

DEPARTMENT: WATER AND SANITATION

CHIEF DIRECTORATE WATER ECOSYSTEMS

DIRECTORATE RESERVE DETERMINATION

DETERMINATION, REVIEW AND IMPLEMENTATION
OF THE RESERVE IN THE OLIFANTS/LETABA SYSTEM

FIELD SURVEY REPORT



June 2016

Final



water & sanitation

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REPUBLIC OF SOUTH AFRICA

DEPARTMENT: WATER AND SANITATION

Directorate: Reserve Determination

**DETERMINATION, REVIEW AND IMPLEMENTATION OF THE RESERVE IN THE
OLIFANTS/LETABA SYSTEM**

WP10940

FIELD SURVEY REPORT

JUNE 2016

Prepared by:

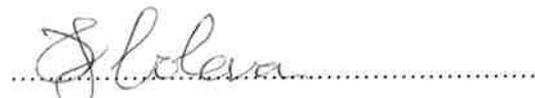
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DOCUMENT INDEX

Reports as part of this project:

Bold represents this report

REPORT INDEX	REPORT NUMBER	REPORT TITLE
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2.0	RDM/WMA02/00/CON/0215	Information and Data Gap Analysis Report
3.0	RDM/WMA02/00/CON/0315	Field Survey Report

LIST OF ABBREVIATIONS

ASPT	Average Species per Taxon
CD: WE	Chief Directorate: Water Ecosystems
DO	Dissolved oxygen
DWS	Department of Water and Sanitation
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
EC	Electrical Conductivity
EI	Ecological Importance
EIS	Ecological importance and sensitivity
EWR	Ecological Water Requirements
IEI	Integrated Ecological Index
ES	Ecological Sensitivity
IUA	Integrated Unit of Analysis
MC	Management Class
NWA	National Water Act
PES	Presentation Ecological State
RDM	Resource Directed Measures
RQO	Resource Quality Objectives
SQ	Sub-Quaternary
WQ	Water Quality
WRUI	Water Resource Use Index
WMA	Water Management Area

EXECUTIVE SUMMARY

The Chief Directorate: Water Ecosystems has recently commissioned the study 'Determination, Review and Implementation of the Reserve in the Olifants/Letaba System'. With water resources in the Olifants Water Management Area (WMA 2) having been classified and Resource Quality Objectives determined (2011-2014) the preliminary Reserve determined in 2001 for the Olifants system and in 2006 for the Letaba system, is now required to be superseded by the Reserve. With the preliminary Reserve having been determined nine years prior to the water resource classification, a review and update is required to ensure that the Reserve is in accordance with the water resource classes and is applicable to the current system needs and demands.

The purpose of this study is thus to determine, review and implement the Reserve in the Olifants/Letaba System; with the aim of specifically addressing ecological gaps and reviewing and updating the preliminary Reserves that have been determined.

An assessment of the system was undertaken during the inception and gap analysis phases of the study to identify and confirm the priority water resources, quaternary and sub-quaternary catchments, EWR sites, wetlands and groundwater driven systems where ecological gaps exist and need to be addressed. In terms of finalising the Reserve for the Olifants/Letaba System, the data and information required for prioritised ecological gaps are to be filled either by Rapid III assessments, re-survey of hydraulics at existing EWR sites, biological surveys and by the use of existing hydraulics for revision of requirements and ecological consequences. Further to these water quality sampling, wetland surveys and groundwater assessments are to be undertaken to support the development and definition of the ecological specifications needed.

For the rivers component of the Reserve determination, two field surveys have been included within the scope of the study to complete the Rapid III assessments, re-survey of hydraulics at existing EWR sites and biological surveys required for the priority river reaches. The first of the surveys undertaken in an attempt to address the ecological gaps for the Olifants catchment was a dry season survey during October 2015. The field survey of the Letaba/Shingwedzi catchment will be undertaken in February 2016.

This report documents the details of the field survey undertaken in the Olifants catchment.

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1. INTRODUCTION

1.1 BACKGROUND

With the water resources in the Olifants Water Management Area (WMA 2) having been classified in 2011 and Resource Quality Objectives (RQOs) determined in 2014 the preliminary Reserve determined in 2001 for the Olifants system and in 2006 for the Letaba system, is now required to be superseded by the Reserve. With the preliminary Reserve having been determined nine years prior to the water resource classification, a review and update is required to ensure that the Reserve is in accordance with the water resource classes and is applicable to the current system needs and demands. The Department of Water and Sanitation (DWS) thus recently commissioned the study 'Determination, Review and Implementation of the Reserve in the Olifants/Letaba System'.

The purpose of this study is thus to determine, review and implement the Reserve in the Olifants/Letaba System; with the aim of specifically addressing ecological gaps and reviewing and updating the preliminary Reserves that have been determined

The proposed management classes and RQOs have been published for public comment by Government Notice and once approved by the Minister of Water and Sanitation will be gazetted and thereafter be implemented. As the class of the water resources for the Olifants/Letaba system have now been determined, the Reserve can be determined and gazetted. The aim of this study is to support the process to the gazetting of the Reserve.

There are four main components that will be addressed through the study work process. These include the:

- Review and analysis of existing information;
- Filling in of the ecological gaps identified;
- Scenario analysis and operational considerations; and
- Setting the Reserve, defining the ecological specifications and developing the resource management plan.

The focus of the study is not to redo the previous resource directed measures work that has been done to date, but rather to fill in the gaps in the system where ecological protection is required and is necessary, that has not been addressed previously. In addition the Reserve determined in 2001 for the Olifants catchment requires review and update at identified sites in the system, due to changes in habitat.

For the rivers component of the Reserve determination, two field surveys have been included within the scope of the study to fill in the gaps with the ecological information needed.

1.2 STUDY AREA

The study area is the Olifants WMA (WMA 2) and includes the Olifants, Letaba and Shingwedzi systems.

The spatial extent of the area includes tertiary drainage regions B11, B12, B20, B31, B32, B41, B42, B51, B52, B60, B71, B72 and B73 in the Olifants system, B81, B82 and B83 in the Letaba area, and B90, the Shingwedzi catchment.

The map of the study area is shown in Figure 1.

1.3 FIELD SURVEYS

An assessment of the system was undertaken during the inception and gap analysis phases of the study to identify and confirm the priority water resources, quaternary and sub-quaternary catchments, Ecological Water Requirement (EWR) sites, wetlands and groundwater driven systems where ecological gaps exist and need to be addressed. This was based on the review of the preliminary Reserve Determinations, the Water Resource Classification studies, RQO determination studies, the Reconciliation Study, water resource management studies, water quality studies, ecological information and data, and expert knowledge and experience. The outputs of these above-mentioned studies together with the results from the recently completed desktop PES/EI/ES (2013) study by the DWS and relevant conservation information has been utilised to confirm the scope of the Reserve Determination required. The prioritisation was undertaken and confirmed during a specialist workshop held over the 27th to 31st July 2015. It was attended by the study team members, specialists and the DWS study management team from the Directorate: Reserve Determinations.

This overview gap analysis provided a list of priority quaternary catchments (with associated river reaches) that are important to the system from an ecological perspective or support the system to achieve the desired ecological condition, which require new, supplementary data, information or analysis to finalise the Reserve.

Gaps are to be addressed either by Rapid III assessments, re-survey of hydraulics at existing EWR sites, biological surveys and by the use of existing hydraulics for revision of requirements and ecological consequences. Further to these water quality sampling, wetland surveys and groundwater assessments are to be undertaken to support the definition of the ecological specifications needed.

