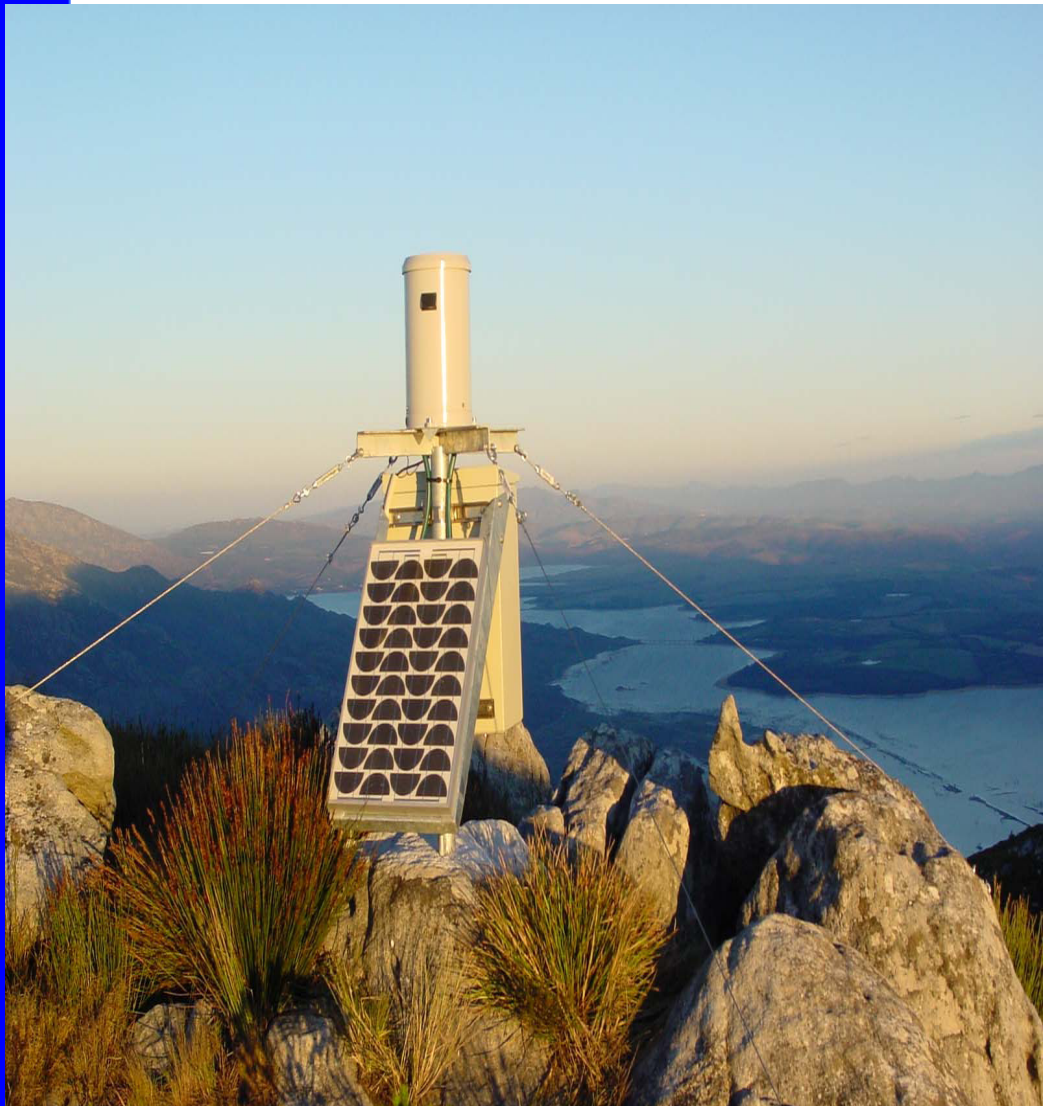


# A 5-YEAR WATER RESOURCE QUALITY MONITORING PLAN



Cover Photo: Mountain rainfall gauge at Franschoek,  
Western Cape, South Africa  
(Courtesy: Hydrological Services, DWAF)

**Republic of South Africa**

# **A 5-Year Water Resources Quality Monitoring Plan**

**Department of Water Affairs and Forestry  
Directorate: Information Programmes  
Pretoria**

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## FOREWORD

Historically, the objectives of South Africa's water resources quality monitoring networks and programmes were not so strongly focused on ongoing decision-making. With increasing water scarcity, the focus will be on a holistic assessment of water resources to support various, often competing, human needs and to ensure the sustainability of the environment. With this in mind, the need to coordinate and integrate water resources monitoring is embedded in the national water legislation, i.e. Chapter 14 of the National Water Act (Act 36 of 1998) which mandates the Minister to "*ensure the continued and coordinated monitoring of water resources in its broadest sense...*"

The Policy and Regulation Branch of the Department of Water Affairs and Forestry has recognized the need to integrate water resource quality monitoring services through harmonizing monitoring and analysis methods used by different monitoring programmes and institutions. A *Strategic Framework for National Water Resource Quality Monitoring* document (DWAF, 2004) was developed in order to provide a basis for reviewing the current monitoring programmes and designing new programmes. A Water Resource Quality Monitoring Task Team from the Chief Directorate: Information Management, was established to work towards an effective and efficient monitoring service and this *5-Year Water Resource Quality Monitoring Plan*, developed in consultation with Regional Offices, provides the necessary direction.

