IMPLEMENTATION OF THE WATER RESOURCES CLASSIFICATION SYSTEM AND DETERMINATION OF THE RESOURCE QUALITY OBJECTIVES FOR SIGNIFICANT WATER RESOURCES IN THE LETABA CATCHMENT

PROJECT NUMBER: WP 10640

INCEPTION REPORT

SEPTEMBER 2012

Report Number: RDM/WMA02/00/CON/CLA/0112

water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

RIA08_2012

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
CHIEF DIRECTORATE: RESOURCE DIRECTED MEASURES

CLASSIFICATION OF WATER RESOURCES AND DETERMINATION OF THE RESOURCE QUALITY OBJECTIVES IN THE LETABA CATCHMENT

INCEPTION REPORT:

Report Number: RDM/WMA02/00/CON/CLA/0112

OCTOBER 2012

REFERENCE

This report is to be referred to in bibliographies as:

Department of Water Affairs, South Africa, October 2012. Classification of Water Resources and Determination of the Resource Quality Objectives in the Letaba Catchment. Prepared by*:* Rivers for Africa eFlows Consulting (Pty) Ltd.

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DEPARTMENT OF WATER AFFAIRS AND FORESTRY
CHIEF DIRECTORATE: RESOURCE DIRECTED MEASURES

CLASSIFICATION OF WATER RESOURCES AND DETERMINATION OF THE RESOURCE QUALITY OBJECTIVES IN THE LETABA CATCHMENT

INCEPTION REPORT: DRAFT

Report Number: RDM/WMA02/00/CON/CLA/0112

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ACKNOWLEDGEMENTS

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TERMINOLOGY AND ACRONYMS

BID	Background Information Document
CD:RDM	Chief Directorate: Resource Directed Measures
D:RQS	Directorate: Resource Quality Services
DAM	Desktop adjustment model
DRM	Desktop reserve model
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
ECs	Ecological Categories
EGS	Ecological Goods and Services
EGSA	Ecological Goods and Services Attributes
EI	Ecological Importance
EIS	Ecological Importance and Sensitivity
ES	Ecological Sensitivity
ER	Economic Region
EWR	Ecological Water Requirements
GDP	Gross Domestic Product
G&S	Goods and Services
HDI	Historically Disadvantaged Individuals
IFR	Instream Flow Requirements
IHI	Index of Habitat Integrity
IUA	Integrated Unit of Analysis
IWRM	Integrated Water Resources Monitoring
KNP	Kruger National Park
MC	Management class
NGO	Non Governmental Organization
PES	Present Ecological State
PMT	Progress Management Team
PSC	Project Steering Committee
PSP	Professional Service Provider
REC	Recommended Ecological Category
RDRM	Revised desktop reserve model
RHAM	Rapid Habitat Assessment Method
RQO	Resource Quality Objectives
RQS	Resource Quality Services
RWQO	Resource Water Quality Objective
RU	Resource Unit
SCI	Socio-Cultural importance
SPATSIM	Spatial and Time Series Information Modelling
SQ	Sub quaternary
TOR	Terms of Reference
TPC	Threshold of Potential Concern
VEGRAI	Vegetation Response Assessment Index
WIM	Water Impact Model
WMA	Water Management Area
WRC	Water Research Commission
WRCS	Water Resource Classification System
WRPM	Water Resources Planning Model
WRUI	Water resource use importance
WRYM	Water resources yield model

1 INTRODUCTION

1.1 BACKGROUND

The Chief Directorate: Resource Directed Measures (CD: RDM) of the Department of Water Affairs (DWA) initiated a study for the provision of professional services to undertake the implementation of the Water Resources Classification System (WRCS) and determination of the Resource Quality Objectives (RQOs) for significant water resources in the Letaba catchment. Rivers for Africa was appointed as the Professional Service Provider (PSP) to undertake this study

1.2 STUDY AREA OVERVIEW

The study area is the catchment of the Letaba River and illustrated in Figure 1.1.

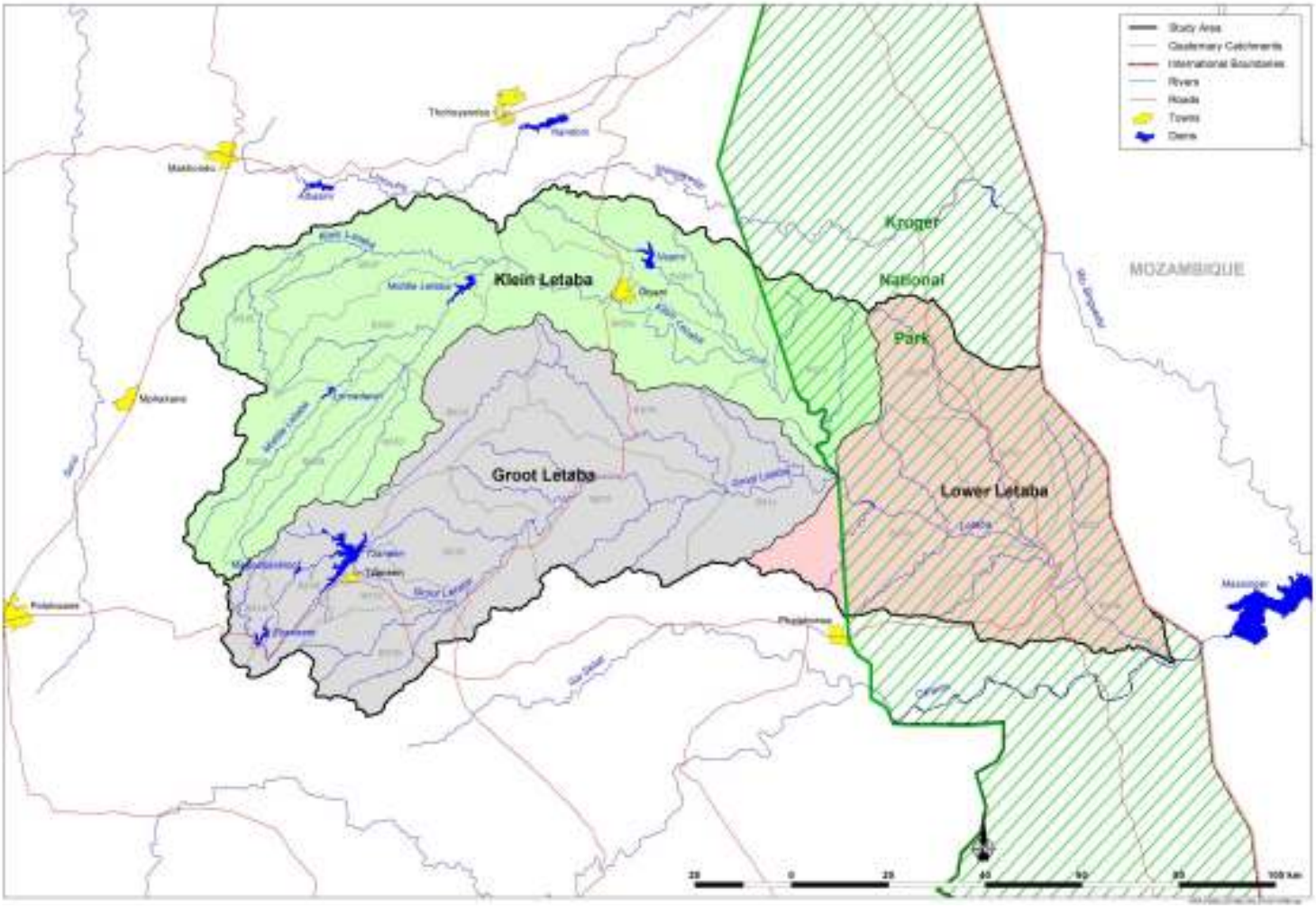

Figure 1.1 Study area: Letaba River Catchment

The Letaba catchment is located in the North East of South Africa. 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 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 low lying plains cover most of the WMA and have gentle to flat slopes.

The main urban areas are Tzaneen and Nkowankowa in the Groot Letaba River catchment and Giyani in the Klein Letaba River catchment. Approximately 80 to 90% of the population can be considered as rural, scattered throughout the WMA. A large proportion of the population depends on subsistence farming and this makes availability of water a vital subject for consideration.

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 average potential mean annual gross evaporation (as measured by S pan) ranges between 1 300mm in the extreme western mountainous region and 2 000mm in the northern and eastern areas. The highest 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. A wide spectrum of soils occur in the WMA, 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. 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.

From a groundwater region and response unit perspective, the catchment can be largely classified as Crystalline igneous and metamorphic basement rocks of Swazian to Randian age underlying the Lowveld region. Aquifers are predominantly secondary, with the exception of the alluvial deposits. The land surface has been dissected by erosion beginning in the early Cretaceous along the Escarpment which forms the western watershed to the early Miocene in the east.

The hydrogeology of the Letaba catchment is characterized by secondary or fractured aquifers formed by mainly metamorphic basement rocks of the Goudplaats Gneiss, Giyani and Gravelotte Greenstone belts, Igneous rocks of the Lebombo Granite, Makhutzi Granite, various younger granitoid intrusions of the Vorster Suite and gabbroic intrusions of the Rooiwater Suite Timbavati Gabbro. Intergranual aquifers (unconsolodiated to semi consolidated materials, with primary porosity) occurs on the Letaba River, mainly inside the Kruger Park.

2 AVAILABLE INFORMATION

2.1 HYDROLOGICAL DATA PREVIOUS AND PARALLEL STUDIES

The Letaba River system has been the subject of various studies including water resource analysis (hydrological), development planning investigations such as the recent completed '*Groot Letaba Water Resource Development Feasibility Study*' and the current study for the '*Development of a Reconciliation Strategy for the Luvuvhu and Letaba Water Supply System*'. Various Ecological Water Requirement (EWR) determination studies have been carried out in the study area and the Letaba River is one of the few river systems where the implementation of the EWR is taking place in accordance with the recommendations and tools from the study on the '*Development and Pilot Implementation of a Framework to Operationalise the Reserve*'.

It is important to note that a detail update of the hydrology and the development of high resolution network simulation models are being carried out as part of the above-mentioned Reconciliation Strategy Study. Application of that data in the Classification Study will be essential to ensure consistency in planning, operation and the selection of the appropriate management classes.

Members of this study team is responsible for the development of Reconciliation Strategy Study, which will be a significant advantage of this team with respect to study area knowledge as well as smooth integration and coordination.

2.2 RIVER RESERVE STUDIES

During 1994, an Instream Flow Requirements (IFR) study was undertaken for the Letaba River. This was one of the first IFR studies ever undertaken by DWA and the first IFR study where hydraulics were considered. This study was refined during 1996. The focus of these studies were downstream of Tzaneen Dam. A Comprehensive Reserve study was then undertaken and finalised in 2006. This study included seven EWR sites of which 5 are in the main river, one in the Letsitele and one in the Middle Letaba Rivers. This EWR study included a scenario phase and the output of this study was that a Scenario 6.2 was selected as the Reserve.

2.3 GROUNDWATER STUDIES

Information on the groundwater reserve is available in the document "Letaba Catchment Reserve Determination Study- Groundwater Report" that was produced in 2006. Tables are presented in the report representing calculated groundwater contributions to the reserve on a quaternary basis.

Information on groundwater resources will be available from the Letaba–Luvuvhu Reconciliation study. In terms of groundwater delineation: the study is evaluating borehole yields, groundwater use and groundwater exploitation potential by quaternary catchment, by lithology, and by water supply scheme. In addition, the study will quantify the impacts of abstraction on base flow. This will allow an assessment of the groundwater status.

3 INFORMATION AND REQUIREMENTS

3.1 WATER RESOURCE MODELLING

It is proposed that the water resource models and related hydrological data to be produced by the Reconciliation Strategy Study be applied for all water resource analyses in this study. It was originally determined during the proposal phase of this study that, according to the current programme of the Reconciliation Study the high resolution Water Resource Yield Model (WRYM) should be available by January 2013. This has now been adjusted due to some unforeseen problems with the Validation Study's landuse information, necessary for the hydrology preparation that is required to be reassessed. A variation order has been submitted to request that an additional landuse validation task be carried out in the Reconciliation Study. If this variation order is approved, the WRYM can be expected to be available in June 2013. Should the variation order be denied, the Reconciliation Study team will have to utilise the available landuse information to the best of their abilities, and while a WRYM will still be produced, the accuracy of the hydrology used may be questionable. While the water resource network is being configured, allowance will be made for the inclusion of the required nodes (to be identified as part of Task D3.2); this will prevent the need for reconfiguration and ensure all analyses are carried out consistently.

The remodelling of the hydrology will also include the modelling of the surface groundwater interactions, so that the impact of groundwater abstraction on baseflows can be quantified.

Scenario evaluation will be carried out with either the Water Resources Yield Model or Water Resource Planning Model. The selection of the model will be discussed with the Client prior to the execution of scenarios to be identified in Task D4.1.

3.2 RIVERINE RESERVE DETERMINATION

3.2.1 Present Ecological State (status quo) of biophysical nodes

A vital contribution to the classification study is the results of the ongoing study: Review and update of the desktop Present Ecological State (PES) and Ecological Importance (EI) – Ecological Sensitivity (ES) of South African rivers according to sub-quaternary catchments: Olifants Primary Catchment (WRC project number: K5/2041). It is virtually impossible to undertake the Classification without these results as has been identified during the current Vaal and Olifants Classification studies. The proposed study team has undertaken this work and the results are available.

3.2.2 Comprehensive Reserve results (2006) study

As mentioned in Chapter 2, the 2006 study was undertaken following previous outdated IFR studies. There are some minor problems with the results of this study, however the study team is aware of these and are of the opinion that the results are of sufficient standard to use in the WRCS. This therefore means that the focus of the EWR quantification during the WRCS will be on the desktop biophysical nodes.

3.2.3 Implementation of the Reserve

Most of the specialists on this study team was involved in the study: Development and Pilot Implementation of a Framework to Operationalise the Reserve (DWAF 2009). As the title implies, this study included pilot studies of which one was the Letaba River. This river is the only river where the Reserve is actively being implemented according to the operational rules designed as

part of the 2009 study. Cognisance will have to be taken in the WRCS study of this operation and it must be included in the modelling of the system. No audit has been undertaken on the success or current status of the monitoring. It is not proposed to do this as part of the study; however an overview of the status quo in terms of this study is proposed.

3.2.4 Biomonitoring activities

Biomonitoring has been taking place within the Kruger National Park (KNP) regularly and with a higher frequency since 2006. The DWAF 2009 operationalisation study also included a monitoring component. The Rapid Habitat Assessment Method (RHAM) was developed as part of the monitoring component and was pilot tested on the Letaba River amongst others. The emphasis was on the EWR sites on the Letaba River close to Die Eiland in Hans Merenski Nature Reserve (EWR 3) and on in the KNP (EWR 7). Monitoring in terms of the RHAM is still ongoing as part of a WRC KNP initiative and as members of this proposed study team as involved in this work, the results can be utilised, especially in the determination of the RQOs.

4 PROJECT PLAN

4.1 INTEGRATION OF WATER RESOURCE CLASSIFICATION SYSTEM AND RESOURCE QUALITY OBJECTIVE STEPS

According to the Terms of Reference (TOR) the main aim of this study is two-fold:

- To co-ordinate the implementation of the Water Resource Classification System (WRCS) in order to classify all significant water resources in the Letaba Catchment.
- To determine Resource Quality Objectives (RQOs) using the DWA procedures.

It is therefore evident that the Classification processes have to be applied within the scope of this study and that RQOs must be determined. Underlying these linked process, is also the eight step Reserve process. Even though the Reserve has been undertaken, any integration also has to consider the Reserve steps due to the extremely close relationship between these three processes. To ensure integration of these processes, Reserve determination documentation for Rivers (DWAF, 1999b; Kleynhans and Louw, 2007; DWAF, 2008a) and Estuaries (DWAF, 2008b) as well as the seven step procedure for determining the water resource class (DWAF, 2007b) and for RQOs and the associated guideline documentation (DWA, 2011c) were consulted by key specialists in the study team. Based on this information an integrated project plan and approach for this study was formulated. Due to the significant overlap within these three processes, the project plan focussed on designing an integrated process and steps. Furthermore, the lessons learnt during pilot studies on the WRCS (the Vaal River) (DWAF, 2007b) were incorporated into the design of this integrated process.