For the rivers component of the Reserve determination, two field surveys have been included within the scope of the study to complete the Rapid III assessments, re-survey of hydraulics at existing EWR sites and biological surveys required for the priority river reaches.

The purpose of the report is to document the first field survey undertaken in the Olifants catchment of the study area.

The field survey of the Letaba/Shingwedzi catchment area will be undertaken during March/April 2016.

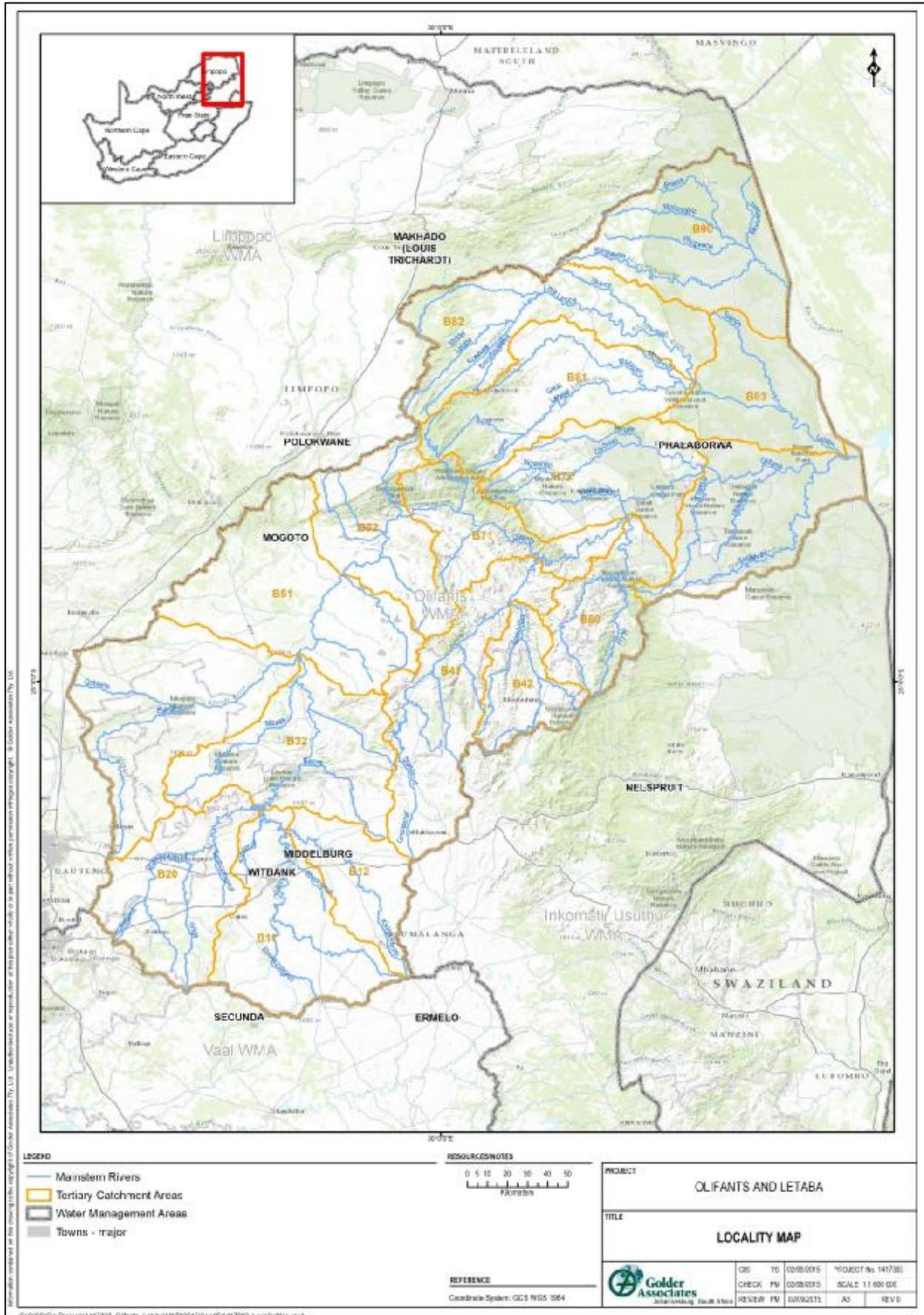


Figure 1: Olifants/Letaba System study area

2. OLIFANTS CATCHMENT FIELD SURVEY

The gap analysis undertaken included the identification of the priority sites/river reaches and the type of survey required per site. The surveys required at the sites included either:

- New rapid III or re-survey existing site (S sites);
- Using existing hydraulics + updated biological data from the surveys (H sites);
- Biological surveys only for revised Ecstatus and extrapolation of EWR with Desktop Reserve Model (B sites);
- Biological surveys and re-assess ecstatus (E sites); and
- Biological surveys/Water Quality only (X sites).

The location of the priority sites and type of survey in the Olifants catchment are indicated in **Figure 2**.

The Olifants field survey was conducted from 05 October to 16 October 2015, with a focus on the EWR sites (S sites) where a new Rapid III site was identified or an existing site required re-survey. Within this period the team also visited as many of the biological sites when in the vicinity of the quaternary catchments (B, X and E sites). The programme undertaken for the field survey is attached as Appendix A.

All EWR sites planned to be visited were completed and only a few biological sites still remain, these are currently being conducted in conjunction with other field trips for efficiency.

The study team were accompanied by DWS officials from the Chief Directorate Water Ecosystems as part of the capacity building exercise. The officials included:

- Gladys Makhado;
- Happy Khumalo; and
- Boitumelo Sejamoholo (first week of the survey).

The officials DG Hlongwane and B Manamela from the DWS Bronkhortspruit Regional Office accompanied the team on 8-9 October 2015 to sites in the Upper Olifants catchment area.

2.1 SURVEY SITES

Sixteen EWR sites and seventeen biological sites were visited during the field survey of the Olifants Catchment. These are listed in Table 1 and indicated in Figure 3 and Figure 4.

