similar hydrological characteristics. They follow the division of the country into drainage regions as used by the Department of Water Affairs and Forestry.

ECOLOGICAL IMPORTANCE	A measure of the extent to which a particular species, population or process contributes towards the healthy functioning of an ecosystem. Important aspects include habitat diversity, biodiversity, the presence of unique, rare or endangered biota or landscapes, connectivity, sensitivity and resilience. The functioning of the ecosystem refers to natural processes.
ENVIRONMENTALLY SENSITIVE AREA	A fragile ecosystem which will be maintained only by conscious attempts to protect it.
HYDROLOGICAL YEAR	The twelve-month period from the beginning of October in one year to the end of September in the following year.
IRRIGATION QUOTA	The quantity of water, usually expressed as m^3 / ha per year, or mm per year, allocated to land scheduled under the scheme. This is the quantity to which the owner of the land is entitled at the point at which he or she takes delivery of the water and does not include conveyance losses to that point
MEAN ANNUAL RUNOFF	Frequently abbreviated to MAR, this is the long-term mean annul flow calculated for a specified period of time, at a particular point along a river and for a particular catchment and catchment development condition. In this report, the MARs are based on the 70-year period October 1920 to September 1990 inclusive.
OPPORTUNISTIC IRRIGATION	Irrigation from run-of-river flow, farm dams, or compensation flows released from major dams. As storage is not provided to compensate for reduced water availability in dry years, areas irrigated generally have to be reduced in dry years.
QUATERNARY CATCHMENT	The basic unit of area resolution used in the WR90 series of reports published by the Water Research Commission and also in this report. The primary drainage regions are divided into secondary, tertiary and quaternary catchments.

	The quaternary catchments have been created to have similar mean annual runoffs: the greater the runoff volume the smaller the catchment area and vice versa. The quaternary catchments are numbered alpha-numerically in downstream order. A quaternary catchment number, for example R30D, may be interpreted as follows; the letter R denotes Primary Drainage Region R, the number 3 denotes secondary catchment 3 of Primary Drainage Region R, the number 0 shows that the secondary catchment has not, in this case, been sub-divided into tertiary catchments, and the letter D shows that the quaternary catchment is the fourth in sequence downstream from the head of secondary catchment R30.
RESERVE	The quantity and quality of water required (a) to satisfy basic human needs by securing a basic water supply, as prescribed under the Water Services Act, 1997 (Act No. 108 of 1997) for people, who are now or who will, in the reasonably near future, be (i) relying upon; (ii) taking water from; or (iii) being supplied from, the relevant water resource; and (b) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource as indicated in the National Water Act (Act No. 36 of 1998).
RESOURCE QUALITY	The quality of all the aspects of a water resource including: (a) the quantity, pattern, timing, water level and assurance of instream flow; (b) the water quality, including the physical, chemical and biological characteristics of the water; (c) the character and condition of the instream and riparian habitat; and (d) the characteristics, condition and distribution of the aquatic biota.
RESOURCE QUALITY OBJECTIVE	Quantitative and verifiable statements about water quantity, water quality, habitat integrity and biotic integrity that specify the requirements (goals) needed to ensure a particular level of resource protetion.

SCHEDULED LAND	Irrigable land to which a water quota has been allocated.
SUBSISTENCE FARMING	Small-scale farming where almost all produce is consumed by the farmer's household or within the local community.
WATER IMPORTS	Water imported to one drainage basin or secondary sub-catchment from another.
WATER TRANSFERS	Water transferred from one drainage basin or secondary sub-catchment to another. Transfers in are synonymous with water imports.
YIELD	The maximum quantity of water obtainable on a sustainable basis from a dam in any hydrological year in a sequence of years and under specified conditions of catchment development and dam operation.

PART 1: INTRODUCTION AND OVERVIEW

CHAPTER 1: BACKGROUND TO THE LUVUVHU/LETABA WMA INTERNAL STRATEGIC PERSPECTIVE

1.1 LOCATION OF THE LUVUVHU/LETABA WMA

Figure 1.1 shows the location of the Luvuvhu/Letaba WMA, which falls within the Limpopo Province.

CLICK TO VIEW GRAPHIC

Figure 1.1: Location of the Luvuvhu / Letaba 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 Resources 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)

The Objectives of the ISP Process 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 Office can hand over its management functions to an 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 resources within the area of concern. Stakeholders need to be made aware of the bigger picture as well as the management detail associated with each specific water resource management unit.

1.3.1 Approach Adopted in Developing the ISP

The ISP for the Luvuvhu/Letaba WMA was developed in five stages as follows:

i) Stage 1:

Determining the current status of water resource management and relevant water resource management issues and concerns in the Luvuvhu/Letaba WMA. This was achieved through interviews with individual members of DWAF's RO in Polokwane and Tzaneen and by collating information from the NWRS, WMA report, Water Resource Situation Assessment (WRSA) report and other catchment study reports. The following topics were discussed with Regional Office staff and their issues and concerns documented:

- Water Availability and Supply 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) Stage 2:

The first workshop constituted of two parts, i.e. Workshops 1A and 1B. These were held on the 17 & 18 June 2003 and 24 & 25 July 2003 respectively. The attendees of the workshops included Limpopo Regional Office officials, National Water Resource Planning directorate and other DWAF directorates, together with Professional Service Providers who were facilitating the process. Workshop 1A focussed on issues specific to the Letaba/Shingwedzi river catchment as documented in (i) above.

Workshop 1B was held on the 24 to 25 July 2004. This workshop focused on the Luvuvhu/Mutale river catchment.

iv) Stage 3:

The third stage involved the preparation of the second workshop (Workshop 2) document to be used for refining strategies to address the various issues and concerns, during the second workshop. This workshop was planned to cover both the Letaba/Shingwedzi and the Luvuvhu/Mutale catchments.

v) Stage 4:

The fourth stage was the second workshop held on the 17 and 18 September 2003. 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.

vi) Stage 5:

The fifth stage was the finalisation of the ISP document.

As can be deduced from the above this Luvuvhu/Letaba 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. Adopting this procedure means that this ISP remains a 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. Relevant and readily available details have however been included where possible. The responsible authority for the further development of each strategy is indicated. For the most part this is the Regional Office, which remains responsible for involving the relevant DWAF directorates.

1.3.2 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. The introduction of new strategies also needs 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 liasing 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

Changes to this ISP will depend on need, and will be managed by DWAF until the CMA is in place to develop its own Catchment Management Strategy. Revisions may be required as frequently as annually, or only once in five years, with frequency based on the degree to which conditions change and knowledge advances. New information affecting this ISP and the need for new and additional strategies must be brought to the attention of the Catchment Manager responsible for the Letaba/Luvuvhu ISP. The current incumbent is Mr W Tunha, who has been delegated the task of managing version control.

1.3.3 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 NWRS contains 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.

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 superseded 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, in some cases, emerged. The level of study has been very detailed and intense for the ISP. This has 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 works 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 (annual) 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**.

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Figure 1.2: Diagram showing DWAF Integrated Water Resources Management approach

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.

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 users 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 4 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 1.6 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.

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.

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 generators will be obliged to pay, depending on the quantity and quality of their discharge.

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.

Groundwater quality requires equal attention, and more so as we recognise the importance of groundwater in supplementing our meagre surface 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 of strategy within this ISP – considered primarily within the Water Quality Strategy and also under Groundwater. 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. 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 strategies 4.1-14, 4.1-15, 4.2-1, 4.2-2, 4.2-3, 4.3-1, 4.3-2 and 4.3-3 in Part 4 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.

See the Groundwater Strategies No. 4.1-14 and 4.1-15.

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. 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.

In this ISP refer to Strategy 4.1-12.

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.

CHAPTER 2: BROAD OVERVIEW OF THE LUVUVHU/LETABA WATER MANAGEMENT AREA FROM A RESOURCE MANAGEMENT PRESPECTIVE

2.1 LOCALITY AND PHYSICAL CHARACTERISTICS

The Luvuvhu/Letaba Water Management Area (WMA) lies entirely within the Limpopo Province. The WMA is located adjacent to and shares watercourses with Zimbabwe and Mozambique, and the Limpopo River demarcates the northern boundary of the WMA (see **Figure 2.1**). The Kruger National Park (KNP) lies along the eastern boundary, and occupies approximately 35% of the Water Management Area. Mozambique forms the eastern border of the KNP.

The main rivers in the WMA are the Luvuvhu, Shingwedzi, Klein Letaba, Middle Letaba and Groot Letaba rivers, which all flow in an easterly direction. The confluence of the Luvuvhu and Limpopo rivers forms the common point where South Africa borders on both Zimbabwe and Mozambique. The Shingwedzi River first flows into the Rio des Elephantes (Olifants River) in Mozambique, which then joins the Limpopo River. The two main tributaries of the Letaba River, the Klein and Groot Letaba, have their confluence on the western boundary of the Kruger National Park, whilst the Letaba River flows into the Olifants River just upstream of the border with Mozambique.

The topography of the Luvuvhu/Letaba WMA varies from a zone of high mountains in the west through low mountains and foothills in the central part of the WMA to a zone consisting of flat lowland plains in the east.

The mountainous zone or Great Escarpment includes the northern portion of the Drakensberg mountain range and the eastern Soutpansberg, which both extend to the western parts of the water management area, and the characteristic wide expanse of the Lowveld to the east of the escarpment. The highest peaks have an elevation of more than 2 000 m above mean sea level (msl). This zone is deeply incised by the major tributaries draining the WMA. The plains zone covers most of the WMA and is generally flat with gentle slopes.

The main urban areas are Tzaneen and Nkowakowa in the Groot Letaba River catchment, Giyani in the Klein Letaba River catchment, and Thohoyandou in the Luvuvhu River catchment. The rural population is scattered throughout the WMA.

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2.2 CLIMATE

The climatic conditions vary considerably within the Luvuvhu/Letaba Water Management Area.

2.2.1 Temperature

The mean annual temperature ranges from about 18 °C in the mountainous areas to more than 28 °C in the northern and eastern parts of the WMA, with an average of about 25,5 °C for the WMA as a whole. Maximum temperatures are experienced in January and minimum temperatures occur on average in July.

2.2.2 Precipitation

Rainfall is seasonal and occurs mainly during the summer months (i.e. October to March). It is strongly influenced by the topography. The peak rainfall months are January and February. The mean annual precipitation varies from less than 450mm in the lowland plain (northern and eastern part of the WMA) to more than 2300 mm at Entambeni in the Soutpansberg in the mountainous areas (south western and north western parts of the WMA). See **Figure 2.2.**

2.2.3 Evaporation

The average potential mean annual gross evaporation (as measured by A-pan) ranges between 1 800 mm in the extreme western mountainous region to 2 400 mm in the northern and eastern areas. The highest A-pan evaporation occurs in the period October to January and the lowest is in June. See **Figure 2.2**.

2.3 GEOLOGY

The geology is varied and complex and consists mainly of sedimentary rocks in the north and metamorphic and igneous rocks in the south. High quality coal deposits are found near Tshikondeni and in the northern part of the Kruger National Park, whilst the eastern limb of the mineral rich Bushveld Igneous Complex touches on the southern parts of the water management area. With the exception of sandy aquifers in the Limpopo River Valley, the formation is of relatively low water-bearing capacity. A wide spectrum of soils occur in the water management area, with sandy soils most common.

2.4 LAND USE

Present land use, as shown in **Figure 2.3**, is dominated by the large undeveloped expanse, which demarcates the Kruger National Park. Extensive areas under rain fed cultivation together with a large number of rural villages, occur throughout most of the remaining Lowveld area.

Intensive irrigation farming is practised in the upper parts of the Klein Letaba River catchment, upstream and downstream of the Middle Letaba Dam, and particularly along the Groot Letaba and Letsitele Rivers, as well as in the upper Luvuvhu River catchment. Vegetables (including the largest tomato production area in the country), citrus and a variety of fruits such as bananas, mangoes, avocados and nuts are grown. Large areas have been planted with commercial forests in the high rainfall parts of the Drakensberg escarpment and on the Soutpansberg.

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Thohoyandou, Tzaneen and Giyani are the largest urban centres in the WMA, with some agro-based industries mainly at Tzaneen.

Approximately 35% of the land area of the water management area along the eastern boundary falls within the Kruger National Park, with the rivers flowing through the park of particular importance with regard to maintaining ecosystems. Several private game reserves adjoin the park, whilst a number of other conservation areas are scattered throughout the water management area.

2.5 INTERNATIONAL

The Luvuvhu/Mutale sub-area of the Luvuvhu/Letaba WMA forms part of the Limpopo River Basin, which is shared by South Africa, Botswana, Zimbabwe and Mozambique. With all the rivers in the WMA flowing directly from South Africa into Mozambique, developments and water resource management in South Africa can impact directly on Mozambique. Co-operation on water matters between South Africa and Mozambique (Letaba River) is facilitated through the bilateral Joint Water Commission between the two countries. International co-operation with respect to the use and management of the watercourses in the Limpopo River Basin (Luvuvhu River), is overseen by the Limpopo Watercourse Commission (LWC), with membership by all four basin states.

The four basin states recently completed a joint hydrometric study of the Limpopo River Basin. An agreement has been reached in principle to carry out a full basin study.

2.6 SUB-AREAS

The Luvuvhu/Letaba WMA lies within primary drainage regions A and B, and consists of secondary drainage regions A9, B8 and B9 and includes a total of 45 quaternary catchments.

Five key areas or management units were identified within the WMA, as shown in Figure **2.1.** The quaternary catchments constituting each key area are given in Table 2.1. As discussed in Section 1.1.1 the WMA broadly consists of two sub-regions, namely the Luvuvhu/Mutale sub-region and the Letaba/Shingwedzi Sub-Region, consisting of the Groot Letaba, Klein Letaba, Lower Letaba, and the Shingwedzi sub-areas, asdefined in the National Water Resource Strategy (NWRS). The Luvuvhu/Mutale sub-region is the same as the sub-area defined in the NWRS.

Table 2.1: Sub-areas

Sub-area / Key Area	Quaternary catchments in Key Area
Luvuvhu / Mutale	
Upper Luvuvhu	A91A, A91B, A91C, A91D
Middle Luvuvhu	A91E, A91F, A91G, A91H
Lower Luvuvhu	A91J, A91K
Mutale at Luvuvhu	A92A, A92B, A92C, A92D
Groot Letaba	
Upper Groot Letaba	B81A, A81B
Lower Groot Letaba	B81C, B81D, B81E, B81F, B81G, B81H, B81J
Klein Letaba	
Middle Letaba Dam	B82A, B82B, B82C, B82D
Klein Letaba catchment	B82E, B82F, B82G, B82H, B82J
Lower Letaba	
Letaba down to the confluence with the Olifants	B83A, B83B, B83C, B83D, B83E
Shingwedzi	
Shingwedzi catchment	B90A, B90B, B90C, B90D, B90E, B90F, B90G, B90H

Segregation of the sub-areas (also referred to as key areas or management units in this report) was based on practical considerations such as size and location of sub-catchments, homogeneity of natural characteristics, location of pertinent water infrastructure (e.g. dams) and economic development. This segregation of sub-areas was also informed by the significant spatial variations in climate, water availability, level and nature of economic development evident throughout the WMA.

The sub-areas as defined in the NWRS (shown in **Figure 2.1**) are:

- The Luvuvhu/Mutale sub-area in the north, which comprises the catchment of the Luvuvhu River together with that of its main tributary the Mutale River.
- The Groot Letaba sub-area, which includes the catchment of the Groot Letaba River down to the confluence with the Klein Letaba River.
- The Klein Letaba sub-area, which includes the catchment of the Middle Letaba River and Klein Letaba River, down to its confluence with the Groot Letaba River.
- The Lower Letaba sub-area comprises the catchment of the Letaba River downstream of the confluence of the Klein and Groot Letaba Rivers, to where it joins the Olifants River just upstream of the border with Mozambique.
- The Shingwedzi sub-area, which corresponds to the South African portion of the Shingwedzi River catchment.

2.7 ECONOMIC ACTIVITY

The Luvuvhu/Letaba WMA contributes less than 1% of the Country's Gross Domestic Product (GDP) (DWAF, 2003a). The largest economic sectors in the WMA (1997 figures) in terms of Gross Geographic Product (GGP) are:

- Government (i.e. public administration, defence and other government services at local level) - 41.3%
- Trade (i.e. retail trade, sale of goods & services, hotels, restaurants, camping sites, etc). - 13.5%
- Agriculture (i.e. agriculture, fishing, forestry, hunting and related services) - 11.9%
- Mining (i.e. mining and quarrying of metallic minerals such as coal and gold, stone quarrying, mining of limestone and other minerals.) - 10.0%

Most of the economic activity in the WMA is centred in the Thohoyandou-area (government and trade), followed by Tzaneen with the surrounding activities in irrigation and afforestation (agriculture, trade). The concentration of government activities can to a large extent be ascribed to the existence of the erstwhile homeland areas of Gazankulu, Lebowa and Venda. The government is the largest contributor to the local economy, but largely because of the comparatively small contributions by other sectors of the economy of the region.

Trade in the Luvuvhu/Letaba WMA is supported by a relatively high population density. This is also supported by the tourism industry associated with the Kruger National Park, private game parks and surrounds.

The large irrigation developments in the WMA, as well as the extensive commercial forestry make significant contributions to the agricultural sector, which in turn is the third largest contributor to the economy of the region. Most of the rain fed cultivation and cattle herding are practised as subsistence farming on communal lands.

Minerals found in the WMA include complex flake graphite, ironstone, marble, fire clay, surficial limestone, magnesium, barile mineralisation, small gold deposits and substantial deposits of coal.

The workforce in the WMA was, in 1994, estimated at 343 000 (DWAF, 2003a). Of these 41% were employed in the formal economy and 49% were unemployed. The WMA has the highest unemployment rate compared to the other WMAs in the country. Of those formally employed, 53% were in the government sector, whilst 19% were in agriculture and 9% in trade.

Agriculture and mining in the WMA are relatively more competitive than the rest of the country. Favourable climate, the variety of products as well as the good performance of the agricultural sector contribute to its comparative advantage.

Land and water resources available for agriculture are already highly developed and utilised, particularly with respect to irrigation and afforestation. This limits the potential for much further growth in the agricultural sector. The greatest potential for economic growth in the WMA lies in the processing of agricultural products as well as with new mining developments. No large-scale plans for such developments are known at this stage.

2.8 DEMOGRAPHY

Some 1 535 000 people (1995 population which is about 3.5% of the country's total) reside in the Luvuvhu/Letaba WMA (DWAF, 2003a). More than 90% of the population is rural based, with most living in informal rural villages and settlements. The population is relatively evenly distributed throughout the region and the density is comparatively high for rural areas. Lower population densities occur in the escarpment and mountainous areas as well as in the extreme north of the WMA. Very few people live in the Kruger National Park. Most of the urban population is found in Tzaneen, Nkowakowa, Thohoyandou and Giyani, which are the main urban centres.

2.9 INSTITUTIONS

There are four types of water-related institutions, which play a role in the Luvuvhu/Letaba WMA. These are:

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

The **Provincial Liaison Committee (PLC)**, the purpose of which is to foster communication and co-operation between DWAF and Provincial Government as well as with Municipalities, Water Boards and important stakeholders (such as the Forestry Industry Association). This committee, which is currently dormant, is meant to serve the whole of the Limpopo Province and is not limited to only the Luvuvhu/Letaba WMA. The PLC has two sub-committees, namely the **Water Resources Planning sub-committee** (currently not active), which coordinates water related planning activities in the Province, and the **Coordinating Committee for Agricultural Water (CCAW),** which deals with matters related to irrigation.

The provincial water and sanitation committee, (WATSAN), which is co-ordinated by the Department of Local Government, has a responsibility for water and sanitation services. District Municipalities (DMs) are defined as Water Services Authorities (WSA) in terms of the Water Services Act (Act 108 of 1997), and are required to prepare Integrated Development Plans (IDPs). Two such district municipalities fall within the WMA; these are Vhembe and Mopani. Vhembe DM consists of four local municipalities (LMs) and three of these fall (but not entirely) within the Luvuvhu/Mutale river catchment. These are Mutale/Masisi, Thulamela and part of Makhado LM. Mopani consists of four local municipalities, which fall within the Letaba/Shingwedzi river catchment namely Greater Giyani, Greater Tzaneen, Greater Letaba and Ba-Phalaborwa (see **Figure 2.4**). It is important to bear in mind that a Local Municipality (see below) can also become a Water Services Authority.

An IDP is a principal strategic planning instrument intended to guide and inform all planning, budgeting, management and decision-making at the level of the District Municipality. The Water Services Act states that a Water Services Development Plan (WSDP) must be part of the IDP. This is an important link between the 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.

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Local Municipalities 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, which includes the WSDP, deals with all services. A WSDP must contain a **water balance, which** provides a useful point of reference for integrated development planning of water resources. As the name indicates, this plan deals with water services, but in preparing a WSDP Local Municipalities must be aware of water resources 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 must include a statement as to the source of its 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 of raw water (i.e. opportunity and constraints) for the Local Municipalities.

Irrigation Boards 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 fulfil a similar function to an irrigation board but whose functions need not be limited only to irrigation practices.

Water Boards are classified in the Water Services Act as Water Services Providers and in this respect fulfil a similar role to Local Municipalities. However, a Water Board deals only with water matters, usually bulk water purification and distribution, perhaps sanitation, but not any other services. The only Water Board in the Luvuvhu/Letaba WMA is Lepelle Northern Water.

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 fulfil the role of the Catchment Management Agency until such time as the CMA is in place and fully functional.

2.10 OVERVIEW OF THE WATER RESOURCES SITUATION IN THE WATER MANAGEMENT AREA

The key issues that have been identified in the WMA and documented in the NWRS are listed in this chapter, while additional issues and proposed broad strategies are discussed in Chapters 4 and 6. Recommended amendments to the NWRS are also discussed in these chapters. Part 4 of this report contains the more comprehensive strategies and management actions proposed for the Luvuvhu/Letaba WMA.

2.10.1 Surface Water

Surface water runoff in the WMA strongly correlates with the areas of high rainfall in the Drakensberg and Soutpansberg. Some 45% of the total surface runoff from the WMA flows down the Klein and Groot Letaba Rivers (most of which is contributed by the Groot Letaba River) and a further 45% is contributed by Luvuvhu and Mutale Rivers.

The relatively flat, low rainfall Lowveld areas generate very little runoff, with the Shingwedzi and Lower Letaba River catchments jointly contributing a mere 10% of the streamflow in the WMA.

Lake Fundudzi is the only natural lake in the WMA. This was formed by an ancient landslide across the Mutale River. There are no large wetlands in the WMA. Both low and flood flows in the rivers are of great importance to the Kruger National Park, with a particularly important ecosystem which exists in the Pafuri Flood Plain along the Limpopo River.

Afforestation in the upper reaches of the Groot Letaba, Luvuvhu and Klein Letaba Rivers (in descending order of magnitude) result in relatively large reductions in streamflow. Substantial infestations of invasive alien vegetation are found in the Luvuvhu and Groot Letaba River catchments. Cultivation practices and over-grazing also impact on the surface runoff, sediment loads as well as infiltration to groundwater. However these impacts have not yet been reliably quantified. The natural mean annual runoff (MAR), and the estimated requirements for the ecological component of the Reserve are summarised in Table 2.2.

Table 2.2: Natural Mean Annual Runoff and Ecological Reserve (million m³/a)

Sub-Area	Natural MAR	Ecological Reserve
Luvuvhu/Mutale	520	105
Shingwedzi	90	14
Groot Letaba	382	72
Klein Letaba	151	20
Lower Letaba	42	13
TOTAL	1185	224

Source: Luvuvhu & Letaba WMA Overview of Water Resources Availability and Utilisation, Report No. P WMA 02/000/00/0203, DWAF, 2003

The surface water resources, which naturally occur in the WMA, have for the most part been highly developed and the water is fully utilised, with little opportunity for additional development. The one exception is the Mutale River catchment. The main storage dams in the WMA are:

Luvuvhu/Mutale Sub-Area
Vondo, Albasini, Damani, Mukumbane and Tshakhuma Dams located in the upper tributaries of the Luvuvhu River. The Nandoni Dam (recently completed) in the Luvuvhu River has already started storing water.

Klein Letaba Sub-area
Lorna Dawn, Rietspruit, Middle Letaba and Nsami dams are located in the catchment of the Klein Letaba River.

Groot Letaba Sub-area
Dap Naudé, Ebenezer, Magoebaskloof, Vergelegen Merensky and Tzaneen Dams are situated in the upper reaches of the Groot Letaba River Catchment.

Shingwedzi and Lower Letaba Sub-areas

There are no major dams in these sub-areas because of the limited water resources and the non-availability of suitable sites. Some small dams have, however, been constructed in the Kruger National Park for game watering. Of these, the most notable are the Kanniedood Dam on the Shingwedzi River and the Engelhard Dam on the Letaba River.

A number of schemes (refer to Sections 3.4 and 5.4 for details) were constructed for the transfer of water to neighbouring water management areas. The largest transfers are from Ebenezer Dam and Dap Naudé Dam to Polokwane and from Albasini Dam to Makhado, both in the Limpopo WMA. There are small transfers from the Groot Letaba catchment for mining near Gravelotte and to rural villages in the Olifants WMA.

A number of options for the possible further development of surface resources have been investigated. The raising of the existing Tzaneen Dam, construction of the proposed Nwamitwa Dam on the Groot Letaba River and a possible dam on the Mutale River are considered feasible options. Storage on the Letsitele River has been found to be unattractive.

2.10.2 Groundwater

For many water users, groundwater constitutes the only dependable source of water and its utilisation is of major importance in the Luvuvhu/Letaba WMA. A large proportion of the rural domestic and stock watering requirements are supplied from groundwater for most of the rural settlements and villages in the WMA. Groundwater is also used for game watering. Substantial quantities of groundwater are abstracted for irrigation purposes in the upper Luvuvhu River Catchment and upstream of the Middle Letaba Dam. In total some 15% of all available yield from water resources in the WMA is from groundwater.