Through a series of special interventions, the Department intends to re-appraise the current monitoring programmes, to develop new monitoring programmes, and to integrate data acquisition, data management and information products for management purposes at the local, national and regional levels. The establishment of appropriate governance structures is seen as one of the key interventions through which DWAF National Office, Clusters, (RO) proto-CMAs, and new Water Management Institutions will become aligned to create the information base for Integrated Water Resource Management.



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Barbara Schreiner  
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# A 5-YEAR WATER RESOURCE QUALITY MONITORING PLAN

## 1. PURPOSE

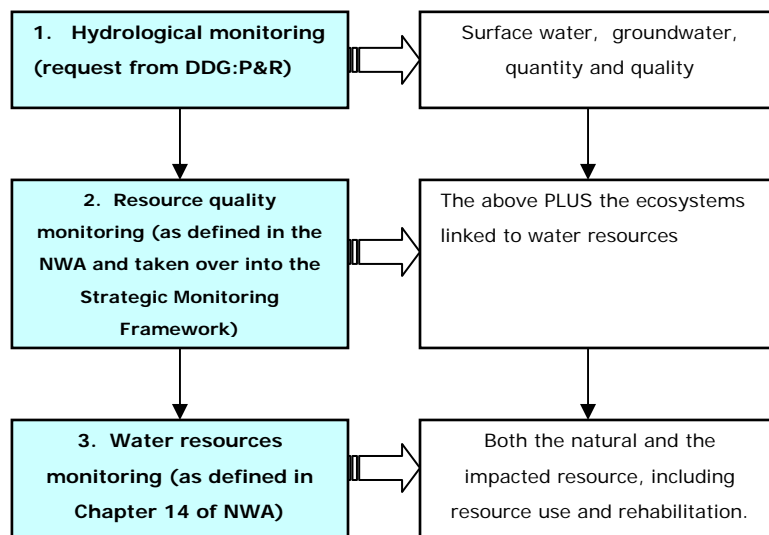
The purpose of this document is to inform Management throughout the Department of the progress with the development of a 5-year plan for Resource Quality Monitoring, as originally requested by the DDG: P&R. It should stimulate widespread discussion on the way forward, because a high level of co-ordination will be required if we are to achieve the desired integrated resource quality monitoring service.

The information in the document is based on the work of a cross-cutting Water Resource Quality Monitoring Task Team from Information Management and a questionnaire action in Head Office and the Regions, concluded with a fully representative DWAF workshop on 15 and 16 April 2004. It must be seen as a rollout of the WRMAIS strategy that was adopted in 2001 and the Strategic Framework for National Water Resource Quality Monitoring Programmes (DWAF, 2004) completed this year.

The report is structured into summaries of existing and envisaged programmes, an expression of the status of this monitoring and where we would like to be in 5 years. Together with this, the critical interventions required to get there, are also described.

## 2. SCOPE

The scope of monitoring to be addressed has grown from 1) hydrological to 2) resource quality and possibly to 3) water resource monitoring.



The progression from hydrological to water resource monitoring implies an increasing focus on operational management of the resource as will be required at WMA and lower levels of management. Even though the Department will not physically have to perform all this monitoring,

it will have to prepare for its Chapter 14 role, which defines the purpose of National Monitoring Systems as:

**To facilitate the continued and co-ordinated monitoring of various aspects of water resources by collecting relevant information and data through established procedures and mechanisms from a variety of sources, including organs of state, water management institutions and water users.**

Systems must provide for:

**Appropriate data and information necessary to assess, amongst other matters: -**

- a) **Quantity, quality, use and rehabilitation of water resources.**
- b) **Compliance with water resource quality objectives;**
- c) **Health of aquatic eco-systems; and**
- d) **Atmospheric conditions that may influence water resources.**

### **3. EXISTING PROGRAMMES**

A summary of all existing DWAF monitoring programmes are provided in *Table 1*.

A total of 11 resource quality monitoring programmes are currently run in DWAF. Monitoring is mainly for consider status and trends. There are four main databases that are populated with these monitoring data, i.e. the WMS, NGA/REGIS, HYDSTRA and GIS. The custodians of the monitoring data are situated in various Head Office directorates. The Regional Offices are the operators, responsible for the physical data acquisition in the field.

The various programmes in both Head Office and Regions undertake some individual reporting. There are, as yet, only a few laid-down reporting requirements and limited guidelines and standards in this regard.

Examples of the spatial distribution of available monitoring points are included for one of the older programmes, i.e. Hydrology, in *Figure 1*.

The current expenditure for resource quality monitoring by Head Office and the Regions is estimated at R190 million/annum. This figure excludes contributions by other governments and private institutions. A breakdown of this expenditure into the main functional areas of data acquisition, data management and information dissemination/generation is shown in *Table 2*. In general the Regions' focus is on data acquisition and the Head Office focus on data management and support. More regular information products at a regional scale are needed for short-term planning and management.