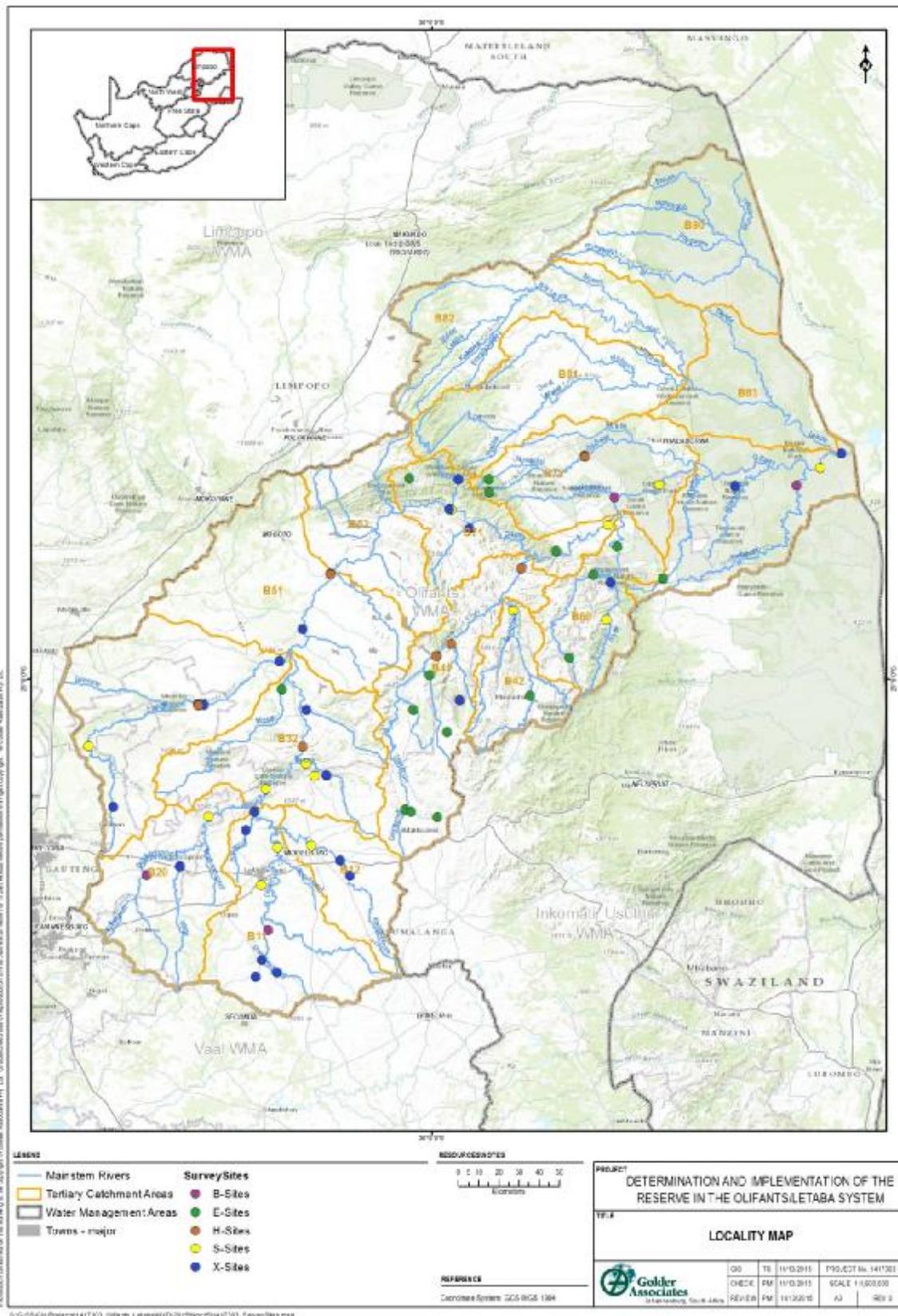


Figure 2: Priority sites identified indicating type of survey required

Table 1: Sites in the Olifants Catchment surveyed during the Field Survey (5-16 October 2015)

EWR site/ Biological site	Quaternary catchment	River	Coordinates	Sub-reach	Comments and level
S1	B31C	Elands	-25,303074; 28,46311	B31C-00770	New rapid 2 (no hydraulics)
S2	B20J	Wilge (Lower)	-25.619625; 28,999047	B20J-00998	Replace existing Olifants-EWR4, rapid 3
S3	B20F	Wilge	-25,843984; 28,871978	B20F-01150	New rapid 3
S4	B11G	Olifants	-	B11G-01225	Biological survey only, no suitable hydraulic site
S5	B11J	Olifants	-25,759183; 29,309564	B11J-01086	Replace existing Olifants-EWR1, rapid 3
S6	B12D	Klein Olifants	-25,748872; 29,458649	B12D-01118	Replace existing Olifants-EWR3, rapid 3
S7	B32A	Olifants	-25,496324; 29,254597	B32A-00937	Replace existing Olifants-EWR2, rapid 3
S8	B32A	Kranspoortspruit	-25,437714; 29,475619	B32A-00950	Resurvey existing OLI-EWR3
S9	B32C	Selons	-25,379969; 29,435557	B32C-00936	New rapid 3
S10	B71D	Olifants	-24.239917; 30.082457	B71D-00412	Replace existing Olifants-EWR8, rapid 3
S11	B42H	Spekboom	-24,694155; 30,361267	B42H-00553	New rapid 3
S12	B60B	Blyde (Upper)	-24,734412; 30,778321	B60B-00566	New rapid 3
S13	B71J	Olifants	-24,307563; 30,785695	B71G-00428	Replace existing Olifants-EWR11, rapid 3
S14	B60J	Blyde (Lower)	-24,407481; 30,827404	B60J-00444	Replace existing Olifants-EWR12, rapid 3
S15	B72D	Olifants	-24,12843; 31,01457	B72D-00326	Replace existing Olifants-EWR13, rapid 2 (no hydraulics)

EWR site/ Biological site	Quaternary catchment	River	Coordinates	Sub-reach	Comments and level
S16	B73H	Olifants	-24,049426; 31,731751	B73H-00311	Replace existing Olifants-EWR16, rapid 3
B1	B11E	Steenkoolspruit	-26,0824.61; 29,1608.27	B11E-01297	Biological surveys only for revised ecostatus and extrapolation of EWR with DRM
B2	B20D	Bronkhorstspruit	-25,5304.5; 28,4325.7	B20D-01146	Biological surveys only for revised ecostatus and extrapolation of EWR with DRM
E5	B41C	Masala	-25,0827.6; 29,5459.4	B41C-00766	Biological survey to reassess ecostatus
E7	B41F	Klip	-24,5904.58; 29,5919.70	B41F-00699	Biological survey to reassess ecostatus
H7	B41H	Dwars	-245038.33; 30,0530.24	B41H-00640	Updated biological data (using existing hydraulics)
X1	B11C	Steenkoolspruit	-26,1928.78; 29,1827.39	B11C-01449	Biological surveys/WQ only
X2	B11D	Dwars-in-die-wegspruit	-26,2040.27; 29,1244.90	B11D-01467	Biological surveys/WQ only
X3	B11D	Steenkoolspruit	-26,1608.94; 29,1417.73	B11D-01366	Biological surveys/WQ only
X5	B11L	Olifants	-25,3550.23; 29,1227.42	B11L-01024	Biological surveys/WQ only
X6	B12B	Klein Olifants	-25,5305.62; 29,3758.39	B12B-01192	Biological surveys/WQ only
X7	B12C	Klein Olifants	-25,4903.25; 29,3525.98	B12C-01153	Biological surveys/WQ only
X10	B31A	Elands	-25,3430.04; 28,3435.79	B31A-00963	Biological surveys/WQ only
X17	B41G	Groot Dwars	-25,0539.99; 30,0720.72	B41G-00721	Biological surveys/WQ only
X18	B41H	Steelpoort	-24,5339.71; 30,0101.67	B41H-00610	Biological surveys/WQ only

EWR site/ Biological site	Quaternary catchment	River	Coordinates	Sub-reach	Comments and level
X19	B71C	Mohlapitse	-24,0613.01; 30.0706.47	B71C-00292	Biological surveys/WQ only
X20	B71B	Olifants	-24,1413.08; 30,0435.75	B71B-00335	Biological surveys/WQ only
X21	B71E	Motse	-24,1852.46; 30,1023.34	B71E-00429	Biological surveys/WQ only
X8	B20F	Wilge	-25,5039.16; 28,5218.40	B20F-01150	Biological surveys/WQ only