There is uncertainty regarding the quantity of groundwater abstracted upstream, downstream and in the vicinity of Albasini Dam as well as about the reliable yield and abstraction from the dam. There is a possibility that a strong inter-dependence may exist between surface flow and groundwater where much of the base flow in the river is from groundwater.

Over-exploitation of the groundwater resource occurs at some locations in the WMA, notably in the vicinity of Thohoyandou, at Gidiana and possibly downstream of Albasini Dam.

The quality of groundwater in the WMA is generally good particularly in the mountainous areas. Water of high mineral content occurs in some of the drier parts. There are no records of significant pollution of groundwater.

2.10.3 Water Availability and Water Requirements

Due to the high rainfall on the escarpment, which forms the western boundary of this WMA, two of the sub-areas of this WMA, namely the Groot Letaba and the Luvuvhu/Mutale have relatively large water resources. These catchments are in stark contrast to the Lower Letaba and the Shingwedzi catchments where the water resources are negligible. The total local yields for the Groot Letaba, Klein Letaba and Luvuvhu/Mutale sub-areas as at year 2000 are 159 million m^3/a, 32 million $^3/a$ and 115 million m^3/a respectively. Further details on water requirements, availability and water balance are discussed in Chapters 4 and 6 of this document.

By far the largest user of the available water resources in the WMA is irrigation, with other significant users being forestry and rural domestic water use, international requirements, and transfers out of the WMA.

The total water requirements for the Groot Letaba, Klein Letaba and Luvuvhu sub-areas are 181 million m³/a, 37 million m³/a and 119 million m³/a respectively.

2.10.4 Management objectives

There are a number of generic objectives relating to the management of the water resources of all the sub-areas of the Luvuvhu/Letaba WMA. These are:

- Effective and sustainable water resources management and development, which recognises International requirements, the Ecological Reserve and the productive, sustainable and equitable use of water as an asset to be utilised to bring about economic and socio-economic benefit;
- To know and understand the size and availability of the water resource;
- Equitable allocation of the available water resource to encourage the development of the rural economy to contribute to poverty eradication;
- To make more efficient use of the existing available water resources to all water user sectors. This could enable the CMA to free up additional water in future, which can be put to beneficial use;
- Maintaining water quality that is fit for use for its intended purpose and maintaining aquatic ecosystem health on a sustainable basis, with the negative externalities being borne by the responsible institutions (polluter-pays principle);
- 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 specific objectives relating to specific issues or problems in the Luvuvhu/Mutale catchment. These are listed in the strategies attached as **Part 4.2 and 4.3**.

2.10.5 Key Issues

Key considerations listed in the NWRS are:

- The water resources, which occur within the water management area are nearly fully developed or being developed, with the available water being highly utilised. Limited options for further resource development exist.
- The requirements for and availability of water are approximately in balance at present (with the exception of the Groot Letaba sub-area where the deficit is substantial) and although no significant change in the requirements for water is foreseen, implementation of the Reserve will result in serious deficits in some catchments.
- It is likely that additional water will have to be transferred to Makhado in future, for which provision has already been made in the planning of Nandoni Dam.
- The potential exists for new mines to be developed and possible future power generation from the coalfields in the north, which have not specifically been provided for in the projected future water requirements.
- Ensuring the adequate availability of water of appropriate quality with respect to the ecological requirements of the Kruger National Park.
- The over-exploitation of groundwater is not sustainable, whilst there is insufficient knowledge on the long-term sustainable yield from groundwater and inter-dependencies with surface water.
- Honouring of all obligations with respect to Mozambique.

PART 2: LUVUVHU AND MUTALE RIVER CATCHMENTS

CHAPTER 3: DESCRIPTION OF THE LUVUVHU AND MUTALE RIVER CATCHMENTS

3.1 OVERVIEW

There are about 518 000 people in the Luvuvhu/Mutale River catchments (DWAF, 2003a). More than 90% of the population is classified as rural, most of whom live in rural villages and informal settlements. Most of the urban population is found in Thohoyandou. Many of the rural people live in a subsistence economy supported by financial remittances from migrant workers in other centres. Social and cultural traditions are very strong, dominated by the Venda with their unique and most interesting history and culture and pride in being associated with the North African Hamites or Black Jews. Traditional leadership and governance is very strong leading to special relationships with democratic structures.

Proximity to Mozambique has led to Portuguese influences going back more than a century with names such as Albasini still being evident.

The area is rich in natural resources, with the exception of minerals. The limited mineral resources are dominated by deposits of coking coal in the northeast near Masisi. The favourable climate and soils led to the development of the Levubu (or Albasini) Irrigation Settlement in the 1940's. Originally reliant on run-of-river diversions, this scheme soon led to the construction of Albasini Dam in 1952 and its subsequent raising in 1970/71. The dam is conveniently located to serve the irrigation scheme but the catchment area is relatively arid leading to low yields. Severe water shortages in the early 1990's prompted intensive development of groundwater to sustain high yielding permanent fruit crops.

The main concentration of the urban population around Thohoyandou relies on water supplies from the Vondo Regional Water Scheme in the Mutshindudi River, the most important tributary of the Luvuvhu River. This water source has been almost fully utilized and supplies will soon be augmented from the Nandoni Dam, recently completed on the Luvuvhu River, south- east of Thohoyandou.

For many years Makhado, formerly Louis Trichardt, has had an allocation of water (2.4 million m^3/a) from Albasini Dam where the municipality built a purification works.

Independent agricultural development in the headwaters of the Luvuvhu River has had a significant impact on the water supplies available from Albasini Dam. Forestry development at Entabeni in the Soutpansberg has an impact on the Albasini Dam and more so on the water available from the Lutanyanda and Barotto streams also used by irrigators at Levubu.

To the east of Levubu, in the area previously in Venda, irrigation other than fruit estates is very limited. In fact, many old irrigation schemes have fallen into disuse and are being rehabilitated for the development of new, emergent farmers.

The Luvuvhu River supports an important ecosystem, which is in reasonable to good condition. This includes the Luvuvhu Gorge on the western boundary of the Kruger Park and the Pafuri Floodplain among other components. This is subject to increasing threat from upstream abstractions.

The Mutale River drains the northern slopes of the Soutpansberg, a catchment more arid than the catchment of the Luvuvhu River. The catchment area is less developed than in the Luvuvhu but population pressures are increasing significantly. No major storage dam exists in the catchment although a site has been identified for the possible development of a major pumped storage hydroelectric scheme. This proposal is not attractive, mainly for geotechnical reasons, which renders construction of the scheme uneconomic. Lake Fundudzi, a holy place for local people, is located in the catchment.

Extensive areas of irrigable land occur in the lower reaches of the Mutale River but development is limited, inter alia, by the availability of water at reasonable cost.

3.2 PHYSICAL CHARACTERISTICS

The Luvuvhu River catchment covers a total area of 3 800km² and the Mutale River catchment of 2 150km². The Luvuvhu catchment is drained by the Luvuvhu River and its major tributaries the Latonyanda, Mutshindudi and Mbwedi rivers. The Mutale catchment is drained by the Mutale River and its main tributary, the Mbodi River.

The predominant topographical feature is the Soutpansberg mountain range, which forms the northern boundary of the Luvuvhu River Basin. Its highest points and steepest slopes are situated in the upper portion of the catchment. This has a profound effect on the hydrology of the rest of the catchment with significant higher rainfall a result of the topographic influence.

The region generally has a hot humid climate with predominantly summer rainfall. The rainfall is largely influenced by the topography. The mean annual precipitation (MAP) varies from 1 800mm in the mountainous areas to 300mm at the Limpopo River.

Evaporation increases gradually from about 1 400mm/a in the west to about 1 900mm/a in the east. About 60% of the evaporation occurs during the six months from October to March. Frost is rare.

3.3 LAND USE

The upper third of the Luvuvhu River catchment is mainly utilised for agriculture with forestry dominating the higher lying areas in the Soutpansberg Mountain Range. The main user of water in this part of the catchment is the Levubu Irrigation scheme situated directly below the Albasini Dam. The middle part of the catchment is heavily populated with the existence of various urban and semi-urban settlements as well as numerous scattered rural villages. Land use here is predominantly subsistence agriculture. The lower portion consists of the wilderness areas of the Makuya and Kruger National Park. The Mutale catchment is less developed than the Luvuvhu catchment and is predominantly rural.

There are two main mines within the catchment; the Tshikondeni Coal Mine and the Geocapro Magnesite Mine. These are reported to have no significant impact on the hydrology or water quality in the catchment. Water use by the mines is also very limited.

The areas under irrigation and afforestation are shown in **Figures 3.1** and **3.2** respectively.

3.4 WATER RELATED INFRASTRUCTURE

3.4.1 Major Dams

The major dams in the Luvuvhu/Mutale catchment are listed in Table 3.1.

Table 3.1: Major dams in Luvuvhu/Mutale sub-area

Dam	River	MAR (million m³/a)		Capacity (million m³)	Firm Yield (million m³/a)
		Virgin	Net		
Vondo	Mutshindudi	30.8	29.5	30.4	16.9
Albasini	Luvuvhu	18.8	11.0	25.6	5.0
Tshakhuma	Barotta	7.0	7.0	2.1	1.7
Mambedi	Mambedi	2.9	2.9	7.0	0.6
Damani	Ngwedi	13.0	12.8	12.4	6.4
Nandoni	Luvuvhu	196	146	163	55.0
Total					

Notes:

1 MAR and Yields (excluding Nandoni Dam) are based on simulated flow records (1920 to 1985)

2. Source: DWAF, 1990c.

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The Mambedi Dam is privately owned by the Sapekoe Tea Company. The catchment of the Mambedi stream is mostly on the Sapekoe property. The water from this dam is used by Sapekoe for its tea and coffee plantations.

Albasini Dam was built in 1952 and was raised (by means of spillway gates) in 1970/71. This dam was built primarily to supply the Levubu Irrigation Scheme.

Vondo Dam was completed in 1982 to provide domestic/industrial water for Thohoyandou and its surrounding areas. This was then raised in 1992 to increase the dam's storage capacity six-fold to 30,5 million m³. Tshakhuma Dam was completed in 1990 to supply the Tshakhuma Irrigation scheme.

The Damani Dam (built in the mid 1990's) was originally constructed to supply water to the Damani Coffee Estate (now dormant), which required 4,08 million m³/a. It is now proposed to supply the Damani Regional Water Supply Scheme from this dam.

3.4.2 Water Transfers

Some 2.4 million m^3 of water is allocated for transfer from Albasini Dam to Makhado Municipality in the Limpopo WMA. A number of regional water supply schemes, which are located within the Luvuvhu/Mutale sub-area, have been developed to supply water for domestic, irrigation and industrial purposes. Some of these schemes transfer water across tertiary catchment boundaries and these include:

- Vondo Regional Water Scheme (Luvuvhu River catchment) to villages in the Klein Letaba River catchment.

- Malamulele Regional Scheme (Luvuvhu River catchment) to villages in the Shingwedzi River catchment.

3.4.3 Water Supply Schemes

There are a number of water supply schemes, and a large number of privately owned irrigation developments in the Levuvhu catchment. These schemes are discussed below. Irrigation is the largest water user and is likely to remain so for some time.

3.4.3.1 Schemes Located in the Luvuvhu River Catchment

Schemes located in the Luvuvhu River catchment utilize water from the Luvuvhu River and its tributaries, the Mutshindudi and Ngwedi Rivers.

(i) **Vondo Regional Water Scheme**

The Vondo Regional Water Supply Scheme (RWSS) draws its water from the Vondo Dam on the Mutshindudi River. The full irrigation allocation from this dam to the Tshivase Tea Estate is only available when storage in the dam is above 90% of full supply capacity. When the dam is below this level, then only 50% of the irrigation allocation may be abstracted.

Domestic water requirements are also supplied from this scheme from Donald Fraser in the north to Vuwani in the south. The RWSS serves 126 villages and the Thohoyandou urban area. A small percentage of the water is transferred to villages in the Letaba River catchment.

(ii) **Tshakhuma Water Supply Scheme**

The Tshakhuma Scheme, which is supplied from the Tshakhuma Dam, is planned to serve 6 villages when completed. The aim of this scheme is to reduce the dependency of the rural domestic demand of the area on the Vondo Scheme.

(iii) **Damani Water Supply Scheme**

Currently the area earmarked for the proposed Damani RWSS consists of 27 villages most of which are presently supplied with water from the Vondo Scheme. In future this scheme will be supplied from the Damani Dam.

(iv) **Mhinga/Lambani Water Supply Scheme**

Water is drawn from a weir in the Luvuvhu River and this scheme currently serves 7 of the 20 villages in the area. Future phases are planned to serve the rest of the villages. About 0,35 million m³/a is abstracted from the Luvuvhu River. Shortages experienced during the drier months will be relieved when Nandoni Dam comes on stream.

(v) **Malamulele East Regional Water Scheme**

Run-of-river water is abstracted from the Luvuvhu River near Malamulele. At present only 1,5 million m³/a is available because of a lack of water in the river, especially during the drier months. This scheme delivers water to about 55 villages. Most of the water abstracted and treated is transferred and used in the Shingwedzi River catchment.

(vi) **Levubu Irrigation Water Supply Scheme**

The Levubu Irrigation Water Supply Scheme is supplied from Albasini Dam and from weirs on the Luvuvhu, Latonyanda and Barotta streams via an extensive system of interlinking canals. The scheme is scheduled to supply 1,845 ha of irrigation land with an allocation of 15.4 million m^3/a (excluding distribution losses). Water supply for irrigation in this area is also obtained from the Mambedi and Tshakhuma dams. The Sapekoe Estate at Mambedi has an allocation of 2.0 million m^3/a from Albasini Dam, if water is available after other needs have been satisfied.

The Albasini Dam also supplies domestic water to Makhado in the Limpopo WMA. A water allocation of 2,4 million m³/a has been made to Makhado and environs. However, only about 1,6 million m³/a has been available in the past due to the low yields from Albasini Dam. [The dam's catchment is relatively arid].

3.4.3.2 Schemes Located in the Mutale River Catchment

The Mutale River Catchment consists of tertiary catchment area A92 and includes catchments of the Mutale River, Mbodi River and tributaries thereof.

The water schemes operating in this catchment are the Mutale RWSS and the Masisi RWSS.

The Mutale RWSS is planned to supply water to some 130 villages within the catchment area of the Mutale River. Not all of the 130 villages are at present connected to the scheme and these rely on boreholes. A future extension of the scheme is planned in order to connect all the villages.

The Masisi RWSS currently supplies water to 10 villages from boreholes for domestic use. The Tshikondeni coalmine utilizes 1,5 Mℓ/day (0.55 million m³/a) from a 0,23 million m³ off-channel dam and from boreholes.

A proposed water supply scheme in this area will consist of an abstraction weir on the Mutale River.

3.5 LUVUVHU AND MUTALE CATCHMENTS WATER QUALITY PERSPECTIVE

3.5.1 Overview

Based on an assessment of the water quality from existing Department of Water Affairs and Forestry data and information from the State of the Rivers Report: Letaba and Luvuvhu River Systems (WRC report no. TT165/01), it was established that the water in the Luvuvhu/Mutale river catchments is of good quality and not adversely affected by the activities in the catchment. The water quality parameters generally do not exceed the South African Water Quality Guidelines. The predominant water quality problem across the catchment is a tendency towards eutrophication.

Water quality is assessed against the fitness for use, both by present water users and potential users of water in the catchment. Predominant water uses in the Luvuvhu catchment are domestic use, subsistence farming, forestry, agriculture and conservation. The catchment was divided into three zones for land use and water quality analysis:

1. Luvuvhu River to the Mutshindudi River confluence
2. Mutale River
3. Luvuhu River from the Mutshindudi River confluence to the Mozambique border.

3.5.2 Luvuvhu River to the Mutshindudi River Confluence

Land use in the upper reaches of the Luvuvhu catchment, upstream of Albasini Dam, is dominated by forestry and agriculture. There is also extensive development of smallholdings for fruit farming in the upper reaches. The Levubu Irrigation scheme is situated directly below the Albasini Dam. Subsistence farming is widely practised across this area and there are plans to revive smallholder irrigation schemes. There are a number of tea and coffee estates supplied by Vondo Dam, Makumbane Dam, Mambedi Dam and from run of river. Water quality is adequate for agricultural purposes throughout the catchment.

The population of the catchment is concentrated around Thohoyandou. The town is supplied from Vondo Dam. Villages without a piped water supply use water directly from rivers, springs and boreholes. Water quality assessments indicate that water is of adequate quality for human consumption, however increased nutrients from washing and bathing in rivers does stimulate algal growth. Clay from the river banks is used for brick making, resulting in increased erosion of the banks. The riparian zone is also damaged by clearing of vegetation for firewood and by overgrazing. Lack of adequate solid waste disposal facilities also results in increased litter and pollution of surface water resources.

There are a number of sewage treatment plants in the catchment:

- Thohoyandou sewage treatment plant
- Malamulele sewage treatment plant
- Venda Prison sewage treatment plant

The effluent from the Thohoyandou sewage treatment plant (STP) is used in a fish farm. There is no monitoring data available to assess the sewage treatment plant discharges and they remain potential sources of pollution.

The pH from readings recorded at many gauges exhibited an increasing trend from the mid 1980s to the early 1990s. Values have since stabilised, on average, at pH 8 (WRC, 2001).

3.5.3 Mutale River

There are presently no water quality gauging stations on the Mutale River. The predominant land uses are rural settlements and subsistence agriculture. There are two sewage treatment plants in the catchment: Donald Fraser sewage treatment plant and William Earl sewage treatment plant. Coal mining takes place in the lower Mutale catchment. The Sambandou Wetland is of ecological importance and threatened by agricultural development.

3.5.4 Luvuvhu River from the Mutshindudi River Confluence to the Mozambique Border

This area lies predominantly in the Kruger National Park. There are no adverse water quality problems in the area, though low levels of eutrophication are evident.

3.6 OVERVIEW OF GROUNDWATER RESOURCES OF THE LUVUVHU AND MUTALE CATCHMENTS

Groundwater resources are available throughout both the Luvuvhu and Mutale catchments, but in varying quantities depending upon the hydro-geological characteristics of the underlying aquifer.

The central parts of the Luvuvhu catchment are heavily populated and widespread rural communities are a feature of the area. Many communities rely on groundwater although conjunctive use schemes (surface and groundwater) are also widespread. Information concerning groundwater use in the Luvuvhu/Letaba WMA was obtained from Mr. W. du Toit, Assistant Director Geohydrology DWAF, responsible for the North Region. Estimates of groundwater use per individual catchment were not available.

Regionally the natural groundwater quality is generally good, satisfies the DWAF water quality guidelines and is suitable for domestic and agricultural use.

Information concerning routine monitoring undertaken by DWAF was not available and it is understood that no monitoring is currently taking place.

Further details on the groundwater are provided in **Appendices J and K**.

CHAPTER 4: STRATEGIC WATER RESOURCES PERSPECTIVE OF THE LUVUVHU / MUTALE RIVER CATCHMENTS

4.1 INTRODUCTION

While the broad water resources perspective of the WMA was provided in Chapter 2 (Section 2.10) based on the NWRS, the details of the water resources, water use and water quality of the Luvuvhu/Mutale River catchments are provided in this Chapter. From this the key issues are identified and broad strategies developed to address these issues. Detailed strategies specific to the Luvuvhu/Mutale sub-area are attached in **Part 4.2** of this report. The Letaba / Shingwedzi sub-area is discussed in Chapters 5 and 6 with detailed strategies covered in **Part 4.3.**

The estimates of the water availability and water requirements that have been used in this ISP report were derived mostly from the Luvuvhu and Letaba Water Management Area report (DWAF, 2003a). This also serves as the basis for the NWRS.

The NWRS used five sub-areas to describe the water resources situation of the WMA. This ISP used six sub-areas, having considered the Luvuvhu and Mutale catchments as two separate areas. To avoid confusion with the Luvuvhu/Mutale sub-area of the NWRS, this report refers to the Luvuvhu sub-catchment and the Mutale sub-catchment. The reason for this is that there are certain issues relating to the water resources of the Luvuvhu River catchment that are addressed in this ISP report that are not relevant to the Mutale River catchment.

4.2 WATER AVAILABILITY

The availability of water in the Luvuvhu/Mutale sub-catchment is summarised in **Table 4.1**. The gross surface water resource in the Luvuvhu sub-area is estimated at 94 million m^3/a. Surprisingly, only a small portion of this is derived from major dams, with the Albasini Dam's yield quoted as 5 million m^3/a (DWAF, 1996) and that of the Vondo Dam as 16,9 million m^3/a. There are a number of significant smaller dams in the catchments downstream of the Albasini Dam with relatively high yields due to the high rainfall in these mountainous areas. The yield from these dams has been estimated at 25 million m^3/a. The balance of the gross yield is comprised of run-of-river yield (50 million m^3/a), the majority of which is derived from the Mutshindudi, Mbwedi, Tshinane, and Lweludi tributaries, which rise in the high rainfall areas of the Soutpansberg.

There is also a relatively large groundwater resource in this catchment, estimated to be about 16 million m^3/a (DWAF, 2003a). Large scale utilization of the groundwater resource occurs mostly downstream of the Albasini Dam where it is used by irrigators and in the vicinity of Thohoyandou where it is used to supply rural communities.

The WMA report put the impact of the ecological Reserve on the yield at about 20 million m^3/a. It must be pointed out, however, that this is based on the storage in the catchment in the year 2000 and that if the storage is increased, as is the case with the construction of the Nandoni Dam, this impact will increase, as indicated in **Table 4.2**.

Alien invasive vegetation is a particular problem in the upper reaches of the Luvuvhu catchment where the area of alien vegetation is estimated to be 168 km^2 in the A91A to A91D quaternary catchments, which have a total surface area of 889 km^2, i.e. 20% of the upper reaches of the catchment are infested with alien vegetation. The impact of this alien invasive vegetation on the water resource is estimated to be 8 million m^3/a and while there may be some uncertainty to this figure, the removal of alien vegetation in this catchment will make some additional water resources available.

Table 4.1 summarises the above water availability.

Table 4.1: Water availability in the Luvuvhu and Mutale sub-catchment (year 2000)

Resource category	Available/impact (million m^3/a)		
	Luvuvhu River sub-catchment	**Mutale River sub-catchment**	**NWRS (Luvuvhu/Mutale Sub-area)**
Gross surface water resource:	94	31	125
Subtract:			
- Ecological Reserve	20	6	26
- Alien vegetation	8	3	11
Net Surface water resource	66	22	88
Ground water	16	4	20
Return flows	6	1	7
Total local yield	**88**	**27**	**115**

Note: Natural Mean Annual Runoff for Luvuvhu / Mutale sub-area is 520 million m^3/a.

4.2.1 Adjusted Water Availability (year 2003 with Nandoni Dam)

The NWRS quotes a local yield of 208 million m^3/a for the year 2025. This increase in yield (from 115 to 208 million m^3/a) is based on the additional yield of the Nandoni Dam. This increase in the resource is a point of debate and an issue, which is addressed in this ISP. The White Paper WP A – 98, which, while not specifically documenting the yield of the dam, stated that the Nandoni Dam will be able to supply the following:

- Domestic requirements: 48 million m^3/a,
- Irrigation: 10 million m^3/a, and
- The Ecological Reserve: 35 million m^3/a.

This total supply of 93 million m^3/a was the value used in the NWRS to indicate the future local yield. However, this 'supply' of 93 million m^3/a is not the same as the concept of 'Local Yield' used in the NWRS, which is the yield after allowing for the ecological Reserve.

Investigating this discrepancy further, it was found that the feasibility study report for the Nandoni Dam (DWAF, 1996) quotes a yield of 55 million m^3/a, after supplying an ecological requirement of 35 million m^3/a (on average) and 7 million m^3/a as drought flow. This is essentially the yield quoted in the White Paper (WP – A 98). In the absence of any better information, the drought flow has been accepted as the additional impact of the ecological Reserve on the yield of the catchment. The net surface water resource of the Luvuvhu River sub-catchment is therefore 121 million m^3/a (66+55). The recommended revised situation for 2003 is shown in **Table 4.2.**

Table 4.2: **Water availability in the Luvuvhu and Mutale sub-catchment (year 2003 – with Nandoni Dam)**

Resource category	Available/impact (million m3/a) Million		
	Luvuvhu River sub-catchment	**Mutale River sub-catchment**	**NWRS (Adjusted) (Luvuvhu/Mutale Sub-area)**
Gross surface water resource:	156	31	187
Subtract:			
- Ecological Reserve	27	6	33
- Invasive Alien Plants	8	3	11
Net Surface water resource	121	22	143
Ground water	16	4	20
Return flows	6	1	7
Total local yield	**143**	**27**	**170**

4.3 WATER REQUIREMENTS IN 2003

The water requirements in the Luvuvhu catchment are given in **Tables 4.3 and 4.4**. **Table 4.3** summarises the water requirements in the Luvuvhu/Mutale sub-area for year 2000 development levels. These figures are then adjusted for year 2003 development levels as given in **Table 4.4.**

Table 4.3: Local water requirements in the Luvuvhu and Mutale sub-catchments (at 1:50 year assurance) in 2000

User sector	Water requirement/ Impact on yield (million m^3/a)		
	Luvuvhu River sub-catchment	Mutale River sub-catchment	NWRS Luvuvhu/Mutale (Sub-area)
Irrigation	73	24	97
Urban	4	0	4
Rural	8	2	10
Industrial and mining	0	1	1
Afforestation	6	1	7
TOTAL	**91**	**28**	**119**

The irrigation requirement in the Luvuvhu/Matale sub-area is based on an irrigated area of 124 $km^{2,}$ the majority of which is in the Luvuvhu catchment downstream of the Albasini Dam. Due to low runoff into the dam, the yield of the Alabasini Dam is not sufficient to supply all the water requirements of irrigators in the Levubu Government Water Scheme. However, these irrigators also make use of farm dams and groundwater to supplement their supplies. Estimates of irrigation requirements in the Mutale catchment are based on small schemes that were developed though most of these have fallen into disuse.