To emphasize the overlap within the various processes, all RQO steps are addressed and RQO generated either within the Reserve determination and/or the WRCS process. The two RQO toolkits that have been designed are impractical as most of the information cannot be supplied within Excel spreadsheets. These toolkits can however be used as a checklist, were report references are supplied where appropriate information is provided.

The integrated process is provided in Figure 4.1 and forms the basis of the scope of this study. The scope of the study is therefore designed around the INTEGRATED STEPS and not the individual process steps. Comments are made in the last column of the figure to indicate which steps of the Reserve has been undertaken, and what will be reviewed or updated as part of the RQO component of this study.

Figure 4.1 Integrated project plan derived from the Reserve, Classification and RQO steps and guidelines

4.2 CHALLENGES

4.2.1 Hydrology

All hydrology required for this study will be obtained from the Reconciliation Strategy Study. A detailed hydrology assessment is being undertaken in that study which should, for the first time, produce reliable hydrological records for the Letaba catchment. Impacts of groundwater are being included in the calibrations. The accuracy of the hydrology is, however, dependant on the land use information used for the rainfall-runoff simulations. There is currently a process in place to request that the land use information be updated (See Section 3.1) and the outcome of this request will impact on the accuracy of the hydrology obtained.

It is important to note that this study is dependent on information/deliverables produced by the Reconciliation Strategy Study team, and is regarded as a risk as any delays in producing the deliverable required by this study will have a direct impact on the study programme.

4.2.2 Output of the Reserve study

Reserve results are generated as an EWR rule which is a flow duration table. The natural simulated hydrology is used to generate the final output. If the hydrology changes, then the final EWR output is not valid anymore, especially if changes are significant. It was recognised that the hydrology used for the 2006 EWR study was outdated and it is likely that there will be significant changes. Therefore, the basis of the EWRs (dry and wet drought and maintenance EWRs) will have to be used to generate new EWR rules. The problem is further exacerbated as the EWR data and the scenarios that were developed towards the end of the study were not stored in the correct format in Spatial and Time Series Information Modelling (SPATSIM).

4.2.3 EWR estimates at desktop biophysical nodes

EWR estimates will have to be provided for a large number of desktop biophysical nodes. During previous studies, the Desktop Reserve Model and/or the Desktop Adjustment Model was used to estimate these results. These results were then modified in context of the present day hydrology to ensure that estimates (based on natural hydrology) did not exceed present day hydrology unless improvement is required. Present day hydrology, at subquaternary scale is therefore required and should be available if the hydrology issues as part of the Reconciliation Strategy Study is sorted out. This could impact on the confidence in the EWR estimates.

4.2.4 Availability of tools used in Reserve and RQO studies

Although some of the tools used during the Reserve determination process have been finalised and manuals provided (e.g. EcoStatus determination process manuals emanating from WRC project K8/619), some other tools are still under development or in an early stage of testing. An example is the process to determine EcoSpecs for fish using the output of the Rapid Habitat Assessment Method. The use and applicability of these tools will be assessed during the study at the time when they are required, and the most appropriate version available at that stage of the study will be used to generate the results. The study specialists will also attempt to be in continuous contact with the developers of the relevant models to ensure they are up to date regarding new approaches and developments. It is of utmost importance that the developers of these tools and models will be prepared to provide guidance, training and manuals to ensure proper and accurate application and results.

The Revised Desktop Reserve Model (RDRM) (Hughes *et al*., 2011) has been developed and documented. The revision was undertaken to provide desktop estimates for rivers with higher confidence and with direct ecological input compared to the existing Desktop Reserve Model. It is proposed to make use of this model in terms of estimating EWRs, but it is acknowledged that this model has not been rigorously tested and/or applied for numerous nodes.

4.2.5 Economic and economic related terminology

Economics, Socio economics and Ecosystems Goods, Services and Attributes: There are separate components of the study that deal with these aspects. Due to the confusion that often result in the use of the various terms (including Goods and Services, macro-economics and Ecosystem services), an explanation is provided below of the use of these terms within this study:

The economic components consider the formal and market linked economy. This relates to the aspects of the water usage that has a known or estimated value that can be measured as part of the overall economy of the catchment. This component is sometimes called “socio-economic” as changes to the economic usage of water and decisions made to alter resource allocation has a social impact. The social impact is often linked to employment creation (or loss of employment) and increases and decreases in wealth allocated to particular sectors of society.

Ecosystems Goods Services and Attributes (EGSA) (previously referred to as Goods & Services or EcoSystem services) refers to the usage of goods, services, and attributes linked to the resource in question. Usage is often, although not always, by communities that are vulnerable and defined as poor. The use of these goods and services is not captured in formal market analysis. This is of particular importance within the context of this study. Ecosystem services can provide values that contribute to overall economic wellbeing but because these services are supplied without a formal “market” intervention these are often ignored or underestimated.

4.3 STUDY RISKS AND UNCERTAINTIES

A number of factors have been identified that could have a significant influence on the execution and completion of the Classification of Water Resources and Determination of the Resource Quality Objectives in the Letaba Catchment. These factors could influence both the cost and the timing of the study. Table 4.1 provides a summary of the activities in the study along with the possible delays, associated cost implications and an explanation of these.

Table 4.1 Possible delays to the study programme and additional costs resulting from Study uncertainties.

Task description	Duration (weeks)		Comment
	Possible Duration Delay (weeks)	Possible Increase in Cost (R excl VAT)	
Task D1.1: Water resources component	12	N/A	The study is dependent on information/deliverables (water resource network and infrastructure information) produced by the Reconciliation Strategy Study team, and is regarded as a risk as any delays in producing the deliverable required by this study will have a direct impact on the study programme.
Task D3.1: Setting up system model and provision of natural and present day data	12	N/A	The study is dependant on hydrology produced in the Reconciliation Strategy Study. The risk to this study is that the level of confidence in the results produced is directly dependant on the hydrology obtained from the Reconciliation Strategy Study. Hydrology will be obtained from the study, but depending on outside factors (for example the approval of a variation order) one of three levels of hydrology will be provided: A: If the approval to undergo a detailed validation of land use takes place, high resolution, high confidence hydrology will be produced and made available for this study. If the variation order is denied, one of two possibilities remain: B: High resolution low confidence (because of poor land use data) hydrology will be produced. C: The existing hydrology which is a low resolution and low confidence will be used.
Task D4.5 Water quality consequences: Availability of Resource Water Quality Objectives	n/a	n/a	Interim Resource Water Quality Objectives (RWQOs) require a detailed stakeholder process and or DWA workshops to set up or verify RWQOs, The proposal was clear that existing information only will be used and no stakeholder process. If RWQOs are not available, the approach will be meetings with DWA: Water Quality Planning and national and regional water quality DWA personnel. The alternative approach would for example also include the use of water quality guidelines and undertaking a desktop verification process with the water quality DWA team, Should this proposed approach be followed, it is assumed that further work in the catchment will be undertaken by DWA: Water Quality Planning, as done for the Vaal catchment. The information provided during this study will therefore be the initiation of the RWQO and RQO process, and will include the updating of ecological water quality objectives by using EcoSpecs available from Reserve studies.
Task D4.6 Preliminary Management Classes	n/a	n/a	Inclusion of NFEPA results would be aided by providing results for each SQ reach in an Excel spreadsheet. A table with the motivations for each NFEPA is also crucial and this is apparently not readily available.The risk is that the NFEPA information will not be adequately included in the Management Classes. Work is currently underway with RQS, DWA attempting to extract some of the information in a user-friendly format.

5 SCOPE OF WORK: PROJECT MANAGEMENT, INCEPTION, AND INFORMATION COLLATION

5.1 TASK A - PROJECT MANAGEMENT

The objective of this task is to ensure effective, efficient and pro-active management. The aim is to ensure that comprehensive technical documents that details the results of a successful study process be delivered on time, on budget and as per brief. This task requires a multi-disciplinary team and the management structure has been designed accordingly

5.1.1 A1 Project Management Meetings (Progress meetings)

The proposal caters for 5 Progress management team (PMT) meetings to be held in Pretoria. The Client has accepted responsibility for the provision of venues and dates of the meetings as well as providing the agenda and the minutes. A detailed progress report will be provided prior to every meeting by the Consultant. An additional PMT meeting, which serves as the inaugural or inception meeting, will be held at the initiation of the study to approve the inception report.

Task responsibility: Louw, Van Rooyen, Mullins, Lotter

Actions

- Prepare progress reports.
- Participate in meetings.

Deliverables and milestones

- Progress reports – Deliverable 1.

Responsibility of the Consultant

- Preparation of the progress reports and participation in the meetings.
- The Consultant is not responsible for the logistical arrangements of meetings (only their own travel and participation), the agenda and the minutes.

5.1.2 A2 Technical team management and coordination

Integration and coordination between the various tasks is essential as well as the technical management of the tasks. All coordination within, and between tasks (i.e. between task leaders) are included here.

Task responsibility: Louw D, Koekemoer S, Mullins W, Van Rooyen

Actions

- Continuous liaison.

5.1.3 A3 Project Steering Committees

Stakeholders representing specific sectors of society (e.g. agriculture, mines, government (local, provincial and national), conservation) will be identified and asked to serve on a Project Steering Committee (PSC) for the duration (18 months to two years) of this project. The PSC members will provide representative inputs and perspectives, ensure strategy implementation and provide strategic advice and guidance.

Three meetings are allowed for in the budget of this task. Meetings are to be held in Tzaneen. In preparation for the meetings, invitation letters and proposed agendas will be distributed to the PSC members providing them with sufficient information about the status of the project, the purpose of the meetings and what will be expected of them (e.g. read through documents prior to the meeting

and provide inputs and comments). After each meeting, the minutes of the meeting will be distributed to all those who have attended the meeting. Supporting documents (consisting of an updated Background Information Document (BID)) will be sent to the PSC members two weeks before the meeting and minutes within two weeks after the meeting.

It is proposed that PSC meetings be held as follows and with the proposed main items for discussion:

PSC meeting 1: February/March 2013

Discussion: Status quo assessment and delineation of Integrated Unit of Analysis (IUAs). Identification of priority areas and desktop biophysical nodes. Catchment visioning for IUAs based on Status Quo.

PSC meeting 2: September/October 2013

Discussion: EWR results for EWR sites.
Selecting and defining operational scenarios.

PSC meeting 3: March 2014

Discussion: Consequences of operational scenarios (estuary, river, economics, EGSA).
Presentation of Management Classes (MC).
RQOs.

Task responsibility: Lotter A, Louw D, Van Rooyen P, Mullins W

Information required

- Confirmation on PSC members and updates to that as the process unfolds.
- Sufficient information as per the discussion points above at least one month before each meeting

Actions

- Keep PSC member list as was provided by the DWA updated throughout the process.
- Invite stakeholders to become members of the PSC.
- Two weeks before each meeting, compile invitation letter and agenda and distribute electronically to all PSC members.
- Compile minutes of each meeting and distribute within two weeks after each meeting.
- Obtain approval from DWA for the distribution of all documents prior to distribution.
- Arrange logistics for all meetings (arrangement of venue, catering (if not held at DWA), printing of attendance registers and related supporting documents, arrangement of projector and laptop).

Deliverables and milestones

- Invitation letters, agendas, attendance registers and minutes of the PSC meetings as mentioned above.
- PSC membership list.
- Invitation letter to identified stakeholders to become a member of the PSC.
- Terms of Reference for the PSC.
- Project Steering Committee meetings (Deliverable 2)

Responsibility of the Consultant

- Confirmation of information to be discussed at each meeting one month before the meeting.
- Approval of the DWA on all documents that will be made public prior to distribution.
- Inviting PSC members to attend meetings – however consultants will not be responsible to ensure attendance of any member.

5.1.4 A4 Financial management

Financial management consists of the management of the project budget including the monthly invoices, budget balancing and cash flow projections. Invoices will be time and cost based as per contract. Monthly invoices will be provided if work has been undertaken for the study as well as a monthly summary progress report.

Task responsibility: Mallory, Louw

Actions

- Prepare monthly cash flow projections.
- Prepare minimum of monthly invoices.
- Provide summary progress report to accompany invoices.

Deliverables and milestones

- Invoices and cash flow projections – Deliverable 3.

5.2 TASK B - PROJECT INCEPTION

The objective of the project planning and process integration task is to produce a concise, clear and unambiguous Inception Report. This is required to ensure that the Client, and consultants are clear as to the deliverables, timing and budget of the programme. The inception phase will consist of:

- Team liaison to refine the approach, project plan and plan the inception report.
- Meeting with DWA to present the approach, project plan and programme.
- Provision of a draft and then final Inception Report.
- Appointment of sub-consultants.

Task responsibility: Louw D, Scherman P, Van Rooyen P, Lotter A, Cloete R, Huggins G, Koekemoer S, Mallory H

Information required:

- Information from DWA regarding Rapid Reserves and the Intermediate and Comprehensive Reserves on the Letaba Rivers.
- Hydrological models and setups as they become available.

Actions

- Internal planning liaison.
- DWA inception meeting (see Task A1.)

Deliverables and milestones

- DWA inception meeting (12 October 2012)
- Draft Inception Report: September 2012 – Report 1.
- Sub-consultants appointed: October 2012 – Deliverable 4.

Responsibility of the Consultant

- Ensuring that agreement is reached during negotiations and are incorporated in the Inception Report and conveyed to the rest of the team.
- Appoint the sub-consultants as approved by the DWA. Note however that the Consultant cannot be held responsible if indicated specialists resign or leave their work – however it is the responsibility of the consultant to find suitable replacements. Any replacements must be agreed on by the Consultant and the Client.

5.3 TASK C - WATER RESOURCE INFORMATION AND DATA GATHERING (HYDROLOGICAL MODELLING AND RESERVE)

The information on the water resources will be based on the current hydrological and modelling tasks of the Reconciliation Study. This data will be at high resolution and appropriate level of confidence. No gathering of data will be required since the same team members will be involved in both studies. It is proposed a summary of the data and information be prepared in line with the Classification Study procedures.

In preparation for the identification of the IUAs and biophysical nodes, a description of the water resource components, operating rules and relevant development planning consideration will be compiled.

The proposed study team is not aware of any catchment wide water quality model for the study area and therefore detail simulations of water quality will not be possible in the Classification Study. (A comprehensive literature review has been carried out for the reconciliation Strategy Study and therefore will not be repeated in this study).

Reserve information will be obtained from existing reports and the DWA database.

Task responsibility: Van Rooyen P, Louw D, Koekemoer, Haasbroek B,

Information required

- Information from previous study reports.
- Information from the DWA Reserve database and DWA directorates active in the study area.
- All available flow and dam balance information from DWA.

Actions

- Data gathering and desktop analysis of available information.

Deliverables and milestones

- Data availability tables - November 2012 (Deliverable 5).

Responsibility of the Consultant

- Collect, collate and review of all the required water resources information available.

5.4 TASK D - DETERMINATION OF THE MANAGEMENT CLASS AND RQOs

This task forms the major components of the study and is addressed in Chapter 5 according to a hierarchical task structure which is summarised in Table 5.1.

