AUTHORS

EXECUTIVE SUMMARY

Background

The Water Law Principles of 1996 clearly set the direction of the future of water resources management. The twin threads of sustainability and equity run through the Principles, the National Water Policy of 1997 and the National Water Act (Act 36 of 1998). The key to balancing sustainability and equity lies in the provisions for the Reserve, and in our ability to quantify a Reserve, as well as to manage water uses so as to meet the Reserve.

The move to integrated management of water resources, on an ecosystem basis, requires the introduction of a new set of tools for resource management, tools that are flexible, protective and can take account of extreme differences within South Africa, both in socio-economic conditions, and in natural variability of aquatic ecosystems.

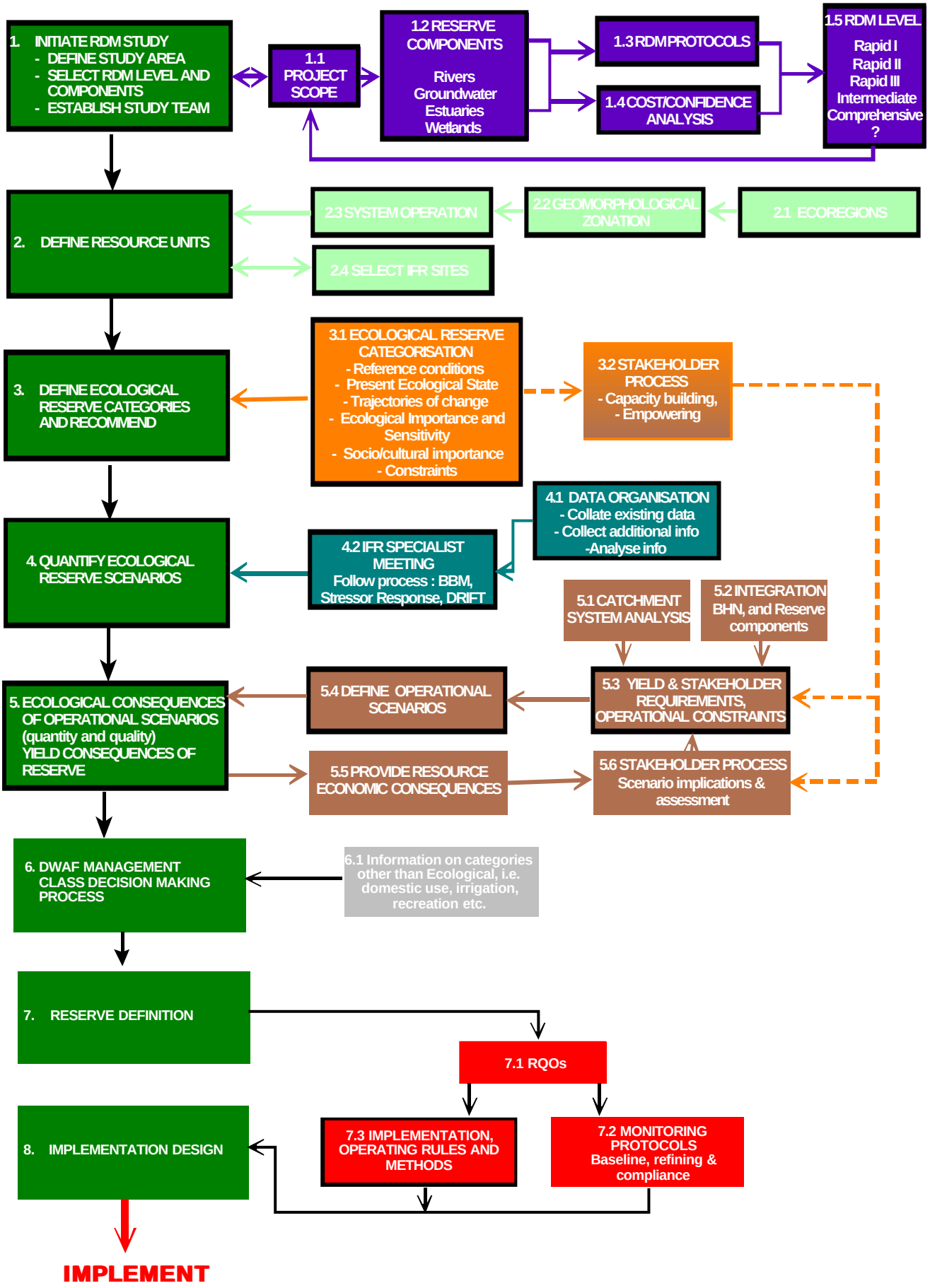
When the drafting of water legislation began in 1997, a selection of tools was already available which were in line with the new thinking arising from the Water Law Principles and the National Water Policy. The tools had not, at that time, been specifically tailored to fit the legislation (since the legislation itself had yet to be developed in detail), but it was clear that existing scientific approaches and procedures had the potential to serve as the foundation for a new suite of policy and regulatory tools for implementation of policy and legislation.