The impact of afforestation on the available resource is based on an afforested area of 167 km^2. Most of this (134 km^2) is in the Luvuvhu catchment, which has a significant impact on the available yield due to its location upstream of the Albasini and Vondo Dams. The afforestation in the Mutale catchment is all situated in the high lying area around Lake Fundudzi. According to the Mutale River Water Resources Investigation (DWAF, 1999) there is scope for additional forestry in the catchment. However, this 'availability' was based on climatic conditions and land availability and did not consider the water resources of the catchment. As such, before any additional afforestation is considered, this will have to be carefully appraised. It would probably be necessary to alleviate the impact of the additional forestry with the construction of dams.

Thohoyandou accounts for most of the urban water requirements in the catchment. The bulk of the rural requirements emanate from the Malamulele and Paswane areas, which are partially supplied from the Vondo Regional Water Supply scheme. With the completion of the Nandoni Dam, the rural areas of Malamulele, Paswane and Lambani will also be supplied from this dam.

The water requirements in the Luvuvhu catchment is unlikely to increase significantly as little growth is expected in the near future.

A slight increase in urban and rural water requirements have been assumed for the 2003 development levels while 10 million m^3/a was allowed for in the planning of Nandoni Dam for the rehabilitation of the irrigation schemes downstream of the dam (White Paper WP A - 98). This is reflected in **Table 4.4**. The total requirement of 132 million m^3/a (year 2003) is the same figure quoted in the WMA Report (DWAF, 2003a) as the requirement in year 2025.

Table 4.4: Local water requirements in the Luvuvhu and Mutale sub-catchments (at 1:50 year assurance) in 2003

User sector	Water requirement/ Impact on yield (million m^3/a)		
	Luvuvhu River sub-catchment	Mutale River sub-catchment	NWRS (Adjusted Luvuvhu/Mutale Sub-area)
Irrigation	83	24	107
Urban	5	0	5
Rural	9	2	11
Industrial and mining	0	1	1
Afforestation	6	1	7
TOTAL	**103**	**28**	**131**

4.4 TRANSFERS

The NWRS refers to a transfer out of 2 million m^3/a from the Albasini Dam. This water is for Makhado. The water resources of the Albasini Dam are over-allocated so there is no possibility of increasing this transfer to meet the increased requirements of Makhado. The White Paper (WP A – 98) proposes a pipeline from Nandoni Dam to the Albasini purification works from where purified water will be pumped further to Makhado to meet the increasing water requirements of this town and the surrounding area. This pipeline has however not yet been constructed. No allocation is specified in the White Paper (WPA – 98) for the transfer from Nandoni Dam to meet additional water requirements for Makhado. The WMA Report (DWAF, 2003a) however recommends that an additional 5 million m^3/a should be reserved from Nandoni Dam for transfer to Makhado.

As discussed in section 4.3.4, the possibility of supplying water from the Nandoni Dam to the water-stressed Klein Letaba area is also being considered. It is intended to replace rural water requirements supplied from Middle Letaba Dam with water supplies from Nandoni Dam.

4.5 RECONCILIATION OF REQUIREMENTS AND AVAILABLE WATER

A reconciliation of the water requirements with the available resources has been done as part of this ISP for the year 2003.

Table 4.5: Reconciliation of requirements and available water for the year 2003

		Luvuvhu River sub-catchment	Mutale River sub-catchment	NWRS Sub-area
Available Water	Local Yield	143	27	170
	Transfer In	4	5	0
	Total	147	32	170
Water requirements	Local requirements	103	28	131
	Transfers out	7	4	2
	Total	110	32	133
Balance		37	0	37

Units: Million m³/a

The 2003 development level (which is an indication of the situation after the completion of the Nandoni Dam, see **Table 4.5** indicates a significant surplus of 37 million m^3/a in the Luvuvhu catchment, with no change in the Mutale catchment. This is lower than the 77 million m^3/a surplus shown in the NWRS for 2025 due to the different and more conservative interpretation of yield adopted in this ISP. There is nevertheless some uncertainty as to the impact of the ecological Reserve on the yield of the Nandoni and this could again alter these projections. The reserve needs to be determined comprehensively before making large-scale allocations of the additional yield.

It is recommended therefore that a more detailed analysis be carried out as a priority to determine the available resource more accurately. As part of this exercise, a comprehensive Reserve needs to be determined.

4.6 WATER QUALITY

The water quality situation assessment for the Luvuvhu/Mutale catchment is described in detail in Section 3.5. It was established that the water in the Luvuvhu/Mutale catchment is of good quality and not adversely affected by the activities in the catchment. The water quality parameters generally do not exceed the South African Water Quality Guidelines. The predominant water quality problem across the catchment is a tendency towards eutrophication.

4.7 SUMMARY AND BROAD STRATEGY

- The water resource of the Luvuvhu and Mutale catchments is surprisingly large considering the limited storage. This is due to the high rainfall in the Soutpansberg, which results in high run-of-river yields in both catchments.
- Water requirements in the Luvuvhu catchment, (year 2000) dominated by irrigation, have exceeded the available resource, while the water use in the Mutale (year 2000), again mostly irrigation, is approximately in balance with the resource.
- The recent completion of the Nandoni Dam will result in a surplus of 37 million m³/a becoming available in the Luvuvhu catchment.
- There is a high but unmonitored groundwater use in the Luvuvhu catchment and it is not certain how this groundwater use impacts on the surface water resource.

- Preliminary ecological Reserves have been carried out in the Luvuvhu catchment. A comprehensive reserve determination is required to confirm the available surplus in the catchment.

The broad strategy for the Luvuvhu and Mutale catchments is that a detailed analysis is required to accurately determine the available resource. In the short term, there is surplus available following the completion of the Nandoni Dam and allocations can be made for domestic water use and to revitalise the irrigation schemes downstream of the Nandoni Dam, which have fallen into disuse. In the medium term, however, the water resources situation of the Luvuvhu catchment needs to be understood better. This must include the groundwater/surface water inter-dependency and a comprehensive Reserve determination, which also considers the requirements of the Pafuri flood plain.

In terms of the White Paper (WP A-98), primary water requirements are expected to more than double from 31.6 million m³/year (year 2000) to 70.5 million m³/year in year 2020. The WMA Report (DWAF, 2003a) indicates that water requirements in the Luvuvhu/Mutale sub-area will increase from 119 million m³/year (year 2000) to 131 million m³/year in year 2025 (i.e. a growth of 10% over 25 years or a mere 0.39% per a).

There is uncertainty regarding the projected population growth in this sub-area, which casts doubt on the estimated future water requirements. It is therefore recommended that a certain amount of water from the Nandoni Dam should be reserved to cater for the additional future requirements if it is eventually established that the current estimation of future requirements is lower than expected. It is also recommended that future requirements should be investigated further.

In terms of the available surplus, it is recommended that a quantity of additional water be made available for irrigation on a temporary basis, without negatively affecting other user sectors. This water could be beneficially used for the irrigation of annual crops but would require careful planning and management.

No immediate management action is required in the Mutale catchment. Existing irrigation schemes, which are currently dormant, can be revitalised up to a total irrigation requirement of 24 million m^3/a using existing allocations. Additional domestic requirements should be sourced firstly from the groundwater resource.

There is scope for the construction of dams on the Mutale River in order to make yield available for poverty eradication but these would be very costly due to the unfavourable terrain.

PART 3: LETABA AND SHINGWEDZI RIVER CATCHMENTS

CHAPTER 5: DESCRIPTION OF THE LETABA AND SHINGWEDZI RIVER CATCHMENTS

5.1 OVERVIEW

Some 1 017 200 persons (DWAF, 2003a) reside in the Letaba/Shingwedzi river catchments, with the population concentrated mainly in the central third of the combined catchments.

There are ten proclaimed towns in the area. The major towns are Tzaneen, Giyani, Nkowakowa, Ga-Kgapane and Lenyenye, with between 5 000 and 8 000 people each. Only 8% of the total population reside in the urban centres.

The population density in the rural areas varies between 250 to 750 persons per km². Very few people reside within The Kruger National Park (less than 3000).

5.2 PHYSICAL CHARACTERISTICS

The Letaba River catchment covers a total area of 13 400km² and the Shingwedzi River catchment covers a total area of 5 600km². The Letaba River catchment is drained by the Groot Letaba River and its major tributaries the Klein Letaba, Middle Letaba, Letsitele and Molototsi rivers. The Shingwedzi River and its major tributaries the Shisha, Mphongolo and Phugwane drain the Shingwedzi River catchment.

High mountains occur along the western boundary of the catchment, with foothills and undulating plains over the remainder of the study area.

The rainfall is largely influenced by the topography. As a result of the orographic effects caused by the mountainous zone, mean annual precipitation (MAP) varies between 700mm and 1500mm (See **Figure 2.2**) in the mountainous zone. The annual rainfall over the remainder of the sub-catchment ranges from 450mm to 800mm. More than 85% of the annual rainfall occurs during the summer months.

A total of about 120 rainfall-recording stations were installed in the Letaba/Shingwedzi river catchments of which some 50% have been decommissioned. More than 75% of all the stations are located in the western third of the catchment.

Evaporation increases gradually from about 1 500mm/ain the west to 1 900mm/ain the east. About 60% of the evaporation occurs during the six summer months from October to March. Frost is rare.

5.3 LAND USE

Figure 5.1 shows the land use pattern in the Letaba/Shingwedzi catchments**.**

The Letaba River catchment (and particularly the Groot Letaba sub-area) is a highly productive agricultural area with mixed farming including cattle ranching, game farming, dry land crop production and irrigated cropping. Agriculture, with the irrigation sector in particular, is the main base of the economy of the region.
The total area irrigated measures about 242km^2. These areas occur mainly along the Groot Letaba River, and its tributaries, the Middle Letaba, Lower Klein Letaba, and the Letsitele Rivers. (See **Figure 5.1**). The area of land irrigated no longer bears any relation to the irrigation scheduled areas although the maximum allocation of water to each property is unchanged. In general twice the scheduled area is irrigated each year, with the actual water application varying according to availability, crop type, age of the crop and the irrigation technique.

Permanent fruit crops (i.e. bananas, citrus and mangoes, 47%) and vegetable and grain cash crops (53%) are cultivated.

Some 484 km^2 of pine and blue gum plantations have been established in areas with rainfall of more than 900mm/a, mainly in the upper reaches of the Groot Letaba River catchment (See **Figure 5.2**).

Forests have a negative impact on the hydrology through the reduction of runoff by interception and evapotranspiration. Reduction in runoff is estimated at about 52 million m³/a, about 25% of the natural runoff in those catchments were afforestation occurs. The impact of forests on rivers during low flows is particularly severe. Since most of the afforestation was planted and developed long before dams in the catchment were built, it is estimated that the firm yield of the major dams would have been about 10% higher without the afforestation.

The Groot Letaba River catchment was classified as a Category 1 catchment in 1972, effectively closing the catchment to any additional forestry with only normal felling and replanting permitted. Under the National Water Act (NWA of 1998) an application for a forestry water use license would now be evaluated in much the same way as any other water use licence but with the added consideration that impacts on low flows cannot be managed. Given that all the catchments but for the Lower Letaba are in balance or deficit, it is most unlikely that any new afforestation would be licensed without compensatory storage being provided.

CLICK TO VIEW GRAPHIC

CLICK TO VIEW GRAPHIC

5.4 WATER RELATED INFRASTRUCTURE

5.4.1 Major Dams

Surface water resources are extensively developed with a large number of small to major dams constructed to meet domestic (urban and rural), irrigation and industrial water needs. The water supply schemes generally consist of dams for storage, bulk water pipelines and canals for conveyance.

There are several large dams located within the Groot Letaba and Klein Letaba sub-areas. Information on all the large dams in these sub-areas is summarised in Table 5.1.

Table 5.1: Major dams in Letaba and Groot Letaba and Klein Letaba sub areas

Dam	River	Full Supply Capacity (FSC) (10^6m^3)	Full Supply Area (FSA) (km^2)	Built	MAR(million m^3/a)		Firm Yield (million m^3/a)
					Virgin	Net	
Groot Letaba:							
Dap Naude	Broederstroom	2.04	0.281	1958	15.44	10.5	3.2
Ebenezer	Groot Letaba	70.1219	3.86	1959	48.9	32.5	23.9
Magoebaskloof	Politsi	4.99	0.453	1971	35.7	29.1	9.1
Hans Merensky	Ramadiepa	1.26	0.486	1958	31.3	25.3	6.8
Tzaneen	Groot Letaba	157.57	11.69	1977	200.6	159.	58.0
Thabina						0	
Modjadji 3							
Klein Letaba:	Thabina	2.80	0.24	1984	7.1		2.9
Middle Letaba	Molototsi	8.16	1.16	1997	8.8	5.5	4.4
Nsami						8.4	
Lorna Dawn	Middle Letaba	184.00	19.3	1984	72.0		16.0
	Nsama	24.40	5.7	1976	5.4	61.1	1.2
	Middle Letaba	12.00	1.2	1971	23.2	5.4	2.3
	Nsama					21.1	
Total							

5.4.2 Water Transfers

Several bulk water schemes transfer water out of the Groot Letaba sub-area. The schemes include:

- Dap Naude Dam to Polokwane Municipal area (Limpopo WMA)
- Ebenezer Dam to Polokwane Municipal area (Limpopo WMA)
- Nkowakowa/Ritavi to villages in the Selati catchment (Olifants WMA)
- Thabina Dam to villages in the Selati catchment (Olifants WMA)
- Groot Letaba River to Consolidated Murchison Gold Mine (Olifants WMA)

The allocated quantities of water and current transfer rates are discussed in Section 5.4.3. The transfer schemes all draw water from the Groot Letaba River system.

A large number of regional water supply schemes have been developed to supply water for domestic, irrigation and industrial purposes. Many of these schemes transfer water across tertiary catchment boundaries and these include:

- Giyani Regional scheme: Nsami Dam (Klein Letaba River catchment) to villages in the Groot Letaba River and Shingwedzi River catchments.
- Middle Letaba Regional scheme: Middle Letaba Dam (Klein Letaba River catchment) to villages in the Luvuvhu River and Groot Letaba River catchments.
- Malamulele West Regional scheme (Klein Letaba River catchment) to villages in the Luvuvhu River catchment.

The groundwater resources are extensively developed to meet domestic water supplies in rural villages and for irrigation particularly in the Middle Letaba River catchment and along Groot Letaba and Letsitele rivers. The groundwater schemes generally comprise dispersed borehole schemes.

5.4.3 Regional Water Supply Schemes

5.4.3.1 Schemes located within Groot Letaba River Catchment

Schemes located within the Groot Letaba River catchment utilize water from the Groot Letaba River and its tributaries to supply water to various towns including Polokwane, Tzaneen, Haenertsburg, Duiwelskloof and to a number of rural villages. Large areas of irrigation are also supplied with water from these schemes. The water supply schemes are described below.

(i) **Dap Naude Water Supply Scheme**

This scheme draws water from the Dap Naude Dam, which is located in the upper reaches of the Broederstroom tributary of the Groot Letaba River. The Dam has a Full Supply Capacity of 2.04 million m³. The historic firm yield of the dam is 3.2 million m³/a.

The dam is owned by the Polokwane Municipality. Water from the dam is used exclusively to meet domestic and industrial water demands in Polokwane. Compensation water is released for irrigation in accordance with a Water Court ruling.

In terms of Water Court Order (10 August 1976), Polokwane was allowed to increase capacity of the Dap Naude Dam from 1.94 million m³ to 2.04 million m^3 by means of gates and to increase abstraction to 6.53 million m^3/a. No allowance for the ecological reserve has been made at Dap Naude Dam although releases are made throughout the year. Its also uncertain at what assurance the allocation from Dap Naude was made. Currently, 2 million m³/a is transferred to Polokwane.

(ii) **Ebenezer Dam Water Scheme**

The Ebenezer Dam was constructed to meet the water demands of domestic and irrigation users (gross storage capacity 70 million m³/a and 1:50 year yield of 23.9 million m³/a). Originally there were two domestic user groups; Tzaneen and Polokwane and its environs. Tzaneen Municipality have a water allocation of 3.58 million m^3 /a from this dam.

The water allocation for Polokwane and its environs is 12 million m^3/a, having been reduced from the 18,5 million m^3/a given in White Paper WP I '84.

Irrigation water is released from the Dam directly into the river and diverted further downstream into two canal systems at George's Valley weir and Pusela weir. The irrigation water users are located along the river reach between Ebenezer Dam and Tzaneen Dam and have an allocation of 12.92 million m^3/a.

The total quantity of water allocated from Ebenezer Dam is therefore 28.5 million m^3/a. With a yield of 23.9 million m³/a (historical yield), the dam is currently over-allocated.

(iii) **Polokwane Government Regional Water Supply Scheme**

The Polokwane Government Regional Water Supply Scheme (PGRWS) draws bulk water from Ebenezer Dam as described above.

This scheme is operated by Lepelle Northern Water. The allocation from Ebenezer Dam for this scheme is 12 million m³/a and 6.53 million m³/a from Dap Naude Dam. The current transfer rate to Polokwane from Ebenezer Dam is approximately 10 million m³/a due to infrastructure limitations.

(iv) **Magoebaskloof Dam Scheme**

The Magoebaskloof Dam with a gross storage capacity of 4 million m³ was originally intended to supply irrigation water to the now disbanded Tzaneen Irrigation Board and Sapekoe. However the need later arose for domestic and industrial water in Politsi, Duiwelskloof and Ga-Kgapane. The historic firm yield of this dam is estimated at 9,1 million m³/a.

A canal transfers water from the Magoebaskloof Dam to Vergelegen Dam, from where Politsi, Duiwelskloof and Ga-Kgapane are supplied.

Irrigation water users draw water from the canal as well as from the Vergelegen Dam.

(v) **Hans Merensky Dam Scheme**

Westfalia Estates and Sapekoe in the B81B catchment obtain water from Hans Merensky Dam (capacity 1,26 million m³) on the Ramadiepa River, and directly from the river, as well as from the Selokwe River and its tributaries. In addition, Sapekoe Estates has an allocation of 0,87 million m³/a from Debengeni River (of which 0,6 million m³/a is for irrigation), which is obtained via a pipeline. The yield of the Hans Merensky Dam is estimated at 6,8 million m³/a.

(vi) **Vergelegen Dam Scheme**

The Vergelegen Dam (capacity 0,3 million m³) is mainly a balancing dam for accepting water from the Magoebaskloof Dam with some inflow from it's own catchment. The water stored in the dam is used to irrigate some 435 ha on the Sapekoe Tea Estate and to supply domestic and industrial water to Politsi, Duiwelskloof and Ga-Kgapane.

Irrigation water is abstracted either directly from the dam basin and outlets or from a gravity pipeline. Irrigation use is estimated to be 3,2 million m³/a.

(vii) **Tzaneen Dam Scheme**

Tzaneen Dam is located on the Groot Letaba River close to Tzaneen and has a gross storage capacity of about 157,6 million m³. This serves mainly the irrigation demand along the Groot Letaba River valley, domestic and industrial water supply to Tzaneen, Nkowakowa, Letsitele, Consolidated Murchison Gold Mine, several other small industrial users and a large number of rural villages. Provision has also been made to maintain a flow of 0.6 m^3/sec where the Letaba River enters the Kruger National Park for ecological requirements through the release of water from the Tzaneen Dam.

The irrigation water is released directly into the Groot Letaba River. The released water is abstracted from the river by pump irrigators and is also diverted from the river into canals the Letaba North, N&N and Prieska weirs. The weirs are located approximately 10 km, 17 km and 75 km downstream of Tzaneen Dam.

The irrigation allocation of 103.9 million m³/a is abstracted as follows:

- Letaba North - 27.8 million m^3/a
- N&N - 12.5 million m^3/a
- Prieska (Masala) - 7.9 million m^3/a
- Pump irrigators - 55.7 million m^3/a

The combined domestic and industrial water allocation is 7.13 million m^3/a, released from the dam for abstraction from the river further downstream. This allocation is to various users, which include Nkowakowa (4.38 million m^3/a), Ritavi 1 (0.28 million m^3/a), Letsitele (0.42 million m^3/a), Letaba Citrus Processors (0.15 million m^3/a), Koedoe Corp (0.10 million m^3/a), Addington farms (0.05 million m^3/a) and Consolidated Murchison Gold Mine (1.75 million m^3/a).

The total present water allocation from Tzaneen Dam is 111 million m^3/a.

(viii) **Thapane Dam Scheme**

This scheme abstracts water from a weir in the river downstream of the Thapane Dam. The Thapane Dam is located on a tributary of the Groot Letaba River. Various boreholes with a combined yield of 1,4 Mℓ/day (0.5 million m³/a) provides additional water to this area.

In addition, about 1 740 ha is irrigated in the upper reaches of the Nwanedzi and Hlangana Rivers by pumping from a number of farm dams, estimated to have a total combined storage capacity of about 10 million m³.

(ix) **Thabina Dam Scheme**

The Thabina Dam has a capacity of 2,8 million m³ and is located in the Thabina River, a tributary of the Letsitele River (a major tributary of the Groot Letaba River). Some 193 ha (small holder schemes) are irrigated from run-of-river with limited supplies from Thabina Dam. The total annual requirement for irrigation is 1.61 million m^3. The local domestic requirement is about 1.39 million m^3 and this is supplied from Thabina Dam.

In the lower reaches of the Thabina River, irrigation water is diverted by a weir into a canal on the right bank to irrigate some 193 ha. Impoundments on tributaries of the Thabina River including Rigo Dam (capacity 1,30 million m³) and Burgersfort Dam (capacity unknown) are used to augment irrigation water supply.

(x) **Letsitele Run-Of-River Scheme**

The Letsitele River is a major tributary of the Groot Letaba River. About 2 169 ha is scheduled for irrigation out of the river. Six canals currently supply run-of-river water to about 900 ha and the remaining area is irrigated from river pumps. About 1 600 ha are under permanent crops. The remainder of the area is irrigated on an opportunistic basis.

5.4.3.2 Schemes located in the Klein Letaba River Catchment

Schemes located within the Klein Letaba River Catchment utilize water from the Koedoes, Middle Letaba, Brandboontjies and Nsami Rivers and tributaries of these rivers. These rivers all finally flow into the Klein Letaba River, which is a major tributary of the Letaba River.

(i) **Middle Letaba RWSS – Historical Overview**

The Middle Letaba Dam water supply scheme was developed in the late nineteen seventies in the catchment of the Middle Letaba River to supply water to the domestic and agricultural sectors. Since then the situation changed significantly, with the domestic supply increasing constantly. By 1998 only 1 360ha of the 2400ha of land earmarked for irrigation was utilized. The main reason was the low level of assurance of supply.

In November 1992 and from July 1994 to February 1995 (7 months) the Middle Letaba Dam failed hydrologically. In the latter period the domestic demand was supplied by pumping water from the dead storage into the outlet tower. Two major reasons for the failure were over-utilization of the yield and the apparent over-estimation of the yield.

Water supply problems are aggravated by a lack of cost recovery as well as inequitable distribution and wastage of water.

(ii) **Middle Letaba RWSS**

The Middle Letaba Dam (capacity 194 million m^3 and yield of 16 million m^3/a) delivers water to the Nsami Dam (capacity 24,4 million m^3) through a 60km concrete canal with a capacity of 4 m^3/s. On the left bank, irrigation plots have been developed alongside the canal and 11 pumpstations deliver water from the canal through a pipeline system to the field edge. A minimum flow has to be maintained in the canal to ensure sufficient head on the pumps. From Nsami Dam, a short canal (6 km long) delivers water to irrigation plots on the left bank of the Nsami River, including 200 ha of bananas. Other irrigation areas not linked to the canal system include areas at Mabunda, the Melkplasies and Dumazi, where water is obtained directly from the Klein Letaba and Nsami Rivers.

A total of 2 400 ha has been developed and equipped for irrigation. The irrigation water demand to serve this area is estimated at 21 million m^3/a. However, because of water shortages and the increased use of water for domestic purposes, the present area irrigated (including the other areas described above) is only 1 300 ha and the mean annual field edge requirement is estimated at 10,3 million m^3/a).

The Middle Letaba Regional Water Scheme has as its sources the Middle Letaba Dam and the Nsami Dam.

The bulk water supply scheme can be subdivided into three main sections, as described below:

- 89 Villages supplied from a treatment works at Middle Letaba Dam
- 29 Villages supplied from a treatment works (Malamulele West Water Works) located adjacent to the canal between Middle Letaba Dam and Nsami Dam
- 58 Villages and Giyani Town supplied from the treatment works at Nsami Dam

Extensive irrigation occurs in the Middle Letaba River catchment (B82A, B82B, B82C and B82D), which is upstream of the Middle Letaba Dam, with the main crop being tomatoes. The area irrigated varies during the season from 2 100 ha to 3 700 ha. Water is pumped directly from the river and from storage dams that have been built on the Brandboontjies, Koedoes and Middle Letaba Rivers.

During the drought of the 1980's, a large number of boreholes (320) were developed and annual groundwater usage may vary from 10% to 90% of the total irrigation usage, depending on surface water availability. On average, a 50/50 split between the sources is used. Based on a planted area of 3 700 ha, the mean field edge water requirement is estimated at 19,5 million m^3/a.

(iii) **Klein and Middle Letaba Reconnaissance Study**

A reconnaissance study of the Klein and Middle Letaba Catchment was recently concluded (DWAF, 2003b).