Table 5.1 Tasks and subtasks proposed for this study

TASK STRUCTURE
TASK A- PROJECT MANAGEMENT
A1 Project Management Meetings (Progress meetings)
A2 Technical team management and coordination
A3 Project steering committees
A4 Financial management
TASK B - PROJECT INCEPTION
Task B1: Inception report planning
Task B2: Inception report
Task B3: Mobilisation of study team
TASK C: WATER RESOURCE INFORMATION AND DATA GATHERING
TASK D: DETERMINE MANAGEMENT CLASS & RQO: TASK STRUCTURE

TASK STRUCTURE
TASK D1: DELINEATE IOA & DESCRIBE STATUS QUO
Task D1.1 Water resources component
Task D1.2 Economic Component
Task D1.3: Goods & Services component
Task D1.4: Water Quality Status Quo
Task D1.5 Rivers and associated aquatic ecosystems
Task D1.6: Integration of above components to identify and define IUAs
Task D1.7: Identification of river biophysical nodes and level of assessment.
Task D1.8: Status Quo Report
TASK D2: LINK VALUE AND CONDITION
Task D2.1 Stakeholder Identification and database compilation
Task D2.2 Project Announcement (BID and Advertisement)
Task D2.3 Issues and Response Report
TASK D3: QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY EGSAS
Task D3.1 Setting up system model and provision of natural and present day data.
Task D3.2 EWRs for key biophysical nodes (EWR sites)
Task D3.3 EWRs for desktop biophysical nodes
Task D3.4 Consequences of G & S at sites where the REC is an improvement of the PES
Task D3.5 EWR report
TASK D4 IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES
Task D4.1 Identification of scenarios
Task D4.2 Ecological consequences
Task D4.3 Economic consequences
Task D4.4 G&S consequences
Task D4.5 Water quality consequences
Task D4.6 Integration of consequences to provide preliminary Management Class for stakeholder evaluation
TASK D5: STAKEHOLDER INVOLVEMENT
Task D5.1 Newsletters
Task D5.2 Public meeting
TASK D6 RQO
Task D6.1 EcoSpecs & TPCs
Task D6.2 Non-ecological water quality
Task D6.1 Groundwater RQO's
TASK D7: STEP 7 PREPARING INFORMATION FOR GAZETTING (TEMPLATES)
TASK D8: CAPACITY BUILDING
Training session 1: Introductory workshop, incl. integration
Training session 2: Status quo workshop
Training session 3: Yield modelling workshop
TASK D9: MAIN REPORT

6 DETERMINATION OF THE MANAGEMENT CLASS & RQOS: TASK D

6.1 TASK D1: DESCRIBE STATUS QUO, DELINEATE IUAs AND RUs, IDENTIFY BIOPHYSICAL NODES

The objective of defining Integrated Units of Analysis (IUAs) is to establish broader-scale units for assessing the socio-economic implications of different catchment configuration scenarios and to report on ecological conditions at a sub-quaternary (SQ) scale. IUAs are therefore a combination of the socio-economic zones defined in watershed boundaries, within which ecological information is provided at a finer scale.

The objective of this task is to describe and document the status quo which includes various components such as water use, economy, EGSA, river and wetland ecology and to identify water quality problems. This information is used to define the IUAs. The process is summarised in a flow diagram, Figure 6.1. Once the IUAs are delineated, biophysical nodes must be identified for different levels of EWR assessment.

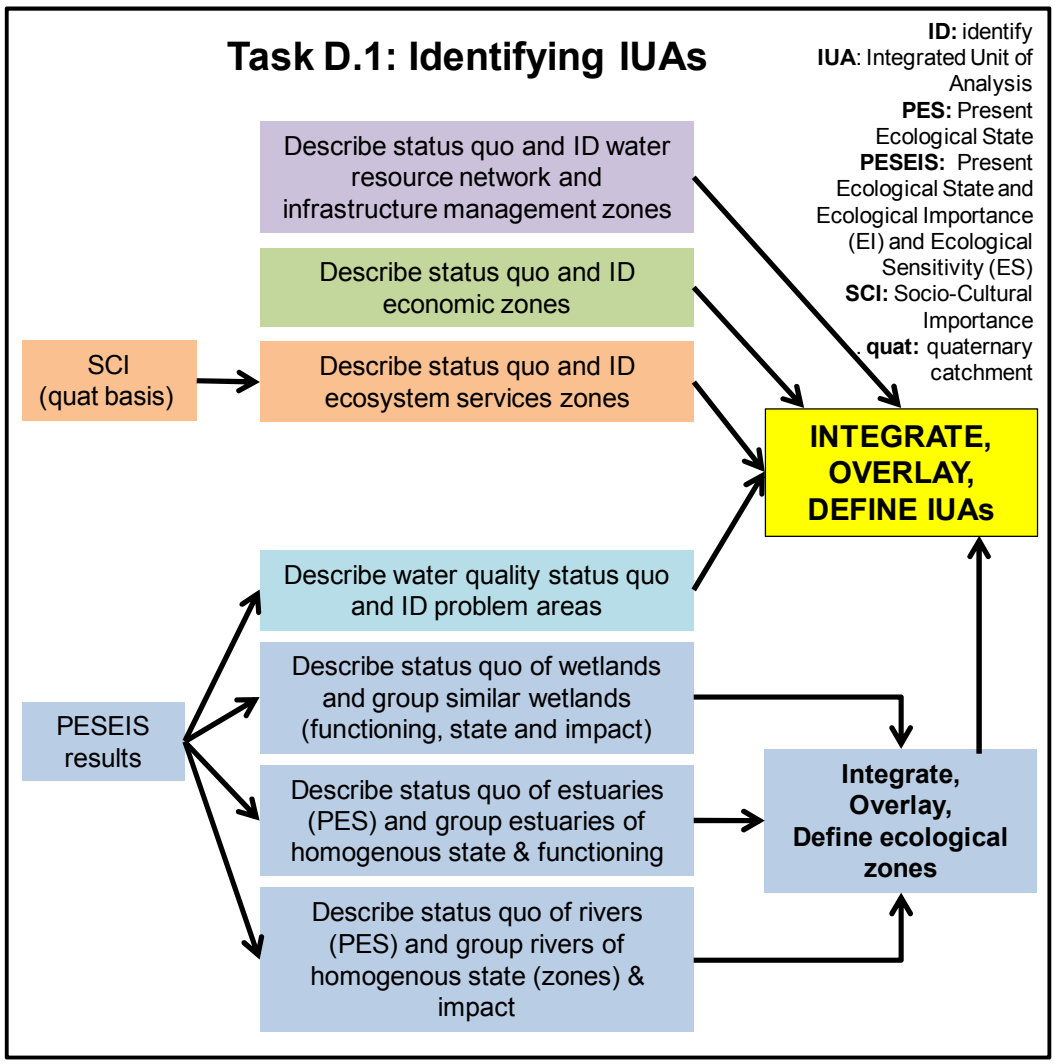

Figure 6.1 Summary of process to identify IUAs

6.1.1 Task D1.1: Water resources component

The water resource network and infrastructure information from the Reconciliation Strategy Study will be assessed for the purpose of defining the IUAs, identification of nodes and sites with respect to water abstraction infrastructure. Operational and development planning information from the

Reconciliation Strategy Study as well as other planning processes will be integrated in the definition of the IUAs and nodes. The most up to date information on the water use as well as data for possible future scenarios will be summarised for use in the scenario evaluation task.

A consolidated description of the water resource network and infrastructure will be compiled and all nodes for analysis will be identified and presented. Coordination with the Reconciliation Strategy Study will ensure appropriate nodes are built into the models.

Task responsibility: Van Rooyen, Seago.

Information required

- Schematics of all model networks and configurations.
- Reports of all available hydrological, yield and/or WRPM studies done in the WRPM Information of Reconciliation Strategy Maintenance Study, including operational and other scenarios.

Actions

- Develop map of all important land and water use information, major dams (including planned), points with acceptable observed data and planned operational strategies. Also an indication of level of modelled data confidence.
- Develop summary of all major water and land uses.
- Undertake a Water Resource Use Importance (WRUI) assessment

Deliverables and milestones

- Spreadsheets with WRUI results: December 2012 – Deliverable 6
- Status quo of water resources described and operational zones defined: December 2012 – Deliverable 6.

6.1.2 Task D1.2: Economic component

It is proposed that the Letaba River catchment be sub-divided into eight (8) economic regions to accommodate the different climatic and economic realities of the catchment. The factors considered for the sub-division of the catchment included the climatic conditions, the economic activities, the operation of the water resources infrastructure and the scheduled water use per hectare in the case of irrigation agriculture.

The Letaba catchment has four distinct socio-economic characteristics which can be described as follows:

i. the high commercial forestry and irrigation agriculture with its high value crops, such as citrus, avocados and bananas, located in the headwaters of the Great Letaba catchment and the Letsitele and Nwanedzi tributaries are complemented by the large irrigation areas situated along the lower sections of the river; furthermore the catchment also has agro-industries such as canning and juice plants;
ii. the irrigated agriculture upstream of the Middle Letaba Dam where nearly 50% of the country's tomatoes are produced,
iii. the residential areas of the Great Letaba and Klein Letaba catchments. The Letaba River catchment hosts two major urban centres namely Giyani and Tzaneen, and
iv. the tourism sector which is situated in the upper reaches of the Great Letaba and below the confluence with the Klein Letaba into the world renowned Kruger National Park.

It is proposed that the main stem of the Great Letaba River catchment be divided into three economic regions plus the Kruger National Park as a forth one, namely ER 1 to ER 3 and ER 8 (the Kruger National Park). Two of the tributaries namely the Letsitele and Molototsi will be

analysed as separate economic regions namely ER 4 and ER 5. Deliberation of these regions will be based on hydrological and biophysical considerations with an agro-hydrologic system approach.

The Middle and Klein Letaba catchment will include the economic regions, ER 6 and ER 7 respectively. The latter regions will be kept separated from the Great Letaba system as they differ in terms of economic make-up.

For each economic region, the water users and user sectors dependent on the water supplies in each region will be identified.

The present-day socio-economic status of the whole catchment will be described and quantified based on the economic social level using appropriate economic and social models.

In the Letaba Catchment it is necessary to model the value of water used by each of the main water users that exist within each sub-system. These water users include:

- Irrigated Agriculture that includes orchard crops and vegetables.
- Game Farming outside the Kruger National Park and eco-tourism activities in and outside the Kruger National Park.
- Commercial Forestry.
- Domestic Households, especially the rural communities.
- Industry, such as the saw mills and juice factories.

For analysing the social-economic situation, the following econometric model approach will be used to determine the current situation of the Letaba Catchment:

- Macro-economic models driven by water, based on the Limpopo SAM (Water Impact Model).
- Scoring system for scenario evaluation.

The socio-economics perspective study will therefore require an assessment of the socio-economic impacts to be undertaken. To accomplish this, an econometric model approach based on the input-output model will have to construct for each of the Economic Regions. The Water Impact Model (WIM) will be used to express the socio-economic impacts. The WIM is in the form of a dynamic computerised water entitlement model which can be used to identify and quantify the following indicators:

- Economic benefits.
- Maximum possible water reduction.
- Capitalised impact.

The first step to calculate the macro-economy of each of the Economic Regions in the Great, Middle and Klein Letaba River catchments will be to identify and establish the detailed water users in terms of volume currently used. In the case of irrigation and commercial forestry the detailed areas under production is determined together with the different crops produced.

A WIM will be constructed for the catchment and the identified ERs. The model is driven by the level of production output in the specific region. It measures the social and economic effects on irrigation agriculture, commercial forestry and industry. For agriculture the model can accommodate up to ten individual products and for forestry it makes provision for pine and gum sub-species.

The following impacts will be estimated by the WIM:

- Gross Domestic Product (GDP).
- Low Income Households and Total Households.
- Employment Creation.

Task responsibility: Mullins, Cloete, Majoro

Information required

- Hydrology: Volume of water used per activity per catchment (domestic, irrigation, and industry).
- Information to be collected by Mosaka Economists which includes:
    - Irrigation database: Hectares, crops specification, production budget requirements (ton/ha), labour requirements for the different users in this sector.
    - Commercial Forestry: Production budget
    - Heavy Industry: Saw Mills (forestry beneficiation).

Actions

- Analysis of economic activity for the catchment and disaggregating of activities into regions:
- Develop applicable Water Impact Model (WIM) for each Economic Regions.

Deliverables and milestones

- Prepare Economic Region baseline of the major water users for the Status Quo Report (Report 2): December 2012 – Deliverable 7.
- Economic regions map with quantification of economic sectors per region (provided in the Status Quo Report, Report 2).

6.1.3 Task D1.3: Ecosystem Goods, Services and Attributes component

The present-day socio-economic status of the whole catchment will be described, based on the economic and social importance assessed from a literature review as well as mapping information and site visits if required. Where quantitative data is not available a qualitative description will be provided. The objective of describing communities and their well-being within each socio-economic region to provide the baseline against which to estimate changes in social wellbeing for each of the catchment configuration scenarios evaluated. This requires a description of the levels of financial, physical, human, social and natural capital available to each community, and constructing a measure or index of social well-being from the data collected.

Some information on the Ecological Goods and Services (EGSA) of the Letaba is available and will be used for this purpose. It should be noted that the objective in describing and valuing the use of aquatic ecosystems is to determine the way in which aquatic ecosystems are currently being used in each socio-economic region, and to estimate the value generated by that use. This will provide the baseline against which the socio-economic and ecological implications of different catchment configuration scenarios can be compared.

It is important to point out that while EGSA will be identified and described in qualitative terms, a baseline value can often only be described for some of these, as the information required is not available without investing in a costly survey. As such it is therefore more practical to measure changes in Ecological Goods and Services Attributes (EGSA) values relative to a reference point rather than computing a baseline value. As such values with importance of ECSA is analysed in this step and the value will be attached as an output of Tasks 4 and 5 (Steps 4 and 5).

Water quality input to Reserve Goods and Services studies will be assessed and provide water quality information as required.

Task responsibility: Huggins

Information required

- Economic information.
- Demographic information.

- Maps of the study area and Economic Zones.

Actions

- Identifying EGSA, provide importance and complete a Socio-Cultural Importance evaluation.

Deliverables and milestones

- Delineating and describing communities that are deemed to be important with respect to EGSA. : December 2012 – Deliverable 8.
- SCI importance for quaternary catchments

Responsibility of the Consultant

- Provision of the Status Quo EGSA component.

6.1.4 Task D1.4: Water Quality Status Quo

This task will utilize all available information to identify water quality issues and problems in the catchment, including areas outside of the ecological biophysical nodes and EWR sites. Present state assessments will therefore be conducted where data are available and where water quality hot spots have been identified. The Reserve results area available for the catchment.

Task responsibility: **Scherman**

Information required

- Water quality metric information from the PESEIS project.
- All Reserve-related water quality data currently available for sites in the WMA.

Actions

- Water quality analysis and producing a map showing water quality hotspots, with associated reasons.

Deliverables and milestones

- Water quality component of the Status Quo Report: December 2013 – Deliverable D9.

6.1.5 Task D1.5: Rivers and associated aquatic ecosystems

Currently a country wide study, commissioned by DWA and the WRC is being undertaken to determine the PES and Ecological Importance (EI) – Ecological Sensitivity (ES) of South African Rivers at sub-quaternary (SQ) level. SQ reaches are delineated on the basis of hydrological changes, i.e. at tributary confluences and is provided by DWA: Resource Quality Services (RQS). Each of the SQ reaches represents a Resource Unit (RU), i.e. the length of river for which a status assessment and EWR assessment will be valid for.

The Present Ecological State (PES) information used as part of this process will therefore be sourced from the desktop PESEIS study. It is imperative that DWA should give guidance and make the final decision on which EI and ES ratings should be used (i.e. those based on medians, maximums, etc.) as it is contained in the final model.

During this task, existing information on wetlands obtained from the Reserve study and the PESEIS information will be used to group river related wetlands and to determine importance. The wetland status quo assessments will also be incorporated and used together with the river information to define the ecological zones. All of the above mentioned information will be captured in excel spreadsheets that will allow integration of the different parameters or metrics considered (such as river PES, river EI, river ES, wetland PES, wetland EIS).

The water resource zones will be used as an indication of how the system is being operated and the different land uses. Within these (as these zones are usually at a larger scale than the final IUAs), the different Ecological Categories (ECs) for each of the SQ reaches (approximately 78) will be assessed and grouped according to similarity of impacts and state.

Task responsibility: Kotze P, Louw D, Mackenzie J, Deacon A, Huggins G, Koekemoer S

Information required

- PESEIS results in the required format (available).
- Wetland and water quality information in the correct format.
- Economic and hydrology zones.

Actions

- Specialist session to integrate results, overlay and determine ecological zones. Status quo will also be summarised

Deliverables and milestones

- Status quo assessment of rivers and wetlands (PESEIS) and identified ecological areas of homogenous state: January 2013 - Deliverable 10.

Responsibility of the Consultant

- The consultant is not responsible for developing a process on how to use EIS information when determining the REC.

6.1.6 Task D1.6: Integration of above components to identify and define IUAs

All information generated during the preceding tasks will be used to integrate the results by overlaying the different zones and defining the IUAs (Figure 6.1). These IUAs will be presented to the steering committee and the final IUAs documented in the Status Quo Report.

Task responsibility: **Louw,** Mullins, Van Rooyen, Huggins

Information required

- Maps illustrating the outcomes of all information emanating from Tasks D1.1 to D1.6.

Actions

- Meeting.