Each of the existing programmes has also provided its own estimate of required 5-year growth in the capital budget (infrastructure). This is summarised in *Figure 3*, showing both the present (2004/05) and 5th year (2008/09) requirements.

**Table 1: CURRENT MONITORING PROGRAMMES**

	<b>National Microbial Monitoring Programme (NMMP)</b>	<b>River Health Programme (RHP)</b>	<b>National Chemical Monitoring Programme (NCMP)</b>	<b>National Eutrophication Monitoring Programme (NEMP)</b>	<b>◆ National Radioactivity Monitoring Programme (NRMP)</b>
<b>Purpose</b>	Status and Trends	Status and Trends	Various purposes based on historical development of programme, but mainly for trend and status monitoring	Status and Trends	Status and Trends
<b>Measurement</b>	Microbes ( <i>E coli</i> , Faecal coliform)	Biological indicator (Fish, Vegetation Invertebrates)	Water Quality Samples*	Phosphate Nitrogenous compounds Chlorophyll Algae Cyanobacteria	Dose calculation (concentration of radionuclides)
<b>Database</b>	WMS: HO	WMS: HO (Rivers database)	WMS RO	WMS HO	WMS HO
<b>Custodian</b>	HO: RQS	HO: RQS DEAT WRC	HO:RQS	HO: RQS	HO: RQS  NNR**
<b>Operator(s)</b>	HO: RQS DoH	RO:RQS PPT+++	RQS RO Agents HMP	RO, RQS	Being designed
<b>Reporting</b>					
1. Information Products	Microbial Status report	State of river reports of fish, invertebrates, riparian vegetation. In some cases hydrology and geomorphology	Tables, Graphs Assessment reports, and planning reports	Eutrophication status reports	Radiological water quality status report
2. Frequency	Bi-monthly and Annually	Annually	Variable depending on need	Annually	Regularly
<b>MTEF Provision 2004/5 (Capital expenditure)</b>	R1.5 m (or R6.4 m without sharing costs with other stakeholders)	R1.5 m (May be increased to R2.0 m, depending on procured activities to be decided on 19/3/2004)	R9.3 m	R 0.8 m ( *or R9.2 m without sharing costs with other stakeholders)	R0.76 m (Only for design, no sampling yet)

**Table 1: (continued) CURRENT MONITORING PROGRAMMES**

	<b>◆ National Toxicity Monitoring Programme (NTMP)</b>	<b># Ecological Reserve Determination and Monitoring</b>	<b>Hydrographic Surveys for sedimentation</b>	<b>Dam walls for dam safety</b>
<b>Purpose</b>	Status and Trends	Ecological reserve monitoring: compliance, conformance. Status and Trends	Sedimentation	Dam safety
<b>Measurement</b>	Toxicants, Toxicity	<p>1. Development of Integrated biological and ecological indices and methods for ecological reserve specifications</p> <p>2. Development of methods to integrate present ecological state of components into eco-status. Includes development of some predictive capability.</p> <p>3. Development of adaptive resource monitoring and management systems for ecological reserve</p>		
<b>Database</b>	WMS, HO	WMS HO		
<b>Custodian</b>	HO:RQS	HO: (D:RDM) HO: (D:RQS)	Business Information	Business Information
<b>Operator(s)</b>	Being designed	HO: RDM/RQS	Business Information	Business Information
<b>Reporting</b>				
1. Information Products	Toxicological water quality status report	Ecological Status and trend of resource quality. Data can feed information to RHP (state of rivers reports)	Reservoir Volume and Sedimentation	Coordinates and diagrams
2. Frequency	Regularly	Interim, and once in 5 year cycle from start of monitoring	Every 20 years per Dam	Twice per Year
<b>MTEF Provision 2004/5 (capital expenditure)</b>	R1.31 m (only for design)	R1.4 m (incl PSP costs)	R2.0 m	R2.0 m

**Table 1: (continued) CURRENT MONITORING PROGRAMMES**

	<b>(£) Hydrological Monitoring Programme (HMP)</b>	<b>Geohydrological Monitoring Programme (GMP)</b>
<b>Purpose</b>	Status and Trends	Status and Trends
<b>Measurement</b>	Water Quality Samples for RQS  Continuous surface water levels at gauging stations, canals and dams (versus time) and or flow rates in pipelines  Rainfall and evaporation depth in mm (daily, monthly, annually)	Rainfall depth and chemical character EC and Temperature  Groundwater level Flow heights (Springs) Isotope-Chem + Sample  Isotope (Stable and Tracer) Trace elements
<b>Database</b>	Hydstra (Regions and HO) HO performing auditing function RO populating database	HO RO
<b>Custodian</b>	HO (Hydrological services) RO	National groundwater monitoring coordinator
<b>Operator(s)</b>	HO (Hydrological services) RO	National (HO) Region (RO)
<b>Reporting</b>		
1. Information Products	Flow and Dam records (continuous, daily, monthly, annual, flood peaks)  Total flow regime Evaporation and rainfall records (daily, monthly, annually)	Groundwater balance Geochemical trends and spatial changes  Geohydrological reports
2. Frequency	(Dams and Flow Gauging stations) Continuous, daily, monthly, annually. (Rainfall and evaporation) daily, monthly and annually	Hourly readings of groundwater levels. Bi-annual sampling of quality
<b>MTEF Provision 2004/5 (capital expenditure)</b>	¥ R 23.7 million	R 3.5 million