The main objectives of this reconnaissance study were:

- To determine the yield of the current water supply system (yield and associated assurance of water supply of the existing system).
- To determine and confirm water requirements in the Water Supply Study Area (present and future domestic, livestock, irrigation and Ecological Reserve requirements).
- To investigate means for satisfying these requirements (assessment of groundwater resources and potential for further development of surface water – two most suitable dam sites on the upper Klein Letaba River were investigated at a reconnaissance level of detail).

(iv) Conclusions of the Klein and Middle Letaba Reconnaissance Study

The conclusions from the study were:

- From the updated hydrological analysis it is clear that a new dam in the upper Klein Letaba River will not improve the water supply of the present system significantly due to large water requirements for the ecology. A desktop estimate of the ecological water requirements was made. The RDM office has since embarked on a study to determine the water requirements for the Comprehensive Reserve.

  In addition to that, it was also found that all possible new dam sites are characterised by low yields and high costs of construction.

- The groundwater resources are under-utilized and under-developed. There is a perception amongst water users that groundwater resources are not as viable as surface resources. Well fields have been developed but are under-utilized and potential exists to make better use of them. In general there is potential for further development of groundwater resources.

- The per capita water usage was found to be high and that water was also used inefficiently. Potential exists for the efficient use of water. The even distribution of water is also a problem. Some people get it all the time whilst others get it intermittently.

- Water losses in the canal between the Middle Letaba and Nsami dams (supplying the domestic and irrigation sector) are high and measures should be taken to reduce them.

- This study concentrated on water needs of the domestic sector but the water needs of the irrigation sector should also get attention as this sector gained importance in the recent poverty alleviation drives. The water rights of the irrigators, water allocations and legal issues in this regard and the efficient use of irrigation water are issues that should be studied in more detail.

(v) Recommendations of the Klein and Middle Letaba Reconnaissance Study

- Construction of new dams
  It was recommended that no new dams should be built in this catchment.

- Groundwater resources strategy
  A program has to be developed to improve the utilisation of groundwater. Further groundwater resources development for future water requirements should be undertaken. This would reduce the number of people dependant on surface water.

The Regional Office in collaboration with the District and Local Municipalities would be responsible for the implementation of this strategy.

- Water Conservation and Demand Management strategy for the domestic sector. An awareness campaign is necessary to involve the water users and other parties concerned in actions to improve the efficiency of water use.

  The efficient operation of the water supply system should be addressed in this strategy. The distribution system should be modelled and operating rules be determined to ensure even distribution of water and the reduction of losses (i.e. to prevent reservoirs overflowing). Where required, monitoring and control systems should be upgraded.

  Some form of cost recovery should be implemented. Water use should be metered; institutional and organisational arrangements should be in place to enhance this process. Compliance monitoring should be undertaken. This will ensure that water losses are reduced to a minimum and that the efficient use of water is assured.

  Future institutional arrangements should be analysed and the best option implemented.

  Institutional Oversight and Water Use Efficiency should take this further and the Regional office would be responsible for the implementation of the strategy.

- Investigation to reduce losses from the canal:
  An investigation into measures to reduce water losses from the canal should be commissioned. This should be done after the operating rules for the distribution system have been completed.

  Options Analysis should be responsible for this initiative.

- Clarify water rights and allocations to irrigators:

  The water rights and allocations to irrigators as well as the legal issues should be clarified. It is a complex problem and goes hand in hand with the efficient use of irrigation water as well.

  Options Analysis, Water Use Efficiency and the Regional office should be responsible to implement this recommendation.

5.4.3.3 Shingwedzi River Catchment

Only the Malamulele East RWS operates in the catchment and is supplied from a weir in the Luvuvhu River.

According to information from the Basin Study, an area of 270 ha was being developed for irrigation in about 1988. Water was to be sourced from the Makuleke Dam on the Mphongolo River.

In the Madonsi Tribal Authority, 19ha of vegetables are irrigated with water obtained from boreholes and directly from the Shingwedzi River.

5.5 LETABA AND SHINGWEDZI CATCHMENTS WATER QUALITY PERSPECTIVE

Based on an assessment of the water quality from existing Department of Water Affairs and Forestry data and reports of studies conducted in the catchments, it was found that generally the water in the Letaba and Shingwedzi catchments is of good quality and not adversely affected by the activities in the catchment. Although water quality parameters (with the exception of phosphates) generally do not exceed the South African Water Quality Guidelines, there is evidence of deterioration of quality over time. This is likely to deteriorate further with the future development of these catchments. An effective monitoring programme must be implemented for efficient management of the water quality and the subsequent optimisation of water use and development within the catchments.

Water quality is assessed against the fitness for use, both by present water users and potential users of water in the catchments. Predominant water uses in the Letaba and Shingwedzi catchments are irrigation, domestic use and ecology.

Sources of pollution can be divided into two categories: Diffuse sources, such as agricultural runoff and informal domestic wastewater; and point sources, which include industrial and mining effluents, and treated sewage effluents.

5.5.1 Diffuse Sources

Irrigated agriculture is concentrated in the Groot Letaba catchment, along the Politsi River, upstream of Tzaneen Dam, and along the lower Groot Letaba River; in the Middle Letaba catchment upstream of the Middle Letaba Dam; and in the Klein Letaba catchment around Giyani.

Runoff from agricultural areas includes fertilizers (phosphates and nitrates) and pesticides. Although nitrate levels remain safely within guideline levels, phosphates often exceed the Target Water Quality Range. The most significant effect of elevated phosphorus is its stimulation of the growth of aquatic plants. Phosphate levels in the catchments generally remain within the mesotrophic range, where nuisance growth of aquatic plants and blooms of blue-green algae can occur, though the algal blooms are seldom toxic.

Deterioration in quality due to irrigation practices is evident at the Letaba Ranch monitoring point in the lower Groot Letaba River, especially in the winter months and through most of 2002. A similar trend is evident further downstream, at Mahlangene in the Kruger National Park.

The Middle Letaba Dam has steeply rising trends in salt concentrations, calcium, chloride, magnesium and sodium. pH averages 8.2. Although Guideline values are not exceeded, the increasing trend is of concern. The trend may be attributable to irrigation practices upstream of the dam, but the issue requires further investigation. Declining quality is also evident at Nsami Dam, though no exceedance of irrigation and drinking water guidelines were recorded there.

The extensive use of chemicals in the Letaba catchment is noted and further investigation of this issue is required. Issues surrounding agricultural practices and their associated water quality problems must be prioritised.

The other diffuse pollution source in the catchment is domestic wastewater washed into the rivers from areas with inadequate sanitation facilities. Bacterial pollution is likely, but the extent of bacterial pollution cannot be assessed since there are no bacterial monitoring parameters in the existing monitoring network. High nutrient loads are also associated with domestic wastewater. Most gauges have phosphate levels that exceed the Target Water Quality Range, but generally do not exceed the mesotrophic range.

5.5.2 Point Sources

Industrial point source pollution is not widespread, given the limited industrial activity. Most industry is concentrated in Tzaneen, but there is no recent monitoring data available to assess the impacts. Effluent from many industries is recycled or used for irrigation. A problem was reported on the Politsi River, with a canning factory discharging effluent high in fruit acids and chemical oxygen demand.

Although mining is not a major activity in the region, there are a number of mines that do pose a pollution risk to the rivers. These include Motale coal mine, the abandoned Louis Moore and Klein Letaba gold mines, Gravelotte Mine, a Titanium mine near Nkowakowa, Fumani gold mine and the New Union gold mine in the Shingwedzi catchment. There are no monitoring data available to assess the impacts of these mines.

The following sewage treatment plants (STP) discharging effluent into the rivers provide further point sources of pollution. Tzaneen STP (Groot Letaba), Giyani STP (Klein Letaba), Nkowakowa (Letsitele), Malamulele (Phugwane) and Ga-Kgapane (Middle Letaba). Effluent from the Lenyenye STP is used for irrigation. Reports indicate that discharges do not always comply with effluent standards.

Water hyacinth is a problem in certain reaches of the lower Groot Letaba River. Increased nutrient levels result in enhanced growth of plants and algae to nuisance levels.

Aquatic plants increase transpiration losses, provide an environment for the breeding of malaria mosquitoes and bilharzia snails, prevent boating, and block irrigation canals.

5.6 OVERVIEW OF GROUNDWATER RESOURCES OF THE LETABA AND SHINGWEDZI CATCHMENTS

Groundwater resources are available throughout the Letaba and Shingwedzi catchments, but in varying quantities depending upon the hydrogeological characteristics of the underlying aquifer.

Parts of the Letaba catchment are heavily populated and widespread rural communities formally in Venda and Gazankulu are a feature of the area. Many communities rely on groundwater although conjunctive use schemes are also widespread.

Overall the available groundwater resources within the catchment are under utilised although this clearly depends both on the groundwater occurrence and the demand. Even weaker groundwater occurrence areas can often provide more than the RDP level of 25 litres per person per day.

Generally the groundwater quality is good, satisfies the DWAF water quality guidelines and is suitable for domestic and agricultural supply.
Refer to Appendix K for details on groundwater in the Letaba and Shingwedzi catchments.

Refer to Appendix K for details on groundwater in the Letaba and Shingwedzi catchments.

CHAPTER 6: STRATEGIC WATER RESOURCES PERSPECTIVE OF THE LETABA/SHINGWEDZI RIVER CATCHMENTS

6.1 GROOT LETABA SUB-AREA

6.1.1 Water Availability

Table 6.1 summarises the surface water resources of the Groot Letaba sub-area.

Table 6.1: Water availability in the Groot Letaba sub-area (1:50 year assurance)

Resource category	Available/impact (million m^3/a)
Gross surface water resource:	168
Subtract:	
- Ecological Reserve	25
- Alien vegetation	10
Net Surface water resource	133
Ground water	23
Return flows	14
Total local yield	**170**

Note: Natural Mean Annual Runoff for Groot Letaba sub-area is 382 million m^3/a

The gross surface water availability in the Groot Letaba sub-area is estimated at 168 million m^3/a, which is derived from the yield of the Tzaneen and Ebenezer dams as well as significant run-of-river abstractions. The Tzaneen Dam, if operated in isolation, provides a yield of approximately 60 million m^3/a. However, when operated in a systems context to supply water to irrigators downstream only when the run-of-river flows are inadequate, the total yield is much greater. Hence the large gross yield of the system. To meet the requirements of the ecological Reserve, (based on a desktop estimate) means that an estimated 25 million m^3/a, of otherwise available yield must be released into rivers. Invasive Alien Plants reduce the yield by a further 10 million m^3/a, the available surface water resource is then 133 million m^3/a (at a 1:50 year assurance).

The historical yield of the Ebenezer Dam is quoted in the Groot Letaba Feasibility Study report as 23,9 million m^3/a, which is much less than the 31,7 million m^3/a given in White Paper WP I '84. Allocations have been based on the yield of 31,7 million m^3/a and the dam is therefore now over-allocated.

Return flows are available for re-use and, in general, contribute to the available resource. In the Groot Letaba sub-area there are undoubtedly substantial return flows from irrigation in the catchment. These are estimated to contribute 13 million m^3/a to the available water resources in the Groot Letaba. This estimate is based on a 10% return flow, which is typical of return flows from irrigation. However, it should be noted that irrigation practices in the Groot Letaba are known to be very efficient and that the return flow estimate used in the NWRS could be too high.

The recently completed registration of water use gives the groundwater use as 23 million m^3/a. This groundwater use is mostly downstream of the Tzaneen Dam where it is used to supplement irrigation supplies from surface water during times of drought. In many cases groundwater abstraction takes place close to the river and probably has a direct impact on the surface water flow. This groundwater/surface water dependency needs to be quantified and the availability of groundwater should be studied in more detail.

6.1.2 Water Requirements

Table 6.2: Summarises the local water requirements in the Groot Letaba River catchment (at 1:50 year assurance).

Table 6.2: Local Water Requirements in the Groot Letaba River Catchment (1:50 year assurance)

User sector	Water requirement/ Impact on yield (million m^3/a)
Irrigation	133
Urban	3
Rural	10
Industrial and mining	0
Afforestation	35
Power Generation	0
Total local requirements	**181**

The irrigation requirement in the Groot Letaba catchment is based on an irrigated area of 191 km^2. Approximately 28 million m^3/a of this requirement occurs upstream of the Tzaneen Dam and is supplied from the Ebenezer Dam (13.9 million m^3/a), the Magoebaskloof Dam (7 million m^3/a) and run-of-river (7.1 million m^3/a). The irrigation requirement downstream of the Tzaneen Dam is 105 million m^3/a. This is supplied partially from the Tzaneen Dam with irrigators making use of run-of-river and the many weirs on the Groot Letaba River to increase the total yield made available from Tzaneen Dam. Some of the irrigation is also supplied from tributaries to the Groot Letaba, farm dams and groundwater.

The irrigators downstream of the Tzaneen Dam generally experience a low assurance of supply with severe restrictions being placed on their water use during periods of drought.

The forestry requirement is based on an afforested area of 417 km^2, which reduces the runoff by an estimated 50 million m^3/a. This reduces the yield of the system by an estimated 35 million m^3/a as given in **Table 6.2.**

6.1.3 Transfers

There are no transfers into the Groot Letaba River sub-area. However, there is a significant transfer out of the sub-area to Polokwane. The bulk of the water for this transfer is sourced from the Ebenezer Dam while Polokwane also transfers water from Dap Naude Dam. According to White Paper WP I – 84, the allocation to Polokwane from the Ebenezer Dam is 18,5 million m^3/a. However, this was later reduced by means of a court order to 12 million m^3/a. Polokwane also have a water court order which allows them to abstract up to 6,53 million m^3/a from the Dap Naude Dam. This is in excess of the historical yield of the dam, which is quoted estimated to be 3,2 million m^3/a (White Paper WP I-84) before making any allowance for the ecological Reserve. The current transfer rate to Polokwane from Ebenezer Dam is approximately 10 million m^3/a.

There is also a small transfer out of the Letaba catchment downstream of the Tzaneen Dam to the Consolidated Murchison Gold mine near Gravelotte. The allocation for the mine from Tzaneen Dam is 1.8 million m^3/a. The actual transfer to the mine to meet current requirements is estimated at 0,4 million m^3/a and this is not expected to increase in the foreseeable future. Also, about 0,3 million m^3/a is transferred out to domestic users in the Olifants WMA from the Thabina Dam.

The total transfer in 2000 out of the Letaba catchment is summarised as follows:
Polokwane:

- From Ebenezer Dam: 10 million m^3/a
- From Dap Naude Dam: 3,2 million m^3/a
- From the Letaba River: 1,8 million m^3/a
- From the Thabina Dam: 0.3 million m^3/a

  Total: 15,3 million m^3/a

6.1.4 Reconciliation of Requirements and Available Water

Table 6.3 provides a reconciliation of the water use with the available resource for the year 2000.

Table 6.3: Reconciliation of requirements and available water for the year 2000

Available Water	Local Yield	170
	Transfer In	0
	Total	170
Water requirements	Local requirements	181
	Transfers out	15
	Total	196
Balance		(26)

The above water balance indicates that the Letaba catchment is in deficit. The users who are currently experiencing water shortages are the irrigators downstream of the Tzaneen Dam.

6.1.5 Water Quality

Details of the water quality situation assessment of the Letaba/Shingwedzi catchment are provided in Section 5.5. Based on an assessment of the water quality from existing Department of Water Affairs and Forestry gauge data and reports of studies conducted in the catchments, it was found that the water in the Letaba and Shingwedzi catchments is of good quality and not adversely affected by the activities in the catchment. Although water quality parameters generally do not exceed the South African Water Quality Guidelines, there is evidence of deterioration of quality over time. This is likely to deteriorate further with the future development of these catchments. An effective monitoring programme must be implemented for efficient management of the water quality and the subsequent optimisation of water use and development within the catchments.

6.1.6 Summary and Broad Strategy

- Substantial run-off is generated in the upper reaches of the catchment but forestry has a significant impact on this.
- Dams such as Tzaneen, Ebenezer and Magoebaskloof result in substantial utilisable yield in this catchment.
- The catchment as a whole is in deficit although users upstream of the Tzaneen Dam enjoy a relatively high level of assurance while users downstream experience shortages.
- Irrigation has developed and expanded to fully utilise the water resources but this is prior to the calculated allowance required for the ecological Reserve. These are mostly perennial high-value crops. Financial losses during droughts have resulted in more efficient water use by irrigators. Current schemes are reportedly very efficient and well managed. There might be limited scope for further improvements.

- Large-scale afforestation in the upper catchments has a large impact on the water resources.
- The implementation of the Reserve could result in serious socio-economic disruption in the catchment. This needs to be taken into account when setting and implementing the Reserve.

The broad longer-term strategy is to implement compulsory licencing. The Reserve determination is already under way in anticipation of licensing. In order to mitigate the negative impacts of this, further development of the resource must be considered such as the construction of Nwamwitwa Dam and the raising of Tzaneen Dam.

No new licenses should be issued to irrigators. Increasing domestic requirements should be met from Water conservation and demand management (WC& WDM) to be applied in the town of Tzaneen, and after that from Tzaneen Dam. Trade from irrigation will be necessary for this. Groundwater should be urgently investigated in detail as a source for rural domestic use.

6.2 KLEIN LETABA SUB-AREA

6.2.1 Water Availability

The gross surface water availability in the Klein Letaba sub-area is estimated at 27 million m^3/a, most of which is derived from the yield of the Middle Letaba Dam and the smaller dams upstream. There is also a relatively large groundwater resource in this catchment, with current yield estimated to be about 30% of the current utilisation in the sub-area. After allowing for the ecological Reserve, which reduces the gross yield by an estimated 4 million m^3/a, and invasive alien plants, which reduce the yield by a further 2 million m^3/a, the available surface water is 21 million m^3/a (at a 1:50 year assurance).

Return flows are given in the NWRS as contributing 2 million m^3/a to the available water resources in the Klein Letaba. This estimate is probably a bit low considering the inefficient use in and around Giyani, from which large return flows (as a percentage of total use) can be expected. However, since no reliable data on return flows are available, the NWRS estimate of 2 million m^3/a has been accepted in this ISP.

The contribution of groundwater to the available water in the Klein Letaba sub-area is estimated to be about 9 million m^3/a. This groundwater use is mostly upstream of the Middle Letaba dam where it is used to supplement surface water supplies for irrigation. Groundwater was also used to supply most of the rural population in the sub-area, but much of this has now been replaced by reticulated supply from the Middle Letaba Dam. Estimates of groundwater use are therefore uncertain in this sub-area due to this rapidly changing situation. There is potential for increased groundwater use in this sub-area.

Table 6.4 summarises the above water availability.

Table 6.4: Water availability in the Klein Letaba sub-area

Resource category	Available/impact (million m^3/a)
Gross surface water resource:	27
Subtract:	
- Ecological Reserve	4
- Invasive Alien Plants	2
Net Surface water resource	21
Ground water	9
Return flows	2
Total local yield	**32**

6.2.2 Water Requirements

Table 6.5: Local water requirements in the Klein Letaba River catchment (at 1:50 year assurance)

User sector	Water requirement/ Impact on yield (million m^3/a)
Irrigation	25
Urban	3
Rural	8
Industrial and mining	0
Afforestation	1
Power Generation	0
Total local requirements	**37**

The irrigation requirement in the Klein Letaba catchment is based on an irrigated area of 51 km^2. Most of this irrigation is upstream of the Middle Letaba Dam and is sourced from small dams and from groundwater. Irrigation downstream of the Middle Letaba Dam has fallen into disuse apparently due to decreasing assurance of supply as more and more of the yield of the Middle Letaba Dam is supplied to Giyani and other towns for domestic use. This fallow irrigation has been included in the above estimate of irrigation requirements.

There is limited afforestation in the upper reaches of the Klein Letaba sub-area. Based on the estimated area of 67 km^2, the reduction in runoff is estimated to be only 2 million m^3/a with an impact on the available resource of only 1 million m^3/a.

6.2.3 Transfers

The NWRS does not list any transfers into or out of the Klein Letaba sub-area. However, some of the rural water supply schemes do fall into both the Klein Letaba and the Luvuvhu catchment, and in practice there are small transfers to and from these two sub-areas. These are not significant from a water resources point of view.

The option of supplying domestic requirements at Giyani and the surrounding settlements from the soon-to-be completed Nandoni Dam in the catchment is being considered.

6.2.4 Reconciliation of Requirements and Available Water

Table 6.6 provides a reconciliation of the water use with the available resource for the year 2000.

Table 6.6: Reconciliation of requirements and available water for the year 2000

Available Water	Local Yield	32
	Transfer In	0
	Total	32
Water requirements	Local requirements	37
	Transfers out	0
	Total	37
Balance		(5)

The Klein Letaba sub-area is in deficit. However, when the ecological Reserve is disregarded, the deficit is negligible. Therefore, until such time as the Reserve is implemented, no significant water shortages should be experienced assuming Water conservation and Demand Management measures are put in place for Giyani which will reduce current usage. It is mainly irrigation schemes downstream of the Middle Letaba Dam that currently experience water shortages. These shortages are due to the decreasing assurance of supply as more and more of the yield of the Middle Letaba Dam is supplied to Giyani and its surrounds for domestic use. These domestic supplies exceed actual requirements due to high unaccounted for water (leakages, wastage, etc) in the Giyani area. Most of the irrigation schemes downstream of the dam have fallen into disuse and these are one of the many targets of the Department of Agriculture's irrigation revitalisation project.

There are reported water shortages in the Giyani area and the more remote villages, but these are due to infrastructure and management problems, which can be addressed through water conservation and demand management.

6.2.5 Summary and Broad Strategy

- Most of the water use is for irrigation, while domestic use is also significant.
- Original estimates of the yield of the Middle Letaba dam were much higher than is now believed to be the case. This, together with rapidly increasing supply from this dam to meet domestic requirements has resulted in irrigators downstream of the dam experiencing serious deficits, to the extent that they have ceased operating. These irrigation schemes are the target of the irrigation revitalisation project, but there is no water available for this purpose.
- Water use in Giyani is very inefficient and wasteful. Water conservation and demand management measures are soon to be implemented in this area.

The broad strategy for the Klein Letaba sub-area is to urgently implement water conservation and demand management measures in the Giyani area. These interventions are already in progress. Compulsory licencing will not solve the problem of deficits downstream of the Middle Letaba Dam and this is therefore not recommended as an urgent action. In the longer term, a better understanding of water use, and especially the sources of supply, is required in this sub-area, for which a detailed water resource and utilisation assessment is recommended.

No licenses should be issued for new irrigation. Increasing domestic requirements should be met from water conservation and demand management to be applied in the Giyani region with possible supplies in the longer term from the Nandoni Dam. Groundwater should be developed to supply community gardens.

Additional yield could be made available by constructing a dam on the Klein Letaba River, which is currently undeveloped. However, the feasible dam sites are not particularly suitable and any dam in this catchment would be very costly.

6.3 LOWER LETABA SUB-AREA

6.3.1 Water Availability, Requirements and Reconciliation

The Lower Letaba sub-area is situated downstream of the Groot Letaba and Klein Letaba sub-area and falls entirely within the Kruger National Park. This sub-area therefore receives all the water flowing out of the Groot Letaba and Klein Letaba sub-areas (see **Figure 2.1**). For all practical purposes, no sustainable yield is derived from runoff in the Lower Letaba sub-area. Water use in the catchment is negligible and as a result there are no return flows that contribute to the water resource. The groundwater resource is given in the NWRS as zero, but this is based on actual groundwater use and is not an indication of the actual potential resource. There are undoubtedly groundwater resources in the sub-area, but these have not been reliably quantified (see Appendix J and K).

Game watering and domestic requirements for the rest camps in the park are supplied mostly from groundwater. The environmental requirements of the Lower Letaba are important because the river flows through the Kruger National Park.

However, these requirements must be supplied from the upper catchments (mostly the Groot Letaba) where the majority of the runoff originates. These requirements are currently not being supplied in full and a strategy is required to address this problem.

There are no transfers into or out of the Lower Letaba sub-area.

The NWRS indicates no significant water requirements or sustainable water resources in this sub-area, and therefore shows this catchment to be in balance. However, the assumption has been made in the NWRS that the environmental flow requirements are being met. In the case of the Lower Letaba, this is not currently the case because the two upstream sub-areas are stressed and irrigators use all the low-flow in the river and do not release adequate flows for the ecology.

6.3.2 Summary and Broad Strategy

- There are no significant water resources generated in this sub-area. The only water requirements are to supply the ecological requirements in this sub-area.
- The sub-area is ecologically important because it is situated mostly in the Kruger National Park.
- The ecological requirements are not being met in full due to over-utilisation of the resource in the upstream sub-areas where the majority of the flow originates.

The strategy for this sub-area is to ensure that river flows are sufficient to meet the ecological requirements of the lower Letaba River. This will nessecitate intervention in the upstream sub-areas, especially in the Groot Letaba sub-area. This ecological Reserve strategy must therefore apply to the whole Letaba catchment. Some of the aspects of this strategy could include:

- Comprehensive Reserve determination (in progress)
- Implementation of the Reserve. This necessitates comprehensive flow monitoring and enforcement of minimum flows. The construction of the Nwamitwa Dam may be required to make this strategy implementable.
- No licenses to new irrigators should be issued. Domestic requirements should be met from ground water.

6.4 SHINGWEDZI SUB-AREA

6.4.1 Introduction

The Shinwedzi sub-area is a head-water catchment, which drains into Mozambique. It is situated almost entirely within the Kruger National Park (see **Figure 2.1**).

6.4.2 Water Availability

For all practical purposes, no sustainable yield is derived from surface flow in the Shingwedzi catchment. There could be small yields derived from small farm dams but these would probably be of very low assurance due to low and variable rainfall.

Water use in the catchment is negligible, so return flows do not contribute to the water resource.

6.4.3 Water Requirements

The NWRS gives a total water requirement of 3 million m^3/a. This is all rural water use (domestic, stock and game watering) and is supplied from groundwater.