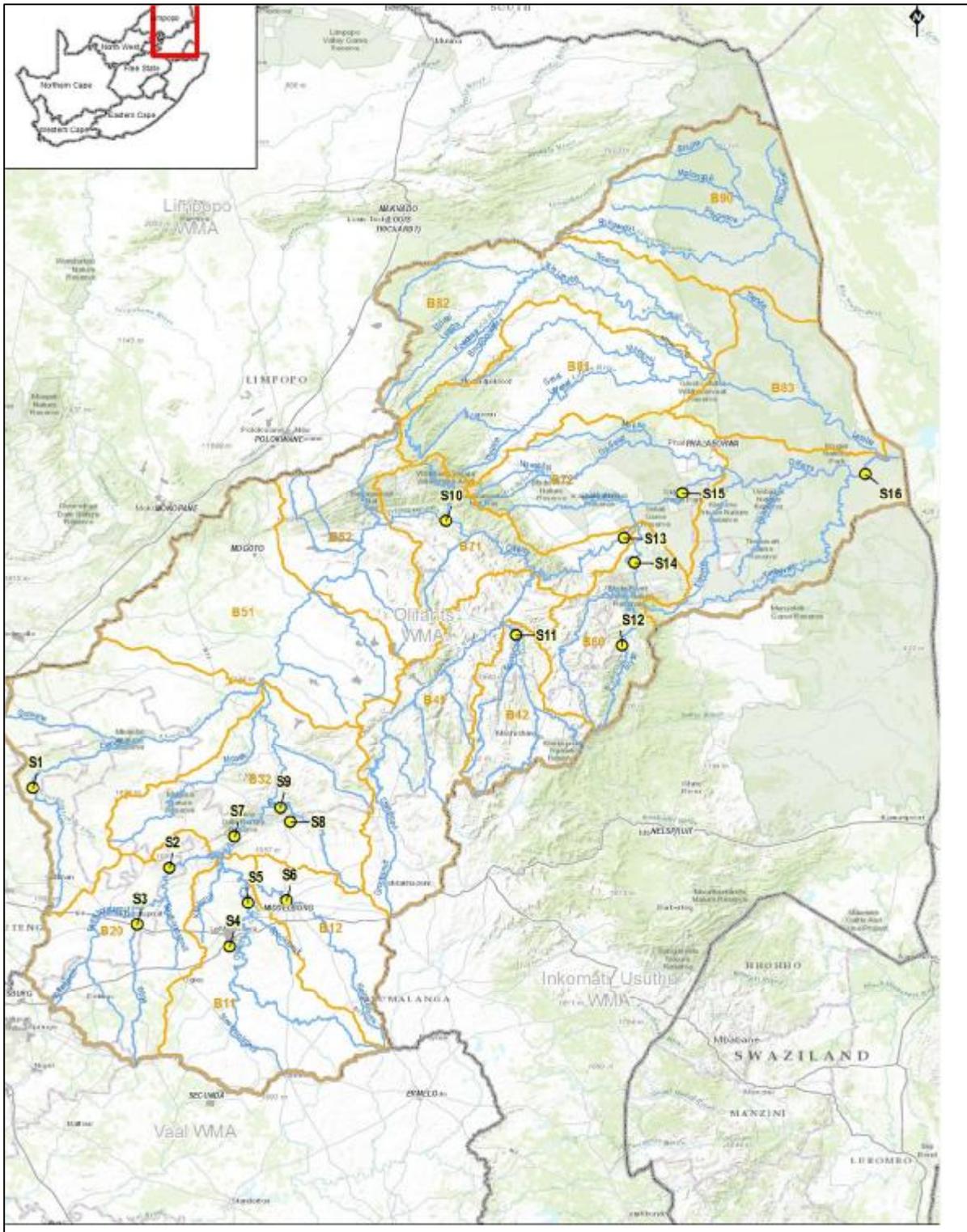


Figure 3: Sixteen EWR sites surveyed (Existing and New Rapid III)

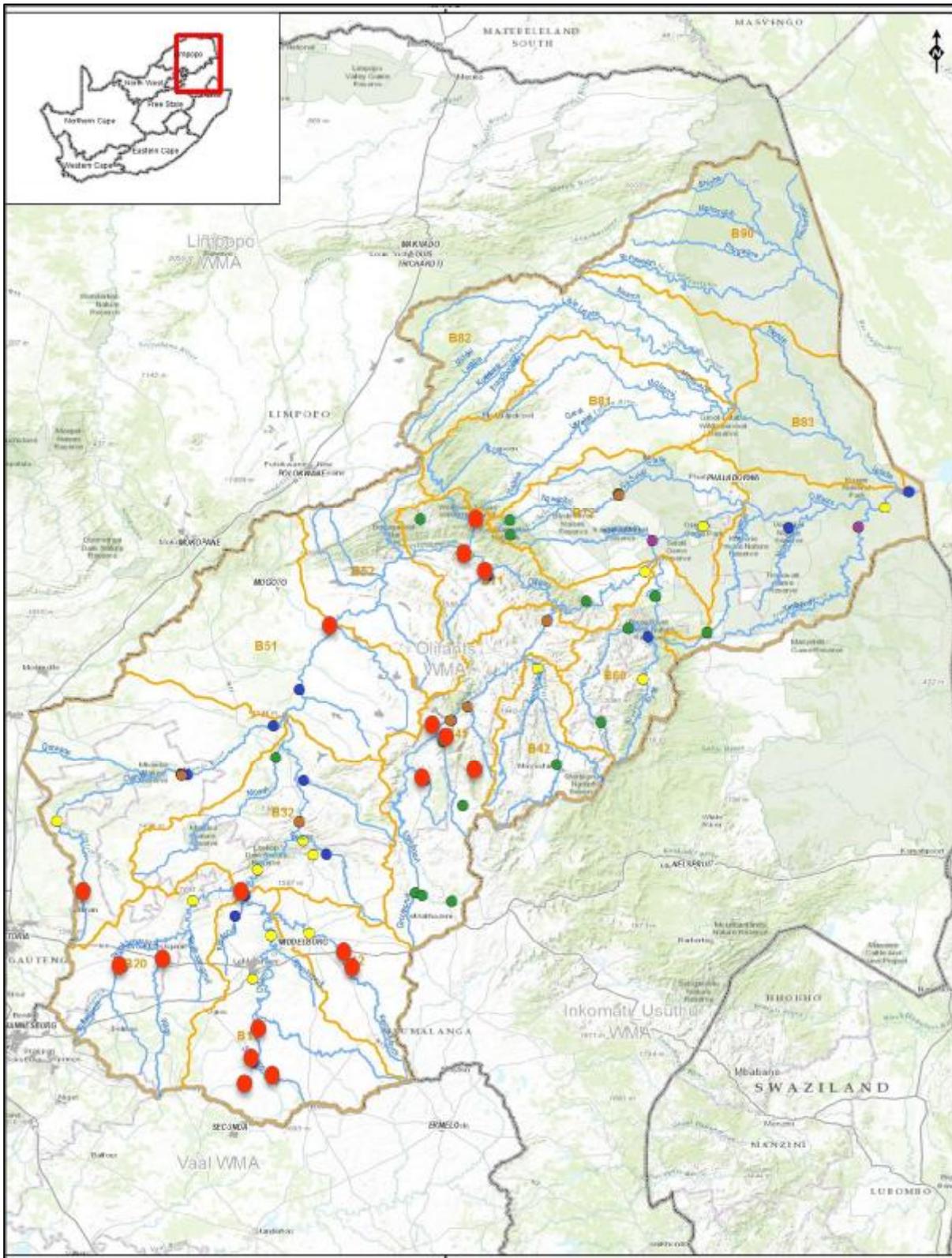


Figure 4: Seventeen Biological sites surveyed (●)

The sampling and/or surveys included the following:

- Hydraulic surveys were undertaken at 13 EWR sites;
- Discharge measurements were done at 15 of the 16 EWR sites;
- Fish and invertebrates surveys were done at most sites, where flow was present;
- *In situ* measurements were done at all sites where flow was present, and
- Visual assessments of habitat and vegetation were undertaken at all sites.