- ∅ HMP doing approx. 60% of water quality sampling on behalf of NCMP  
PPT+++ Universities, SAN parks, Some RO, DEAT  
NNR\*\* National Nuclear Regulator  
NECSA+ Nuclear Energy Council of South Africa  
Monitoring programmes that include groundwater  
Ecological reserve: only at conceptual level, not yet a programme  
¥ Funds not received  
£ List of Hydrological Monitoring Stations attached

**Table 1: (continued) CURRENT MONITORING PROGRAMMES**

	<b>National Toxicity Monitoring Programme (NTMP)</b>	<b># Ecological Reserve Determination and Monitoring</b>	<b>Hydrographic Surveys for sedimentation</b>	<b>Dam walls for dam safety</b>
<b>Purpose</b>	Status and Trends	Ecological reserve monitoring: compliance, conformance. Status and Trends	Sedimentation	Dam safety
<b>Measurement</b>	Toxicants, Toxicity	1. Development of Integrated biological and ecological indices and methods for ecological reserve specifications 2. Development of methods to integrate present ecological state of components into eco-status. Includes development of some predictive capability. 3. Development of adaptive resource monitoring and management systems for ecological reserve		
<b>Database</b>	WMS, HO	WMS HO		
<b>Custodian</b>	HO:RQS	HO: (D:RDM) HO: (D:RQS)	Business Information	Business Information
<b>Operator(s)</b>	Being designed	HO: RDM/R QS	Business Information	Business Information
<b>Reporting</b>	Toxicological water quality status report	Ecological Status and trend of resource quality. Data can feed information to RHP (state of rivers reports)	Reservoir Volume and Sedimentation	Coordinates and diagrams
1. Information Products				
2. Frequency	Regularly	Interim, and once per 5-year cycle from start of monitoring	Every 20 years per Dam	Twice per Year
<b>MTEF Provision 2004/5 (capital expenditure)</b>	R1.31m (only for design)	R1.4 m (incl PSP costs)	R2m	R2m

**Table 2: CURRENT (2004/05) MONITORING BUDGET AND BREAKDOWN IN FUNCTIONS AND STANDARD ITEMS.**

<i>Programme</i>	<b>TOTAL BUDGET (million)</b>	<b>Data Acquisition</b>	<b>Data Management</b>	<b>Information Generation/ Dissemination</b>	<b>Other (Capacity building, Management, Research &amp; Development)</b>
<b>Hydrological Services</b>	28*	35%	50%	15%	
<b>Resource Quality Services</b>	29	42%	4%	7%	46%
<b>Business Information</b>	18	70%	25%	5%	
<b>Information Programmes</b>	20	14%	68%	9%	9%
<b>TOTAL Head Office</b>	<b>95</b>				
System Development	25				
<b>TOTAL for 9 Regions **</b>	<b>72</b>	<b>78%</b>	<b>19%</b>	<b>3%</b>	
<b>DWAF TOTAL</b>	<b>192</b>				

\* Does not include capital equipment for which R23,7m was requested for 2004/5.

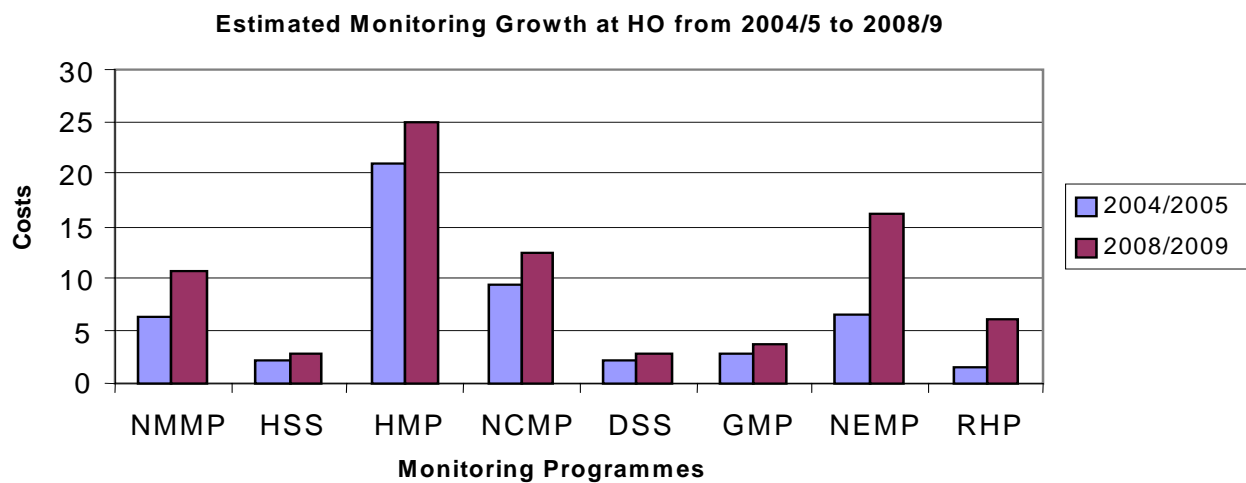
\*\* Estimate based on complete figures received from Limpopo, Western Cape and Mpumalanga Regions. Indications are that this figure can be higher.