6.4.4 Transfers

There are no transfers into or out of the Shingwedzi sub-area.

6.4.5 Reconciliation of Requirements and Available Water

The NWRS indicates that this catchment is in balance, with the water requirements being fully met from the resource.

6.4.6 Summary and Broad Strategy

- The sub-area is situated mostly in the Kruger National Park, water requirements are limited and these are met from groundwater. The area is essentially in balance.
- No management intervention is required in this catchment.
- Additional domestic requirements, should they arise, can be met from groundwater.

PART 3: LETABA AND SHINGWEDZI RIVER CATCHMENTS

CHAPTER 7: COMPARISON OF THIS ISP WATER BALANCES WITH THE FIRST EDITION NWRS

7.1 INTRODUCTION

In this section, the water balances presented for the various Key Areas are summarised into the Sub-area divisions used in the first edition of the NWRS so that comparison with this first edition can be made easily and differences explained.

7.2 WATER REQUIREMENTS

A summary of the water requirements as documented in this ISP is provided in **Table 7.1** while **Table 7.2** contains the water requirements of the NWRS.

Table 7.1: Water requirements/allocations of the Letaba/Luvuvhu WMA in the year 2005 (million m^3/a). Key Areas as defined in this ISP report.

Key Area/ Sub-area	*Irrigation*	*Urban*	*Rural*	*Mining and bulk industrial*	*Power Generation*	*Afforestation*	*Total local requirements*	*Transfers out*	*Grand Total*
Mutale	24	0	2	1	0	1	28	4	32
Luvuvhu	73	4	8	0	0	6	91	7	98
Luvuvhu/ Mutale	97	4	10	1	0	7	119	2	121
Shingwedzi	0	0	3	0	0	0	3	0	3
Groot Letaba	133	3	10	0	0	35	181	15	196
Klein Letaba	25	3	8	0	0	1	37	0	37
Lower Letaba	0	0	0	0	0	0	0	0	0
TOTAL	255	10	31	1	0	43	340	17	357

Note: The shaded rows refer to sub-areas as defined in the NWRS

Table 7.2: Water requirements/allocations of the Luvuvhu/Letaba WMA in the year 2000 as given in the First Edition NWRS (million m^3/a).

Sub-area	*Irrigation*	*Urban*	*Rural*	*Mining and bulk industrial*	*Power Generation*	*Afforestation*	*Total local requirements*	*Transfers out*	*Grand Total*
Luvuvhu/Mutale	97	4	10	1	0	7	119	2	121
Shingwedzi	0	0	3	0	0	0	0	0	3
Groot Letaba	126	3	10	0	0	35	174	11	185
Klein Letaba	25	3	8	0	0	1	37	0	37
Lower Letaba	0	0	0	0	0	0	0	0	0
TOTAL	248	10	31	1	0	43	333	13	346

The water requirements given in this ISP are the same as that given in the NWRS.

Numerous detailed studies as well as local knowledge were consulted as part of this ISP, and although discrepancies in the water requirements were found, these were generally small. It must be accepted that in the absence of verification of the water use in the WMA, there will be a measure of uncertainty. It is believed that this uncertainty is fairly small in the Letaba/Luvuvhu WMA and that NWRS paints a fairly accurate picture of the water requirements in the WMA.

7.3 WATER RESOURCES

A summary of the water resources as documented in this ISP is provided in **Table 7.3** while **Table 7.4** contains the water resource of the NWRS.

Table 7.3: Water resources of the Luvuvhu/Letaba WMA in the year 2005 (million m^3/a) per Key Area (ISP) and per sub-area (NWRS) as determined as part of this ISP report.

Key Area / Sub-area	*Natural Resources*		*Usable return flow*	*Total local yield*	*Transfer in*	*Grand total*
	Surface Water	*Groundwater*				
Mutale	22	4	1	27	5	32
Luvuvhu	121	16	6	143	4	147
Luvuvhu/ Mutale	143	20	7	170	0	170
Shingwedzi	0	3	0	0	0	3
Groot Letaba	133	12	14	159	0	159
Klein Letaba	21	9	2	32	0	32
Lower Letaba	0	0	0	0	0	0
TOTAL	**297**	**44**	**23**	**361**	**0**	**361**

Note: The shaded rows refer to sub-areas as defined in the NWRS

Table 7.4: Water resources of the Luvuvhu/Letaba WMA in the year 2000 (million m^3/a) per sub-area as given in the NWRS

Key Area / Sub-area	*Natural Resources*		*Usable return flow*	*Total local yield*	*Transfer in*	*Grand total*
	Surface Water	*Groundwater*				
Luvuvhu/ Mutale	88	20	7	115	0	115
Shingwedzi	1	2	0	0	0	3
Groot Letaba	133	12	14	159	0	159
Klein Letaba	21	9	2	32	0	32
Lower Letaba	1	0	0	0	0	1
TOTAL	**244**	**43**	**23**	**310**	**0**	**310**

The water resources of the Luvuvhu/Letaba WMA, as determined for this ISP, are somewhat higher than given in the NWRS. The reason for this is that the ISP includes the yield of the recently completed Nandoni Dam which was not included in the NWRS and which gives the situation in the year 2000. While there may be some uncertainty as to how the ecological Reserve impacts on this new surface resource, the best estimates currently available have been used in this ISP, and these indicate an increase in the surface water resource of about 33 million m^3/a.

Other very minor differences relate to the surface water resources of the Shingwedzi and Lower Letaba Key Area. The NWRS water resources give these as 1 million m^3/a each. A closer look at the surface water resources of these Key Areas, indicates that the run-of-river yield is zero and there are no significant dams in either catchment. The surface water resource, at least at a 1:50 year assurance, is negligible.

7.4 RECONCILIATION OF REQUIREMENTS AND AVAILABILITY

A reconciliation of the water requirements and available resource, as documented in this ISP, is provided in **Tables 7.5** while **Table 7.6** contains the reconciliation as given in the First Edition NWRS.

Table 7.5: Reconciliation of requirements and available resource of the Luvuvhu/Letaba WMA in the year 2005 (million m^3/a).

Key Area	Available water			Water requirements/allocations			Balance
	Local yield	Transfers In	Total	Local requirements	Transfers out	Total	
Mutale	27	5	32	28	4	32	**0**
Luvuvhu	143	4	147	91	7	98	**49**
Luvuvhu/ Mutale	170	0	170	119	2	121	**49**
Shingwedzi	0	0	3	3	0	3	**0**
Groot Letaba	159	0	159	181	15	196	**(37)**
Klein Letaba	32	0	32	37	0	37	**(5)**
Lower Letaba	0	0	0	0	0	0	**0**
TOTAL	**361**	**0**	**361**	340	17	357	**4**

Note: The shaded rows refer to sub-areas as defined in the NWRS

Table 7.6: Reconciliation of requirements and available resource of the Luvuvhu/Letaba WMA in the year 2003 as given in the NWRS (million m^3/a)

Key Area	Available water			Water requirements/allocations			Balance
	Local yield	Transfers In	Total	Local requirements	Transfers out	Total	
Luvuvhu/Mutale	115	0	115	119	2	121	**(6)**
Shingwedzi	3	0	3	0	0	3	**0**
Groot Letaba	159	0	159	174	11	185	**(26)**
Klein Letaba	32	0	32	37	0	37	**(5)**
Lower Letaba	0	0	1	0	0	0	**1**
Total	**310**	**0**	**310**	333	13	346	**(36)**

The reconciliation carried out as part of this ISP indicates that there is a significant surplus in the Letaba/Luvuvhu WMA. This surplus is due to the yield of the recently completed Nandoni Dam that was not taken into account in the NWRS.

PART 4 - STRATEGIES

4.1 CATCHMENT - WIDE STRATEGIES

The Strategies listed below have been divided into three broad types:

Part 4.1: Strategies that apply to the whole WMA and are not specific to a particular area or catchment. These are referred to as "Catchment-wide Strategies" in this document;

Part 4.2: Strategies that are specific to the Luvuvhu/Mutale catchment and these are referred to as catchment-specific strategies

Part 4.3: Strategies that are specific to the Letaba/Shingwedzi catchment also referred to as catchment-specific strategies.

Part 4.1: Catchment-wide strategies

Strategy 4.1.1 : International Water-related strategy
Strategy 4.1.2 : Ecological reserve strategy
Strategy 4.1.3 : Forestry strategy
Strategy 4.1.4 : Monitoring and Information management strategy
Strategy 4.1.5 : Development of new water resources infrastructure
Strategy 4.1.6 : System operating rules
Strategy 4.1.7 : Transfers out of the WMA
Strategy 4.1.8 : Revitalisation of smallholder irrigation schemes
Strategy 4.1.9 : Institutional development and support – Cooperative governance
Strategy 4.1.10 : Institutional development and support – Local and catchment level
Strategy 4.1.11 : Recreation on dams and rivers
Strategy 4.1.12 : Public health and safety
Strategy 4.1.13 : Groundwater availability and utilisation
Strategy 4.1.14 : Groundwater monitoring and protection
Strategy 4.1.15 : ISP Implementation

Strategy No.:	4.1-1

CATCHMENT WIDE STRATEGIES

INTERNATIONAL WATER-RELATED STRATEGY

MANAGEMENT OBJECTIVE	♦ **Effective and sustainable** water resources management and development in the catchment, which recognises international requirements as a high priority user.
SITUATION ANALYSIS/ MOTIVATION	The Luvhuvhu, Letaba and Shingwedzi catchments all form part of the Limpopo Basin, which is shared by Botswana, Zimbabwe, South Africa and Mozambique. When managing the catchments of the Letaba and Luvuvhu WMA, international agreements must be adhered to. At the moment, there are no specific agreements in place with any one of the basin countries with regard to water releases, accordingly no operating rules are in place to govern any water releases. There is however an agreement in place between Mozambique and South Africa relating to the Massingir Dam located on the Mozambique leg of the Olifants River (see figure 2.2 in Chapter 2). As part of this agreement South Africa is not required to release water to Mozambique from existing schemes in this WMA. However, the development of new infrastructure within South Africa will have to be based on careful consideration of international requirements, and agreement needs to be obtained from Mozambique and Zimbabwe. Co-operation on water matters between South Africa and Mozambique only (Letaba River), is facilitated through the bilateral Joint Water Commission between the countries. International co-operation with respect to the use and management of the watercourses in the Limpopo River Basin (Luvuvhu River) is overseen by the Limpopo Watercourse Commission (LWC) with membership by all four basin countries (South Africa, Mozambique, Zimbabwe and Botswana). In addition the SADC protocol on shared watercourses is in place. The overall objective of the Protocol is to foster closer co-operation for judicious, sustainable and co-ordinated management, protection and utilization of shared watercourses and advance SADC's agenda of regional integration and poverty eradication. Even though the Protocol applies to the whole region and not only the Limpopo Basin, catchment managers in the Luvhuvhu and Letaba WMA need to understand its requirements. The LWC was recently established with the primary responsibility to ensure conformity with the SADC Protocol principles at local levels and to report to the SADC Water Sector in Gaberone on the progress being made in the implementation of the Protocol's provisions. The commission, amongst others, regulates the flow regime in the Limpopo River system for the benefit of all. There is also an existing Water Resources Technical Committee (WRTC), which provides technical support and advice to the SADC Water Sector on the shared watercourses such as the Limpopo River Basin. The WRTC also considers and approves terms of reference (TOR) for consultancies as well as their appointment in the shared watercourses. The above paragraphs indicate that there are institutions, which can be used as vehicles for better management of river basins such as the Limpopo. In view of this, the member states must move towards an agreement on best institutional arrangement and an agreement on best water sharing mechanisms. Flood events in the Limpopo River, have a serious impact on the downstream users. A typical example is the 2000 flood event, which cost lives, damage to agricultural activities, roads and water infrastructure and properties.

	Damage could be reduced by the installation of early flood warning devices in the main stem of the Limpopo but also in the tributaries where the floods originate, such as the Letaba and Luvuvhu catchments. Procurement, installation and maintenance of such warning systems should be the responsibility of all member states. The Protocol must therefore be unpacked to clearly spell-out how flood events in shared watercourses must be dealt with by member states. Droughts are also a problem in the Limpopo Basin. A joint drought management plan for the whole basin must be developed. The plan must provide a process: ▪ To form an integrated approach for the assessment of drought conditions, ▪ To reach agreement on drought action levels, ▪ To formulate actions that should be taken as drought conditions occur in order to assure adequate water supplies to different priority users Cooperative governance, data sharing, knowledge and skills transfer, and any other common issues required for better management of the Limpopo River basin must be promoted by all member states.
STRATEGY	• The SADC protocol must be unpacked to clearly define DWAF's responsibilities in this WMA with respect to flood events, low flows and monitoring. A strategy should then be developed to ensure that the catchment is managed and operated in such a way that the policies on international agreements and relations are complied with.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Unpack the SADC protocol and draw up a management and operating policy for the WMA to deal with International issues.	DWAF D: International Development Coordination Priority: Medium
• Develop a flood warning system in cooperation with the Limpopo Basin member states to inform Mozambique of impending floods.	DWAF D: International Development Coordination Priority: Medium
• Keep DWAF's Directorate: International Development Co-ordination informed of all proposed developments.	Regional Office Priority: High

Strategy No.:	4.1-2

CATCHMENT WIDE STRATEGY

ECOLOGICAL RESERVE STRATEGY	
MANAGEMENT OBJECTIVE:	♦ Determine, implement and monitor the ecological Reserve in the WMA
SITUATION ANALYSIS/ MOTIVATION	A comprehensive Reserve Determination Study has recently commenced on the Letaba Catchment. As for the rest of the WMA the ecological Reserve has not been determined to a high level of confidence. Detailed studies were undertaken as part of the Groot Letaba Water Resource Development Feasibility study while more recently rapid determinations were carried out at a few points, namely at the Tzaneen Dam and downstream of the Nandoni Dam. These have been signed off as the preliminary Reserve for the purposes of licensing. However no operating rules are in place to meet these ecological requirements. $14x10^6$ m^3/a has to be released from the Tzaneen Dam for the Ecological Water Requirement of the Kruger National Park (KNP). It is, however, problematic since the existence of weirs in the Letaba main stem makes the management difficult. This quantity is not measured at the point where the Groot Letaba River enters the KNP. The Letaba catchment is water stressed with the result that during droughts, almost all flow is abstracted from the river and very little is left to meet the ecological requirements. This also impacts on the lower Letaba, which flows through the Kruger National Park, and has high ecological requirements. Implementation of the ecological Reserve will obviously exacerbate this situation. The Luvuvhu catchment is less of a problem since although the water resource is over-exploited in the upper reaches of the catchment, there are substantial flows derived from the mountainous area in the middle reaches, which ensure ample flow in the lower undeveloped reaches of this catchment, except during droughts when flows are inadequate. With the completion of the Nandoni Dam, the flow regime will change and releases of at least 7 million m^3/annum (i.e. drought flow) will have to be made from this dam to meet the downstream ecological requirements. A preliminary Reserve estimate of 35 million m^3/annum has been approved for the Nandoni Dam but this leaves much less yield available than was previously determined during the planning phase of the dam. The Mutale catchment is currently not a problem with regard to ecological requirements given that much of the allocated water is not being used, although if irrigation schemes are revitalised to use their full allocation, this will almost certainly impact on the ecological Reserve during low flows. A comprehensive Reserve determination study is required for the Luvuvhu and Mutale catchments although this is not necessary in the short term.
STRATEGY	• A hydrological update and water resources modelling exercise is required in the Letaba Catchment (i.e. Groot Letaba, Klein Letaba and Lower Letaba sub-areas). This will be necessary to reconcile the ecological reserve requirements with the water use requirements and SFRAS. This needs to be done before the closure of the reserve determination contract to establish whether or not and by how much the ecological reserve can or cannot be achieved with the current levels of infrastructure and water use in the catchment. • A management plan needs to be formulated and implemented to ensure that Nandoni Dam and Tzaneen Dam and other infrastructure in the river systems are operated in a way that ensures the availability of the Reserve in the respective rivers. This will form part of the operating rules, which need to be developed to meet the ecological requirements.

	• No additional Reserve-related studies are required now (other than those already initiated), other than to initiate an ecological monitoring programme. This will facilitate the comprehensive Reserve determination process in the Luvhuvhu and Mutale catchments in future.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Complete the Reserve determination in the Letaba catchment. • Implement an ecological Reserve monitoring programme in the entire WMA. • Develop and implement a management plan to ensure that river systems are operated in a way that ensures the availability of the Reserve.	**Responsibility:** RDM Office **Priority:** High **Responsibility:** Regional Office **Priority**: High **Responsibility:** Regional Office **Priority**: High

Strategy No.:	**4.1-3**

CATCHMENT WIDE STRATEGIES

FORESTRY STRATEGY

MANAGEMENT OBJECTIVE

To gain a better understanding of the impact of afforestation on the water supplies available to other users and to apply an equitable and defensible methodology for issuing licences.

SITUATION ANALYSIS/ MOTIVATION

Forestry is an important land-use activity in the WMA, occupying a total of 653km² and making a significant contribution to the Gross Geographic Product (GGP). (Refer to Appendices B.1, B.2, E.1 and E.2). The industry supports several saw mills. The reduction in runoff due to forestry is in excess of 50 million m³/a while the impact of this reduction in runoff on the water supplies available to other users is estimated at 43 million m³/a as detailed below:

Sub-Area	Afforested Area	Impact on Yield (million m³/a)
Groot Letaba	417	35
Klein Letaba	67	1
Luvuvhu	134	6
Mutale	35	1
TOTAL	**653**	**43**

This impact is felt mostly at the Ebenezer and Tzaneen Dams.

There is potential for limited additional forestry in the Mutale catchment, which provides scope for small-scale growers to enter into this sector. Afforestation in the Letaba and Luvuvhu catchments is considered to have reached its maximum extent.

STRATEGY

- Forestry expansion is dependent on the availability of water and licenses cannot be issued for further afforestation where catchments are in deficit or where there is a danger of not meeting the reserve requirement.
- Forestry will not be treated differently to any other user sectors and no specific limitation on forestry will be imposed; at least from a water resources perspective.
- Notwithstanding the above, there is no scope for additional forestry licences in the Letaba or Luvuvhu catchments, while the possibility exists for small allocations in the Mutale catchment.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
Assess the potential for additional forestry in the Mutale catchment.	**Dir:** Abstraction and in-stream use **Priority :** Medium

Strategy No.:	4.1-4

CATCHMENT WIDE STRATEGIES

MONITORING AND INFORMATION STRATEGY	
MANAGEMENT OBJECTIVE	To improve on existing data capture and information management systems in the Letaba and Luvuvhu WMA so as to achieve the efficient and effective management of the water resource and the protection of the riverine ecology.
SITUATION ANALYSIS/ MOTIVATION	There are a number of facets to monitoring and information management in the Letaba and Luvhuvhu WMA. These are: hydrological, water-use (ground water and surface water) and ecological. The hydrological information and the systems in place to maintain this information seem to be adequate in the Letaba and Luvhuvhu WMA. There is however, always room for improvement through the installation of additional flow gauging stations. Water use, on the other hand, is very poorly monitored, if at all, and records of past water use are very sketchy at best. Groundwater use is not monitored at all. Two issues pertain to abstraction control: • Who is authorised to abstract water? (i.e. the number of paper licences issued is unknown) • How does actual water usage compare with the official allocation? This information is currently not available. There is no ecological monitoring being carried out in the Luvuvhu/Letaba WMA.
STRATEGY	The Regional Office must take responsibility for coordinating monitoring activities in this WMA. All existing monitoring needs to be determined and coordinated by the Regional Office (RO) to eliminate duplication and optimize efforts. The RO needs to liaise with all relevant directorates at DWAF with regard to their monitoring requirements, prioritise the tasks, budget for them, and implement. The priority of a monitoring and information strategy for the Letaba and Luvuvhu WMA is to set up a system to accurately and reliably measure water use, both from surface and groundwater. It is only through the implementation of such a strategy that control over the water use in the WMA can be gained. This is imperative in this WMA where the water resource is already fully exploited, and reallocation will be required before the ecological Reserve can be successfully implemented. Monitoring of actual water use is also essential if water management charges are to be successfully and fairly billed to water users in the WMA. Setting up and implementing a water use monitoring system for this WMA will be a huge task, for which a detailed strategy needs to be developed. Some guidelines are provided in this broad strategy: - Start with the large water users in the catchment - Share the responsibility of monitoring with bulk water users. For example, monitor and invoice water user associations. How they determine and divide the cost amongst their members is then their responsibility.

	The monitoring of groundwater use and the water table is also essential. This must be carefully planned together with monitoring of surface flow and water abstraction so that the groundwater/surface water interaction can be determined in this WMA. Ecological monitoring needs to be planned, budgeted for and implemented in all major rivers (Letaba, Luvuvhu and the Mutale). This will greatly facilitate the determination of the ecological Reserve. In the lower reaches of the WMA, this can be done in cooperation with the Kruger National Park.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• A suitable site should be identified for installation of a gauging station in the Mutale River catchment. This is necessary for the Reserve determination.	**Responsibility:** Regional Office **Priority:** High
• Develop a detailed strategy to incrementally introduce water use monitoring into the WMA, for both groundwater and surface water.	**Responsibility:** Regional Office **Priority:** High
• Verify existing lawful use; this will go a long way in understanding current abstractions (location and quantity). All lawful use then to be monitored and illegal abstractions terminated.	**Responsibility:** Regional Office **Priority:** High
• Institute compliance monitoring and involve WUAs in this exercise.	**Responsibility:** Regional Office **Priority:** High
• Implement ecological monitoring in the WMA.	**Responsibility:** Regional Office, assisted by the D: Resource Directed Measures **Priority:** High
• Review the surface water gauging requirements of the WMA and develop a medium-term strategy to improve this if required.	**Responsibility:** Regional Office **Priority:** Medium
• Determine all existing monitoring activities (all aspects and levels) and coordinate all monitoring (DWAF and other organisations) to remove duplication and to optimise efforts.	**Responsibility:** Regional Office **Priority:** High
• Liaise with all relevant directorates/managers on additional monitoring requirements and prioritise these. Plan, budget and implement action plan.	**Responsibility:** Regional Office assisted by NWRP Directorate **Priority:** High

Strategy No.:	4.1-5

CATCHMENT WIDE STRATEGIES

DEVELOPMENT OF NEW WATER RESOURCES INFRASTRUCTURE	
MANAGEMENT OBJECTIVE	To ensure that any new water related infrastructure fulfills specific economic and/or social needs and is fully compliant with all relevant legislation and International Water Use agreements.
SITUATION ANALYSIS/ MOTIVATION	There is potential for further development of the water resources in the Letaba/Luvuvhu WMA. A number of possible water resource developments have been identified in the past. These are: • Nwamitwa Dam (Groot Letaba River, to meet growth in domestic water requirements and present irrigation requirements). • Raising of the Tzaneen Dam • Dam on the Mutshindudi River (tributary of the Luvhuvhu) • Possible dams on the Mutale River: The catchment has a large runoff and is virtually undeveloped in terms of dams. However, the topography is not particularly suitable for the cost effective construction of dams. • New dam in the upper Klein Letaba River catchment; hydrological analysis however indicate that this will not improve water supply of the present system significantly due to large water requirements for the ecology. • Nandoni Dam (Luvuvhu River) currently under construction. Creation of a new major storage dam in the Groot Letaba River just below the confluence of the Nwanedzi River (Nwamitwa Dam) is the only remaining option for increasing the availability of water to the extent necessary to meet the objectives in relation to primary water use, ecological requirements and irrigation in the Groot Letaba sub-area (Reference: Letaba Feasibility Study). Subject to environmental approval the dam could be constructed. The raising of the Tzaneen Dam was found to add very little to the yield of the system. However investigations on the merit of raising Tzaneen Dam, which were conducted for the Irrigation Board as part of the Groot Letaba Resource Development Feasibility Study (DWAF report No. PB B810/00/0298), indicated that this could result in significant economic benefits for the irrigation sector through decreasing the risks and consequences of future shortages. A cost benefit ratio of at least 3.5 and probably more than 4 has been estimated. If irrigators are prepared to fund this, there is no technical reason why the dam could not be raised. Feasibility level studies of new storage have not been undertaken on the Mutshindudi or Mutale Rivers. Indications are however that dams on the Mutale river and in the Klein Letaba catchment would be very costly due to the unfavourable topography and foundation conditions. Releases from Nandoni and Nwamitwa dams and from Tzaneen Dam (after raising) will go a long way in meeting some of the requirements for the ecological Reserve. (Refer to the bibliography for more information on studies done in this WMA.*)*
STRATEGIC APPROACH	Additional storage will be required if environmental releases are to be met without compulsory licensing, although this storage will also negatively affect high flows. Storage should be approved provided users are able to fund this, and is seen as a preferable alternative to curtailing existing use. WCDM and all other possible measures (such as the clearing of invasive Alien Plants) should be implemented before further infrastructure is approved.

	New storage should be aimed both at reconciling the current water balance and at providing additional water for equity users. Additional use, based on any new storage, must be conservative so that the ecological Reserve is satisfactorily supplied, and so that there is no risk of deficits against becoming the order of the day.
STRATEGY	• Water resource developments such as the Nwamitwa Dam should proceed, subject to environmental approval. • Feasibility studies into possible further developments in the Luvuvhu catchment and the Mutale catchment are not a high priority but could be put on the long-term budget.