3 DESCRIPTION OF THE SITES SURVEYED

A description and details of the sites surveyed and the observations noted are described in Table 2 to Table 34 below.

Table 2: Details and Characteristics of Site S1

SITE	DETAILS	VIEW
<i>Site</i>	S1	
<i>River</i>	Elands River	
<i>Quaternary Catchment</i>	B31C	
<i>Co-ordinates</i>	-25,303074; 28,46311	
<i>IUA</i>	4	
<i>SQ Reach</i>	B31C-00770	
<i>IEI Rating</i>	3	
<i>WRUI Rating</i>	2	
<i>Survey Type</i>	Rapid III	
<i>PES</i>	C	
COMMENTS/OBSERVATIONS	<p>High organic material content observed. This can be attributed largely to leaves from canopy. Some algae and siltation present. Good site for biological surveys in future.</p> <p>Discharge: 0.0085 m³/s</p> <p>Water Quality: pH 8.7; EC 16.0 mS/m; DO 5.03 mg/l</p> <p>ASPT: 6.45</p> <p>Fish Habitat: Good</p>	

Table 3: Details and Characteristics of Site S2

SITE	DETAILS	VIEW
<i>Site</i>	S2	
<i>River</i>	Lower Wilge River	
<i>Quaternary Catchment</i>	B20J	
<i>Co-ordinates</i>	-25.619625; 28,999047	
<i>IUA</i>	2	
<i>SQ Reach</i>	B20J-00998	
<i>IEI Rating</i>	3	
<i>WRUI Rating</i>	2	
<i>Survey Type</i>	Rapid III	
<i>PES</i>	C	
		
COMMENTS/OBSERVATIONS		<p>Flow velocity was very low. Dense algae and fine sediments were observed. Green algae dominate in fast flowing water.</p> <p>Sediments noted out of channel and as a result less green algae. Fish: 10 - 380 mm, 40 min.</p> <p>Discharge: 0.124 m³/s</p> <p>Water Quality: pH 8.7; EC 54.0 mS/m; 7.38 mg/l</p> <p>ASPT: 6.62</p> <p>Fish Habitat: Fair</p>

Table 4: Details and Characteristics of Site S3

SITE	DETAILS	VIEW
Site	S3 and X8	
River	Wilge River	
Quaternary Catchment	B20F	
Co-ordinates	-25,843984; 28,871978	
IUA	2	
SQ Reach	B20F-01150	
IEI Rating	3	
WRUI Rating	3	
Survey Type	Rapid III and biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>Deeply incised banks that are collapsing. Lots of algae and silt. Bedrock, cobbles and boulders present. Some embedment. Low flow is restricted by undercut and root wads. Depth of 25 – 350 mm for fish, 25 min.</p> <p>Discharge: 0.0035 m³/s</p> <p>Water Quality: pH 8.6; EC 44.0 mS/m; DO 4.85 mg/l</p> <p>ASPT: 5.42</p> <p>Fish Habitat: Fair</p>

Table 5: Details and Characteristics of Site S4

SITE	DETAILS	COMMENT
Site	S4:	<p>Not surveyed</p> <p>No suitable hydraulic site present.</p>
River	Olifants	
Quaternary Catchment	B11G	
Co-ordinates	-	
IUA	1	
SQ Reach	B11G-01225	
IEI Rating	2	
WRUI Rating	4	
Survey type	Rapid III	
PES	D	

Table 6: Details and Characteristics of Site S5

SITE	DETAILS	VIEW
Site	S5	
River	Olifants	
Quaternary Catchment	B11J	
Co-ordinates	B11J-01086	
IUA	1	
SQ Reach	-25,759183; 29,309564	
IEI Rating	2	
WRUI Rating	4	
Survey type	Rapid III	
PES	B	
COMMENTS/OBSERVATIONS		<p>Algae is dense, some silt present. Flow is very low flow. Water has a chemical smell.</p> <p>Macro channel = 95 m, Active = 50 m, wet = 12 m</p> <p>Land owner says CCAR, MSAL, OMOS, BMAR caught in large pools.</p> <p>Discharge: 0.163 m³/s</p> <p>Water Quality: pH 8.6; EC 100 mS/m; DO 5.02 mg/l</p> <p>ASPT: 5.37</p> <p>Fish Habitat: Good</p>

Table 7: Details and Characteristics of Site S6

SITE	DETAILS	VIEW
Site	S6	
River	Klein Olifants	
Quaternary Catchment	B12D	
Co-ordinates	-25,748872; 29,458649	
IUA	1	
SQ Reach	B12D-01118	
IEI Rating	2	
WRUI Rating	4	
Survey type	Rapid III	
PES	D	
COMMENTS/OBSERVATIONS		<p>Algae present. Flow was low. Solid waste was observed in the river channel. Invasive plants (riparian) present.</p> <p>Discharge: 0.391 m³/s</p> <p>Water Quality: pH 8.9; EC 74 mS/m; DO 6.07 mg/l</p> <p>ASPT: 4.29</p> <p>Fish Habitat: Fair</p>

Table 8: Details and Characteristics of Site S7

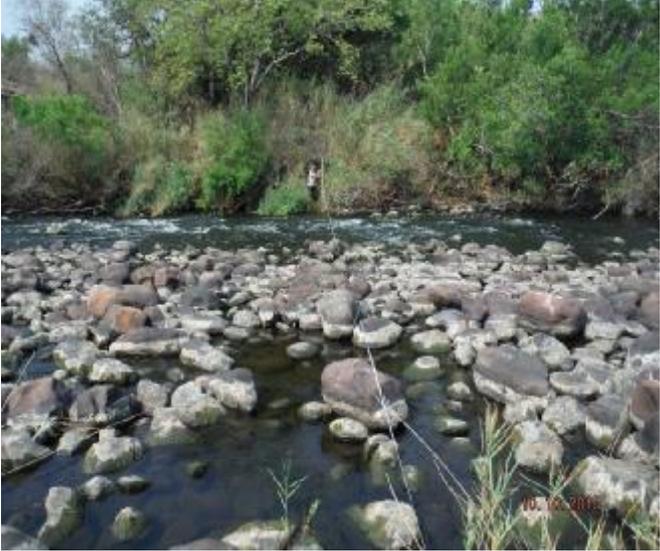
SITE	DETAILS	VIEW
Site	S7	
River	Olifants	
Quaternary Catchment	B32A	
Co-ordinates	-25,496324; 29,254597	
IUA	3	
SQ Reach	B32A-00937	
IEI Rating	3	
WRUI Rating	3	
Survey Type	Rapid III	
PES	B	
COMMENTS/OBSERVATIONS		<p>Cobbles and boulder habitat present. High algae. Very low flow. Limited marginal vegetation present.</p> <p>Discharge: 1.452 m³/s</p> <p>Water Quality: pH 8.8; EC 81 mS/m; DO 6.75 mg/l</p> <p>ASPT: 5.59</p> <p>Fish Habitat: Good</p>