	<b>Personnel</b>	<b>Admin</b>	<b>Inventories</b>	<b>Equipment</b>	<b>Professional Services</b>
<b>Head Office</b>	45%	9%	2%	11%	33%
<b>Regions</b>	45%	26%	5%	22%	2%



Figure 1: All Hydrological Monitoring Stations

Figure 2. Capital Budget Growth Requirements of Existing Monitoring Programmes



NMMP- National Microbial Monitoring Programme HSS – Hydrological Survey for Sedimentation HMP – Hydrological Monitoring Programme NCMP – National Chemical Monitoring Programme DSS – Dam Survey GMP – Geohydrological Monitoring Programme NEMP – National Eutrophication Monitoring Programme RHP - River Health Programme



#### 4. NEW PROGRAMMES

New programmes cannot be discussed in detail, because no formal analysis has been done at this stage. The purpose of this section is to indicate the scope and type of new programmes, some general observations and an indication of expected growth during the next 5 years for particular programmes. This is shown in *Table 3* below.

A general observation is that the existing national programmes have largely focussed on resource status and trends monitoring, whereas the *most growth* in monitoring will be:

- towards assessing water and land-based impacts on the resource and
- towards managing impact (compliance monitoring).

This will be achieved through authorisations, policy changes, rehabilitation etc. This monitoring will mainly support resource management that will be delegated to lower levels, and will, to a large extent, also have to be done by the users themselves.

**Table 3: NEW RESOURCE MONITORING PROGRAMMES**

POTENTIAL OR EMERGING PROGRAMME	COMMENTS	EXPECTED GROWTH
<b>Existing national programmes</b>	These are all expected to expand again as water resource management at WMA level takes off, requiring a more detailed status and trends monitoring.	*
<b>Aquatic Health</b>	The River Health Programme must still significantly grow to cover the whole country and must expand to include other aquatic ecosystems, in particular wetlands and estuaries and probably also groundwater. This programme will serve status and trends monitoring at national level and performance/compliance monitoring at lower levels.	***
<b>Ecological Reserve</b>	This will be done for compliance monitoring and also to help establish information for determining the high confidence Reserve. It will be a continuation of driver monitoring, which largely exists (e.g. hydrology, geomorphology, water quality) and biological response monitoring, which is new. Ecostatus can only be assessed through an integration of various monitoring outputs, usually by means of numerical modelling. This has significant capacity implications for Regions and future CMAs. An urgent business analysis is required to plan for this complex monitoring and its relation to Aquatic Health monitoring.	**
<b>Ecological changes (local and regional scale).</b>	Land use impacts on ecological systems are usually only understood by the integration of several ecological disciplines. Other countries address this in the International Long Term Ecological Research (ILTER) network in specific research sites like a watershed or a coastal environment. In South Africa this is co-ordinated under the South African Environmental Observation Network (SAEON). Maximum impact is achieved through user and general public participation).	*
<b>Environmental impacts of water use and water resources infrastructure</b>	More focused monitoring is required before, during and after impact as part of EIAs and SEAs.	**

POTENTIAL OR EMERGING PROGRAMME	COMMENTS	EXPECTED GROWTH
<b>Land-use/ land management changes</b>	<p>Many land use and land management practices are expected to change in order to protect and conserve water in the national interest;</p> <p>Besides in-stream measurement, the land cover itself can be monitored, in particular by remote sensing;</p> <p>Resource quality objectives provide for this type of observation.</p> <p>Opportunity to address as part of ESA Space Observation drive in Africa.</p>	**
<b>Sediment</b>	<p>To date sediment is only measured as an average load through the reservoir survey programme. As catchment management starts to take off, a much greater focus on erosion and run-off control can be expected with an emphasis on more detailed sediment concentration monitoring. Interpretation and management of many water quality constituents also require knowledge of the concurrent sediment concentrations.</p>	*
<b>Rural Water Quality</b>	<p>This is a particular need, in areas where communities still rely on unprotected water supplies. This would have to include surface water and groundwater programmes like microbial, toxicity and radioactivity monitoring.</p>	**
<b>Water abstraction use</b>	<p>There is general consensus that water use information represents the biggest uncertainty in water balance calculations at this stage.</p> <p>Information is needed for control purposes, and for catchment hydrological assessments and projections.</p> <p>A monitoring programme would link together data from various acquisition activities, e.g. registration, compliance monitoring, auditing, space observations and special studies.</p> <p>The challenge here will not be in new data collection, but in enforcement of collection and provision by users and the effective storage and processing of this information.</p>	
<b>Diffuse water abstraction use (controlled activities)</b>	<p>More knowledge and policy needs to be built up on the impact of this use; must be done together with use sector.</p>	**
<b>Diffuse pollution</b>	<p>More knowledge and policy needs to be built up on the impact of this use; must be done together with use sector.</p> <p>Also to measure the impact of remediation policies nationally and locally.</p>	**
<b>Atmospheric conditions (e.g. rainfall quantity and quality, temperature, evapo(trans)piration)</b>	<p>Essential because of climate changes.</p> <p>Together with Weather Services and others.</p> <p>For modelling, planning and operation. Flood, drought and disaster management.</p>	**
<b>GEMS (Global Environmental Monitoring System)</b>	<p>Designed to use information from current monitoring programmes, not spend additional funds on new monitoring points.</p> <p>Reporting done nationally</p>	*
<b>Transboundary programmes</b>	<p>Management of transboundary water resources often requires a greater density of monitoring and special attention to all components of the monitoring functions. Commitments are usually made in bi-lateral agreements, eg. the Incomaputo agreement.</p>	**