MANAGEMENT ACTION	**RESPONSIBILITY/ PRIORITY**
• Initiate the process towards getting the Nwamitwa Dam approved, or at least towards a definitive decision on this dam.	**Responsibility:** D: NWRP **Priority:** Medium

Strategy No.:	4.1-6

CATCHMENT WIDE STRATEGIES

SYSTEM OPERATING RULES	
MANAGEMENT OBJECTIVE	To ensure that all dams and water supply systems in the WMA are operated so as to ensure equitable levels of assurance to the various water use sectors supplied by the systems.
SITUATION ANALYSIS/ MOTIVATION	During droughts, it is often necessary to impose restrictions on water users so as to avoid complete failure of the water supply system. Typically restrictions will be imposed at different levels for different users, according to their ability to cope with reduced levels of water supply. Irrigators are usually restricted first and the most severely. Domestic and industrial users are subject to less severe restrictions, but these are not always implemented effectively. Shortages in supply often result from operation and maintenance problems not related to availability of water. The main systems in the WMA are: • Groot Letaba • Klein Letaba • Luvuvhu No documented system operating rules are in place for either Groot Letaba, Klein Letaba or the Luvuvhu systems for the normal day to day operation of the systems. In the case of the Groot Letaba sub-area, water releases are made directly from Tzaneen Dam to the Groot Letaba River to allow abstraction further downstream by each of the users. The actual water release from the dam is determined by the WUA who check the stage in the Prieska and Jasi Weirs as well as the inflows to the Groot Letaba, Letsitele and Nwanedzi rivers (DWAF, 1990d). According to these findings, the releases from Tzaneen Dam are adjusted. This procedure was developed through experience. Attempts are made to ensure that no spillage occurs from Prieska weir. Though no system operating rules are in place, some operating rules have been developed to handle some individual elements such as Tzaneen and Middle Letaba dams in drought conditions. The area manager has developed a drought-operating rule for Tzaneen Dam based on water levels. A certain quantity of water is reserved for industrial and domestic use. The water above this reserve, indicated by a corresponding dam level, is made available for irrigation. This information is then made available to the Water User Association who then decide for themselves when to implement restrictions. There are no system operating rules that are currently in place. The operating rules for Tzaneen and Middle Letaba dams ensure that high priority domestic users will receive their water during droughts by imposing restrictions on irrigators. This type of operating rule needs to be extended to other dams in the WMA, but will need to be reviewed and revised to allow for the ecological Reserve. No operating rules are in place for dams in the Luvuvhu catchment.
STRATEGY APPROACH	It is recognised that the management of water resources in the Luvuvhu/Letaba WMA can be significantly improved through a review of system operating rules. Innovative and flexible approaches such as that introduced by the Area Manager:

	Tzaneen are encouraged. DWAF should work closely with downstream users towards optimizing operations and devote the necessary resources, recognizing the size of savings that can be achieved. The monitoring of releases and of water delivered at key points in the system should be given priority.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Capture and formalize area manager's (Tzaneen) drought operating rules.	**Responsibility:** DWAF: Regional Office **Priority:** Medium
• Develop and implement operating rules for each system. These must be made known to all those affected. Monitoring to ascertain the success of the operating rules also needs to be implemented.	**Responsibility:** DWAF Regional Office **Priority:** Medium

Strategy No.:	4.1-7

CATCHMENT WIDE STRATEGIES

TRANSFERS OUT OF THE WMA

MANAGEMENT OBJECTIVE

To ensure that National priorities and strategies with regard to water use are adhered to.

SITUATION ANALYSIS/ MOTIVATION

Transfers

From Dam/River	Catchment	To/Recipient	Catchment	Allocation (million m³/a)	Actual Abstraction (million m³/a)
Ebenezer	Groot Letaba	Polokwane	Limpopo WMA	12	10
Dap Naude	Groot Letaba	Polokwane	Limpopo WMA	6.53	2.5
Albasini	Luvuvhu	Makhado	Limpopo WMA	2.4	1.6
Letaba River	Letaba	Murchison Gold Mine	Olifants WMA	1.75	0.7
Nandoni	Luvuvhu	Makhado	Limpopo WMA	5 (proposed in NWRS)	

Transfers are made out of the Upper Letaba catchment to supply Polokwane. These transfers are from the Ebenezer and Dap Naude Dams. The allocation to Polokwane from the Ebenezer Dam is 12 million m^3/a while the Dap Naude Dam is owned by the Polokwane Municipality and a court order allows them to transfer up to 6.53 million m^3/a currently from this dam. The historic firm yield of this dam is however only 3,2 million m^3/a and the current transfer to Polokwane is 2.5 million m³/a. No allowance for the ecological Reserve has been made at Dap Naude Dam. Its uncertain at what assurance the allocation from Dap Naude was made and this requires further investigation by way of a study to firm up on this allocation or the "existing lawful use". This may mean reaching some agreement with Polokwane.

The NWRS reserves 18.5 million m³/a for transfer to Polokwane while the current transfer rate to Polokwane from Ebenezer Dam is 10 million m³/a due to infrastructure limitations.

The Upper Letaba is stressed due to over-allocation of the resource and over development of the irrigation sector. The transfers out of the WMA were allocated long before the catchment became stressed.

Currently a transfer of 1.6 million m^3/a (allocation is 2.4 million m^3/a) is made from Albasini Dam to Makhado in the Limpopo WMA. This is due to the low yields from Albasini Dam whose catchment is relatively arid.

There is also a small transfer of 0.7 million m^3/a (allocation is 1.75 million m^3/a) out of Letaba River (downstream of the Tzaneen Dam) to the Murchison Mine, which is in the Olifants WMA. It should be established whether the current utilization of 0.7 million m³/a is the mine's ultimate requirement with the view to re-allocate the balance.

In terms of the NWA, inter-WMA transfers fall under the jurisdiction of the Minister of Water Affairs and Forestry and not the CMA. The transfers out of the Letaba are listed in the NWRS as 11 million m^3/a and requiring National authorisation.

STRATEGY	• DWAF have allocated commitments which are not currently being met and which cannot be met without great difficulty. While DWAF will seek to honour these commitments, in some instances (e.g. Dap Naude Dam) this is not physically possible. In other instances there are very critical implications. The approach is therefore to seek a rationalisation of the current allocations based on what is currently expected and what is possible. DWAF will develop an understanding and a long-term transfer plan with both Makhado and Polokwane and will seek national authorisation for any revision. • In the meantime transfers out of the upper Letaba catchment to Polokwane to continue. Abstractions from the Dap Naude Dam to be limited to 2,5 million m^3/a pending a Reserve determination. The total transferable allocation to Polokwane out of the Letaba catchment should therefore be limited to 14,5 million m^3/a (i.e. 2.5 million m^3/a from Dap Naude and 12 million m^3/a from Ebenezer Dam). The requirements of Polokwane beyond this 14,5 million m^3/a must be obtained from other sources.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
• Carry out a Reserve determination for the river downstream of the Dap Naude Dam and then review the allocation to Polokwane from this source. This may have to be done as part of a larger compulsory licensing process for the whole Letaba catchment.	**Responsibility:** DWAF D: Resource Directed Measures D: NWRP **Priority**: High
• Investigate and firm up on the Dap Naude Dam allocation or the "existing lawful use". If necessary reach some agreement with Polokwane.	**Responsibility:** DWAF D: Resource Directed Measures D: NWRP **Priority**: High
• Water requirements for Makhado to be augmented from supplies from Nandoni Dam.	**Responsibility:** DWAF D: Resource Directed Measures D: NWRP **Priority:** High
• Establish actual requirements by Murchison Gold Mine and re-allocate the balance if available.	**Responsibility:** DWAF – Regional Office **Priority:** High

Strategy No.:	4.1-8

CATCHMENT WIDE STRATEGIES

REVITALISATION OF SMALL HOLDER IRRIGATION SCHEMES	
MANAGEMENT OBJECTIVE	This initiative does not fall within the jurisdiction of DWAF. The Department however has the obligation to provide water resource information that supports this initiative. Within the context of cooperative governance, DWAF should provide information regarding water availability at each scheme, issue licenses where appropriate, assist with the establishment of WUAs and provide financial subsidies where warranted.
SITUATION ASESSMENT/ **MOTIVATION**	The Limpopo Provincial Department of Agriculture (LDA) has embarked on a programme of revitalization of smallholder irrigation schemes. The main objective of this programme is to transfer ownership of "government owned" smallholder schemes to emerging farmers in a sustainable manner for the purpose of viable crop production and food security. The LDA has identified a total of 33 schemes in the Luvuvhu/Letaba WMA for revitalization; 19 are located in the Luvuvhu/Mutale catchment and 14 in the Letaba/Shingwedzi catchment. These cover a total area of 6 720 ha supporting a total of 4 986 farmers. The potential water use at 9 000m^3/ha is 60.5 million m^3 per year. All these schemes fall within the former "Homeland" areas and were established by " Homeland" governments. Water allocation to these schemes was not formerly within the authority and responsibility of DWAF. The revitalization programme recognizes the need for DWAF approval via the Provincial Co-ordinating Committee for Agricultural Water (CCAW). Poor state of infrastructure; low level of land use; low evel of productivity; well below potential water use; inefficient irrigation methods; and focus mainly on subsistence crops generally characterize these schemes. The viability of some of these schemes is negatively affected by the shortage of surface water resources and groundwater should be investigated as first option. The approach to the revitalization of the schemes includes: • Undertaking feasibility assessments including water availability and allocation. • Establishing appropriate institutional and management structures (i.e. formation of farmer groups and WUAs) for individual or clusters of schemes in terms of the Water Act. A total of 28 schemes in the Limpopo Province have been subjected to this process since 1998. A more detailed situation assessment is provided in Appendix H.
STRATEGY	• With the exception of the Mutale River catchment, development of surface water resources is near the limit of the WMA's full potential. Accordingly no new sources of surface water will be available to support irrigation requirements of the smallholder schemes. In the meantime DWAF will continue to supply urban/rural domestic users who have usurped some of the supply to the irrigations schemes. • DWAF supports the revitalization programme given existing constraints. • Water allocation to each scheme must be confirmed depending on availability. • DWAF should proactively indicate where water is likely to be available for schemes in the revitalization programme. In addition DWAF should also identify upfront those schemes that are unsustainable due to the non-availability of water. This information should be clearly communicated to the Department of Agriculture and other relevant role players via the Coordinating Committee for Agricultural Water.

	• DWAF should actively participate in the Coordinating Committee for Agricultural Water (CCAW). • The process of establishing WUAs is complex and time consuming. A special effort should be made to facilitate the approval of WUA applications.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
• Determine the status of water availability and the existing lawful use (i.e. license status) at each scheme. Integrate this information into the LDA's technical investigations. • Determine where water can be sourced for each scheme.	**Responsibility**: Dir NWRP; RO **Priority**: High

Strategy No.:	4.1-9

CATCHMENT WIDE STRATEGIES

INSTITUTIONAL DEVELOPMENT AND SUPPORT: CO-OPERATIVE GOVERNANCE	
MANAGEMENT OBJECTIVE	The objective of co-operative governance is to ensure that all regulating authorities, which are 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.
SITUATION ANALYSIS/ MOTIVATION	A Catchment Management Strategy decentralizes 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 water 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 cooperative governance is essential to ensure that the objectives of these institutions can be realized. Co-operative governance which is already in place in the Luvuvhu/Letaba 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 Co-ordinating Committee for Agricultural Water which deals with matters related to irrigation. In addition to the above, there are District Municipalities (Vhembe and Mopani) and Local Municipalities (Mutale / Masisi, Thulamelo, Greater Giyani, Greater Tzaneen, Greater Lebaba and Ba-Phalaborwa). Refer to Section 2.9. These are responsible for preparation of IDPs and WSDPs. A WSDP must contain a water balance, which provides a point of reference for integrated development planning of water resources. In preparing a WSDP, Local Municipalities must be aware of water resources related planning initiatives such as Catchment Management Strategies, Business Plans of water boards and business plans of other water services providers. The Local Municipality must include a statement as to the source of its raw water and discharge of waste in its WSDP and will use this ISP as a source/reference document.
STRATEGY	The objective is one of Integrated Catchment Management. This requires committed cooperation between all partners. DWAF believes that good management can best be achieved through cooperative governance and will do all it can to inform and engage its cooperative governance partners. This will be enhanced through a culture of transparency and a sharing of information. Resources will be made available to ensure that DWAF officials are able to participate in cooperative governance forums. At the same time DWAF expects and hopes that all partners in the management of the catchment and water resources will reciprocate.

	A major issue in the Luvuvhu/Letaba is the frequent lack of compliance by some local authorities, particularly with regard to discharges from wastewater treatment works. Cooperative governance is one of the tools at DWAF's disposal to deal with this problem.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
Participate actively in Forums such as: - Environment management - Land Care with NDA - Forestry licensing through the LAACs - Irrigation planning through the CCAW (including provision of information) WS&S - Negotiations with District and Local Authorities – information into IDPs Support to Local Authorities in terms of securing and accessing future supplies.	**Responsibility:** DWAF Regional Office / CMA **Priority:** High

Strategy No.:	4.1-10

CATCHMENT WIDE STRATEGIES

INSTITUTIONAL DEVELOPMENT & SUPPORT STRATEGY: LOCAL AND CATCHMENT LEVEL	
MANAGEMENT OBJECTIVE	The Regional Office should assume institutional responsibility over all Water Resource Management functions and will be supported by DWAF Head Office Directorates.
SITUATION ANALYSIS/ MOTIVATION	District and local authorities in the catchment have severe financial and human resource constraints since they have only recently been established. All Local Municipalities / Water Services Authorities have prepared and submitted WSDPs. But these WSDPs lack adequate reference to water resource matters. No extraordinary schemes are intended in these plans that could have a major effect on water availability in the region. DWAF will need to provide more input into these local-planning processes to ensure that growth and future supplies are planned for and synchronized. Liaison between the various institutions also needs to be encouraged in the interest of integrated water resources management. Irrigation boards are currently being transformed to Water User Associations. This process will continue and these bodies will fulfill their roles in line with the NWA and the NWRS.
STRATEGY	The Regional Office and the Directorate: National Water Resources Planning should maintain contact with the District and Local Municipality role players and work with them to identify water resources that can be utilised. Long-term planning to avert water shortage crises must be encouraged. Capacity building and support to the District and Local municipalities must intensify as more responsibility (especially water services link with water resources) is shifted from national government.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
• Maintain contact with District and Local municipalities and use this ISP to communicate information regarding sources and availability of water.	Regional Office (Priority High)
• Continue with the establishment and empowerment of the Water User Associations. More support (especially basic financial) needs to be given to the various WUAs.	Regional Office (Priority High)

Strategy No.:	4.1-11

CATCHMENT WIDE STRATEGIES

RECREATION ON DAMS & RIVERS		
MANAGEMENT OBJECTIVE	To provide a balance between recreational use, nature and the nuisance factor to local inhabitants; and to provide an environment at dams in the catchment that encourages recreational opportunities. This includes taking steps to improve and maintain the quality of water in the dams.	
SITUATION ANALYSIS/ MOTIVATION	Urban and other economic centres need to offer their citizens affordable recreational opportunities. Dams are often located within travelling distance of such centres and therefore provide an opportunity to meet these social requirements. The surface and shores of dam reservoirs in South Africa have traditionally been used for all forms of recreation (e.g. power boating, yachting, fishing). In most cases DWAF, through its Directorate: Social and Ecological Services, develops zoning plans for the way in which the public uses the reservoirs. DWAF has sophisticated processes to determine and manage potential impacts that may arise from recreational activities and therefore promotes recreation and tourism within realistic frameworks around this water resource infrastructure. Allowance is also made for the ecology (i.e nature reserves or sanctuaries are usually created where the river enters the dam). More recently, DWAF has started considering ways in which jobs can be created around these recreational facilities as a means of reducing poverty levels of local inhabitants.	
STRATEGY	• Provide an environment at the dams that is conducive to recreation Activities. Specific action plans will need to be developed in conjunction with the various tourism authorities to optimise this form of Economic use. Job creation strategies should feature prominently in these plans. Affordability of access to these recreational activities for all Citizens must also be considered.	
MANAGEMENT ACTIONS		**RESPONSIBILITY/PRIORITY**
• Prepare an inventory of recreational assets and opportunities.		**Responsibility**: Dir Water Abstraction and Instream Use Priority: Low
• Collate all information on the water quality in the various dams and the various recommendations already put forward to address these problems.		**Responsibility**: RO **Priority**: Low

Strategy No.:	4.1-12

CATCHMENT WIDE STRATEGIES

PUBLIC HEALTH & SAFETY	
MANAGEMENT OBJECTIVE	DWAF needs to ensure that users in the Luvuvhu/Letaba WMA are safe from the effects of poor water quality that can create health problems (e.g. cholera). Ensure that strategies are put in place to deal with floods and droughts. All dams (especially large farm dams) must have a low hazard rating (i.e. low risk of failure) and pose minimal threat to people and infrastructure downstream.
SITUATION ANALYSIS/ MOTIVATION	The Department's current commitments are associated with: • Managing floods and drought disasters by direct intervention on the ground • Reducing pollution and preventing serious or hazardous pollution events, and • Promoting dam safety. ***Floods*** Floods in the Luvuvhu/Letaba WMA have proved to be devastating in the past. Although these are natural events over which there is little opportunity for control, some measures could be put in place to limit flood damage such as early warning systems. In order to be meaningful, warnings must be based on reliable forecasts and an effective communication system. ***Droughts*** This WMA regularly experiences a series of years of lower than average rainfall (usually in 11 year cycles). Farming activities are usually very hard hit with severe local economic consequences. Rural communities rely mainly on groundwater resources, which often fail during drought cycles. Urban and other users who are supplied from storage suffer less from shortages. ***Public Health and Water Quality*** Water Resource Managers are responsible for securing adequate quantities of water, at the right quality, for all water users. Refer to Strategies 4.2.3 and 4.3.3 for water quality related issues. ***Dam Safety*** Responsibility for implementing dam safety regulations rests with the Department through its Dam Safety Office. Owners of dams higher than 5m are responsible for their safety. All such dams must be registered and be subject to regular safety inspections, including those owned by DWAF.
STRATEGY	DWAF's (and eventually the CMA) future commitments under the National Disaster Management Act which was promulgated in 2003 will be: • To participate in supporting and enforcing disaster management planning by all relevant authorities. • To draft a National Flood Management Policy (DWAF). • To implement a Dam safety policy (DWAF). • To co-operate with the Department of Agriculture on drought relief strategies and policy formulation.

	• To prevent pollution of water resources (i.e. limiting health hazards such as cholera). • To prepare a situation assessment regarding the state of dams including large farm and mining dams.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
A specific person in the Regional Office should be tasked to set up a plan of action and to co-ordinate all the activities mentioned above. This Office must be supported by other Directorates in DWAF in preparing the various situation assessments and strategies.	**Responsibility**: RO and Dir: Policy and Strategy Coordination **Priority**: High

Strategy No.:	4.1-13

CATCHMENT WIDE STRATEGY

GROUNDWATER AVAILABILITYAND UTILISATION	
MANAGEMENT OBJECTIVE	• Develop local groundwater resources in preference to piping surface water long distances. • Equitable availability of ground water resources to all users. • Management of available resources to ensure long-term sustainability. • Develop knowledge of the groundwater resources. • Promote awareness of groundwater conservation. • Identification of sole use, or conjunctive use, of groundwater.
SITUATION ANALYSIS/ MOTIVATION	The groundwater situation is described in more detail in Appendices J & K as well as Sections 3.6 and 5.6. Groundwater is available throughout the Letaba, Shingwedzi, Luvuvhu and Mutale catchments in varying quantities depending upon the hydrogeological characteristics of the prevailing lithology. The catchments are characterised by a different geology and lithology, each with distinctive groundwater characteristics. The entire WMA is underlain by hard rocks with aquifers limited to secondary features associated with weathering and geomorphic structure. Structural features are important and higher borehole yields are generally associated with these. An exception is the localised occurrences of small alluvial deposits along the Groot Letaba River.
STRATEGY	• Preparation of a catchment wide assessment of the groundwater resources is required to document the magnitude of the resource. The Groundwater Resources Information Programme (GRIP) will provide important quantitative data for the communal land areas within the WMA. This, together with information held on the National Groundwater Data Base (NGDB) for the entire WMA, forms the base for the assessment. • Delineate areas showing aquifers with usable quantities of groundwater. • Optimal development of the available groundwater resources must be done using a proper scientific approach. • Ensure development of groundwater in preference to surface water in areas where the demands can be satisfied by locally available groundwater resources. • Focus on proper groundwater development methods to build knowledge and confidence in groundwater. Make the paradigm shift towards the strategy of investing in groundwater development potential in appropriate places in order to build confidence. This must be supported by National Policy Guidelines. • Groundwater resources are usually sufficient to meet the RDP level of supply within a reasonable distance of all users and should be exploited accordingly.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
• Continue with and complete the GRIP project. Extend this project to incorporate areas outside of the communal lands. • Ensure groundwater development is done by trained geohydrologists to follow a scientific approach and to adhere to DWAF and SABS standards as a minimum. • Invest enough funds to investigate the full extent and potential of groundwater availability and its utilisation. • Promote the use of groundwater with local municipalities and ensure WSDPs identify this as a viable source where relevant. • Develop groundwater as the first priority for any scheme. • Ensure conjunctive use where groundwater resources alone are inadequate to satisfy the demand. • Groundwater should be considered for new settlements arising from land claims.	**Responsibility:** Dir WRPS; RO **Priority:** High

Strategy No.:	4.1-14

CATCHMENT WIDE STRATEGY

GROUNDWATER MONITORING AND PROTECTION	
MANAGEMENT OBJECTIVE	• The sound and effective management of the available groundwater resources to ensure long term sustainability using monitoring data as the reference base • Long-term aquifer protection. • Promote awareness of groundwater conservation.
SITUATION ANALYSIS/ MOTIVATION	**MONITORING AND INFORMATION** The NWA requires the Minister to establish national monitoring systems for water resources to collect appropriate data and information necessary to assess: • The quantity, quality and use of water in water resources • The rehabilitation of water resources • Compliance with resource quality objectives • The health of the aquatic ecosystems • Atmospheric conditions which may influence water resources, and • Other data and information, which may be necessary. Continuous monitoring of **groundwater** levels is required at an estimated 460 points for an effective national network (currently 150 points). The intention is to refine and develop the present system at three levels, namely nationally, in major aquifers and locally. **Resources** currently available for monitoring are generally inadequate throughout all existing systems. There is currently no routine DWAF groundwater-monitoring programme (of water abstractions, water levels and water quality) in the Luvuvhu Letaba WMA. There are no DWAF monitoring boreholes in the WMA. **INFORMATION** • General background information is available on the published 1:2 500 000 Groundwater Resources of the Republic of South Africa prepared by J.R. Vegter (1995). • Regional information is available from the published 1:500 000 hydrogeological maps of Messina 2127 and Phalaborwa 2330. • More detailed information for communal land areas can be obtained from the GRIP project of DWAF. • Information is also available on the National Groundwater Data Base (NGDB) of DWAF. • Drilling Rigs are currently not registered. Ideally, whenever a borehole is drilled, DWAF should be provided with information on borehole location, depth, yield and water quality. **POLLUTION HAZARD** Groundwater pollution is an increasing threat. Pollution of groundwater can result from: • Domestic use • Agriculture

	• Mining • Waste disposal • Pit latrines
STRATEGY	**MONITORING** • Effective groundwater management and monitoring is essential for long-term sustainability of the supply and to protect the resource. • Undertake a census of all current groundwater monitoring in the WMA. • Implement a groundwater monitoring programme at selected key localities, in Groot Letaba, Middle Letaba and Luvuvhu Sub-Areas, including abandoned mines and important well fields/boreholes. This will involve water level measurements and water quality sampling. • Implement strategy of routine abstraction monitoring in areas of heavy groundwater use, e.g. downstream of Albasini Dam and upstream of the Middle Letaba Dam. • Establish a monitoring protocol to include frequency of water abstraction and water level measurements and groundwater sampling, and the range of constituents to be analysed for, (as a minimum this must incorporate pH, TDS, conductivity, macro anions, macro cations, Fe, F, and NO_3. Samples collected near working and abandoned mines will also need to be analysed for parameters relevant to the mining operation, e.g. CN at old gold mines. • Integrate current local monitoring, e.g. at Tshikondeni Mine, with the catchment wide monitoring programme. • Individual mines, e.g., Tshikondeni coal mine (near Masisi in the NE of the Mutale catchment), routine monitoring needs to be undertaken to satisfy the terms of their mining licence. Monitoring around abandoned mines is also required. **INFORMATION** • Establish a database to record all monitoring data; this database will either be the NGDB or compatible with the NGDB. • Incorporate the GRIP data. • Appoint custodian of the information database. **PROTECTION** • The increasing threat of pollution of groundwater resources from latrines and increasing population, with elevated TDS and NO_3, must be managed. • Census of operational and abandoned mines is required to assess potential groundwater pollution threats and determine the need for remediation • Test pumping to prepare management recommendations for the optimum long term sustainable use of the groundwater resource is needed for all boreholes equipped with motorised pumps.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
• Develop a regional monitoring programme incorporating both surface and groundwater monitoring to meet the specific situation within the Luvuvhu/Letaba WMA. • Ensure groundwater development adheres to sound scientific principles. • Ensure boreholes are sited, drilled, tested and equipped with sustainability as the overriding consideration. • Establish wellhead protection areas in accordance with DWAF guidelines. • Ensure mines, industry and waste dumps have valid licenses and approved EMPR's/EIA's where necessary. • Undertake a hydro census of all boreholes along the Letaba and Luvuvhu rivers used for irrigation, determine the lawfulness of use, encourage efficient operation of irrigation schemes to minimise water consumption and maximise returns to the farmer.	**Responsibility:** Dir WRPS; Dir Hydrological Information; RO **Priority**: High

Strategy No. 4.1-15

CATCHMENT WIDE STRATEGY

ISP IMPLEMENTATION	
MANAGEMENT OBJECTIVE	To ensure that the approaches put forward by the Department through this ISP are adopted and implemented in the Luvuvhu/Letaba WMA. This will require willpower, funding and capacity.
SITUATION ASSESSMENT	The ISP is a departmental 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 Luvuvhu/Letaba WMA – and lists suggested actions towards achieving good management of the water resources. 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 Luvuvhu/Letaba 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 CMA.
	The ISP is subject to the approach set out in the NWRS – and details this approach for the Luvuvhu/Letaba WMA. It expresses HOW water resource planning and management will be carried out in the WMA. It is a living document. As such the ISP may be adjusted and adapted when new and better ideas are presented. The implementation of the ISP is an enormous task. 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 accepted that it would not be possible to immediately implement all management actions identified in this ISP. Funds and capacity are real constraints. The approach is to take the ISP and to use it as instruction, guidance, and motivation in the development of yet clearer management and action plans. These must be built into Departmental Business plans, and budgeted for as part of Departmental operating costs. This will necessarily be in a phased manner as dictated by available resources, but it is important that the ISP be used to leverage maximum funds, maximum capacity, and to bring optimum management to the WMA.