Table 9: Details and Characteristics of Site S8

SITE	DETAILS	VIEW
Site	S8	
River	Kranspoortspruit	
Quaternary Catchment	B32A	
Co-ordinates	-25,437714; 29,475619	
IUA	3	
SQ Reach	B32A-00950	
IEI Rating	3	
WRUI Rating	2	
Survey type	Rapid III	
PES	C	
COMMENTS/OBSERVATIONS		<p>Water was discoloured. Algae and silt was observed covering cobbles. Habitat bedrock and boulder/cobbles with some sand and gravel. In stream vegetation was limited. When inundated there will be good overhanging vegetation and undercut banks.</p> <p>Discharge: 0.013 m³/s</p> <p>Water Quality: pH 8.6; EC 9.0 mS/m; 6.86 mg/l</p> <p>ASPT: 6.55</p> <p>Fish Habitat: Fair</p>

Table 10: Details and Characteristics of Site S9

SITE	DETAILS	VIEW
Site	S9	
River	Selons	
Quaternary Catchment	B32C	
Co-ordinates	-25,379969; 29,435557	
IUA	3	
SQ Reach	B32C-00936	
IEI Rating	3	
WRUI Rating	4	
Survey type	Rapid III	
PES	C	
COMMENTS/OBSERVATIONS		<p>Very low flow observed. Cobble and boulders present. Riffles with limited algae. Pool had dense green algae bloom. Some vegetation observed, mainly root wads. Parasites observed on BPAU</p> <p>Discharge: 0.038 m³/s</p> <p>Water Quality: pH 8.8; EC 27.0 mS/m; DO 6.11 mg/l</p> <p>ASPT: 5.94</p> <p>Fish Habitat: Good</p>

Table 11: Details and Characteristics of Site S10

SITE	DETAILS	VIEW
Site	S10	
River	Olifants	
Quaternary Catchment	B71D	
Co-ordinates	-24.239917; 30.082457	
IUA	10	
SQ Reach	B71D-00412	
IEI Rating	2	
WRUI Rating	4	
Survey type	Rapid III	
PES	D	
COMMENTS/OBSERVATIONS		<p>Very low flow present. Pool, cobbles, boulders and sand observed. Silt deposition. Vegetation and undercut banks limited due to low water level.</p> <p>Discharge: 2.343 m³/s</p> <p>Water Quality: pH 8.8; EC 63 mS/m; DO 7.6 mg/l</p> <p>ASPT: 6.25</p> <p>Fish Habitat: Fair</p>

Table 12: Details and Characteristics of Site S11

SITE	DETAILS	VIEW
Site	S11	
River	Spekboom	
Quaternary Catchment	B42H	
Co-ordinates	-24,694155; 30,361267	
IUA	8	
SQ Reach	B42H-00553	
IEI Rating	3	
WRUI Rating	3	
Survey type	Rapid III	
PES	C	
COMMENTS/OBSERVATIONS		<p>Pool, cobbles, boulders present. Very low flow observed. Water discoloured green with some silt present. Good root wads present.</p> <p>Discharge: 0.028 m³/s</p> <p>Water Quality: pH 9.1; EC 61 mS/m; DO 7.29 mg/l</p> <p>ASPT: 7.55</p> <p>Fish Habitat: Fair</p>

Table 13: Details and Characteristics of Site S12

SITE	DETAILS	VIEW
Site	S12	
River	Upper Blyde	
Quaternary Catchment	B60B	
Co-ordinates	-24,734412; 30,778321	
IUA	13	
SQ Reach	B60B-00566	
IEI Rating	4	
WRUI Rating	1	
Survey type	Rapid III	
PES	B	
COMMENTS/OBSERVATIONS	<p>Pool, cobbles, boulders observed. Snag trees under bridge provided habitat. High silt loads observed. Limited overhanging vegetation.</p> <p>Discharge: 2.039 m³/s</p> <p>Water Quality: pH 8.4; EC 19.0 mS/m; DO 11.95 mg/l</p> <p>ASPT: 6.5</p> <p>Fish Habitat: Good</p>	

Table 14: Details and Characteristics of Site S13

SITE	DETAILS	VIEW
Site	S13	
River	Olifants	
Quaternary Catchment	B71J	
Co-ordinates	-24,307563; 30,785695	
IUA	10	
SQ Reach	B71G-00428	
IEI Rating	3	
WRUI Rating	4	
Survey type	Rapid III	
PES	C	
COMMENTS/OBSERVATIONS		<p>Water was silty and substrate was smothered in fine silt. Cobbles were embedded. Little boulders and bedrock were present. Vegetation limited but under higher flow undercut banks and root wads will be present.</p> <p>Discharge: 4.051 m³/s</p> <p>Water Quality: pH 9.0; EC 55 mS/m; DO 11.63 mg/l</p> <p>ASPT: 6..48</p> <p>Fish Habitat: Fair</p>

Table 15: Details and Characteristics of Site S14

SITE	DETAILS	VIEW
Site	S14 and E11	
River	Lower Blyde	
Quaternary Catchment	B60J	
Co-ordinates	-24,407481; 30,827404	
IUA	10	
SQ Reach	B60J-00444	
IEI Rating	3	
WRUI Rating	3	
Survey type	Rapid III	
PES	C	
COMMENTS/OBSERVATIONS		<p>Low flow observed. Habitat consisted of cobbles with snags and root wads. Overhanging vegetation and some undercut banks present. Silt and algae present. Deep pools.</p> <p>Discharge: 0.653 m³/s</p> <p>Water Quality: pH 8.6; EC 20 mS/m; DO 10.92 mg/l</p> <p>ASPT: 5.59</p> <p>Fish Habitat: Fair</p>

Table 16: Details and Characteristics of Site S15

SITE	DETAILS	VIEW
Site	S15	
River	Olifants	
Quaternary Catchment	B72D	
Co-ordinates	-24,12843; 31,01457	
IUA	12	
SQ Reach	B72D-00326	
IEI Rating	2	
WRUI Rating	4	
Survey type	Rapid III	
PES	C	
COMMENTS/OBSERVATIONS		<p>Low flow observed. Some silt. Low algae growth. Sand with limited cobbles. Limited root wads and undercut banks.</p> <p>Discharge: Gauging weir</p> <p>Water Quality: pH 8.8; EC 56 mS/m; DO 10.68 mg/l</p> <p>ASPT: 5.84</p> <p>Fish Habitat: Poor</p>

Table 17: Details and Characteristics of Site S16

SITE	DETAILS	VIEW
Site	S16	
River	Olifants	
Quaternary Catchment	B73H	
Co-ordinates	-24,049426; 31,731751	
IUA	12	
SQ Reach	B73H-00311	
IEI Rating	3	
WRUI Rating	4	
Survey type	Rapid III	
PES	C	
COMMENTS/OBSERVATIONS		<p>Sand and bedrock habitat. Very low flow present. Some stringy algae observed at site.</p> <p>Discharge: Gauging weir</p> <p>Water Quality: pH 8.9; EC 65 mS/m; DO 12.55 mg/l</p> <p>ASPT: 5.84</p> <p>Fish Habitat: Fair</p>

Table 18: Details and Characteristics of Site B1

SITE	DETAILS	VIEW
Site	B1	
River	Steenkoolspruit	
Quaternary Catchment	B11E	
Co-ordinates	-26,0824.61; 29,1608.27	
IUA	1	
SQ Reach	B11E-01297	
IEI Rating	2	
WRUI Rating	4	
Survey type	Biological	
PES	D	
COMMENTS/OBSERVATIONS		<p>Flow velocity very low. Azolla (red fern) abundant. High sediment and algae observed on substrate. Site had some bedrock with overhanging vegetation. Depth 50 – 650 mm for fish, 20 min.</p> <p>Water Quality: pH 8.0; EC 48 mS/m; DO 5.64 mg/l ASPT: 3.43</p> <p>Fish Habitat: Poor</p>