## 5. STATUS OF MONITORING

*Table 4* describes the status of monitoring in terms of the main monitoring components, i.e. Data Acquisition, Data Management and Storage, Information Dissemination and Information

Systems. These were evaluated against the main critical interventions needed as identified during the April 2004 workshop.

**Table 4: WEAKNESSES AND REQUIRED RESPONSES FOR KEY MONITORING COMPONENTS**

	<i>Budget</i>		<i>Regional Capacity</i>		<i>Research &amp; Development</i>		<i>HO-RO interaction</i>	
	Status	Response required	Status	Response required	Status	Response required	Status	Response required
<b>Data Acquisition</b>	Highest portion of budget spend on acquisition	Integration would cut acquisition budget	Regions very poorly capacitated. Capacity already inadequate for existing programmes	Need average 30% growth	No research done i.t.o. feasibility of integrated data acquisition	Urgent research needed	Breakdown in communication after restructuring	New governance for HO-RO relationship needs to be worked out urgently.
	Budget cut drastically each year - but networks need to expand! No continuity in planning design and implementation.	Programmatic budgeting with baseline provision.	Skills, staff and training needed. Recruitment drive lacking	Coordinated capacity building strategy and programme			Monitoring budget not planned cooperatively	Regions input in budget planning not sufficient. Secure National funding, plan with Regions
<b>Data Management</b>	Too little attention given to data management in budget - (hours, software, staff)		Data acquisition requires lots of time - personnel occupied.	Appoint dedicated personnel, consider sharing between programmes			Quality control can improve.	HO to give guidance i.t.o. standards, methods and minimum requirements.

**Table 4:(ctd) WEAKNESSES AND REQUIRED RESPONSES FOR KEY MONITORING COMPONENTS**

	<i>Budget</i>		<i>Regional Capacity</i>		<i>Research &amp; Development</i>		<i>HO-RO communication</i>	
	Status	Response required	Status	Response required	Status	Response required	Status	Response required
<b>Information Generation/ Dissemination</b>	Almost no funds allocated for information dissemination. Regional/WMA level monitoring will require a lot more immediate information provision.	Urgent protocols needed for reporting & feedback	Limited capacity available	Appoint dedicated person	None		Only raw field data from RO to HO and even HO to National database. Not all programmes have fixed reporting mechanisms in place	HO and RO to develop reporting guidelines/ standards together
<b>Information Systems</b>	Different databases poorly aligned and - compatible. No common access for clients.	A national strategy is required to also cater for the new WMI's.			Inadequate priority for integration option.		Limited communication i.t.o. system needs	Combined effort to determine real data needs and integration needs

## 6. OVERALL 5-YEAR GOAL FOR MONITORING

The overall goal that should be achieved within 5 years is

**“An effective and efficient national information service.”**

This entails, amongst others:

- User-focus and value for money.
- Ease of access for users (one point of entry).
- One version of the truth (no duplication).
- Sharing of data acquisition and management.
- Integrated information systems (as far as realistically possible).
- Appropriate capacity (expanded and multi-skilled capacity).

## 7. CRITICAL INTERVENTIONS

To achieve the goal of an effective and efficient national information service in the environment of emerging institutions, growing monitoring needs and significant bottlenecks, will require a number of critical strategic interventions. It is these interventions that the 5-year plan will focus on, rather than the ongoing rollout of the different programmes.

Thirteen key interventions were identified at the workshop and are shown below in *Table 5* in their rollout over the next 5 years. It is clear that the immediate focus during 2004/05 will be to develop the umbrella programme for water resource monitoring as part of the 5-year plan finalisation and to establish governance structures and processes in this regard. Furthermore, procedures need to be developed for appropriate business planning of individual programmes and designing of WMA monitoring plans. In terms of specific priorities, the business plans for Water Use monitoring and Aquatic Ecosystem Health monitoring need to be developed during 2004/05.

For further direction each of the strategic interventions is briefly discussed.

### 7.1. Umbrella Programme

To provide an indication of the all-encompassing nature of such a national programme, the objectives of the “US Water Information Co-ordination Programme,” already running since the sixties, are quoted here as possible point of departure for a similar programme here.

#### US Water Information Coordination Programme.

Overall purpose: To improve water information for decision-making about natural resources management and environmental protection.