MANAGEMENT ACTIONS	RESPONSIBILITY/PRIORITY
• 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, WUAs, Water Boards 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.	**Responsibility:** Regional Office **Priority:** High

PART 4.2

DETAILED CATCHMENT SPECIFIC STRATEGIES: LUVUVHU / MUTALE CATCHMENTS

Note: In the following strategies, the Allocation Strategy for Luvuvhu and Mutale River catchments also covers the following sub-strategies:

- Resource availability
- Water use requirements
- Water reconciliation
- Schedule 1 and General Authorisation
- Compulsory licensing
- Supply to District and local Municipalities

Strategy 4.2.1: Water allocation strategy (Luvuvhu River Catchment)
Strategy 4.2.2: Water allocation strategy (Mutale River Catchment)
Strategy 4.2.3: Water quality management (Luvuvhu/Mutale Catchment)
Strategy 4.2.4: Water conservation and water demand management

Strategy No.:	4.2-1

CATCHMENT SPECIFIC STRATEGIES

WATER ALLOCATION STRATEGY (LUVUVHU RIVER CATCHMENT)	
MANAGEMENT OBJECTIVE	♦ **Effective and sustainable** water resources management and development in the catchment, which recognises International requirements, the ecological Reserve and the productive use of water as an asset to be utilised to bring about 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.
SITUATION ANALYSIS / MOTIVATION	The water balance of the Luvuvhu catchment is shown in Chapter 4 (See Section 4.3, Tables 4.5a and 4.5b). The tables indicate a deficit of 6 million m³/a (without the Nandoni Dam) and a surplus of 37 million m³/a (with the Nandoni Dam). The main water requirement in the Luvuvhu catchment is irrigation, with an estimated requirement of 73 million m^3/a (refer to Table 4.3 in Chapter 4). Actual allocations are however not well documented or understood. The only other large water use is for domestic purposes and this is supplied to Thohoyandou and surrounding villagers via the Vondo and Malamulele Regional water supply schemes. There is uncertainty as to the domestic water requirements of the region due to the wide disparity in population estimates. The latest estimates from the NWRS put the domestic requirement of the catchment at about 12 million m^3/a. About 1,6 million m^3/a is transferred to Makhado from the Albasini Dam (actual allocation is 2.4 million m³/a). (Refer to Sections 3.4.2 and 4.3.6 in Chapters 3 and 4 for further details). The possibility of increasing the supply to Makhado from the Luvuvhu catchment with water (5 million m³/a) from the Nandoni Dam is being considered as an option. Water is also transferred at a rate of approximately 5 million m^3/a to the Mutale catchment from the Damani Dam to irrigate a coffee plantation and for domestic use. Afforestation reduces the available yield by about 6 million m^3/annum while Invasive Alien Plants are a serious problem in the upper Luvuvhu and is estimated to reduce the yield by a further 8 million m^3/annum. Due to the high rainfall in the Soutpansberg, the tributaries, which rise there, have large runoffs, and these have for the most part not been impounded. There are therefore significant run-of-river yields from these tributaries. The groundwater resources of the catchment are heavily utilised, mostly for irrigation as a conjunctive use together with surface water. On average 11% of the yield from local water resources in the WMA catchment (i.e. 16 million m³/a) is from groundwater. The upper reaches of the catchment appear to be highly stressed and the Albasini Dam over-allocated. Irrigators do however make use of the substantial groundwater resources. The actual use, from surface or groundwater, is uncertain since this is not monitored. The level of stress in the upper reaches of the catchment is based on the estimated quantities of water utilised. With the completion of the Nandoni Dam, a significant surplus of 37 million m³/a will be available in the Luvuvhu catchment. There is still some uncertainty regarding the impact of the ecological Reserve on the yield of the Nandoni Dam and this needs to be determined comprehensively before making large-scale allocations of the additional yield. The issues around water allocations in the Luvuvhu River catchment are:

	• Water requirements in the Luvuvhu catchment, dominated by irrigation, have exceeded the available resource. • The completion of the Nandoni Dam results in a surplus of 37 million m³/a becoming available in the Luvuvhu catchment. • There is a high but unmonitored groundwater use in the Luvuvhu catchment and it is not certain how this groundwater use impacts on the surface water resource. • Preliminary ecological reserves have been carried out in the Luvuvhu catchment but these are low-confidence estimates and only add to the uncertainty with regard to the availability surplus in the catchment.
STRATEGY	A detailed analysis is required to accurately determine the available resource. In the short term, there is surplus available following the completion of the Nandoni Dam and allocations can be made for domestic water use and revitalisation of irrigation schemes downstream of Nandoni Dam which have fallen into disuse. In the medium term, the water resources situation of the Luvuvhu needs to be understood better. This must include the groundwater / surface water inter-dependency and a comprehensive reserve determination, which also considers the requirements of the Pafuri flood plain. • There is no need for compulsory licensing in the Luvuvhu River catchment. • Water supply for domestic water use (via District and Local Municipalities) to receive priority and to be supplied from the following sources (in order of priority): - Water Conservation and Demand Management - Groundwater - Further development of the surface water resource • Conjunctive water use particularly downstream of Albasini Dam needs to be understood.

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Establish and verify actual water allocations and usage in the whole sub-area.	**Responsibility:** Regional Office **Priority:** High
• Review the water demand projections of the Luvuvhu catchment to ensure that an over allocation of the resources does not occur.	**Responsibility:** D: NWRP **Priority:** High
• Carry out a comprehensive Reserve determination for the whole catchment. This must be integrated into a water resources model to determine the impacts and subjected to stakeholder participation.	**Responsibility:** RDM Office **Priority:** Medium
• Carry out a detailed water resources study of the whole catchment with special attention given to groundwater use, groundwater/surface water interaction and the impact of the ecological Reserve.	**Responsibility:** D: NWRP **Priority:** Medium
• Investigate Invasive Alien Plants infestation in more detail to understand its impact and implement a programme to remove the alien vegetation in the catchment.	**Responsibility:** D: WWF **Priority:** High

• Investigate the complex system of water supply from both surface and groundwater sources downstream of Albasini Dam, including the interdependence between surface water and groundwater. • Operating rules for the System need to be developed.	**Responsibility:** D: NWRP, WRPS **Priority:** Medium **Responsibility:** D: NWRP, WRPS **Priority**: High

Strategy No.:	4.2-2

CATCHMENT SPECIFIC STRATEGIES

WATER ALLOCATION STRATEGY (MUTALE RIVER CATCHMENT)	
MANAGEMENT OBJECTIVE	♦ **Effective and sustainable** water resources management and development in the catchment, which recognises International requirements, the ecological Reserve and the productive use of water as an asset to be utilised to bring about 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
SITUATION ANALYSIS/ MOTIVATION	The water balance of the Mutale catchment is shown in chapter 4 (see Section 4.3, Tables 4.5a and 4.5b). The tables indicate that the catchment is in balance. As for all of the Luvuvhu/Letaba WMA, the water use in the Mutale catchment is dominated by irrigation, with an estimated requirement of 24 million m^3/a. Most of the irrigation schemes have fallen into disrepair and disuse, however, and are in need of revitalisation. Domestic water use is estimated at 2 million m^3/a. This is all utilised by rural communities. There are no significant urban centres in the Mutale catchment. Industrial and mining use is 1 million m³/a. In total, the current water requirement is 28 million m³/a (refer to Table 4.3 in Chapter 4). The total available local yield is 27 million m³/a, after taking into account impact of the ecological reserve (6 million m³/a) and Invasive Alien Plants (3 million m³/a). (See Tables 4.1 in Chapter 4). The headwaters of the Mutale catchment are situated in a very high rainfall area of the Soutpansberg mountains. Not surprisingly, there is a significant amount of forestry in these high lying areas, which reduce the available yield by an estimated 1 million m^3/annum. The Mutale catchment is mostly undeveloped as far as its water resources are concerned. There is only one significant dam, the Mukumbani Dam, situated in the upper reaches of the catchment. Currently, the yield of this dam is transferred to the Luvuvhu catchment for irrigation purposes. There are a number of diversion schemes, which divert run-of-river into canals for distribution to irrigated crops. The construction of major dams in the Mutale is technically possible and could make substantial yield available for poverty eradication initiatives. Dams in the catchment would however be very costly due to the unfavourable topography and foundation conditions. The groundwater resource in this catchment is moderate, estimated at 4 million m³/a (i.e. 15% of the local yield). This is used mostly to meet rural domestic requirements.

STRATEGY	• Maintain the status quo in this catchment. Additional allocations are possible, but for wet season use only, unless accompanied by the construction of storage capacity. This represents an opportunity for poverty eradication.
	
	• Water supply for domestic water use (via District and Local Municipalities) to receive priority and to be supplied from the following sources (in order of priority):
	  • Water Conservation and Demand Management
	  • Groundwater
	  • Further development of the surface water resource

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• No immediate water allocation actions are required in the catchment	

Strategy No.	4.2-3

CATCHMENT SPECIFIC STRATEGIES

WATER QUALITY MANAGEMENT – Luvuvhu/Mutale Catchment	
MANAGEMENT OBJECTIVE	• The DWAF has a mandate to manage water resources in a sustainable manner. This implies a holistic approach to planning and protection to promote social and economic development without irreversibly damaging the water resource. • Ensure that the water is fit for the use for which it is intended. This includes both present water uses and potential future uses.
SITUATION ASSESSMENT:	Predominant water uses in the Luvhuvhu/Mutale catchment are irrigation, domestic use, subsistence farming, forestry, agriculture and conservation. The catchment was divided into 3 key areas for water quality assessment purposes: 1. Luvuvhu River to the Mutshindudi River confluence 2. Mutale River 3. Luvuvhu River from the Mutshindudi River confluence to the Mozambique border. The Luvuvhu River is of great cultural and ecological importance. Water quality parameters generally do not exceed the South African Water Quality Guidelines. The predominant water quality problem across the catchment is a tendency towards eutrophication although levels are still low. Water quality is likely to deteriorate further with population growth and expansion of settlements. An effective monitoring programme must be implemented for efficient management of the water quality and the subsequent optimisation of water use and development within the catchment. It is known that there are pipeline(s) traversing the WMA which transport petroleum products. The exact location of these pipeline(s) is not known. **Luvuvhu River to the Mutshindudi River confluence** Water quality is adequate for human consumption and agricultural purposes across the catchment, however increased nutrients from washing and bathing in rivers does stimulate algal growth. Clay from the riverbanks is used for brick making, resulting in increased erosion of the banks. The riparian zone is also damaged by clearing of vegetation for firewood and by overgrazing. Lack of adequate solid waste disposal facilities also results in increased litter and pollution of surface water resources. There are a number of sewage treatment plants in the catchment: • Thohoyandou sewage treatment plant (STP) • Malamulele sewerage treatment plant (STP) • Venda Prison sewerage treatment plant (STP) The effluent from the Thohoyandou sewage treatment plant is used in a fish farm. There is no monitoring data available to assess discharges from the STPs and they remain potential sources of pollution.

	Mutale River There are presently no water quality gauging stations on the Mutale River. The predominant land use is rural settlement and subsistence agriculture. There are two sewage treatment plants in the catchment: Donald Fraser sewage treatment plant and William Earl sewage treatment plant. Coal mining takes place in the lower Mutale catchment. **Luvuvhu River from the Mutshindudi River confluence to the Mozambique border** This area lies predominantly in the Kruger National Park. There are no water quality problems in the area, though low levels of eutrophication are evident. Generally the water quality issues across the catchment include: • Herbicide, insecticide and fertiliser use in agricultural activities, which results in polluted runoff and increased nutrient loads in the rivers. • Use of run-of-river water for domestic purposes such as washing and bathing which results in increased nutrient loading. • Lack of adequate and properly constructed and operated waste disposal facilities, which results in pollution of surface and ground water. • Lack of monitoring and monitoring data for sewage treatment plant effluents. • Lack of monitoring of coal mining areas.
STRATEGY	• An integrated water quality management plan is required which will include current water quality objectives. The plan should be a concise user guide that sets out a clear water quality management strategy. It should provide the current water quality status of the river and identify all pollution sources, as well as the transport, life cycle and effect of the expected pollutants within the context of the river system. • Co-operative governance initiatives, with other DWAF departments, local and district municipalities, and other regional government departments, such as the Department of Agriculture, Department of Energy and Mineral Affairs, Department of Environmental Affairs, Department of Health, etc. must be encouraged as part of integrated planning. Issues surrounding agricultural practices and their associated water quality problems must be prioritised. Smallholder irrigation schemes must be targeted to encourage good agricultural practice, such as the minimisation of water use and the proper use of pesticides and fertilizers. • Water quality issues should also be managed by encouraging self-regulation by users. The formation of Water User Associations should be encouraged and rural communities should be educated on sustainable resource use, for example more efficient subsistence farming and cattle rearing methods to reduce erosion. The public should be empowered to take responsibility for their environment by conducting routine monitoring of the water resource and disclosing offending polluters. • Regional monitoring (i.e. the River Health initiative) must be conducted with the clear aim to enforce the resource quality objectives for the river. This should include the classification of the resource class and the quality requirements of the Reserve. Monitoring should also include toxicity testing. • The RO must assess water quality using acceptable tools. • Those STPs that are managed by DWAF must be brought to compliance levels, by upgrading the process and/or improving management structures, before being handed over to the local municipality. (N.B. Refurbishment of existing plants is part of the DWAF asset transfer process).

	• A solid waste management plan must be devised. • An emergency action plan must be formulated to deal with water quality emergencies, for example toxic spills or the outbreak of water borne disease, in a controlled and effective manner.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• As an initial effort, and based on the existing knowledge base within the Head office and Regional offices of DWAF, it is recommended that river reaches and other areas (incl. groundwater) that are sensitive to water quality problems be identified and preliminary water resource quality objectives set for these areas. This will help to guide decisions regarding policy and regulation, development and licence applications in these sensitive areas.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** High
• Develop an integrated water quality management plan. This should include a detailed situation assessment to identify all polluters and their impacts or potential impacts. Based on this study, a clear water quality management strategy must be put into place.	**Responsibility:** Regional Office **Priority:** Medium
• Initiate co-operative governance with local and district municipalities, and other regional government departments (e.g. Department of Agriculture, Department of Health).	**Responsibility:** Regional Office **Priority:** Medium
• Develop a Regional monitoring system to enforce the resource quality objectives for the river. Indicators must be found to monitor diffuse pollution sources, for example microbial monitoring for contamination by domestic wastewater. Investigate the link between surface and groundwater and integrate surface and groundwater quality monitoring. Monitoring activities must tie in with national monitoring initiatives, including the National Microbial Monitoring Programme and the National Eutrophication Monitoring Programme.	**Responsibility:** Regional Office **Priority:** Low
• Bring DWAF – owned sewage treatment plants to compliance levels before handing over to local municipalities.	
• Formulate a solid waste and hazardous waste management plan.	**Responsibility:** Regional Office **Priority:** Medium
• Implement an exercise to establish the routes of pipelines conveying petroleum, and location of underground storage tanks for petroleum. Implement a programme to monitor and mitigate potential impacts on groundwater resources by these facilities.	**Responsibility:** Regional Office **Priority: Medium** **Responsibility:** Regional Office **Priority:** High

Strategy No. 4.2-4

Water Conservation And Water Demand Management Strategy	
WATER CONSERVATION AND WATER DEMAND MANAGEMENT (WC/WDM) – LUVUVHU/MUTALE CATCHMENT	
MANAGEMENT OBJECTIVE	To make more efficient use of the existing available water resources by all water user sectors. This will enable the catchment management to "free up" additional water, which can be put to beneficial use elsewhere in the catchment or used to meet the ecological water requirements in the river system.

Situation Analysis/ Motivation	**Domestic and Industrial Water Use** There are a number of regional water supply schemes in operation in this catchment. Generally the schemes are not operating effectively, particularly the Vondo Regional Water Scheme, which draws water from the Vondo Dam on the Mutshindudi River. Inequitable distribution of the available water and shortages due to poor management are the main problems rather than system wastage. Good management will improve distribution, and while this will mean better and more efficient use, it will not necessarily result in more water being made available in the system. **Irrigation** The largest concentration of irrigation and the main user of water is the Levubu Irrigation Scheme situated directly below the Albasini Dam. Mostly, permanent crops are grown here i.e. mangoes, litchis, bananas, etc. Previous droughts resulted in severe water shortages, which led to the extensive development of ground water. This also led to the concomitant upgrading of irrigation technology from flood to sprinkler to drip, and even to hydroponics in some cases. Better efficiencies can still be achieved. Substantial water losses occur mainly along distribution canals, particularly the Levubu canal. Reducing canal losses could put 10% of the irrigation usage back into the system. Tea and coffee estates on the right bank of the Luvuvhu River upstream of Albasini Dam have reduced production but seemingly continue to use the same amount of water. There is the likelihood that water drawn for use at these estates is now being "wastefully" utilized. This provides scope for WC & WDM and requires further investigation. **Invasive Alien Plants** Invasive Alien Plants are a particular problem in the upper reaches of the Luvuvhu catchment where the area of alien vegetation is estimated to be 168km² in the A91A to A91D quaternary catchments, which have a total surface are of 889km², implying that 20% of these catchments are infested with alien plants. The impact of these alien invasive plants on the water resource is estimated to be 8 million m³/a in the Luvuvhu catchment and 3 million m³/a in the Mutale catchment. While there might be some uncertainty on the accuracy of these figures, clearly the removal of alien invasive plants will make some resources available for beneficial use.
Strategy	• A WC&DM study needs to be initiated in the Luvuvhu/Mutale catchments in order to identify the opportunities for improving the efficiency of water use. WC&DM measures in these catchments then need to be co-ordinated to ensure efficient use of water and thus improved production from limited water resources. • Working for Water need to continue their efforts to remove invasive alien plants in the Luvuvhu River and Mutale River catchments. Better tools are required to estimate the impact of invasive alien plants on the surface runoff and hence the impact on the yield available to others. These tools must be species specific and distinguish between riparian and non-riparian invasives.

MANAGEMENT ACTIONS	RESPONSIBILITY / PRIORITY
A comprehensive WC & WDM strategy is required for the whole Luvuvhu River Catchment with particular focus on the urban/irrigation user sectors. WC & WDM will help improve distribution efficiencies. Clearing of Alien invasive Plants will create an additional resource.	**Responsibility**: Dir: RDM **Priority**: High

PART 4.3

DETAILED CATCHMENT SPECIFIC STRATEGIES – LETABA/SHINGWEDZI CATCHMENTS

Note: In the following strategies, the Allocation Strategy for the Letaba/Shingwedzi River catchments also covers the following sub-strategies:

- Resource availability
- Water use requirements
- Water reconciliation
- Schedule 1 and General Authorisation
- Compulsory licensing
- Supply to District and local Municipalities

Strategy 4.3.1: Water allocation strategy (Groot Letaba River Catchment)

Strategy 4.3.2: Water allocation strategy (Middle and Klein Letaba River Catchment)

Strategy 4.3.3: Water quality management (Letaba Shingwedzi Catchment)

Strategy 4.3.4: Water conservation and water demand management

Strategy No.:	4.3-1

CATCHMENT SPECIFIC STRATEGIES

STRATEGY: WATER ALLOCATION (GROOT LETABA RIVER CATCHMENT)	
MANAGEMENT OBJECTIVE	**Effective and sustainable** water resources management and development in the catchment, which recognises the Reserve and the productive use of water as an asset to be utilised to bring about 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
SITUATION ANALYSIS/ MOTIVATION	**Water Availability, Requirements and Reconciliation** The Groot Letaba Water Resources development feasibility study was conducted in 1996. The study recommended that a new major dam (Nwamitwa Dam) should be built in the Groot Letaba River and that proposals to raise Tzaneen Dam should be considered. The study also recommended development of new infrastructure to increase availability of secure water supplies for domestic use and for some industries. The natural mean annual runoff of the 652 km^2 catchment of Tzaneen Dam, about 13% of the Groot Letaba River catchment, generates 50% of the runoff. It is significant that most existing major storage dams, except for Modjaji and Thabina dams, are located in the small upper catchment of the Groot Letaba River upstream of Tzaneen Dam. Actual usable groundwater resources have not been successfully quantified and the degree to which this resource is already being used has been found to be a poor indicator of the actual availability. The recently completed registration of water use gives the groundwater use as 23 million m^3/a. This groundwater use is mostly downstream of Tzaneen Dam. Moderate to high groundwater potential is limited to very small areas in the Molototsi River catchment and along the southern watershed with the Olifants River system. The gross surface water availability in the Groot Letaba catchment is estimated at 168 million m^3/a and this is derived from Tzaneen and Ebenezer dams and run-of-river abstractions. After allowing for the impact of the ecological reserve (24 million m^3/a) and alien vegetation (10 million m^3/a), the available surface water resource is 133 million m^3/a (see Table 6.1 in Chapter 6). The total local yield is 170 million m^3/a when groundwater and return flows are accounted for. The historical yield of Ebenezer Dam is 23.9 million m^3/a (DWAF, 1998), which is much less than the 31.7 million m^3/annum given in White Paper WP1 '84. Allocations were based on the yield of 31.7 million m^3/a and the dam is therefore now over-allocated. On the other hand, Thabina Dam located on Thabina River was previously used to supply irrigation to some 193ha of smallholder schemes. Now the dam is currently used to supply domestic requirements and the domestic demand supplied from the dam is almost equal to the yield of the dam with the result that the smallholder irrigation schemes have been allowed to fall into disuse. The total requirement in this sub-area is 181 million (Table 6.2) and the catchment is in deficit of 26 million m^3/a (Table 6.3). **Surface Water Development** A number of possible water resource developments have been identified for this catchment:

- Nwamitwa Dam (on the Groot Letaba River)
- Raising of Tzaneen Dam

Details are discussed in Strategy 4.1-5

Major Water Users

Water use in the Groot Letaba catchment is dominated by irrigation, with an estimated requirement of 133 million m³/a. Irrigated agriculture has long been established along the Groot Letaba River and is very highly developed in an institutional sense and in relation to irrigation equipment technology and management expertise. Irrigated agriculture is the mainstay of the local and regional economy.

While most of the irrigation area benefits from a regulated source, run-of-river abstractions are the main sources along the Nwanedzi and Letsitele Rivers and to some extent along the Thabina River. In view of the high level of development along the Groot Letaba River and the rapidly increasing competition for available supplies, it is accepted that there is no more water for any additional allocation for irrigation.

Other significant users are afforestation, with an estimated impact on the system yield of 35 million m^3/a, transfers out of the upper Letaba to Polokwane (12 million m^3/a allocated), and domestic/municipal use of 13 million m^3/a. It must be pointed out though that there are uncertainties regarding the impact of forestry on the mean annual runoff.

The water resources of the Groot Letaba are not sufficient to meet all the above requirements all of the time. A systems analysis carried out in 1998 (DWAF, 1998) indicates the following percentage of requirements supplied to the various users:
Primary users (transfers, domestic, industrial): 99% level of assurance.
Secondary users (irrigation): 81% level of assurance.

An allowance for ecological requirements was made in the above analysis.

It should be noted, however, that irrigation water requirement in the catchment upstream of the Tzaneen Dam, estimated at 27,7 million m^3/a, is supplied at a relatively high level of assurance. The assurance of supply to irrigators downstream of the dam is therefore even less than stated above. The crops in this area are mostly high value permanent crops (mangos, avocados, litchis, citrus etc) and restrictions to irrigators must be carefully applied so as not to result in permanent and costly damage to crops. Irrigators in the catchment are therefore in a precarious situation, having developed up to, and possibly beyond the point of sustainability in terms of water availability under the old Water Act.

It is likely that the situation of irrigators, in terms of allocation, will worsen once the ecological Reserve has been implemented. The economy and social structure of the region is highly dependent on the irrigation sector and stakeholder involvement in setting the ecological Reserve is therefore paramount to the continued functioning of this region.

Summary of issues

The situation assessment of the Groot Letaba River catchment can be summarised as follows:

- Very highly stressed system; the catchment as a whole is in deficit although users upstream of Tzaneen Dam enjoy a relatively high level of assurance while users downstream experience shortages.