The Resource Directed Measures (RDM) project was initiated to develop existing and new tools for use in Reserve determinations. The RDM project resulted in a series of 15 volumes comprising the set: Resource Directed Measures for Protection of Water Resources. The aim of the volumes pertaining to rivers (quantity) was, within the framework of existing methodologies (such as the BBM), to devise more rapid methods.

This study

A revision of the RDM documents was initiated and this component of the study is specific to the rivers quantity component (Instream Flow Requirements - IFRs).

The product of the revision is a document that describes the theoretical basis of the methods and the sequential steps and numerical methods required to execute them. This report serves as the 'front-end main report"'. The refined process is guided by the annotated flow diagram below.


1. INITIATE RDM STUDY
- DEFINE STUDY AREA
- SELECT RDM LEVEL AND COMPONENTS
- ESTABLISH STUDY TEAM
1.1 PROJECT SCOPE
1.2 RESERVE COMPONENTS
Rivers
Groundwater
Estuaries
Wetlands
1.3 RDM PROTOCOLS
1.4 COST/CONFIDENCE ANALYSIS
1.5 RDM LEVEL
Rapid I
Rapid II
Rapid III
Intermediate
Comprehensive
?
2. DEFINE RESOURCE UNITS
2.3 SYSTEM OPERATION
2.2 GEOMORPHOLOGICAL ZONATION
2.1 ECOREGIONS
2.4 SELECT IFR SITES
3. DEFINE ECOLOGICAL RESERVE CATEGORIES AND RECOMMEND
3.1 ECOLOGICAL RESERVE CATEGORISATION
- Reference conditions
- Present Ecological State
- Trajectories of change
- Ecological Importance and Sensitivity
- Socio/cultural importance
- Constraints
3.2 STAKEHOLDER PROCESS
- Capacity building,
- Empowering
4. QUANTIFY ECOLOGICAL RESERVE SCENARIOS
4.1 DATA ORGANISATION
- Collate existing data
- Collect additional info
-Analyse info
4.2 IFR SPECIALIST MEETING
Follow process : BBM, Stressor Response, DRIFT
5.1 CATCHMENT SYSTEM ANALYSIS
5.2 INTEGRATION BHN, and Reserve components
5. ECOLOGICAL CONSEQUENCES OF OPERATIONAL SCENARIOS (quantity and quality)
YIELD CONSEQUENCES OF RESERVE
5.4 DEFINE OPERATIONAL SCENARIOS
5.3 YIELD & STAKEHOLDER REQUIREMENTS, OPERATIONAL CONSTRAINTS
5.5 PROVIDE RESOURCE ECONOMIC CONSEQUENCES
5.6 STAKEHOLDER PROCESS
Scenario implications & assessment
6. DWAF MANAGEMENT CLASS DECISION MAKING PROCESS
6.1 Information on categories other than Ecological, i.e. domestic use, irrigation, recreation etc.
7. RESERVE DEFINITION
7.1 RQOs
7.3 IMPLEMENTATION, OPERATING RULES AND METHODS
7.2 MONITORING PROTOCOLS
Baseline, refining & compliance
8. IMPLEMENTATION DESIGN
IMPLEMENT

The flow diagram was designed to accommodate the shortcomings identified in the generic procedure, previously utilised for RDM. The main problems are summarised below.