Objectives:-

1. Procedures to conduct interagency business; exchange information and foster collaboration.

2. Plan, design and operate cost-effective national networks for water data collection and analysis;
3. Coordinate funding, staffing and provision of other resources needed to support inter-agency water information services;
4. Collaborate with other groups that coordinate related information, e.g. spatial and meteorological information;
5. Develop uniform standards, guidelines and procedures for the collection, analysis, management and dissemination of water information;
6. Establish a National Water Information Clearinghouse – to improve the awareness of availability of and access to existing information holdings of Federal agencies and the non-federal sector;
7. Publish and distribute documents on WICP activities and conclusions.

## **7.2. Monitoring Governance Model**

A programme with national objectives and many different role players needs clear and agreed governance structures and processes. This is an immediate priority, given the ongoing internal and external restructuring of WRM in South Africa. This need was already foreseen in the 1997 Water Policy White Paper.

Based on the US Advisory Committee on Water, a **National Advisory Committee on Water Information** is proposed for South Africa with objectives:-

- to advise on the co-ordinated rollout of a “Water Information Co-ordination Programme” (a possible sequel to the 5-year plan).
- Linking nationally to other information-related structures, e.g. for Environment (SAEON), Spatial (SAISIS) and Meteorological Information.
- Working through subordinate structures, e.g. the recently approved Advisory Committee for Water Resources Modelling.
- Achieving regional/local coordination through appropriate nodes, e.g. Integrated Water Resources Monitoring Programme in the Western Cape.

## **7.3. Integrated Monitoring Plans for each Water Management Area (WMA)**

This has been a strong recommendation, which came repeatedly out of the ISP process. Such plans could provide the essential user/stakeholder focus and would allow for the systematic rollout of the monitoring plans on a priority basis.

## **7.4. Business Plans for Individual Programmes**

Given the high and increasing costs of monitoring and the growing number of stakeholders as participants, funders and clients, a business approach to monitoring has become essential.

### **7.5. Water Use Monitoring Feasibility Study.**

The priority for water use monitoring has already been briefly discussed in Section 4: New Programmes. Because this presents a new way of monitoring, relying largely on other stakeholders' information, a feasibility study is urgently required to assess among others the "why, what, how and who". This needs to be followed by the development of a business plan for this new programme, should it prove to be feasible.

### **7.6. Aquatic Ecosystem Health Monitoring Business Plan**

The priority for this has already been discussed in Section 4. The business plan should address Aquatic Ecosystem Health monitoring at different levels and how this would also serve the purpose of Ecological Reserve monitoring.

### **7.7. Guidelines and Standards for all Monitoring Levels**

Resource Quality (Water Resources) monitoring guidelines and standards are crucial in any monitoring programmes. They have to address all the components of monitoring, from data acquisition to information generation and dissemination. Up to date this has been handled differently for each functional area and has been for internal use only.

In terms of the Minister's Chapter 14 mandate and the growing delegation of water resources management and accompanying monitoring responsibilities, the development of guidelines and standards needs to be formalised and co-ordinated. These will become the basis for any sharing of monitoring actions and outsourcing in this regard. A typical example would be the progression to service level agreements with Regions with regard to monitoring, which would make standards and guidelines essential.

### **7.8 Development of Auditing Responsibility**

Water resources monitoring will be a major DWAF and water sector business process that will require its own auditing. There is little clarity and no experience with regard to an auditing function. However, according to expert opinion we need not go any further than one of the internationally well-established quality control systems, in particular ISO 9001: 2000. A feasibility study in this regard is a priority, probably also to serve as a forerunner to the guidelines and standards development.

### **7.9. Scoping of Technology for Monitoring**

Given the increasing importance of monitoring and the growing number of stakeholders, a scoping of the technology trends in support of all components of monitoring could be very useful. This would serve as a basis for future research and development investment in this field.

**Table 5: STRATEGIC INTERVENTIONS IN 5-YEAR MONITORING PLAN**

Strategic Intervention	2004/05	2005/06	2006/07	2007/08	2008/09
1. Umbrella programme for monitoring	█	████████████████████			
2. Governance model for monitoring	█				
3. Integrated monitoring plans for each WMA.	█	████████████████████			
4. Business plans for individual programmes.	█	█			
5. Feasibility study for water use monitoring.	█				
6. Business plan for Aquatic Ecosystem Health Monitoring.	█				
7. Guidelines and Standards		████████████████████			
8. Development of auditing responsibility.	█				
9. Scoping of technology for monitoring.			█		
10. Cost-benefit-analysis for monitoring.		█			
11. IT systems		████████████████████			
12. Capacity-building for integrated monitoring		████████████████████			
13. Pilot implementation		████████████████████			

**7.10 Cost-Benefit Analysis for Monitoring**

Monitoring represents an essential long-term investment in support of sustainable water resource development. While the strategic interventions discussed here are to make monitoring more effective and efficient, there has often been uncertainty about the overall investment that needs to be made into monitoring.

Guidance in this regard is essential at a time when we want to work towards a smaller, more efficient public service, want to delegate water resources management and monitoring to lower levels and are considering the outsourcing of the whole hydrological services. Research that would lead to some kind of benchmarking for monitoring is required.

### **7.11 Convergence of IT Systems**

Monitoring, in its full meaning, includes data management, information generation and dissemination. These components need to be supported by information systems. The existing national programmes are largely supported by the following systems:

Surface water: HYDSTRA

Groundwater: NGA/REGIS

Water Quality: WMS

Spatial: GIS

Water use information programmes should increasingly be supported by WARMS.