- There is room for improving efficiency of domestic water use throughout the catchment particularly in Tzaneen;

	• Irrigation has developed and expanded to fully utilise the water resources (prior to any allowance for the ecological reserve). These are mostly perennial high value crops. The irrigators are currently operating at high level of technology and management – this means that there is not much flexibility in respect of restrictions; • Large-scale afforestation in the upper catchment has a large impact (35 million m³/a) on the local yield. • Socio-economic issues dominate; • Implementation of the Reserve could result in having serious socio-economic disruptions in the catchment. This needs to be taken into account when setting and implementing the ecological reserve; • Licences for new domestic water supplies can only be made from savings arising from water conservation and demand management, groundwater or from trading with other lawful users; • Construction of Nwamitwa Dam would not provide for new allocations and would only improve the assurance of supply. Some allocation to new domestic users would be possible; • Forestry and irrigation are considered on par in terms of beneficial water use. Neither sector should be constrained to provide water for the other.
STRATEGY	• The broader long-term strategy is to implement compulsory licensing. The Reserve determination is already under way in anticipation of licensing. In order to mitigate the negative impacts of this, further development of the resource must be considered such as the construction of Nwamitwa Dam and the raising of Tzaneen Dam. • A detailed water resources model has been set up for the Letaba catchment. This must be used to evaluate the impact of the ecological Reserve, which is currently being determined, on the availability of water to all users. If this analysis shows that the implementation of the Reserve will have dire consequences to the economy of the region, then a detailed strategy needs to be developed to mitigate these consequences. Possible options are: - Implement WC/DM in all sectors. - Consider resource augmentation options which could be implemented simultaneously with the Reserve and compulsory licensing e.g. the construction of the Nwamitwa Dam; - Improved system operation. There is scope to utilise the Ebenezer Dam better to spread the risk between irrigators upstream and downstream of the Tzaneen Dam; - Remove Invasive Alien Plants; - Investigate lawful use in the catchment (i.e. validation and verification) and eliminate unlawful use; - Investigate the use of groundwater. • Thabina Dam – an urgent drought analysis of this dam is required. Currently the annual domestic demand supplied from the dam is almost equal to the yield of the dam. There was an allocation for irrigation from this dam in the past. Currently the dam is used entirely for domestic water supply with the result that smallholder irrigation schemes, which were supplied from this source, have fallen into disuse. A proposal was made to construct Ngwabu Dam to supply irrigation.

	• No new allocations are possible from this catchment. No new allocation can also be made as a result of the raising of Tzaneen Dam, as the additional yield will be fully absorbed in improving the assurance of supply. • No new farm dams to be permitted in the catchment. • Water supply for domestic water use (via District and Local Municipalities) to receive priority and to be supplied from the following sources (in order of priority): – Water Conservation and Demand Management – Groundwater – Trading with the irrigation sector

MANAGEMENT ACTIONS	**RESPONSIBILITY/ PRIORITY**
• Once the Reserve has been determined, a detailed plan-of-action needs to be developed for the catchment. This will involve investigating all of the options listed in the strategy above.	**Responsibility:** D: NWRP **Priority:** High

Strategy No. 4.3-2

CATCHMENT SPECIFIC STRATEGIES

WATER ALLOCATION STRATEGY (MIDDLE AND KLEIN LETABA RIVER CATCHMENT)	
MANAGEMENT OBJECTIVE	♦ **Effective and sustainable** water resources management and development in the catchment, which recognises International requirements, the ecological Reserve and the productive use of water as an asset to be utilised to bring about 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.
SITUATION ANALYSIS/ MOTIVATION	**<u>Water Availability, Requirements and Reconciliation</u>** The gross surface water availability in the Klein Letaba sub-area is estimated at 27 million m³/a, derived mostly from the yield of the Middle Letaba Dam and smaller dams upstream. Allowing for the impact of the ecological reserve (4 million m³/a) and Alien Invasive Plants (2 million m³/a), the available surface water is 32 million m³/a. Accounting for groundwater (9 million m³/a) and return flows (2 million m³/a) gives a total local yield of 32 million m³/a (see Table 6.5 in Chapter 6). Groundwater use (9 million m³/a) is mostly upstream of Middle Letaba Dam where it is used to supplement surface water supplies for irrigation. Groundwater was used to supply most of the rural population in the sub-area, but much of this has been replaced by reticulated supply from Middle Letaba Dam. The total local requirement is 37 million m³/a (Table 6.6) and the catchment is in deficit of 5 million m³/a (Table 6.7). Concerns have been raised in the past with respect to the extent of water resources available in this catchment since there have been conflicting reports regarding the yield of the major dams, particularly the Middle Letaba Dam. For example, in 1978 the historical yield of the dam was quoted as 56 million m^3/a. The Letaba Basin Study report (DWAF, 1990) quoted the yield at 12 million m^3/a. Recently (DWAF, 2002) the yield was quoted as 16 million m^3/a. The reason for this discrepancy is that, firstly, the Middle Letaba Dam was not constructed at the site originally planned (i.e. at the confluence of the Middle and Klein Letaba rivers) where the yield would have been much higher. Secondly, the recent drought of the 1990's was the worst on record and resulted in a lower historical yield. Upstream development such as farm dams and irrigation also reduces the yield of the dam. It is evident that use from the Middle Letaba Dam was planned on the large yield figure of 56 million m³/a. It is now however clear that the available yield is much less. With water conservation and demand management strategies in place for Giyani and its surrounds, the yield is adequate for domestic and irrigation requirements downstream of the dam when the ecological reserve is disregarded. In addition new dam sites are characterised by low yields and high costs of construction; as such there is little room for increasing the available yield. With the implementation of the Reserve, revitalisation of smallholder irrigation schemes will not be feasible. Focus should rather be on smaller irrigation (community gardens, etc.) supplied from groundwater.

	Surface Water Development Potential The Klein Letaba River sub-area consists of the Upper Klein Letaba River catchment (B82E and B82F), Middle Letaba River catchment (B82A, B82B, B82C and B82D) and Lower Klein Letaba River catchment (B82G, B82H and B82J). The Upper Klein Letaba River catchment measures about 1 085 km^2 and has a MAR of about 44 million m^3/a. With the exception of a few farm dams, very little development has occurred in this catchment. The Middle Letaba catchment measures about 1 800 km^2 and has a natural MAR of 72 million m^3/a. Extensive development has occurred with a total of 3 700 ha of irrigation. About 5 600 ha have been afforested. Numerous farm dams have been constructed. The Middle Letaba Dam is also located in this catchment. This dam has a storage capacity of about 184 million m^3, which is 256% of the natural MAR. The surface water resources of this catchment are therefore considered to be fully developed [DWAF, 1990b]. The Lower Klein Letaba measures about 2 500 km^2. A small percentage of the catchment lies in the Kruger National Park (KNP). Water used in this catchment is mainly for irrigation. Much of the water used in the Lower Klein Letaba catchment is drawn from Middle Letaba Dam. The Nsami Dam on the Nsama River has a capacity of 24.4 million m^3 and the yield of the dam is about 1 million m^3/a. The dam was designed as an off-channel storage for diversion from Middle Letaba Dam. From the above it is clear that with the exception of the upper Klein Letaba catchment, there is little scope for the construction of additional dams in this sub-area. **Major Water Users** The two largest water uses in the Middle and Klein Letaba catchment are the irrigation sector with an estimated requirement of 25 million m^3/a and domestic requirements estimated at 11 million m^3/a. Other water uses in the catchment are negligible. The irrigation section will be impacted upon by the implementation of the Reserve and it is essential that compulsory licensing be implemented. The main source of supply in this catchment is the Middle Letaba Dam and groundwater. There are also a number of significant farm dams upstream of the Middle Letaba Dam, which make a significant contribution to the system yield. Based on a reconnaissance level analysis carried out as part of this ISP, it appears as if the area upstream of the Middle Letaba is stressed, although this is a self-imposed stress since irrigators have developed to a level at which economic returns are maximised.
	Irrigators downstream of the dam also experience shortages and most of these irrigators' activities have ceased. The provincial department of Agriculture plans to revitalise these schemes but it does not appear as if there is sufficient water available to do so. However, the water available from the Middle Letaba Dam has increasingly been supplied to domestic users in and around Giyani, who apparently continue to experience water shortages. (It is estimated that current domestic requirements equal the yield of the dam!). These water shortages are largely attributed to losses and inefficient use in the domestic sector stemming from the lack of a cost-recovery system in the catchment. A water conservation and demand management study has been undertaken in the Giyani area where the majority of the water losses occur.

	Summary of Issues The issues around water allocations in the Klein Letaba sub-area can be summarised as follows: • Original estimates of the yield of the Middle Letaba Dam were much higher than is now believed to be the case. This, together with rapidly increasing supply from this dam to meet domestic requirements has resulted in irrigators downstream of the dam experiencing serious deficits, to the extend that they have ceased operating. These irrigation schemes are the target of the irrigation revitalisation project, but there is no water available for this purpose. • Water use in and around Giyani is very inefficient and wasteful. Water conservation and demand management measures are soon to be implemented in this area.
STRATEGY	• The broad strategy for the Klein Letaba sub-area is to urgently implement water conservation and demand management measures in the Giyani area (see Strategy 4.3-4). Compulsory licensing will not solve the problem of deficits downstream of the Middle Letaba Dam and this is therefore not recommended as an urgent action. In the longer term, a better understanding of water use, and especially the sources of supply, is required in this sub-area, for which a detailed water resource and utilisation assessment is recommended. • The surface water/groundwater interaction also needs to be investigated and understood in order that the water resource can be managed better. The feasibility of supplementing supplies to this area from Nandoni Dam needs to be investigated as part of this study. • The irrigation water requirements up-stream of the Middle Letaba Dam cannot be met in full from the yield available from the farm dams and run-of-river flows. The irrigators use substantial quantities of groundwater. The impact of this abstraction on surface water flows needs to be understood and quantified. • There is currently no additional water available for allocation. No additional allocations for irrigation will be made while allocations for domestic use must be sourced firstly from more efficient use of water. New supply options such as Nandoni Dam should only be considered once water use in the Middle Letaba is efficient. • Further large-scale groundwater use should be considered only to support high value crops. • Domestic water supply to outlying areas should be sourced from groundwater. • Water supply for domestic water use (via District and Local Municipalities) to receive priority and to be supplied from the following sources (in order of priority): - Water Conservation and Demand Management; - Groundwater; - Further development of the surface water resource.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Implement the recommendations of the WC&DM study	**Responsibility:** D: Water Use Efficiency **Priority:** High
• Investigate conjunctive water use with the view to establishing an understanding of how ground abstraction (u/s of Middle Letaba Dam) impacts on surface water flows.	**Responsibility:** D: NWRP **Priority:** High
• Operating levels need to be determined for the Middle Letaba Dam so that the human reserve requirement of 25l/c/day can be supplied at 100% assurance.	**Responsibility:** D: NWRP **Priority:** High
• Carry out a groundwater study, including surface water/ groundwater interdependency, and integrate these results with the recently completed surface water resource evaluation. Hence confirm or revise plans to supplement the water supply to the Giyani area and identify possible supply options if necessary.	**Responsibility:** D: NWRP, WRPS **Priority:** Medium
• Initiate and implement compulsory licencing	**Responsibility:** RO **Priority:** High

Strategy No. 4.3-3

CATCHMENT SPECIFIC STRATEGIES

WATER QUALITY MANAGEMENT (LETABA AND SHINGWEDZI RIVER CATCHMENTS)	
MANAGEMENT OBJECTIVE	• DWAF has a mandate to manage water resources in a sustainable manner. This implies a holistic approach to planning and protection to promote social and economic development without irreversibly damaging the water resource. • The overall objective of water quality management is to ensure that the water is fit for the use for which it is intended. This includes both present water uses and potential future uses.
SITUATION ANALYSIS/ MOTIVATION	Predominant water uses in the Letaba catchment are irrigation (particularly sub-tropical fruit and citrus), stock watering, domestic use, and nature conservation in the Kruger National Park. Forestry is the predominant land use in the headwaters of the catchment. The major factor affecting water quality is the quantity of water flowing in the river; that is increased pollution concentrations due to reduced flow. This notwithstanding, the water quality in the Letaba and Shingwedzi catchments is suitable for all major water uses. Agrochemicals (fertilizers and pesticides) in irrigation return flows have the potential to negatively impact on the catchment though this is not quantified. Agriculture is the economic mainstay in these catchments. In addition the revitalization of smallholder irrigation schemes is in progress. Therefore issues surrounding agricultural practices and their associated water quality problems must be prioritized. The Middle Letaba Dam has steeply rising trends in concentrations of calcium, chloride, magnesium and sodium. Although South African Water Quality Guideline values are not exceeded, the increasing trend is a concern. The trend may be attributed to irrigation practices upstream of the dam and the issue requires urgent attention. Similar increasing trends are evident at Nsami Dam, which essentially acts as off-channel storage for water supplied to Giyani from the Middle Letaba Dam. Reports of intermittent poor quality releases from Ebenezer Dam have also been noted. Although the quality of Ebenezer Dam may be good overall, the releases from lower water layers within the dam may be responsible for the occasional poor quality releases. Domestic wastewater washed into the rivers from areas with inadequate or poor sanitation facilities is a problem. Bacterial pollution and elevated nutrient loads are associated with domestic wastewater. Health risks posed by water borne diseases in the catchment were reported in the 1980s. However, there have been no reports of cholera outbreaks in the catchment since 2002. The National Microbial Monitoring Programme rated the Klein Letaba River, up to the point where it joins the Nsama River, sixth out of the 10 areas identified nationally as having the highest potential health risk due to faecal pollution. This high risk rating was attributed to a lack of purified water for domestic use. Some of the main settlements around these rivers are Rotterdam, Middelwater, Hanthabala, Raphahlelo and Giyani. This assessment was based on the status of basic domestic water supply and sanitation services in 1994.

	Industrial point source pollution is not widespread. Most small-scale industry is concentrated in Tzaneen and Nkowakowa, including saw mills, log yards, fruit juicing and canning works. Effluent from many industries is recycled or used for irrigation. The potential for surface and groundwater pollution exists from untreated or poorly treated effluent discharges and uncontrolled polluted storm water runoff. Monitoring should therefore be a visible and on-going exercise to discourage would be offenders. Although mining is not a dominant activity in the region, there are a number of active and defunct mines that do pose a pollution risk to the ground and surface water resources. These include Motale coal mine, the abandoned Louis Moore and Klein Letaba gold mines, Gravelotte Mine, a Titanium mine near Nkowakowa, Fumani gold mine and the New Union gold mine in the Shingwedzi catchment. Although existing mines are controlled by their Environmental management Plans, defunct mines will require close monitoring by DWAF. The following sewage treatment plants (STP) discharge into the rivers given in parenthesis; Tzaneen STP (Groot Letaba), Giyani STP (Klein Letaba), Nkowakowa (Letsitele), Malamulele (Phugwane) and Ga-Kgapane (Middle Letaba). Effluent from the Lenyenye STP is used for irrigation. Reports indicate that discharges do not always comply with effluent standards. Water hyacinth is a problem in Groot Letaba River, especially between Tzaneen Dam and Letsitele. The problem extends further down the river, but to a lesser extent. Increased nutrient levels from irrigation return flows result in enhanced growth of plants and algae to nuisance levels. This, coupled with backup behind the large number of weirs in the catchment and the slower flows, provides an ideal environment for the growth of water hyacinth. Aquatic plants increase transpiration losses, provide an environment for the breeding of malaria mosquitoes and bilharzias snails, prevent boating and block irrigation canals. There are no formal solid waste landfills in the catchment. The many informal landfills result in increased litter and solid waste reaching the river courses. There are no hazardous waste disposal sites in the province for medical incinerator ashes. It is unclear how hazardous waste is disposed of.
STRATEGY **STRATEGY**	• An integrated water quality management plan is required that sets out a clear water quality management strategy. This should provide the current water quality status of the river and identify all pollution sources, as well as the transport, life cycle and effect of the expected pollutants within the context of the river system. This would include the National Eutrophication Monitoring Programme (NEMP), the National Microbial Monitoring Programme (NMMP) and the establishment of a Regional Monitoring Programme (RMP), which have been initiated in the WMA. • As an initial effort, and based on the existing knowledge base within the Head office and Regional offices of DWAF, it is recommended that river reaches and other areas (incl. Groundwater) that are sensitive to water quality problems be identified and preliminary water resource quality objectives set for these areas. This will help to guide decisions regarding policy and regulation, development and licence applications in these sensitive areas. • Co-operative governance initiatives, with other DWAF regional departments, local and district municipalities, and other regional government departments, such as the Department of Agriculture, Department of Energy and Mineral Affairs, Department of Environmental Affairs, Department of Health, etc. must be encouraged as part of integrated planning. Issues surrounding agricultural practices and their associated water quality problems must be prioritised. Smallholder irrigation schemes must be targeted to encourage good agricultural practice, such as the minimisation of water use and the proper use of pesticides and fertilisers.

	• Water quality can be effectively managed with limited resources by encouraging self-regulation by users. The formation of Water user Associations must be encouraged. Awareness campaigns to educate rural communities on sustainable resource use, for example more efficient subsistence farming and cattle rearing methods to reduce erosion must be conducted. Empower the public to take responsibility for their environment by conducting routine monitoring of the water resource and disclosing offending polluters.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Regional monitoring (i.e. the river health initiative) must be conducted with the aim to enforce the resource quality objectives for the river. This should include the classification of the resource and the quality requirements of the Reserve. Monitoring should also include toxicity testing.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium
• The Region must assess water quality using acceptable tools.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium
• Most of the STPs are managed by DWAF and there is an issue surrounding the issuing of licences in this case. These STPs must be brought to compliance levels, by upgrading the process and/or improving management structures, before being handed over to the local municipality. (N.B. Refurbishment of existing plants is part of the DWAF asset transfer process).	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium
• An emergency action plan must be formulated to deal with water quality emergencies, for example toxic spills or the outbreak of water borne disease, in a controlled and effective manner.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium
• Develop an integrated water quality management plan. This should include a detailed situation assessment to identify all polluters and their impacts or potential impacts. Based on this study, a clear water quality management strategy must be put into place.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium
• Initiate co-operative governance with local and district municipalities, and other regional government departments (e.g. Department of Agriculture, Department of Health).	**Responsibility:** Regional Office/ Waste Discharge and Disposal **Priority:** Low
• Develop good communication channels with Water User Associations.	**Responsibility:** Dir Waste Discharge and Disposal **Priority:** High
• Develop a Regional monitoring system to enforce the resource quality objectives for the watercourses.	**Responsibility:** Regional Office/ Waste Discharge and Disposal **Priority:** Medium
• Monitoring must be conducted at abstraction and supply points to ensure fitness for use, and at effluent discharge points for point sources to enforce effluent standards. Indicators must be established to monitor diffuse pollution sources, for example microbial monitoring for contamination by domestic wastewater.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium

• Investigate the link between surface and groundwater and integrate surface and groundwater quality monitoring. Monitoring activities must tie in with national monitoring initiatives, including the National Microbial Monitoring Programme and the National Eutrophication Monitoring Programme.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium
• Bring DWAF – owned sewage treatment plants must be brought to compliance levels before handing over to local municipalities.	**Responsibility:** Dir National Transfers **Priority:** Medium
• Identify defunct and abandoned mines and formulate clear management plans to manage these. A proper census is required of operating and abandoned or defunct mines.	**Responsibility:** Regional Office/Dir Waste Discharge And Disposal **Priority:** Medium
• Devise a solid and hazardous waste management plan.	**Responsibility:** Regional Office/Waste Discharge & Disposal. **Priority:** Low
• Implement an exercise to establish location and routes of pipelines conveying petroleum, and location of underground storage tanks for petroleum. Implement a programme to monitor and mitigate potential impacts on groundwater resources by these facilities.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium
• Use chemical spraying or bio-control to control the water hyacinth. The choice of control measure must be in keeping with the overall management objectives for the catchment. Alternatively, mechanically harvest the water hyacinth for its fibre, which can be used for the manufacture of furniture.	**Responsibility:** Regional Office/Dir Waste Discharge and Disposal **Priority:** Medium

Strategy No.:	4.3-4

CATCHMENT SPECIFIC STRATEGY

WATER CONSERVATION AND WATER DEMAND MANAGEMENT STRATEGY – Letaba Catchment

MANAGEMENT OBJECTIVE	To make more efficient use of the existing available water resources by all water user sectors. This will enable the catchment management to "free up" additional water, which can possibly be put to beneficial use elsewhere in the catchment or used to meet the ecological water requirements in the river system.
SITUATION ANALYSIS/ MOTIVATION	**Domestic and industrial water use** *Tzaneen and surrounding areas:* Information on actual water use in this sector is limited by the paucity of records. Estimates indicate that for Tzaneen, the average consumption is about 1200ℓ/c/day including municipal use and losses. This per capita consumption is very high. While individual water users in Tzaneen are metered and pay for the water used, indications are that the price paid for potable water use is too low in relation to its true value. Households use a significant quantity of potable water as well as groundwater for garden irrigation. The water supply situation in the residential areas of Nkowakowa, Lenyenye, Dan and other towns mainly in the Naphuno 1 District is quite different. The level of service varies from street taps to fully serviced houses with water borne sewerage. Very few users are metered and cost recovery is at a very low level. It is reported that unauthorized connections to the reticulation system account for much of the water used making demand management virtually impossible. Information available on water use in these areas is not good but does indicate a level of consumption much higher than is expected. **Middle Letaba Regional Water Supply Scheme (RWS)** The extent of the Middle Letaba RWS is described in Section 2.11.2.2 of the main report. Giyani is the largest urban centre served by this scheme. Scattered rural villages constitute the rest of the distribution area. The scheme is designed to support a total population of 412 000; currently (year 2000) a total of 451 000 people are within reach of the scheme. A water conservation and water demand management (WC&WDM) situation assessment study was completed for this scheme in April 2003 (DWAF, 2003b). Currently there are no water conservation and demand management measures in place. The existing water tariff structure is flat and does not encourage efficiency of water use by consumers. Generally the infrastructure is in a bad state of repair and the telemetry systems are not operational. There is no proper record keeping of the water infrastructure allowing for a planned maintenance programme to be designed. A high proportion of the total quantity of water supplied to Giyani is not accounted for; this consists of a combination of reticulation system losses, unauthorized water connections, faulty water meters, domestic plumbing leaks and general wastage.

	There are reported instances of potable water being used for irrigation in the Giyani area. These factors, combined with the low levels of payment and institutional problems, affect the sustainability of water services. It is also reported that losses along the canal (capacity 4m³/s) from Middle Letaba Dam to Nsami Dam are of the order of 40%. Water and Sanitation South Africa (WSSA) are responsible for water billing in Giyani. On average a total of 5 500 water accounts are sent out. On average only 100 of these accounts are paid each month. As such, little cost recovery is taking place. **Irrigation** The irrigation sector in the Letaba catchment has been developed over many years and now uses far more water than any other sector. Sophisticated water management infrastructure and systems have been developed to regulate and distribute available resources. Information available indicates that the bulk distribution of water is reliably accounted for with very little going to waste or not recorded. Regular shortages, of increasing severity, are an important incentive to maximize distribution efficiency. This has led to improved irrigation management practices based on scientific observations of field conditions and the use of modern irrigation equipment. Flood irrigation is virtually unknown; Sprinkler irrigation has to a large extent made way for micro jet and drip irrigation systems. There is always room for improvement in irrigation systems, but the likelihood of achieving significant savings in use, particularly in the Groot Letaba River catchment, at reasonable marginal cost, is very small. Notwithstanding the above, it is reported that some 20 ha in Thabina are irrigated using purified water. This is obviously unacceptable. In addition, losses occur in the Middle Letaba canal system. This needs investigation and a solution found to reduce these losses. **Invasive Alien Plants** Invasive alien plants is a particular problem in of the Letaba catchment. The impact of these alien invasive plants on the water resources of the catchment is estimated at 10 million m³/a in the Groot Letaba Catchment and 2 million m³/a in the Klein Letaba catchment.
STRATEGY	• A Water Conservation and Demand Management (WC & DM) strategy for the domestic sector should be developed. This should include an awareness campaign to involve the water users and other parties concerned in actions to improve the efficient use of water. The strategy should also address the efficient operation of the water supply system, cost recovery and analysis of institutional arrangements with the view to recommending the best option. • Working for Water need to continue their efforts to remove invasive alien plants in the Crocodile River and Sabie River catchments. Better tools are required to estimate the impact of invasive alien plants on the surface runoff and hence the impact on the yield available to others. These tools must be species specific and distinguish between riparian and non-riparian invasives.

MANAGEMENT ACTIONS	RESPONSIBILITY/ PRIORITY
• Initiate a WC & WDM study of the whole of the Letaba catchment taking into account work already done. Focus mainly on the urban and industrial user sectors.	**Responsibility:** DIR: Water Use Efficiency **Priority:** High
• Implement cost recovery mechanisms.	**Responsibility:** DIR : RO **Priority:** High
• Analyse future institutional arrangements and implement the best option to ensure that Water Conservation and Demand Management is implemented.	**Responsibility:** DIR : Institutional Oversight and Water Use Efficiency **Priority:** High
• Institute awareness campaigns.	**Responsibility:** DIR : RO **Priority:** High
• Address efficient operation of the water supply system. Model the distribution system and determine operating rules. Upgrade monitoring and control systems.	**Responsibility:** DIR : RO **Priority:** High
• Approach Local municipalities to be partners in implementing WC & WDM measures.	**Responsibility:** DIR : RO **Priority:** High
• Manage water users through engineering (i.e. water loss control methods), legal (bye-laws), and economic instruments (proper tariff structures). These direct and non-direct methods of demand management including community awareness programmes need to be considered and DWAF needs to ensure that these measures are included in the WSDPs submitted by municipalities.	**Responsibility:** DIR : RO **Priority:** High
• A specific strategy needs to be developed in order to ensure that any water savings made through WC & WDM measures become available for reallocation by the CMA and is not taken up by established irrigators to expand their irrigated area.	**Responsibility:** DIR : RO **Priority:** High
• Promote introduction of even more efficient irrigation techniques to reduce the water requirements of the irrigation sector.	**Responsibility:** DIR : RO **Priority:** High
Implement recommendations of the report: Department of Water Affairs and Forestry, South Africa 2003. Middle Letaba Water Supply Scheme: Water Conservation and Water Demand Management Situation Assessment Study – Final Version 1 (March 2003). Tlou & Matji (Pty) Ltd.	**Responsibility:** DIR : RO **Priority:** High
Facilitate formation of Water User Associations and involve them in WC & WDM programmes.	**Responsibility:** DIR : RO/Dir Institutional Oversight **Priority:** High

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