Table 19: Details and Characteristics of Site B2

SITE	DETAILS	VIEW
Site	B2	
River	Bronkhorspruit	
Quaternary Catchment	B20D	
Co-ordinates	-25,5304.5; 28,4325.7	
IUA	2	
SQ Reach	B20D-01146	
IEI Rating	3	
WRUI Rating	4	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>Floating debris, sedimentation and organics observed. Moderate flow was a result of release from the dam. Lots of algae and diatoms present (long stringy algae). Clear water. Floating Macrophytes. High parasite on observed fish.</p> <p>Water Quality: pH 8.1; EC 37 mS/m; DO 7.52 mg/l ASPT: 3.92 Fish Habitat: Good</p>

Table 20: Details and Characteristics of Site E5

SITE	DETAILS	VIEW
Site	E5	
River	Masala	
Quaternary Catchment	B41C	
Co-ordinates	-25,0827.6; 29,5459.4	
IUA	6	
SQ Reach	B41C-00766	
IEI Rating	2	
WRUI Rating	3	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>Low flow, limited roots, cobbles (mostly bedrock) observed. Some marginal vegetation. MSAL introduced at site. (Confusion on river name Hoofstadsrivier, Masala, Mapochs)</p> <p>Water Quality: pH 8.72; DO 5.91 mg/l</p> <p>ASPT: 5.67</p> <p>Fish Habitat: Good</p>

Table 21: Details and Characteristics of Site E7

SITE	DETAILS	VIEW
Site	E7	
River	Klip	
Quaternary Catchment	B41F	
Co-ordinates	-24,5904.58; 29,5919.70	
IUA	6	
SQ Reach	B41F-00699	
IEI Rating	4	
WRUI Rating	2	
Survey type	Biological	
PES	B	
COMMENTS/OBSERVATIONS		<p>Low flow, silt higher than expected, some algae, detritus. Cobble/boulders and bedrock with pool observed. Sand in stream with no marginal vegetation. According to local information the DWS noted severe pollution from the mines during construction of Lake De Hoop. Off channel dams to pump and purify were constructed but not active after closure of the Mapochs Mine.</p> <p>Water Quality: pH 8.4; DO 6.08 mg/l ASPT: 6.58 Fish Habitat: Good</p>

Table 22: Details and Characteristics of Site H7

SITE	DETAILS	VIEW
<i>Site</i>	H7	
<i>River</i>	Dwars	
<i>Quaternary Catchment</i>	B41H	
<i>Co-ordinates</i>	-24,5038.33; 30,0530.24	
<i>IUA</i>	6	
<i>SQ Reach</i>	B41H-00640	
<i>IEI Rating</i>	2	
<i>WRUI Rating</i>	4	
<i>Survey type</i>	Biological	
<i>PES</i>	D	
COMMENTS/OBSERVATIONS		<p>Low flow, some silt and limited algae observed. Impacts from grazing, wood harvesting (wood crafters) and mining.</p> <p>Water Quality: pH 8.4; DO 8.49 mg/l</p> <p>ASPT: 6.48</p>

Table 23: Details and Characteristics of Site X1

SITE	DETAILS	VIEW
<i>Site</i>	X1	
<i>River</i>	Steenkoolspruit	
<i>Quaternary Catchment</i>	B11C	
<i>Co-ordinates</i>	-26,1928.78; 29,1827.39	
<i>IUA</i>	1	
<i>SQ Reach</i>	B11C-01449	
<i>IEI Rating</i>	2	
<i>WRUI Rating</i>	2	
<i>Survey type</i>	Biological	
<i>PES</i>	C	
COMMENTS/OBSERVATIONS		<p>Water was clear. High silt and algae observed. Impacts are associated with mining, cultivation, trampling by cattle and erosion. Lots of exotic invasive trees observed. Low gradient, deeply incised homogenous system. Limited instream macrophytes, little overhanging vegetation. No flow, only pool that was silted and algae over substrate. Depth 10 mm – 500 mm for fish, 10 min.</p> <p>Water Quality: pH 8.4; EC 89 mS/m; DO 5.63 mg/l</p> <p>ASPT: 4.45</p> <p>Fish Habitat: Poor</p>

Table 24: Details and Characteristics of Site X2

SITE	DETAILS	VIEW
Site	X2	
River	Dwars-in-die-wegspruit	
Quaternary Catchment	B11D	
Co-ordinates	-26,2040.27; 29,1244.90	
IUA	1	
SQ Reach	B11D-01467	
IEI Rating	2	
WRUI Rating	2	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS	<p>Water discoloured with organic sheen on surface. No flow, standing pool. Deeply incised channel. Some stones in current if there is flow downstream of bridge. Dumping of solid waste (household) observed. Steep banks could be dangerous for sampling in high flow. Deep pool may be as a result of excavation. Cultivation, cattle, trampling, erosion, mining and two power stations are located in close proximity (6 km – 10 km).</p> <p>Water Quality: pH 8.2; EC 85 mS/m; DO 5.49 mg/l</p>	

Table 25: Details and Characteristics of Site X3

SITE	DETAILS	VIEW
Site	X3	
River	Steenkoolspruit	
Quaternary Catchment	B11D	
Co-ordinates	-26,1608.94; 29,1417.73	
IUA	1	
SQ Reach	B11D-01366	
IEI Rating	2	
WRUI Rating	4	
Survey type	Biological	
PES	D	
COMMENTS/OBSERVATIONS		<p>Mining, cattle and cultivation impacts noted. Site is located close to Kriel Power station. Informal settlement near site. Solid waste and faecal matter present.</p> <p>Erosion, incised channel observed.</p> <p>Water Quality: pH 8.7; EC 35 mS/m; DO 6.56 mg/l</p> <p>Fish Habitat: Poor</p>

Table 26: Details and Characteristics of Site X5

SITE	DETAILS	VIEW
Site	X5	
River	Olifants	
Quaternary Catchment	B11L	
Co-ordinates	-25,3550.23; 29,1227.42	
IUA	1	
SQ Reach	B11L-01024	
IEI Rating	3	
WRUI Rating	3	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>High algae observed. Encroachment of alien vegetation on bank and in water (macrophytes). Organic odour present. Sediments resulted in embededness of cobbles. Depth of 50 mm – 600 mm for fish, 20 min.</p> <p>Water Quality: pH 8.9; EC 87 mS/m; DO 7.85 mg/l</p> <p>ASPT: 5.07</p> <p>Fish Habitat: Fair</p>

Table 27: Details and Characteristics of Site X6

SITE	DETAILS	VIEW
Site	X6	
River	Klein Olifants	
Quaternary Catchment	B12B	
Co-ordinates	-25,5305.62; 29,3758.39	
IUA	1	
SQ Reach	B12B-01192	
IEI Rating	2	
WRUI Rating	4	
Survey type	Biological	
PES	D	
COMMENTS/OBSERVATIONS	<p>Algae high and sediment observed. River had strong odour and faecal smell. Informal settlements located in close proximity of site. Cultivation centre pivots in area and cattle grazing and trampling observed. Two pump houses for extraction are observed close to site.</p> <p>Water Quality: pH 8.9; EC 260 mS/m; DO 6.63 mg/l</p> <p>ASPT: 4.72</p> <p>Fish Habitat: Poor</p>	