Convergence of all these systems is required in order to move towards the goal of an effective and efficient information service.

The umbrella programme for DWAF/Water Sector information and monitoring system co-ordination should also become the highest level driver for information system development.

### **7.12 Capacity Building for Monitoring**

Capacity to work towards the stated goal is seen as the most significant bottleneck, particularly the capacity in Regions. Working in a co-ordinated and programmatic way in the implementation of the 5 year plan for resource quality monitoring offers many opportunities for systematic capacity-building, and, where necessary, expansion.

Given the importance of this function, a new capacity building network for resource quality monitoring should be urgently considered under the FET-WATER programme. A special task team for capacity building should be established without delay under a new umbrella programme for monitoring.

### **7.13 Pilot Implementation**

In order to make rapid practical progress and allow a realistic assessment of the way forward with integrated monitoring, the full rollout of the 5-year plan in one pilot area is strongly proposed. This could be a water management area or a whole cluster.

The development of this proposal needs urgent consultation with Cluster Managers.



## 8. CONTRIBUTION TO DWAF STRATEGIC AND BUSINESS PLAN

This 5-year plan should only serve a once-off strategic planning purpose. Its outcomes should immediately be carried over into the normal DWAF planning and budgeting process.

### 8.1. 2005 - 2008 Strategic Plan

KFA 9 fully covers the national monitoring programmes, in particular under the Strategic Objectives:

- 9.3: *To establish, implement and maintain National Monitoring and Information Management system;*
- 9.4: *To ensure representative, capacitated and empowered staff for IWRM;*
- 9.5: *To ensure capacitated and informed stakeholders.*

The more operational monitoring and provision of technical and scientific support required at WMA level will have to be developed under KFA6 and KFA7. A Task Team from Head Office, Regional Co-ordinators and Clusters should develop such a Strategic Plan for 2005-8 as an immediate priority.

### 8.2. 2005/06 Business Plan

In the same way the 5-year Plan outcomes should be immediately worked into the 2005/06 Business Plan.

Areas of special growth have been identified for 2005/06, based on the following:

- the 2004/05 budget breakdown (*Table 2*),
- the capital budget growth requirements of existing programmes (*Figure 2*),
- the indications of growth for various new programmes (*Table 4*) and
- the strategic interventions (*Table 5*).

The required growth in the various functional areas in Head Office and Regions is shown in Table 6.

**Table 6: REQUIRED GROWTH IN MONITORING BUDGET FOR 2005/06.**

<i>Location</i>	<b>Data Acquisition</b>	<b>Data management</b>	<b>Information Gen/Diss</b>	<b>Monitoring infrastructure</b>	<b>Information Systems</b>	<b>TOTAL</b>
<i>HO</i>	-	-	-	<b>R25.0 m</b>	<b>R6.0 m</b>	<b>R38.0 m</b>
<i>Region</i>	<b>R3.0 m</b>	<b>R3.9 m</b>	<b>R1.0 m</b>			

The highest budgetary growth areas can be summarised as:

- increased data management and reporting capacity in Regions ,

- increased expansion of networks, in particular for surface water which has had no growth over the last 3 years,
- increased investment into information system development to work towards convergence of systems. This will lead to overall savings in the medium term.

The growth requirement in data management and information generation/dissemination in Regions has major human resources implications.

It is proposed that a major effort is made to achieve this budget growth for monitoring for 2005/06. If necessary it should be addressed through a DWAF request for supplementary budget.

For the next 3 year budget cycle, Management should set targets for a balancing of growth through required programme expansion and savings through a variety of measures, including integration within different monitoring functions and the application of new technologies. The current Task Team is not yet at a stage to provide recommendations in this regard. A number of the strategic interventions will work in this direction.

## 9. WAY FORWARD

No time and critical momentum should be lost in moving this plan forward, starting in DWAF internally and over time, externally. The following are seen as **immediate actions**:

- Management level interaction with clusters to agree on the plan and way forward
- Acceptance of plan at WRFMC and OpsCom
- Establishment of Information Management/Regional Co-ordination/Cluster Task Team to

work on, inter alia, the following:

1. Co-ordinated inputs in the DWAF 2005/06 – 2007/08 Strategic Plan and 2005/06 Business Plan
2. The development of the monitoring governance model.
3. Establishment of a Steering Committee for the umbrella programme as a component of the governance model.
4. Appointment of task teams for capacity building, information systems, rollout of the overall umbrella programme, etc.
5. Development of the plan to roll out the umbrella monitoring programme in one pilot area (WMA or cluster).
6. Improvement of DWAF-wide communication with regard to monitoring.

## 10. REFERENCES

**DWAF (2004): *Strategic Framework for National Water Resource Quality Monitoring Programmes* by DC Grobler and M Ntsaba. Report No. N/0000/REQ0204, Resource Quality Services, DWAF, Pretoria**

**DWAF (1998): *National Water Act (Act No. 36 of 1998)*. Republic of South Africa Government Gazette, Volume 398, Number 19182.**

*<http://www.usgs.gov/wicp>*