Deliverables and milestones

- IUAs identified and mapped: February 2013 - Deliverable 11

6.1.7 Task D1.7: Identification of river biophysical nodes and level of assessment

IUAs are a combination of the socio-economic region defined in watershed boundaries, within which ecological information is provided at a finer scale. This requires that biophysical nodes be nested within the IUAs (DWA, 2007b). As a starting point, each SQ reach being assessed will represent a biophysical node. Due to the large number of nodes, the process described in the Classification guideline (which refers to the Desktop EcoClassification and the identification of hotspots (Louw & Huggins, 2007)) will be used to identify the final nodes for which EWRs will be assessed and at what level. The focus will be on the desktop biophysical nodes, as the EWRs from the Reserve study are accepted.

The process used is described in Figure 6.2 and relies on the results of the PESEIS study. The total number of initial biophysical zones is 77 river nodes. It is proposed that all the nodes are considered in terms of ecological requirements, but that approximately 50 be selected for EWR estimation. Nodes that will not be used for estimation are those with its source in the KNP and those with no water resource demands on them (often ephemeral drainage lines).

As part of this assessment, the Water Resource Use Importance (WRUI) must be undertaken as well as the Socio-Cultural Importance (SCI). These will likely be undertaken on a sub quaternary scale but grouped where similar.

Task responsibility: **Louw,** Koekemoer, Kotze, Mackenzie

Actions

- Specialist meeting (part of Task D1.5).

Deliverables and milestones

- River biophysical nodes (which can include wetlands) and level of EWR assessment identified: January 2013 – Deliverable 12.

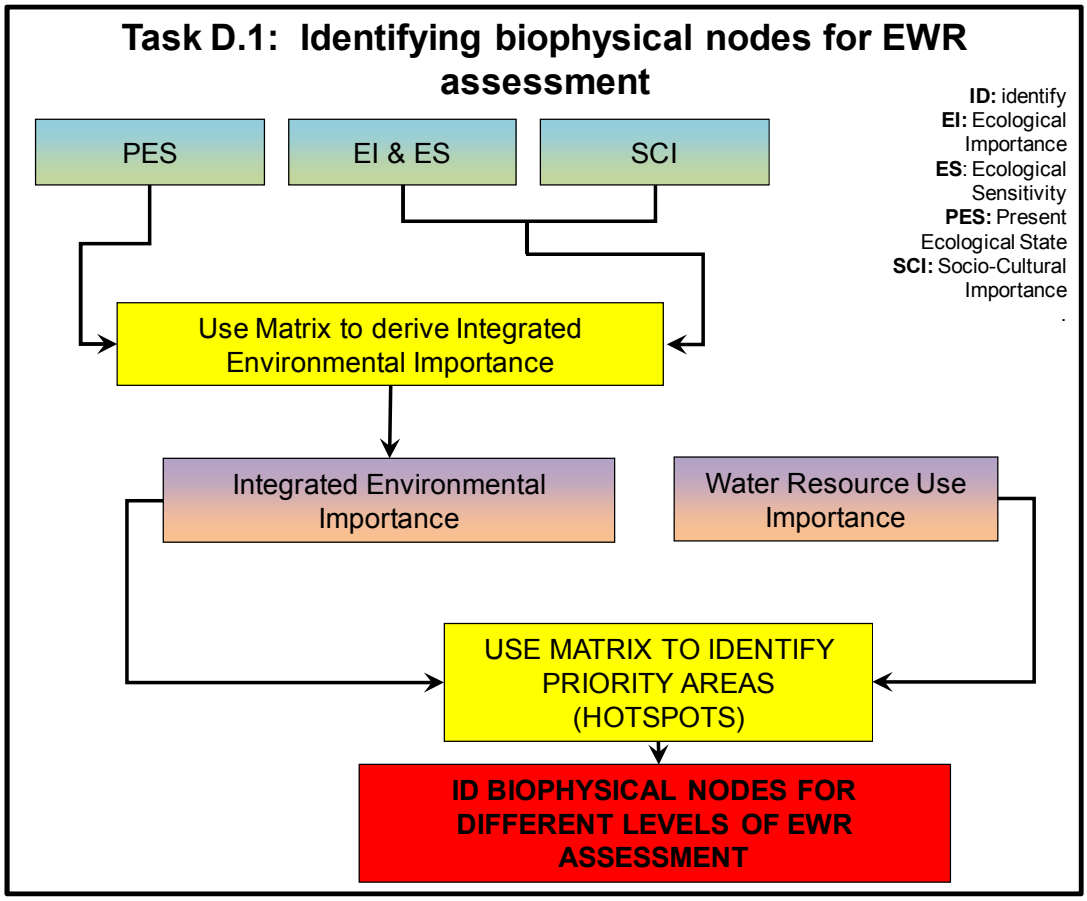

Figure 6.2 Summary of the process to identify biophysical nodes for EWR assessment

6.1.8 Task D1.8 Status Quo Report

All the above information will be documented in a report which will provide the approach, reasoning and results regarding the selection and locality of biophysical nodes and IUAs.

Task responsibility: Louw D, Koekemoer, Mallory

Deliverables and milestones

- First draft Status Quo Report: March 2013 – Report 2 which includes all information generated during Tasks D1.1 - D1.9.

Responsibility of the Consultant

- The client is not responsible for developing guidelines on how to use the EI and ES in making REC recommendations. This guideline should be provided by DWA.
- The consultant is not responsible for any change in programme due to a delay in the provision of the PESEIS data which forms the backbone to the ecological input into this study

6.2 TASK D2: LINK VALUE AND CONDITION

6.2.1 Task D2.1 Stakeholder identification and database compilation

The identification of stakeholders will be on-going, refined throughout the process as the on-the-ground understanding of interested and affected stakeholders improves through interaction with various stakeholders in the Letaba. The identification of key stakeholders for this project is important and will be done in collaboration with the Department, and stakeholders in the study area.

Stakeholders' details will be captured on an electronic database management software programme (Maximiser 9.0) that automatically categorises every mailing to stakeholders, thus providing an on-going record of communications.

Typically, our team would identify relevant stakeholders representing the following sectors of society:

- National, provincial and local government (relevant local and district municipalities);
- Conservation, environment, water, agriculture, forestry and Non-Government Organisations (NGOs);
- Private sector (mining, business, industries) in the vicinity;
- Civil society; and
- Regional and local media.

The draft database will be compiled during the first few weeks of the project implementation period; however a database is dynamic and will be constantly updated as more information becomes available and as stakeholder information change.

Task responsibility: Lotter, Bambisa, Mphake

Information required

- Names and contact details of stakeholders that the DWA specifically would like to be included in the database.

Actions

- Compilation of an electronic stakeholder database.
- Updating and managing the database throughout the project.

Deliverables and milestones

- Electronic stakeholder database (First draft version to be available for review by 30 November 2012) (Deliverable 14a).

Responsibility of the Consultant

- To obtain approval for all documents from DWA before distribution.
-

6.2.2 Task D2.2 Project announcement (BID and Advertisement)

After the Inception Report is approved a Background Information Document (BID) will be compiled for distribution to all stakeholders listed in the database. The purpose of this document will be to announce that the DWA is undertaking the classification process of significant water resources in the Letaba catchment, the process to be followed, anticipated activities, proposed time lines as well as how stakeholders can become involved in the project.

The BID will be accompanied by an announcement letter and a comment/reply sheet to provide people the opportunity to comment on the classification study and to register as a stakeholder or provide names of other possible stakeholders.

This document will also aim to explain the necessity of the project and the context of the study. Information such as where more information can be obtained, the web address for downloading of information, etc will also be shared. At this early stage in the project stakeholders will be requested to provide their comments and inputs. Responses will be captured in an Issues and Responses Report.

Media advertisements

An advertisement will be compiled and submitted to the DWA for placement in newspapers/magazines distributed in the Letaba catchment. The objective of the advertisement will be to announce the project and to invite stakeholder participation. The DWA will arrange and pay for the placement of the advertisements.

Task responsibility: Lotter, Bambisa, Mphake

Information required

- Inputs into the BID – relevant information.

Actions

- Compilation of a BID, reply/comment sheet, announcement letter and distribution thereof to the stakeholders listed in the database.
- Compilation of advertisement copy.

Deliverables and milestones

- BID (Deliverable 13), reply/comment sheet, announcement letter (Deliverable 14c) to be distributed by 15 December 2012. Draft to DWA by November 2012.
- Advertisement copy to be submitted to DWA by 30 November 2012 (Deliverable14b).

Responsibility of the Consultant

- To obtain approval for all documents from DWA before distribution.
- The consultant is not responsible for payments of the advertisements. As agreed with DWA, they will submit media releases and advertisements and the Consultant is responsible for the payment.

6.2.3 Task D2.3 Issues and Responses Report

An Issues and Responses Report will be compiled and kept updated for the duration of the contract. This report will list all the comments from stakeholders (to be received from comment sheets, at meetings, via telephone calls, etc) and responses from the project team. Towards the end of the project, one consolidated Issues and Response Report will be available – recording all the issues and comments raised throughout the project duration.

Task responsibility: Lotter, Bambisa, Mphake

Information required

- Inputs into the Issues and Response Report – relevant information.

Actions

- Compilation of an Issues and Response Report.

Deliverables and milestones

- Issues and Response Report – consolidated version will be available at the end of the contract period. Deliverable 14d

6.3 TASK D3: STEP 3 – QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY EGSAS

6.3.1 Task D3.1: Setting up system model and provision of natural and present day data

Since the Reconciliation Strategy Study will produce high resolution models suitable for analysis of biophysical nodes, it is anticipated that only minor adjustment will have to be made to account for particular requirements for the Classification Study.

Historical time series simulation analyses will be undertaken to generate Natural and Present Day monthly time series for all nodes. All the results will be prepared in properly indexed spread sheets for use at the EWR determination workshops.

Significant groundwater resources will be identified in the study area based on the hydrological analysis from the Reconciliation Strategy Study. Particular attention will be given to area where the groundwater-surface interaction is prominent and potentially would influence river base flow.

Task responsibility: Van Rooyen, Seago, Scheepers, Haasbroek, Sikosana, Sami, Reneke, De Sousa, Talanda

Information required

- WRYM configurations
- Required biophysical nodes

Actions

- Run WRYM and obtain required natural and present day data

Deliverables and milestones

- System model set up with all nodes
- Provision of natural and present day hydrology at all nodes: June 2013 – Deliverable D15

Responsibility of the Consultant

- The Consultant is not responsible for a delay in programme if the VO on the Reconciliation Strategy Study is not approved.

6.3.2 Task D3.2: EWRs for key biophysical nodes (EWR sites)

During the previous Reserve study, scenario 6.2 was selected as the final agreed on scenario to be signed off as the Reserve. The flow duration table (the Reserve output (a .rul table)) is however not in the correct format stored within the Spatial and Time Series Information Modelling (SPATSIM) framework so that adjustments can be made and changes where required for future scenario evaluation. Furthermore, as the hydrology has changed, new EWRs will have to be generated based on the original habitat requirements. During this task, the existing results will be converted within SPATSIM if possible. Additional work and monitoring have taken place specifically focussed on EWR 3 (Letaba River close to Die Eiland Resort) and on EWR 7 in the KNP. Due to the higher confidence in these sites, they should act as drivers for decision-making on scenarios.

Task responsibility: Louw D, Hughes

Information required

- Require revised natural flow regime at the EWR sites from Task D3.1.
- Require the previous study's EWR results – original and scenarios.

Actions

- Source available data
- Regeneration of EWRs and the rules associated with the scenarios.

Deliverables and milestones

- Modified EWR rules: July 2013 (Deliverable D16)

Responsibility of the Consultant

- The consultant is not responsible for redoing a Comprehensive EWR if the results with the new hydrology indicate that there are problems. In this (unlikely) situation, the EWRs will be adjusted with available information

6.3.3 Task D3.3: EWRs for desktop biophysical nodes

One of the requirements of the Classification System (DWAF, 2007b) is the assessment of the Reserve by means of estimating EWRs at approximately 50 desktop biophysical nodes. The estimation process designed for use in the Upper Vaal, Mokolo, Inkomati, Crocodile and Sabie Rivers (Louw *et al*., 2006) will be used to determine whether sites can be extrapolated (Kleynhans *et al*., 2008) from EWR sites or whether appropriate models must be used to estimate the EWRs. As a first option, the RDRM will be used rather than the Desktop Adjustment Model (DAM) (Birkhead, 2008) or the Desktop Reserve Model (DRM). It must be noted that this will be the first time that the RDRM will used for so many sites and if any problems arise, the DAM will be used.

The output of this task will be the standard requirement, i.e. the rule files for the REC at each EWR site. The EcoClassification information from the PESEIS study will be used to determine the REC at each of the nodes. It is important to note that the models that will be used are not appropriate where present day hydrology is higher than natural.

Task responsibility: Louw, Birkhead, Hughes

Information required

- PESEIS information.

Actions

- Natural and present day hydrology at each desktop biophysical nodes.

Deliverables and milestones

- EWR rule and tab tables: July 2013 – Deliverable 17.

Responsibility of the Consultant

- The consultant is not responsible for developing or applying an ecological similarity process to determine where estimation can be used from EWR sites.
- The consultant is not responsible for developing new models. All attempts will be made to use the most appropriate model/s to estimate EWRs. Required adjustments will be made if it is possible within the scope of this project.

6.3.4 Task D3.4: Consequences of EGSA at sites where the REC is an improvement of the PES

Where the REC is an improvement on the PES at the desktop biophysical nodes, a qualitative statement will be made that will describe the likely outcome and significance of a REC that improves conditions beyond that of the PES. This qualitative statement will consider the improvements that will be required which one assumes will be mostly flow related. This will be confined to a description of changes for communities that have a livelihood dependence on the resources under consideration and the significance that the change may bring about. Only EGSA that are a) likely to change under scenarios and b) are important to vulnerable or critical communities will be described or c) have a critical non market economic impact.

Task responsibility: **Huggins,**

Information required

- List of EWR and or other critical geographic entities where the REC is a change from the PES.

Actions

- Qualitative analysis of the EWR and or other critical geographic entities where the REC is a change from the PES.

Deliverables and milestones

- Consequences arising from analysis of the EWR and or other critical geographic entities where the REC is a change from the PES: July 2013 - Deliverable 18 included in Report 3.

6.3.5 Task D3.5 EWR report

All the above information will be documented in a report which will provide information on the hydrology and systems model, as well the results and output of all the other tasks.

Task responsibility: Louw, Koekemoer, Mallory

Deliverables and milestones

- First draft EWR Report: August 2013 – Report 3

6.4 TASK D4: IDENTIFICATION AND EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES

This task is associated with step 4 and 5 of the WRCS. In practice, these two steps function as one and are integrated as Task 4 (or step 4 within the integrated approach).

6.4.1 Task D4.1: Identification of scenarios

Operating scenarios will be defined in accordance with the Reconciliation Strategy Study. The scenarios will be based on the Reconciliation scenarios and integrated scenarios will be identified for this study. Any other recent planning information of proposed developments will be obtained and applied.

Scenario definition and EWR class selection will be carried out in the scenarios definition meetings (usually the progress and steering committee meetings) where the baseline water resource reconciliation status will be presented for each IUA. Members of the study team are intimately involved in the development of the Reconciliation Strategy. This will ensure alignment and enhance integration in the formulation of coherent scenarios.

The water resource model will be configured for each scenario by incorporating the required EWR rule definitions where appropriate. The proposed approach for determining the usable water will be as follows:

Systems supplying urban users:

In these IUAs an analysis of the additional augmentation that would be required to supply the urban sector (relative to the baseline scenario) will be carried out. The additional augmentation needs will be used in the Socio-economic analysis to determine the relevant consequences.

Systems supplying irrigation users:

In IUA areas where irrigation water use is present analysis will be carried out to determine by how much the irrigation will have to be reduced to achieve the selected ecological flow requirements and maintain their baseline assurance of supply. This information will be used in the Socio-Economic assessment to quantify the relevant consequences.

It is assumed for budgeting purposes that there will be a total of **ten** scenarios analysed based on the historical time series. It is further proposed that stochastic risk analysis of **two** scenarios be carried out.

Water resource analysis information will be described in chapters of the relevant task report. Appropriate graphical and tabular summaries of the results will be prepared in annexure of the reports.

Task responsibility: **Van Rooyen P**, Louw D, Hughes D

Information required

- Reconciliation Strategy Study outcomes for inputs into operating scenarios
- Proposed developments
- EWR Rule definitions

Actions

- Source the information required.
- Define scenarios in conjunction with DWA.
- DWA to select and confirm the final operational scenarios.
- Conduct water resource analysis for selected scenarios.