Table 28: Details and Characteristics of Site X7

SITE	DETAILS	VIEW
Site	X7	
River	Klein Olifants	
Quaternary Catchment	B12C	
Co-ordinates	-25,4903.25; 29,3525.98	
IUA	1	
SQ Reach	B12C-01153	
IEI Rating	2	
WRUI Rating	4	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>River reach was dry. Water quality impacts noted (diatoms). Bridge construction nearby. Impacts include grazing cultivation and solid waste.</p> <p>Water Quality: pH 8.8; EC 240 mS/m; DO 5.70 mg/l</p> <p>Fish Habitat: Dry</p>

Table 29: Details and Characteristics of SiteX10

SITE	DETAILS	VIEW
Site	X10	
River	Elands	
Quaternary Catchment	B31A	
Co-ordinates	-25,3430.04; 28,3435.79	
IUA	4	
SQ Reach	B31A-00963	
IEI Rating	3	
WRUI Rating	3	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>Very low flow, riffles limited, substrate has fine silt. Detritus build up noted. Linked to canopy cover. Upstream flow modifications, abstraction and weirs present.</p> <p>Water Quality: pH 8.6; EC 25 mS/m; DO 6.85 mg/l</p> <p>Fish Habitat: Good</p>

Table 30: Details and Characteristics of Site X17

SITE	DETAILS	VIEW
Site	X17	
River	Groot Dwars	
Quaternary Catchment	B41G	
Co-ordinates	-25,0539.99; 30,0720.72	
IUA	6	
SQ Reach	B41G-00721	
IEI Rating	3	
WRUI Rating	2	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>Cobble, boulders and pool observed. Water low flow but clear. Some silt noted. No fish present. Possible impacts from mine.</p> <p>Water Quality: pH 8.4; DO 6.52 mg/l</p> <p>ASPT: 6.21</p> <p>Habitat: Good</p>

Table 31: Details and Characteristics of Site X18 and H3

SITE	DETAILS	VIEW
Site	X18 and H3	
River	Steelpoort	
Quaternary Catchment	B41H	
Co-ordinates	-24,5339.71; 30,0101.67	
IUA	6	
SQ Reach	B41H-00610	
IEI Rating	2	
WRUI Rating	3	
Survey type	Biological	
PES	D	
COMMENTS/OBSERVATIONS		<p>Low/moderate flow present. Releases are made from De Hoop. Water abstraction present (use by construction vehicles and local communities for drinking)</p> <p>Water Quality: pH 8.4; DO 8.93 mg/l</p> <p>ASPT: 5.74</p>

Table 32: Details and Characteristics of Site X19

SITE	DETAILS	VIEW
Site	X19	
River	Mohlapiitse	
Quaternary Catchment	B71C	
Co-ordinates	-24,0613.01; 30.0706.47	
IUA	10	
SQ Reach	B71C-00292	
IEI Rating	4	
WRUI Rating	2	
Survey type	Biological	
PES	B	
COMMENTS/OBSERVATIONS		<p>Low flow with high silt noted after rain (water – brown colour). Pooled SASS sample however difficult to see biotopes.</p> <p>Water Quality: pH 8.4; DO 5.79 mg/l</p> <p>ASPT: 7.33</p> <p>Fish Habitat: Poor</p>

Table 33: Details and Characteristics of Site X20

SITE	DETAILS	VIEW
Site	X20	
River	Olifants	
Quaternary Catchment	B71B	
Co-ordinates	-24,1413.08; 30,0435.75	
IUA	10	
SQ Reach	B71B-00335	
IEI Rating	2	
WRUI Rating	4	
Survey type	Biological	
PES	C	
COMMENTS/OBSERVATIONS		<p>Low flow observed. Invasive vegetation noted in riparian zone. High sedimentation. Water had a blue soapy feel and look to it.</p> <p>Water Quality: pH 8.6; EC 34 mS/m; DO 8.42 mg/l</p> <p>ASPT: 5.96</p> <p>Fish Habitat: Good</p>

Table 34: Details and Characteristics of Site X21

SITE	DETAILS	VIEW
Site	X21	
River	Motse	
Quaternary Catchment	B71E	
Co-ordinates	-24,1852.46; 30,1023.34	
IUA	10	
SQ Reach	B71E-00429	
IEI Rating	1	
WRUI Rating	4	
Survey type	Biological	
PES	E	
COMMENTS/OBSERVATIONS	<p>No fish. Very little water - mostly ephemeral. Some water observed, from rain earlier in week. Little cobble present, mostly sand and no marginal vegetation.</p> <p>Water Quality: pH 8.5; DO 5.84 mg/l</p> <p>ASPT: 6.00</p> <p>Fish Habitat: Poor</p>	



OLIFANTS CATCHMENT FIELD SURVEY TEAM

4 CONCLUSION

In terms of the field survey the following can be concluded:

- The key objectives of field survey were achieved. The surveys were undertaken as planned and required; and
- The DWS personnel were capacitated on site surveys and selection, as well as sampling in some cases. Active participation and contribution was achieved. Each official was given a chosen site and good response was obtained. It should be noted that the DWS officials were unable to accompany the team to all sites due to the incapacity of the vehicle allocated to them. This hindered their participation to some extent.

In terms of the Olifants catchment the following was noted:

- Dry extreme conditions are being experienced, with very low flow conditions;
- The river system is a critical state (drought);
- Poor water quality is prevalent in the system – substantial further deterioration (no capacity available currently which is compounded by low flows). This was specifically noted in the Lower Wilge, Upper Olifants and Klein Olifants;
- These current conditions impact on Ecostatus of the system. This is important and must be considered in the context current situation;
- The system can be considered to be in an extremely stressed state; and
- This cannot be accepted as being the acceptable and significant interventions and actions are required.

APPENDIX A

FIELD SURVEY PROGRAMME: OLIFANTS CATCHMENT – OCTOBER 2015

Programme for rapid III sites and re-survey of existing sites: Field Survey 7-16 October 2015

Date	Site	Description	Notes
Wed, 7/10	S1 S2	Golder Offices, Pretoria Elands, B31B/B31C, new rapid Wilge, B20J, re-survey EWR4_compr	Meet at 09h00 N1-R573 R573-R513-R25
Thu, 8/10	S3 S4	Wilge, B20F, new rapid Olifants, B11G, new rapid	R25-R104-N4-R686-R960 N12-R554
Fri, 9/10	S5 S6	Olifants, B11J, new for EWR1_compr Klein Olifants, B12E, new for EWR3_compr	R555 R555-N11
Sat, 10/10	S7	Olifants, B32A, re-survey EWR2_compr	N11
Sun, 11/10	S8 S9	Kranspoortspuit, B32A, re-survey EWR3_rapid Selons, B32B/B32C, new rapid	N11 R555
Mon, 12/10	S10 S11	Olifants, B71D, re-survey of EWR8_compr Spekboom, B42H, new rapid	R37 R37
Tue, 13/10	S12 S13	Blyde, B60B/B60D, new rapid Olifants, B71J, re-survey EWR11_compr	R532 R532-R36-R527
Wed, 14/10	S14 S15	Blyde, B60J, re-survey EWR12_compr Olifants, B72D, re-survey EWR13_compr	R527 R527-R40
Thu, 15/10	S16	Olifants, B73H, re-survey EWR16_compr	R71
Fri, 16/10		Travel back to Pretoria	