- The steps, provided only in the context of RDM, did not necessarily fit into the overall procedures required for Reserve determination.
- The procedure made reference to management classes which were incorrect as it should make reference to the ECOLOGICAL component of the Management Class only. The Management Class forms part of the classification procedure which has not yet been defined. This led to some confusion regarding the links between the Reserve, the ecological component of the Management Class and the classification process itself.
- The procedure has to be contextualised within the broader process that illustrates how it links to operation and implementation. Without these links, credibility of the recommended processes comes into question.
- The last steps in the procedure were problematic as they could not directly follow on from the previous step. Resource Quality Objectives (RQOs) and monitoring are linked to the final determined Management Class which comprises a separate process.
- The process does not cater for a range of Ecological Reserve Scenarios to be assessed. It also does not include any evaluation of other suggested scenarios which could achieve the same objectives as a recommended Ecological Reserve while meeting more of the user's requirements.

This report

This report contains a description of the basis for the new flow diagram and each of the main tasks are discussed with the emphasis on the blocks underlined in black which is specifically part of this TOR.

- Project scope : This section contains a description of the decision-making required to determine the Reserve components (river, wetland, groundwater etc) that needs to be addressed and the required detail.
- Resource Units : This section contains a description of the process required to identify homogenous units within the study area for which a Reserve must be determined as well as the process to select specific study sites within the Resource Units.
- Define Ecological Reserve Categories : This sections contains a summarised description of the technical process that is followed to determine the Present Ecological State of the river, the Ecological Importance and the definitions of various Ecological Reserve Categories.
- Quantifying Reserve scenarios : This section forms the key part of this document. A summary is provided on an assessment of all international instream flow methodologies undertaken for the Water Law Review. A description is provided of the conceptual basis of the Building Block Methodology (the currently accepted methodology to undertake comprehensive IFRs) as well as the sequence of events followed to apply the methodology. A short description is also provided of two additional methods which can provide comprehensive IFRs.
- Assessing operational scenarios : Reserve scenarios are generated during the previous section and in this section the different methods to integrate the results

are provided as well as detail regarding operational scenarios and the ecological assessment of the consequences of these scenarios.

- Implementation design : This chapter briefly refers to Resource Quality Objectives and Monitoring programmes as well as providing more detail of the ways in which the Reserve can be operated.

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C: A Decision Support System for an Initial Low-Confidence Estimate of the Quantity Component of the Ecological Reserve for Rivers (Hughes)

D: Ecological Importance and Sensitivity

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J: Procedure for assessing the Present Ecological Status and defining Ecological Reserve Categories (Louw - on hold)

ACRONYMS

BBM	Building Block Methodology
BHN	Basic Human Needs
CERM	Comprehensive Ecological Reserve Methodology
DRIFT	Downstream Response on Imposed Flow Transformations
DSS	Decision Support System
DWAF	Department of Water Affairs and Forestry
EIS	Ecological Importance and Sensitivity
IERM	Intermediate Ecological Reserve Methodology
IFR	Instream Flow Requirement
PES	Present Ecological State
RERM	Rapid Ecological Reserve Methodology
RQO	Resource Quality Objectives
SASS	South African Scoring System
SI	Socio/cultural importance
TOR	Terms of Reference
WR90	Water Resources 1990
WRC	Water Resource Commission
WRYM	Water Resources Yield Model