Deliverables and milestones

- Operational scenarios defined and agreed on by DWA: Sep 2013 - Deliverable 19.
- The scenarios definitions, analysis, assumptions and results: January 2014 – Contribution to Report 4

Responsibility of the Consultant

- The consultant is responsible for facilitating the process to define the operational scenarios but is not responsible for the final decision making.
- The consultant is responsible for analysing the selected scenarios (to a maximum of 6 scenarios) (selected by DWA) that have been budgeted for under this.

6.4.2 Task D4.2: River ecological consequences

At the key biophysical nodes (EWR sites), each operational scenario will be evaluated and the impact on the Ecological Category determined. This assessment forms part of the EcoClassification process where the rule-based models are used in a predictive manner. A specialist meeting will be held during which the assessment will take place. The maximum operational scenarios that can be considered are four per system.

As no detailed field work on the desktop biophysical nodes will be undertaken, estimated changes in flows for different ECs cannot be directly related to the responses of biota and the change in functions and attributes for each of these. Broad based assumptions only can be made.

Task responsibility: Louw D, Kotze P, Mackenzie J, Deacon A, Scherman P, Huggins G, Koekemoer S, Rountree M

Information required

- Final agreed scenarios from DWA.

Actions

- Determine an approach on how to use to assess scenarios as the information is not set up to use Habitat Flow Stressor Response

Deliverables and milestones

- Ecological consequences of operational scenarios: October 2013 - Deliverable D20 as part of Report 4

Responsibility of the Consultant

- Co-ordinating and facilitating the specialist meeting where the EcoStatus of the river for each operational flow scenario will be determined.
- Translating the flow scenarios to the required format, and providing specialists with the templates and instructions of what is required.
- Integrating the results and providing the ecological consequences and recommendations.
- Undertaking the logistical arrangements for the consulting team.
- The consultant is not responsible for analysing more than 6 flow scenarios per system.

6.4.3 Task D4.3: Economic consequences

The task of estimating the impact of any water allocation changes can only be implemented once the operational scenarios are available. The application of the WIM to estimate the economic consequences of operational scenarios together with the scoring system will be utilized to determine the relative impact of the water availability change.

Firstly, the WIM will be used to determine the current situation, which will be extended with the use of a multiplier methodology for use in calculating the impact of any water supply changes. It will be expressed in ratios on economic indicators such as GDP/Water, Labour/Water and also the different household's Income/Water. This will be derived from the sectors used in the current situation modeling such as irrigation agriculture. Furthermore, ratios will be determined on each specific economic region identified. It will, as was determined for the current situation impacts, also be expressed in terms of the indicators GDP, Employment Creation, and the distribution of income to the Low Income Households and Total Households. It will, for this analysis, identify the changes if; i.e. water is reduced at a specific catchment in the irrigation sector. This strategy will assist in evaluating the most acceptable option to classify the river system from an economic viewpoint.

Task responsibility: Mullins W, Cloete R, Majoro T

Information required

- Hydrological results.

Actions

- Analysis of operational scenarios determining economic impacts.

Deliverables and milestones

- Economic consequences of operational scenarios: October 2013 - Deliverable D21 as part of Report 4.

6.4.4 Task D4.4: EGSA consequences

Assessment of the impacts of the various scenarios essentially identifies the direction of change (either positive or negative) and estimates the magnitude of the change in benefits and costs that may be experienced within the river system. The process adopted will ensure the analysis of potential economic changes based on a valuation of the status quo, that is, the value of the EGSA currently provided by the water in Letaba River, identifying the potential change that each of the key EGSA may undergo in each of the scenario clusters. Where required the current value of EGSA is multiplied by these factors for each scenario, to provide an indication of the potential future value of the EGSA. The change in value is thus measured as a magnitude of impact and is not costed in "rands and cents". The magnitude of change is estimated by the relevant specialists but facilitated by the EGSA task leader. EGSAs that are considered are those that are a) of

consequence to identified communities and b) likely to change under identified scenarios. This will be addressed during the workshop as set out above.

Task responsibility: Huggins G

Information required

- Input at workshop from key specialists with respect to populating the EGSA matrix.

Actions

- Workshop and consequent report and matrix production that sets out the consequences of operational scenarios of critical EGSA.

Deliverables and milestones

- EGSA consequences of operational scenarios: October 2013 - Deliverable D22 as part of Report 4.

6.4.5 Task D4.5: Water quality consequences (other than water quality consequences associated with the ecological component)

Step 5 of the WRCS is broadly named "assess water quality implications" and includes identifying water quality users and present state. An important factor is assessing the assimilative capacity of the water resource and impacts on downstream users. Determining the levels of protection needed for various users is critical and important information needed by DWA to effectively manage the system.

The following tasks will be undertaken:

- *Assessment of status quo:* to be undertaken as part of Task D1. Note that this task also covers area outside of the ecological biophysical nodes and EWR sites. Present state assessments will therefore be conducted where data are available and where water quality hot spots have been identified.
- *Water quality modelling* to inform the loading of salts and available assimilative capacity. Note that this step can only be conducted at high confidence if a water quality model of the catchment is available and a structured process for pre-screening is available. As water quality modelling is not part of the TOR for this study, water quality modelling undertaken for previous studies (e.g. the reconciliation strategy) will be used as far as possible for the consideration of situations where water quality has to be evaluated for supporting the downstream portions of the catchment. Alternatively load calculations will be conducted where considered applicable. An approach for dealing with nutrients will be designed as part of the study, utilizing a hotspot area related to nutrient enrichment.
- *Water quality consequences* of the selected catchment configuration scenarios will be derived as part of the scenario assessment step, and at points where such scenarios are applicable. This task relates to this task at water quality hotspot areas outside of EWR sites and biophysical nodes.
- *Fitness-for-use for all users* will be assessed using any interim Resource Water Quality Objectives (RWQOs) already designed for the Letaba catchment. Any ecological/ ecosystem objective will be updated using higher confidence water quality EcoSpecs (or ecological specifications) available from the Reserve study. This step will therefore include the comparison of RWQOs and EcoSpecs for the system, and amalgamation and comparison of objectives for all users and the resource base, where information are available. Concentrations at IUA outflow nodes will therefore be tested against water quality requirements of users in the downstream IUA. Note that concentrations will only be determined for selected variables and in water quality hotspot areas.

The cost estimate does not include additional water quality modelling. Requirements for such modelling will be flagged where necessary, although an approach will be developed for nutrients. Note that it is critical for the PSP to liaise with DWA: Water Quality Planning, both at the national level and any water quality personnel in the region.

Task responsibility: **Scherman**

Information required

- Water quality EcoSpecs available for previous Reserve studies.
- RWQOs if produced.

Actions

- Liaison with DWA: Water Quality Planning, both at the national and regional level, in terms of an approach that meets their requirements, data availability and the review of results.

Deliverables and milestones

- An assessment of whether current levels of protection are adequate for the system.
- Water quality consequences of operational scenarios: October 2013 - Deliverable D23 as part of Report 4.

Responsibility of the Consultant

- The Consultant will not undertake stakeholder or DWA workshops for this task, other than input to stakeholder workshops as required during the study.
- Additional water quality modelling will not be undertaken. Requirements for such modelling will be flagged where necessary, although an approach will be developed for nutrients

6.4.6 Task D4.6: Integration of consequences to provide preliminary Management Class for stakeholder evaluation.

All of the above consequences will be considered to determine the preliminary Management Classes (MC) which will be recommended by the study team and DWA and presented to stakeholders (refer to Task D5). At this stage there are no guidelines that are practical to integrate the different consequences and describe the Management Class. If no process is developed in the interim, a qualitative process will be followed with reasoning and arguments being provided for the recommended Management Classes (similar to the Vaal Classification process) (DWA, 2012, *in prep*.)

Task responsibility: Louw D, Scherman P, Mullins W, Van Rooyen P, Huggins G

Actions

- Specialist meeting.

Deliverables and milestones

- Recommended operational scenarios, preliminary Management Classes for stakeholder evaluation and report: January 2014 - Deliverable D24 and February - 2014 – Report 4.

Responsibility of the Consultant

- The consultant is not responsible for applying Multi-Criteria Decision Making approaches unless a specific approach is recommended by DWA and can be accommodated within the existing budget.

6.5 TASK D5: STAKEHOLDER INVOLVEMENT

6.5.1 Task D5.1 Newsletters

Three editions of a Letaba Catchment newsletter, specifically for this project will be produced during the contract period. The purpose of the newsletter will be to provide the broader range of stakeholders updated information on progress made with the project.

The newsletter will be distributed to all stakeholders listed in the stakeholder database. The newsletters will be distributed as follows:

Edition 1: April 2013 (Content based on discussions at 1st PSC meeting)
Edition 2: November 2013 (Content based on discussions at 2nd PSC meeting)
Edition 3: April / May 2014 (Content based on discussions at 3rd PSC meeting)

Please note that the first communication received by stakeholders will be the BID announcing the project in December 2012.

Task responsibility: Lotter, Bambisa, Mphake

Actions

- Compile, print and distribute three editions of the newsletter to the stakeholders listed in the database.

Deliverables and milestones

- Three editions of newsletters (Deliverable D25a (Apr, Nov 2013, May 2014).

Responsibility of the Consultant

- Prior approval of document contents from DWA before printing and distribution of the newsletters.

6.5.2 Task D5.2 Public meeting:

A public meeting will be held with the objective to inform the broader stakeholder base of the progress made with the meeting and to obtain their inputs and comments with regards to the technical work completed to date. Specifically, the following will be presented:

- Operational scenarios, consequences and recommended scenario
- Preliminary management classes based on recommended scenario
- Qualitative RQOs

The meeting will be held in June/July 2014 in the greater Tzaneen area. Before the meeting an invitation letter with a reply/comment sheet and an agenda will be distributed to all on the stakeholder database. Edition 3 of the Letaba Catchment newsletter will be used to provide sufficient information to stakeholders to ensure their productive and meaningful participation at the meeting. Minutes of the meeting will be produced and distributed within two weeks after the meeting.

Task responsibility: Lotter, Bambisa, Mphake

Actions

- Compilation and distribution of an invitation letter, reply/comment sheet and agenda.
- Arrange logistics for the public meeting (arrangement of venue, catering, printing of attendance registers and related supporting documents, arrangement of projector and laptop).
- Compilation and distribution of minutes within two weeks after the meeting.

Deliverables and milestones

- Public meeting (Deliverable 25b, July 2014)

6.6 TASK D6: RESOURCE QUALITY OBJECTIVES

Figure 6.3 is modified from DWA 2011 and illustrates the approach to achieve the RQOs.

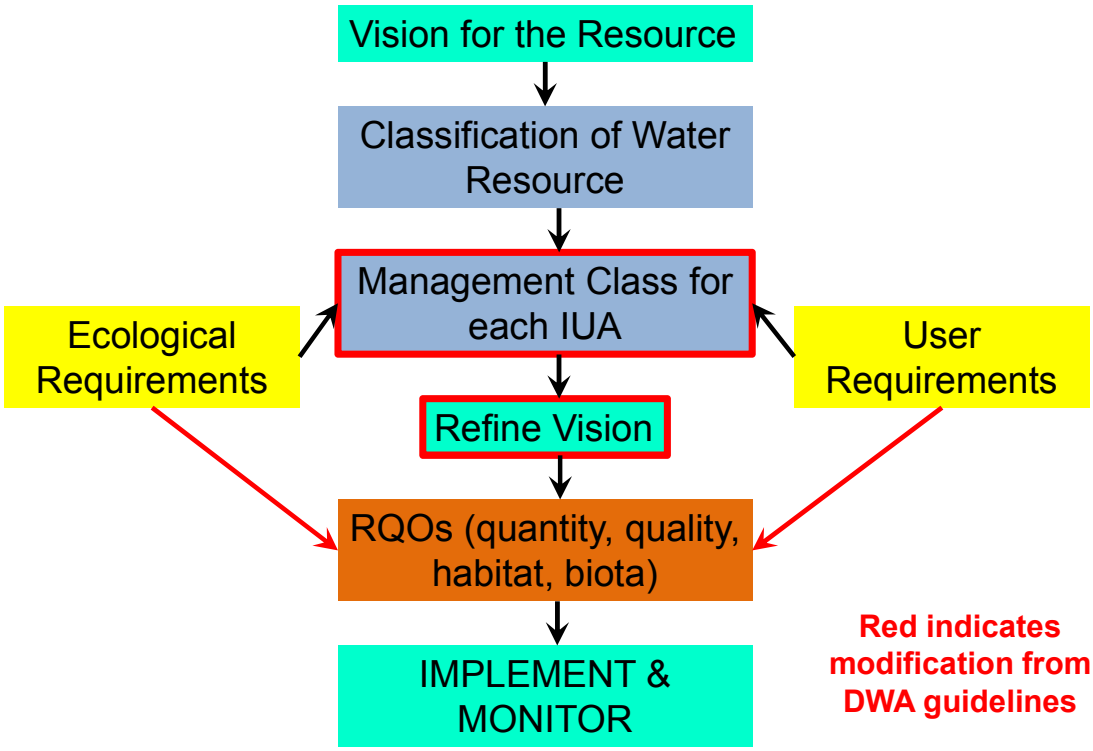

Figure 6.3 RQO process

Figure 6.4 illustrates the relationship between numerical and descriptive RQOs and the tasks where the results are generated. This task D6 integrates all the information in the other tasks and generates any RQO results that have not yet been generated.

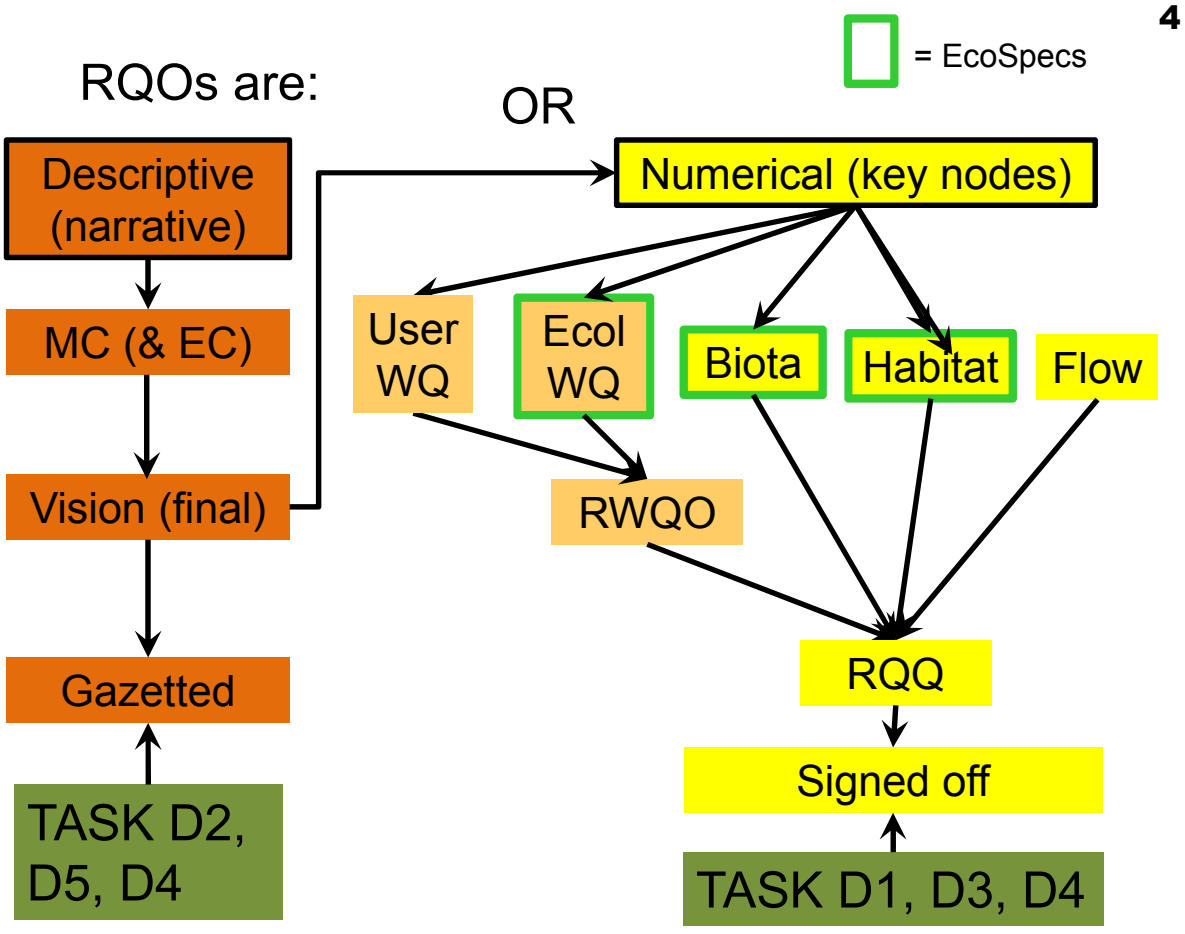

Figure 6.4 Descriptive and numerical RQOs

The only steps within RQOs which are therefore not addressed within previous tasks (as shown in the integration diagram – Figure 3.1), are the groundwater RQOs, the determination of Ecological Specifications (EcoSpecs) and Thresholds of Potential Concerns (TPCs) as well as addressing RQOs for water quality aspects which are not part of the Ecological Reserve. Both of these aspects are described below and these aspects will be combined in Report 10.

6.6.1 Task D6.1: EcoSpecs and Thresholds of Potential Concerns

The objective of this task is to determine the EcoSpecs (the ecological component of RQOs) for the recommended EC and link the ECs to TPCs (Thresholds of Potential Concerns). EcoSpecs will be set for flow, quality, habitat and biota. The quality and flow EcoSpecs are dependent on a decision regarding an acceptable operational scenario as the Ecological Reserve and Management Class. The habitat and biota EcoSpecs must be linked to the relevant category and will be quantified as far as possible. Detailed EcoSpecs can only be provided for the key biophysical nodes whereas broad qualitative statements only can be made for the desktop biophysical nodes.

The Consultant is aware that D:RQS is in the process of method development of determining EcoSpecs and TPCs (*Pers. Comm*. Dr. N. Kleynhans) for rivers. The Consultant will use the most applicable and latest available information and tools at the stage when this Task commences. The Consultant will therefore attempt to liaise with the developers on a continual basis to keep updated regarding the status of new developments. Should the new developments not be available for use, those methods applied in previous studies (Upper Vaal River, Crocodile East, and Mokolo River Reserve studies) will be applied and adapted for the purpose of the current study.

General wetland RQOs will also be included in this section.

The RQO toolkit (Excel spreadsheet) will be used as a checklist and cross-reference to indicate in which reports the specific issues are covered.

Task responsibility: Mackenzie J, Louw D, Kotze P, Deacon A, Koekemoer S, Scherman P

Information required

- Available processes or models from D:RQS.

Actions

- Specialist meeting.

Deliverables and milestones

- RQO toolkit checklist: April 2014 - Deliverable D26
- EcoSpecs and TPCs: May 2014 – Report 5.

Responsibility of the Consultant

- The Consultant is not responsible for the development of approaches to determine EcoSpecs and TPCs other than those available, but will attempt to apply the latest development and models if adequate guidance is provided by the developers (DWA).

6.6.2 Task D6.3: Non-Ecological water quality

As the major component of the work related to setting RQOs is contained within the Classification and Reserve processes, this sub-task will focus on non-ecological water quality RQOs, and will serve primarily as a step to review and finalize the water quality component.

Task responsibility: **Scherman**

Information required

- Resource Water Quality Objectives (RWQOs) if produced.
- RQO model set, if required.

Actions

- Liaison with DWA: Water Quality Planning, both at the national and regional level, in terms of an approach that meets their requirements, data availability and the review of results.

Deliverables and milestones

- RQOs for non-ecological water quality uses: May 2014 – Report 5.

Responsibility of the Consultant

- The Consultant will not undertake stakeholder or DWA workshops for this task, other than liaison with national and regional water quality officers.

6.6.3 Task D6.3: Groundwater RQOs

RQOs can include any objective or goal that may need to be met to ensure that the groundwater resource is maintained in a desired and sustainable state. These typically relate to groundwater levels and gradients. Groundwater quality, groundwater abstraction volumes, land use activities that may impact the quantity and quality of the groundwater resource and the aquifer structure and integrity (Parsons & Wentzel, 2007).

General aquifer management philosophies will be specified in terms of the groundwater RQOs as suggested in the pilot study presented in the Groundwater Resource Directed Measured Manual (Parsons & Wentzel, 2007). As also specified in the same report, it is recommended that detailed RQOs need to be set on a site specific basis per license application in future.

Task responsibility: Sami

Information required

- Groundwater abstraction volumes, water levels and gradients, water quality and landuse activities.

Actions

- Analysis and data.

Deliverables and milestones

- RQOs for groundwater: May 2014 – Report 5.

Responsibility of the Consultant

The Consultant is not responsible for the detailed groundwater RQOs on a site specific basis but general aquifer management philosophies will be specified.

6.7 TASK D7: PREPARING INFORMATION FOR GAZETTING (TEMPLATES).

The PSP will prepare the IWRM summary template in accordance with the format that will be developed in cooperation with the Client. The gazetting will address the Management Class and RQOs. DWA officials will then submit the documentation through the appropriate internal channels for the approval by the Minister of delegated authority. Technical comments will be addressed by the consultants when received during the 60 days comment period. This will likely be after the end of contract. The 60 day comment period represents 2 months and preparing and submitting the necessary documentation could at minimum take a month. If this has to be taken into account within the study programme, it would mean that the study programme to undertake the technical work would be decreased from 24 months to 21 months. The PSP therefore agrees that they will address all comments of a technical nature received during the 60 days of gazetting after contract expiry at no additional costs. Any additional studies that might be required due to comments will not be undertaken.

Task responsibility: Van Rooyen, Koekemoer and Scherman

Information required

- The required templates to be completed by the Consultant. Final templates for completion must be provided at the beginning of Task D7.

Actions

- Completion of the templates according to DWA requirements.
- Review of the information to be sent to the region, if required by DWA.

Deliverables and milestones

- Completion of draft templates for review by DWA.
- Finalization of templates: Aug 2014 – Deliverable 27.

Responsibility of the Consultant

- The Consultant will not provide a template for use, as this will be provided by DWA.
- The Consultant will not be responsible for completion of the legal component of the gazetting process, e.g. the signing-off of templates by the delegated authority.
- The consultant will be responsible for addressing technical comments after contract expiry received during the 60 days gazetting period. This will not include undertaking any studies that may arise from the comments.

6.8 TASK D8: CAPACITY BUILDING

The TOR requires capacity building and training to focus on skills required by water resource managers in the study area, including national CD: RDM staff responsible for this area. A capacity building framework is presented below, which includes feedback from DWA regarding the number and structure of workshops, and persons identified by DWA who will participate in the training process during the study. The training proposed here will be primarily applicable to DWA personnel. **Note that previous exposure or training in EcoClassification or the Revised Desktop Reserve Model will be an advantage. If not previously undertaken, such courses should be considered by the Directorate as previously discussed.**

All trainees might not participate in each step or workshop, depending on their level of experience, prior training and expected outcomes of training and capacity building. Dr Scherman will be responsible for running and auditing the training programme.

Capacity building and training will therefore take place at three levels. These levels are the following:

- Nominated personnel who will be involved at levels other than just the training sessions and will participate in field work and specialist meetings (see Appendix B). The Directorate has nominated Mr Rufus Nengovhela to be one of these trainees.
- A nominated staff member (Mr Nengovhela) will be participating in specific fields in as many activities as possible through a mentorship programme developed by the trainee and task leader. Mr Nengovhela will develop a mentorship programme suited to his and the Directorate's needs, which will be submitted to the task leader for input and implementation. An important aspect of Mr Nengovhela's mentorship will be his review of technical reports. His comments and queries will be workshopped with the relevant specialist and / or relevant task leader.
- Training sessions 1 to 3, which will be available to all interested DWA staff (head office and region) (Appendix B).

It must be noted that the training sessions listed below are preliminary, and can be adjusted by the client according to specific needs.

- Training session 1: Introductory session: Integration of the WRCS, the Reserve and RQO. Three very distinct processes, which show significant overlap within its individual process

descriptions and manuals, were integrated and integrated steps designed. This integration process and the rationale therefore will be presented and discussed with participants. It is foreseen that this will be a one day training session. February 2013 – Deliverable 28.

- Training session 2: Status quo assessment. It is foreseen that this will be a two day training session. The status quo, both process, results and integration, will be demonstrated using this study area results. Presenters will address the following components: Ecology rivers, water quality issues, economy, EGSA, and water resources (hydrology). May 2013 – Deliverable 29.
- Training session 3: Integration of results to formulate Management Classes. The results of the study is nested in the ecological, economic, EGSA, and water quality consequences of various operational scenarios. Based on a recommended scenario, the resulting Management Classes are derived. These are tested with stakeholders. All the consequences results will be presented to trainees and the rationale for the Management Class demonstrated. Trainees will be provided with the results of certain of the IUAs and will be expected to defined their Management Classes for discussion and comparison with final results. May 2014 - Deliverable 30.

Task responsibility: **Scherman**, Louw, Van Rooyen, Mullins, Huggins,

Information required

- Any changes in trainee composition must be forwarded to Dr Scherman.
- Input will be requested regarding training evaluation. This information should be forwarded timeously when requested.

Actions

- Dr Scherman will be responsible for advising trainees and workshop presenters regarding training sessions.

Deliverables and milestones

- Training session 1: Introduction and integration: February 2013 – Deliverable 32
- Training session 2: Status Quo: May 2013 – Deliverable 33
- Training session 3: Management Classes: Jan 2014 – Deliverable 34
- An appendix of the Main Report regarding the capacity building and training undertaken during the study: August 2014 – contribution to Report 11.

Responsibility of the Consultant

- Plan and coordinate training sessions.
- Contact trainees and lecturers regarding training sessions.
- The budget is based on the assumption that DWA can arrange training venues at DWA Roodeplaat Training Centre.
- Audit and report on the training programme.

6.9 TASK D9: MAIN REPORT

The objective of this task is to:

- Document the final EWR rules (based on the recommended operational scenario and the resulting MC and EC);
- Summarise the technical reports in a main report.
- Document rationale and decision-making process regarding the final selected Management Classes (i.e., the resulting MC and reasoning if stakeholders recommend changes from the preliminary MCs).
- Document the lessons learnt chapter.

Accompanied with the main report will be a CD with all electronic data which will include reports, EcoClassification models, spreadsheets, photographs and raw data. The CD will be designed with

folders representing the steps and subfolders the subsidiary steps. A 'readme' file will be provided to guide users through the setup of the CD.

Task responsibility: **Louw**, Mullins, Van Rooyen, Huggins, Scherman, Lotter, Koekemoer, Mallory.

Information required

- Results from all the previous tasks.
- All data required for the CD

Actions

- Collating all existing project data and results.

Deliverables and milestones

- Main Report: Aug 2014 – Report 6.
- Electronic data CD: Aug 2014 – Deliverable 31 as part of Report 6

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7 STUDY PROGRAMME

7.1 MILESTONES: DELIVERABLES AND REPORTS

All deliverables and reports are seen as milestones and are tabled in Table 7.1 and 7.2. The timing is provided in the Gantt (Table 7.3). All references to deliverables are preceded with a 'D' and reports with a 'R' as provided in the tables below and the Gantt.

Table 7.1 Milestones: Deliverables

	Deliverables & Milestones	Date	Tasks
D1	Progress reports		A1
D2	Project Steering Committee meetings & minutes		A3
D3	Monthly progress summary notes & invoices		A4
D4	Subconsultants appointed with TOR & budget	Sep-12	B
D5	Index identification tables	Nov-12	C
D6	Water resources zones & Water Resource Use Importance	Dec-12	D1.1
D7	Economic zones (Regions)	Dec-12	D1.2
D8	EGSA component: Delineation, description and SCI	Dec-12	D1.3
D9	Water quality status quo	Dec-12	D1.4
D10	Ecological zones based on PESEIS information	Jan-13	D1.5
D11	IUAs selected and mapped	Feb-13	D1.6
D13	Identification of river biophysical nodes for level of assessment.	Jan-13	D1.7
D13	BID	Nov-12	D2
D14a	Stakeholder Database (first draft)	Nov-12	D2
D14b	Advertisement	Nov-12	D2
D14c	Announcement Letter	Nov-12	D2
D14d	Stakeholder Issues and responses	Aug-14	D2
D15	Natural and present day hydrology	Jun-13	D3.1
D16	EWRs for EWR sites converted into SPATSIM	Jul-13	D3.2
D17	EWR results for all desktop biophysical nodes	Jul-13	D3.3
D18	EGSA related to REC (if improved from PES)	Jul-13	D3.4
D19	Operational scenarios defined	Sep-13	D4.1
D20	Ecological consequences of operational scenarios	Oct-13	D4.2
D21	Economic consequences of operational scenarios	Oct-13	D4.3
D22	EGSA consequences of operational scenarios	Oct-13	D4.4
D23	Water quality consequences of operational scenarios	Oct-13	D4.5
D24	Recommended operational scenario and preliminary Management Classes	Jan-14	D4.6
D25a	Newsletters and Progress Feedback Letters	Apr 13, Nov 13, May 14	D2
D25b	Public meeting	Jul-14	D5
D26	RQO toolkit checklist	Apr-14	D6
D27	Templates	Aug-14	D7
D28	Training session 1	Feb-13	D8
D29	Training session 2	May-13	D8
D30	Training session 3	May-14	D8
D16	Electronic data CD	Aug-14	D9

Table 7.2 Milestones: Reports

	Reports	Date	Tasks
R 1	Inception report	Sep-12	B
R 2	Status quo report	Mar-13	D1.8
R 3	EWR report	Aug-13	D3.5
R 4	Operational scenarios and Management Class report	Feb-14	D4.6
R 5	RQO report	May-14	D6
R 6	Main report	Aug-14	D9

Note that all deadlines provided for reports refer to the first draft to be provided to the client. It is expected that the client will provide comments within a month and that the report can be finalised afterwards. Depending on the time to provide comments, reports should be able to be finalised within 6 weeks of providing the first draft.

Note that the budget caters only for one round of comments and two hard copies of final reports excluding specialist appendices that will only be in electronic format. A spreadsheet summarising all the comments and the response of the client will be provided with the final report to indicate how the comments have been addressed.

7.2 GANTT CHART

According to the information provided by the Client, the study is to be completed within a 24 month period. A Gantt chart is provided (Table 7.3).

Table 7.3 Gantt chart

TASKS	2012				2013												2014							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
TASK A- PROJECT MANAGEMENT																								
A.1 Progress meetings		D1					D1				D1				D1					D1				D1
A.2 Technical management & coordination																								
A.3 Project Steering Committees						D2							D2						D2					D2
A.4 Financial management		D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3	D3
TASK B - PROJECT INCEPTION																								
Task B.1: Inception report planning																								
Task B.2: Inception report	R 1																							
Task B.3: Mobilisation of study team		D4																						
TASK C: WATER RESOURCE INFORMATION AND DATA GATHERING			D5																					
TASK D.1: DELINEATE IOA & DESCRIBE STATUS QUO																								
Task D.1.1 Water resources component				D6																				
Task D.1.2 Economic Component				D7																				
Task D.1.3: Goods & Services component				D8																				
Task D.1.4: Water Quality Status Quo				D9																				
Task D.1.5 Aquatic ecosystems					D10																			
Task D.1.6: Identify and define IUAs						D11																		
Task D.1.7: ID biophysical nodes & level of assessment.					D12																			
Task D.1.8: Status Quo Report							R2																	
TASK D.2: LINK VALUE & CONDITION																								
Task D.2.1 Stakeholder Identification and database compilation			D14a																					
Task D.2.2 Project Announcement (BID and Advertisement)				D13, 14b, c																				

TASKS	2012				2013												2014							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Task D.2.3 Issues and Response Report																								D14 d
TASK D.3: QUANTIFY EWRS AND CHANGES IN NON-WATER QUALITY EGSAS																								
Task D3.1 Setting up system model and provision of natural and present day data.										D15														
Task D.3.2 EWRs for key biophysical nodes (EWR sites)											D16													
Task D.3.3 EWRs for desktop biophysical nodes											D17													
Task D.3.4 Consequences of EGSA at sites where the REC is an improvement											D18													
Task D3.5 EWR report												R 3												
TASK D.4 ID & EVALUATION OF OPERATIONAL SCENARIOS TO IDENTIFY CONSEQUENCES																								
Task D.4.1 Identification of scenarios													D19											
Task D.4.2 Ecological consequences														D20										
Task D.4.3 Economic consequences														D21										
Task D.4.4 EGSA consequences														D22										
Task D.4.5 Water quality consequences														D23										
Task D.4.6 Integration of consequences to provide preliminary MC																	D24	R4						
TASK D.5: STAKEHOLDER INVOLVEMENT																								
Task D.5.1 Newsletters							D25a								D25a							D25a		
Task D.5.2 Public meeting																							D25b	
TASK D.6: RQO																								
Task D.6.1 EcoSpecs & TPCs																				D26	R 5			
Task D.6.2 Non-ecological water quality																				D26	R 5			
Task 6.3 Groundwater RQOs																				D26	R 5			

TASKS	2012				2013												2014							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
TASK D.7: STEP 7 PREPARING INFORMATION FOR GAZETTING (TEMPLATES)																								D27
TASK D.9: CAPACITY BUILDING																								
Training session 1: Introductory workshop, incl. integration						D28																		
Training session 2: Status quo workshop									D29															
Training session 3: Yield modelling workshop																					D30			
TASK D10: MAIN REPORT																								R 6

8 STUDY TEAM

Rivers for Africa was appointed to undertake the study and have appointed various sub-consultants to undertake the multidisciplinary tasks as required by the TOR. The study team consists of individuals with extensive experience in the field of water resource planning. The team members have been involved in a variety of studies for DWA since 1988. An organogram is provided to illustrate the study team structure (Figure 8.1). The task leaders are listed below:

- Study Leader – D Louw
- Co Study Leader – P Van Rooyen
- River Team Leader – D Louw
- Economics Team Leader – W Mullins
- Ecosystem Goods, Services and Attributes Team Leader – G Huggins
- Stakeholder Participation Team Leader – A Lotter
- Water Quality Team Leader – P Sherman
- Hydrology Team Leader – P Van Rooyen
- Capacity Building Team Leader – P Scherman

The following organizations are represented by the teams:

- Rivers for Africa (R4A)
- WRP
- Koekemoer Aquatic Services (KAS)
- Scherman Colloty & Associates
- Streamflow Solutions
- IWR Water Resources
- Clean Stream Biological Services
- Mackenzie Ecological and Development Services
- Fluvius Environmental Consultants
- Institute for Water Research (IWR)
- Nomad Consulting
- Mosaka Economists
- Digby Wells

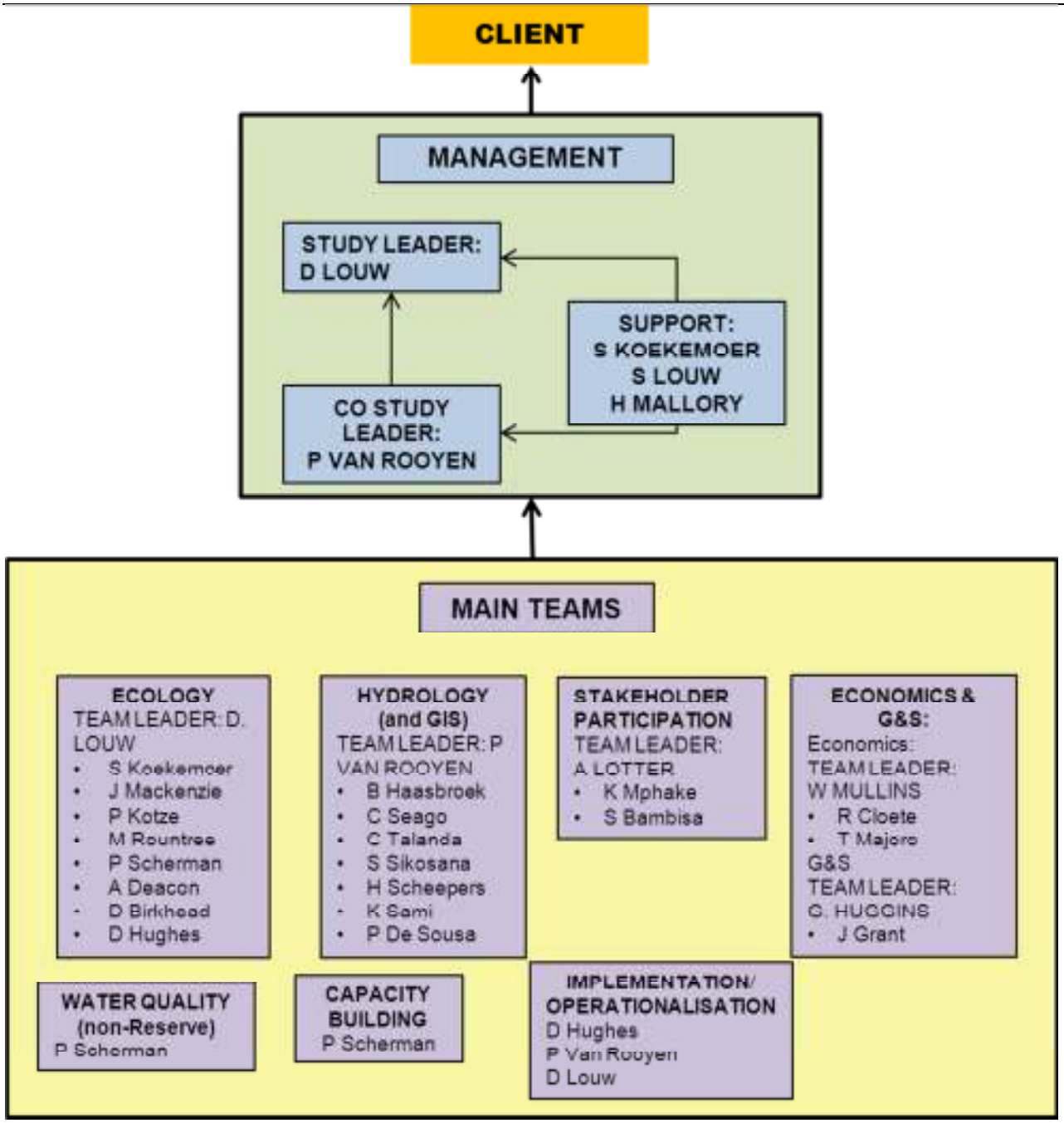

Figure 8.1 Team organogram

9 REFERENCES

Birkhead, A.L. 2008. Chapter 3: Developing an Approach for EWR estimation, using biotic presence, flow preferences and availability of hydraulic habitat. In: Principles of a process to Estimate and/or extrapolated environmental flow requirements. Water Research Commission report no. KV 210/08, Pretoria, South Africa.

Department of Water Affairs (DWA), South Africa. 2011c. Procedures to Develop and Implement Resource Quality Objectives. Department of Water Affairs, Pretoria, South Africa.

Department of Water Affairs (DWA), South Africa. 2012. Classification of Significant Water Resources (River, Wetlands, Groundwater and Lakes) in the Upper, Middle and Lower Vaal Water Management Areas (WMA) 8, 9, 10: Management Classes of the Vaal River Catchment Report. *Prepared by:* WRP Consulting Engineers (Pty) Ltd in association with DMM Development Consultants CC, Rivers for Africa eFlows Consulting (Pty) Ltd, Conningarth Economists, Koekemoer Aquatic Services and Zitholele Consulting (Pty) Ltd. Report No. RDM/WMA8,9,10/00/CON/CLA/0212.

Department of Water Affairs and Forestry (DWAF), South Africa. 2008a. Methods for determining the Water Quality component of the Ecological Reserve. Prepared by Scherman Consulting.

Department of Water Affairs and Forestry (DWAF), South Africa. 2008b. Resource Directed Measures for Protection of Water Resources: Methodologies for the determination of ecological water requirements for estuaries. Version 2. Pretoria.

Department of Water Affairs and Forestry (DWAF). (2007a). Water Reconciliation Strategy study for the Kwazulu-Natal coastal metropolitan areas: First Stage Reconciliation Strategy Report. *Prepared by:* DMM Development Consultants, Golder Associates Africa, Kwezi V3 Engineers,WRP Consulting Engineers and Zitholele Consulting. Report No. PWMA 11/000/00/0907.

Department of Water Affairs and Forestry, South Africa, 2007b Chief Directorate: Resource Directed Measures. Development of the Water Resource Classification System (WRCS) Volume 1 Overview and 7-step classification procedure. October 2006.

Department of Water Affairs and Forestry, South Africa. 1999b. Resource directed measures for the protection of water resources. Volume 3: River ecosystems, version 1.0

Department of Water Affairs, South Africa. 2009. Operationalise the Reserve: Main Report. Prepared by Water for Africa. Compiled by D Louw and S Louw. Report no. RDM/NAT/05/CON/0907

Department of Water Affairs, South Africa. 2010. Comprehensive Reserve Determination Study for Selected Water Resources (Rivers, Groundwater and Wetlands) in the Inkomati Water Management Area, Mpumalanga. Sabie-Sand and Crocodile Systems: Estimation and extrapolation of Ecological Water Requirements (EWRs) at selected hydronodes. Prepared by Rivers for Africa, Authored by Louw, MD and Birkhead, AL.RDM Report no 26/8/3/10/12/007.

Hughes, D.A, Louw, M.D., Desai, A.Y., and Birkhead A.L. 2011. Development of a revised desktop model for the determination of the ecological Reserve for rivers. WRC report. In press.

Kleynhans, C.J. and Louw, M.D. 2007. Module A: EcoClassification and EcoStatus determination. In River EcoClassification: Manual for EcoStatus Determination (version 2) Water Research Commission Report No. TT 333/08. Joint Water Research Commission and Department of Water Affairs and Forestry report, Pretoria, South Africa

Kleynhans,C.J., Birkhead, A.L., and Louw, M.D. 2008. Principles of a process to Estimate and/or extrapolated environmental flow requirements. Water Research Commission report no. KV 210/08, Pretoria, South Africa

Louw, D., Kleynhans, C., Thirion, C., Todd, C., Birkhead, A. and Hughes, D. 2006. The development of a decision support system (DSS) to address the issue of extrapolating ecological reserve (flow) information to other river locations. Draft report, WRC research project K8-657, Pretoria, South Africa.

Louw, MD and Huggins, G. 2007. Desktop Assessment of the Importance and Ecological State of the Maputo River Quaternary catchments. Produced by Water for Africa as part of the Joint Maputo River Basin Water Resources Study – Moçambique, Swaziland and South Africa.

Parsons, R and Wentzel, J. 2007. Water Research Commission: Groundwater Resource Directed Measures Manual. WRC Report No TT 299/07

10 APPENDIX A: REPORT COMMENTS

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
Comments from Rufus Nengovhela				
4.1, 3rd par	The two RQO toolkits that have been designed are impractical as most of the information cannot be supplied within Excel spread sheets. These toolkits can however be used as a checklist, were report references are supplied where appropriate information is provided.	Please indicate the approach you will be using in determining the RQOs	Yes	Stated in report that RQO are generated during Reserve and WRCS process, therefore the methods are existing methods and not new to RQOs See explanation in report Section 6.6.
5.1.3 1st para	The PSC should be a relatively small group of people (no more than 30) that will ensure strategy implementation and provide strategic advice and guidance.	Please do not specify the number	Yes	
5.1.3 3rd para	**PSC meeting 1: April 2013**	I think the first/ inaugural PSC meeting should be held at least before the end of January 2013.	No	Confirmed at PMC meeting that deliverable D1 must be presented, i.e. after Feb 2013.
5.1.3	***Deliverables and milestones***	I think the first/ inaugural PSC meeting should be held at least before the end of January 2013.	No	See above
	Project Steering Committee meetings & minutes: April & October 2013, February and October 2014. D2.	By this time the contract will be all expired.	Yes	
5.2	**TASK B - PROJECT INCEPTION**	What about the proposed IUAs	No	Addressed at PMC meeting - IUAs can only be proposed after task D1 has been undertaken.
table 5.1	**TASK D.7: STEP 7 PREPARING INFORMATION FOR GAZETTING (TEMPLATES**	What about addressing comment/s that will have been received from stakeholders during the 60 days of gazetting	Yes	Addressed under the task itself and under risks section in chapter 2.
6.1.1 para 2	Coordination with the Reconciliation Strategy Study will ensure appropriate nodes are built into the models. The Integrated Units of Analysis will be agreed	IUAs are not included in this report.	Yes	

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
	with the Client in the inception task.			
6.1.4 1st para	This task will utilize all available information to identify water quality issues and problems in the catchment, including areas outside of the ecological biophysical nodes and EWR sites. Present state assessments will therefore be conducted where data are available and where water quality hot spots have been identified. It is assumed that minimal additional work will be needed as the Reserve results are available for the catchment.	Please be specific.	Yes	
6.1.7 1st para	It is proposed that all the nodes are considered in terms of ecological requirements, but that approximately 50 are selected for EWR estimation.	Please indicate why choice the figure.	Yes	
6.2	General comments from Rufus	Please also indicate which mechanism you are going to use. If BID will be once off or not.	Yes	Updated BID sent out before every steering committee meeting.
		Who will pay the media release and advertisement on the local newspapers.	Yes	As agreed with DWA, DWA submits advertisements etc., Consultant responsible for content only.
6.3.1 last bullet	The Consultant is not responsible for a delay in programme if the VO on the Reconciliation Strategy Study is not approved	Please can you indicate this as a risk and provide the mitigation as well or delete this statement.	Yes	
6.3.2 last bullet	The consultant is not responsible for redoing a Comprehensive EWR if the results with the new hydrology indicate that there are problems.	Please can you also indicate this as a risk and provide the mitigation.	Yes	
6.3.2	It is suggested that for all detailed evaluation of operational scenarios on the Letaba River, these sites act as the driver sites.	Why?	Yes	
6.3.5	First draft EWR Report: August 2013 – Report 3	According to the Departmental Business plan and the proposed Quarterly	Yes	As discussed in the Inception meeting, it was agreed that these dates can still change. A

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
		deliverable program submitted to the department by you on the August you indicate that the EWR report will be ready by the end of June 2013.		comparison was made with your quarterly deliverable list and with the Gantt and changes indicated. This will be only for the new financial year. This was communicated by e-mail in an Excel spread sheet.
6.4.1 first sentence	Operating scenarios will be defined in accordance with the Reconciliation Strategy Study. Any other recent planning information of proposed developments will be obtained and applied.	Is this mean that classification scenarios will be based on recon scenarios	Yes	
6.4.1 5th para	It is assumed for budgeting purposes that there will be a total of **ten** scenarios analysed based on the historical time series. It is further proposed that stochastic risk analysis of **two** scenarios be carried out.	Needed to be discussed with the PMC members	Yes	
6.4.1 6th para	Water resource analysis information will be described in chapters of the relevant task report. The scenarios analysis, assumptions and results, will be described in a chapter of the Main Report. Appropriate graphical and tabular summaries of the results will be prepared in annexure of the reports	Why not included in report 4	Yes	
6.7	The PSP will prepare the IWRM summary template in accordance with the format that will be developed in cooperation with the Client. The gazetting will address the Management Class and RQOs. DWA officials will then submit the documentation through the appropriate internal channels for the approval by the Minister or delegated authority.	What about addressing comment/s that will have been received during 60 days of gazetting.	Yes	See Email communication and changes in report indicating that the consultants commit to respond to any technical queries during the gazetting period after the contract has been finalised.
6.8 3rd para	Training sessions for all DWA staff (head office and region).	Please also note that some of the regional office staff were involved in the Vaal and Olifants project.	No	Noted, but these sessions will be completely different to what was presented before.
6.8	Training session 1: Introduction and integration	What about the capacity building summary report.	Yes	The capacity building report is an appendix to the main report.
	Training session 3: Management Classes:	Please can you revisit this date and	Yes	

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
	Jan 2015 – Deliverable 34 An appendix of the Main Report regarding the capacity building and training undertaken during the study: May 2015 – contribution to Report 11	deliverables. Please also note that this project is ending August/September 2014 not 2015.		
6.9 first sentence	The objective of this task is to produce the final EWR rules (based on the operational scenario recommended and final MC and configuration for gazetting) and to summarise the technical reports in a main report.	Can you revisit this sentence, please	Yes	
6.9 1st para	The main report will also include the rationale and decision-making process regarding the selected Management Classes and in essence consists of a summary of all technical reports and other tasks not documented in standalone reports	The main report must also include the lesson learned	Yes	
7.1 last para	Note that the budget caters only for one round of comments	Why one round of comment	No	One round of comment is specified as this is what the proposed budget is based on.
6.3.1		How groundwater will be incorporated in the study. At present, it is does not feature clearly - Adaora Okonkwo	Yes	
Comments from Lebo Masoa				
6		Clarity of the methodologies particularly the RQOs. The RQO is a seven step process however this does not come out in the report. If some of the steps are to be conducted in the Classification process it will be good to that overlap in the two processes. Otherwise I do not understand how a seven step process can be lumped into a single task.	Yes	The proposed approach is based on the integration of steps that are described in Chapter 4, Fig 4.1. The 7 step RQOs process is integrated with the other processes to eliminate duplication, ensure consistency in outcomes and this is what the resources and budget were based on. Task 6 pulls everything together and do some additional work. Task 6 has been updated to better explain this.
		Set up of the methodology / report. My concern with the way the current report is that it lacks detail in terms of the process that is to be followed in setting of RQOs	No	The description in the report rely on and references the standard methods, which will be followed during the study. These standard methods are therefore not

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
		and / or RWQOs. My main concern with this is that the detail might end up being overlooked. We should bear in mind that the objectives are supposed to ensure that the Management Class of the catchment is either maintained or improved are may be required and if the study is conducted at a low confidence this might pose problems in the long run.		repeated in the document. Also the proposed integration of steps is key to the proposed approach and the execution of work within the stated budget. For example, the definition/description of the RQOs are the formulation of the specifications for monitoring that is identified during the detailed work being undertaken in the other tasks. The confidence level that can be achieved depends on the information available. In knowing that detail information is absent at a high resolution (small catchments) and that primary data collection is not proposed, the approach is to define the RQOs / RWQO along with a confidence statement. Specific monitoring requirements to provide the means for management (compliance evaluations) will also be defined. The products from this study will be sufficient to initiate (kick start) monitoring within an adaptive management approach to protect the resource. In its most simple form adaptive management is the execution of the following circular steps; setting objectives, measuring responses, and making corrective measures.
6.2		Stakeholder engagement. Which water user requirements are going to be used for setting of the RWQOs and how are they going to be verified? Bearing in mind that the RWQOs outlines the water user needs with respect to water quality for the intended use as well as their needs with respect to the disposal of water containing waste to the resource. With this in mind it is important to realize	Yes	Due to budget constraints, no stakeholder engagement to determine RWQOs is included in the proposal. If RWQOs are not available, an alternative approach (to engaging stakeholders) have been provided. See risk table in chapter 4.

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
		that the water quality sensitivity of some of the water users such as irrigation, varies depending on the type of crop irrigated. In order to get a set of better representation of water quality requirements in the catchment there might be a need to confirm the available information with key stake holder		
6.4.5	*Fitness-for-use for all users* will be assessed using any interim Resource Water Quality Objectives (RWQOs) already designed for the Letaba catchment and water quality EcoSpecs (or ecological specifications) available from the Reserve study.	Can you please clarify	Yes	
6.4.5	Note that it is critical for the PSP to liaise with DWA: Water Quality Planning, both at the national and regional level.	There is no water quality planning at regional level however there is Water quality management Under Institutional oversight and the responsible person is	Yes	
6.4.5		Non-ecological RWQOs and the ecological RWQOs. I do not understand how are the RWQOs for these users are going to be differentiated/ separated. According to the DWA- Resource Directed Management of Water Qualityl the RWQOs are an integrate or links the Ecological and other users water quality requirements. If there is a need on the setting of the water quality component of the RQOs water quality planning has produced a series of Resource Directed Management of Water Quality documents that can be made available on request	Yes	There was no reference to ecological RWQOs as that terminology does not exist. But yes, can understand that if you have non-ecological RWQS, you should in theory have ecological RWQS!. There is confusion with little clarity in existing guidelines on the links between EcoSpecs and RWQS and the overlap between it. As clarified and presented (and as the meeting agreed), flow diagrams illustrating this process has now been included in Task D6.6 which hopefully better addresses the issues..
Comments from Sadimo Manamela (summary of detailed comments included below this table)				
1.3	Overview of study area	As such description of the area should not only be limited to surface water resources	Yes	

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
		but should be extended to the description of groundwater area and groundwater related aspects as well.		
		Although some of the steps of RQO determination falls within the Reserve determination or the water resource classification process; some do not form part of the Water Resource Classification process or the Reserve determination process and they must be included in the integration process. Those steps are:		
		1. The establishment of a vision op catchment and integrated units of analysis	Yes and no	It is included in the integration process. Refer to Figure 4.1 and integrated step 2. It was omitted in the description of activities in the PSC meeting 1 and has now been included.
		2. Prioritization and selection of Resource Units of for RQO determination	No	See Step 1 in Figure 4.1. RUs as defined in PESEIS and in previous Reserve study will be accepted.
		3. Prioritization of sub-components for RQO determination, selection of indicators for monitoring and propose direction of change	No	Part and parcel of the EcoClassification process as well as the EcoSpecs and TPCs.
		4. Development of Resource Quality Objectives and numerical limits. Also note that: 1. Parsons, 2007 should be used in the delineation of Resource units and integrated Units of Analysis for groundwater 2. Colvin, 2004 should be used in subsequent steps for groundwater RQO determination	Yes	
		The toolkits are being applied successfully in the determination of RQOs in the Olifants Doorn by an independent consulting firm that was never involved in the development of the Procedures to Determine RQOs	n/a	This team has and will formally liaise with the Olifants Doorn Team through DWA to share experiences and the detail technical context within each area. It is the experience of this team that application of the methods will differ from on area to

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
				another.
		As such the PSPs must not deviate from the Water Resource Classification System as well as the Procedures to determine and implement RQOs in the setting of the Management Class and the determination of RQOs respectively**.**	n/a	During discussions and as minuted in meetings with Ms Shane Naidoo, it is acknowledged that both the NWRCS and RQOs are effectively in a pilot testing stage and that all issues must be pointed out and addressed in a cost effective manner. A detailed document indicating gaps and further work on for example the Vaal Classification study has been provided to Ms Naidoo. The consultant is not deviating from the WRCS, however it is devising ways to undertake the technical aspects of the work that is practical and cost effective. The guidelines for the WRCS are quite explicit that many of the suggested approaches have not been tested, are ideas, that need to be refined during application.
		It is clear that the integrated steps did not take account of the steps in the procedure to determine RQOs.	No	The document states that all the 7 RQO steps are explicitly provided for as shown in Figure 4.1 and incorporated into the integrated steps. All 7 steps are included in the integration steps.
		As such it is foreseen that the determination RQOs will not be determined in accordance with the procedures to determine RQOs. Integration steps must also include 1 The establishment of a vision for catchment and integrated units of analysis	No	See comment on same query above.
		2. Prioritization and selection of Resource Units of for RQO determination	No	See comment on same query above.
		3. Prioritization of sub-components for RQO determination, selection of indicators for monitoring and propose direction of change	No	See comment on same query above.

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
		4. Development of Resource Quality Objectives and numerical limits. Also note that: 1. Parsons, 2007 should be used in the delineation of Resource units and integrated Units of Analysis for groundwater 2. Colvin, 2004 should be used in subsequent steps for groundwater RQO determination	Yes	See comment on same query above.
		The task structure does not include tasks associated with some of the steps for determination of RQOs. Those tasks should be included otherwise the RQOs part will not be consistent with the procedures for determining RQOs.	No	All steps in RQOs are include as illustrated in Figure 4.1
		Figures 6.1 PES/EIS results: Only PES/EIS for wetlands, estuaries and rivers are described whereas Groundwater associated PES/EIS are not described at all.	No	There is currently no PES or EIS defined for groundwater (see Groundwater EWR report). Also the groundwater manual by Parsons and Wentzel (2007) is silent on defining what PES EIS could be for groundwater. The approach proposed for this study will be based on the methods proposed by Parsons and Wentzel (2007), the constrains of available data and the work already carried out in the groundwater study (Haupt & Sami, 2006). PESEIS is only relevant for the surface water systems that groundwater support and not groundwater per se. There are exceptions to this, such as in cave systems, but this has not been addressed by DWA.
		Not only operational Scenarios must be covered but other scenarios must be considered in terms of the WRCS. Such scenarios include: § Ecological Sustainable Base configuration Scenario § Planning Scenario § RDM configuration scenario which	No	Operational scenarios include all of these apart from the FEPAs. FEPAS will be incorporated in the definition of the REC only. The information from the FEPAS does not define flows and cannot be incorporation into a flow scenario directly. There are currently discussion/debates in DWA on the details of how FEPAs must be

Page &/ or Section	REPORT STATEMENT	COMMENTS	ADDRESSED IN REPORT?	AUTHOR COMMENT
		includes o PES o REC o Freshwater conservation target overlain on REC configuration o Freshwater conservation target overlain on PES		incorporated and this is not for the consultant to decide.
Comments from Adaora				
Ground-water general	Certain information was required in the inception report on the groundwater. The groundwater specialist commented as follows. Adaora requested that this information be included in the inception report: Groundwater delineation: I am redoing that in the recon study. It is largely already done. I have yields and exploitation potential by Quat, by lithology, and by water supply scheme Utilisation: I have usage as a proportion of harvest and exploitation potential as above, per quat, lithology and WSS. But so far I am relying on usage in WSAM and GRA2, to which I have added a growth figure for rural use. I am waiting for the validation study to update this Present class: I can do based on degree of utilisation	As this information will be generated through another study, it was mostly included in the 'Available information' chapter as requested.	Yes	
		It is required that the PSP acquires the service of a groundwater specialist who will ensure that all groundwater aspects of the WRCS and the procedure to determine RQOs are addressed adequately	No	Karim Sami is part of the team (see Figure 8.1) who is a highly qualified groundwater specialist and is co-author of the groundwater reserve determination study report.

6. STEP 4: SET ECOLOGICAL SUSTAINABILITY BASE CONFIGURATION (ESBC) SCENARIO AND ESTABLISH STARTER CONFIGURATIONS
STEP 5: EVALUATE SCENARIOS WITHIN THE IWRM PROCESS

These two steps are confusing as they are linked and there are overlaps.

Step 4:

Step 4 cannot be done without the simulation model results, but the simulation model is only mentioned at the start of step 5. In general the WRCS did not sufficiently include simulation modelling as a tool which will result in the steps to be clear and concise. These steps are very similar to the Reserve step which addresses the consequences (ecological, EGSA and economics) of different operational scenarios to allow decision making. It is recommended that the Reserve step and tools and these WRCS steps are merged and simplified. The WRCS guidelines should also be revised for this step to better describe the simulation model and how it should be used. Guidelines should also be provided to indicate what should be done if a yield model is not available although, taking into account the importance of the WRCS, this should preferably not be undertaken for a system where a yield model is not available.

This step also gave rise to the statement that a D Ecological Category is the ESBC and which is largely accepted by many DWA personnel. However, this was never the intention (pers com, Dr Cate Brown). The D Ecological Category which in the examples are placed at the estuary (or most downstream point in the study area) is used to demonstrate that D Ecological Categories in the whole of the upstream area will not sustain the lowest point in a D, but it will probably drop beyond a D. The example was included to demonstrate the role of tributaries and linkages between sites. All of this confusion will be alleviated by using and integrated complete simulation model to assess different scenarios and rewriting these steps and guidelines.

Step 5:

There are a vast number of substeps under step 5 (the flow diagram consists of two slides).

Slide 1: Water quality: This step needs extensive revision as the tools and information available to undertaken this work is not generally available within the constraints of time, budget and information. In some cases, modelled TDS might be available and the guideline should include different levels of tools or approaches. Furthermore, this step is actually part of the consequences to operational scenarios and it would be more appropriate to fit into step 4.

Slide 2: Slide 2 of Step 5 is extremely complicated and set in a lot of detail. It would appear that a more simplified way of dealing with this step would be to call it:
Determination of preliminary Management Classes for Stakeholder consideration.
The last block refers to the selection of a subset of scenarios for stakeholder evaluation. In reality, the scenarios (or operational flow scenarios) and the catchment configuration and Management Class for each IUA are linked and should be presented together for stakeholder evaluation.

The WRCS guidelines fall short in providing recommendations and tools for determining the preliminary Management Classes. The ecological WRCS guideline provides a preliminary and untested guideline, based on the Ecological Categories within the IUA, to derive a Management Class. The WRCS guidelines acknowledges that there are potential problems with this approach and that additional testing and work are required. This approach considers only ecological aspects and a way of including economic and EGSA and non-ecological water quality issues must also be developed. The WRCS guidelines again refers to the possible use of the Multi-Criteria Decision Assessment tools available to do this work. It is however doubtful whether this will be a cost-effective approach, but, as indicated in the WRCS guidelines – testing of available tools must be made. In summary, the WRCS does not provide guidelines of how one gets to a Management Class and this is a serious omission.

What is also not clear is the relationship with the Reserve, especially if already signed off. The Classification system could recommend result in a different EC for which the Reserve is signed off. This will have some implications and it will be necessary to explain the situation to stakeholders. These scenarios and protocols should be explicitly addressed and are relevant for this step where preliminary MCs are produced for stakeholders.

11 APPENDIX B: CAPACITY BUILDING PROGRAMME

Number of activity	Date	Task	Activity	Objective	Trainee identification + importance	Training description	Venue	Comment
1	21 - 24 Jan 2013	D10 and D13	Analysis of data by specialists	Completing the DSS spreadsheet in terms of: 1.Confirm NFEPA 2.EIS & REC 3.REC for Revised Desktop Reserve Model 4.Hotspot ID 5.Selection of Desktop Biophysical Nodes	Rufus Nengovhela: High importance. (can accommodate one more person)	Understand the rationale of and completing the DSS template.	Malelane	Mr Nengovhela has confirmed participation. Logistical information is being supplied to him.
2	12 Feb 2013	D11	Internal team leader meeting	Consider all status quo components and delineate preliminary IUAs	Rufus Nengovhela: High importance.	Participate in the identification of IUAs.	Pretoria	Mr Nengovhela has been provided with the dates. Logistical information will be provided.
3	25 Feb 2013	D8	Training workshop 1	Introductory session: Integration of the WRCS, the Reserve and RQO.	All DWA regional + national officials	General training session to explain how the WRCS, Reserve and RQOs fit together.	Pretoria	
4	March 2013	R 2	Status quo Report	Comments and specialist workshopping/discussion, as required.	Rufus Nengovhela: High importance	Participate in completion of reports + gain technical experience.	Pretoria	Part of Mr Nengovhela's mentorship programme.
5	May 2013	D8	Training workshop 2	Status quo assessment.	All DWA regional + national officials	Describe process, results and integration - demonstrate using this study area results.	Pretoria	
6	August 2013	R 3	EWR Report	Comments and specialist workshopping/discussion, as required	Rufus Nengovhela: High importance	Participate in completion of reports and gain technical experience.	Pretoria	Part of Mr Nengovhela's mentorship programme.
7	7 - 11 October 2013	D20	Analysis of data by specialists	Ecological consequences of various operational scenarios.	Low importance	Decision-making process to determine the impacts on Ecological Category.	To be confirmed	
8	January 2014	D24	Internal meeting	Integration of consequences to provide preliminary Management Classes for stakeholder evaluation.	Rufus Nengovhela: High importance	Integration of results for stakeholder evaluation.	Pretoria	
9	February 2014	R 4	Operational scenarios and Management Class Report	Comments and specialist workshopping/discussion, as required.	Rufus Nengovhela: High importance	Participate in completion of reports and gain technical experience.	Pretoria	Part of Mr Nengovhela's mentorship programme.
10	April 2014	D26 (part of)	Internal meeting	EcoSpecs and TPCs (part of Deliverable: RQO toolkit checklist).	Rufus Nengovhela: High importance	Evaluation and integration of EcoSpecs and TPCs.	Pretoria	

Date	Task	Activity	Objective	Trainee identification + importance	Training description	Venue	Comment
May 2014	R 5	RQO Report	Comments and specialist workshopping/discussion, as required.	Rufus Nengovhela: High importance	Participate in completion of reports and gain technical experience.	Pretoria	Part of Mr Nengovhela's mentorship programme.
May 2014	D8	Training workshop 3	Integration of results to formulate Management Classes.	All DWA regional + national officials	All results of consequences will be presented to trainees and the rationale for the Management Class demonstrated.	Pretoria	
August 2014	R 6	Main Report	Comments and specialist workshopping/discussion, as required.	Rufus Nengovhela: High importance	Participate in completion of reports and gain technical experience.	Pretoria	Part of Mr Nengovhela's mentorship programme.