



Rooiberg Waste Facility
Eco-hydrological Desktop Overview

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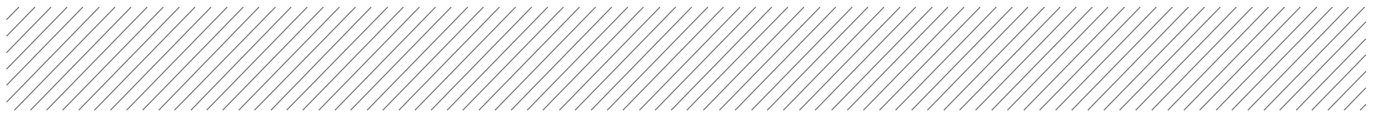
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Acronym List

Acronym	Meaning
NWA	National Water Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
NBA	National Biodiversity Assessment
IWM	Integrated Watershed Management
UNEP	United Nations Environment Programme
WMA	Water Management Area
UNESCO	United Nations Educational, Scientific, and Cultural Organization
IHP	International Hydrological Programme



1. Introduction

1.1 General

The Rooiberg waste disposal facility is situated on the outskirts of Rooiberg in the Limpopo Province (**Figure 1**). It forms part of the 122 unlicensed municipal waste disposal facilities identified throughout the various provinces in South Africa in a study conducted by the Department of Environmental Affairs (DEA). In order to legalise these sites DEA has appointed various professional service providers to assist the various Local Municipalities in the licensing of the waste disposal facilities before the end of the 2013/2014 financial year. Aurecon has been appointed by DEA to undertake the licencing of the Rooiberg Waste Disposal Facility on behalf of the Thabazimibi Local Municipality.

The Rooiberg waste disposal facility services the town of Rooiberg as well as the RDP housing situated just outside of the town. The site is not demarcated and it appears that the waste is being disposed of in an old mining pit. The following types of waste were observed on site; domestic, garden, hazardous and medical waste. There appears to be no evidence of current mine waste. There is currently no management of the site.

This report aims to give an overview of the ecological and hydrological (eco-hydrological) aspects associated with the study area on a local and regional scale.

1.2 Terms of Reference

Give an overview of the affected ecological and hydrological (aquatic) environment by:

- Collecting available information by means of a literature review
- Identify any potential species or ecosystems that are sensitive or of conservation concern within the local setting of the study area
- Propose general mitigation measures to minimise potential risks or impacts associated with the proposed project

1.3 Limitations

- This assessments main objective is a review of available environmental literature and data available for the study area
- This assessment is limited to desktop information available at the time of the assessment
- All land use predictions are made based on available satellite imagery at the time of the assessment

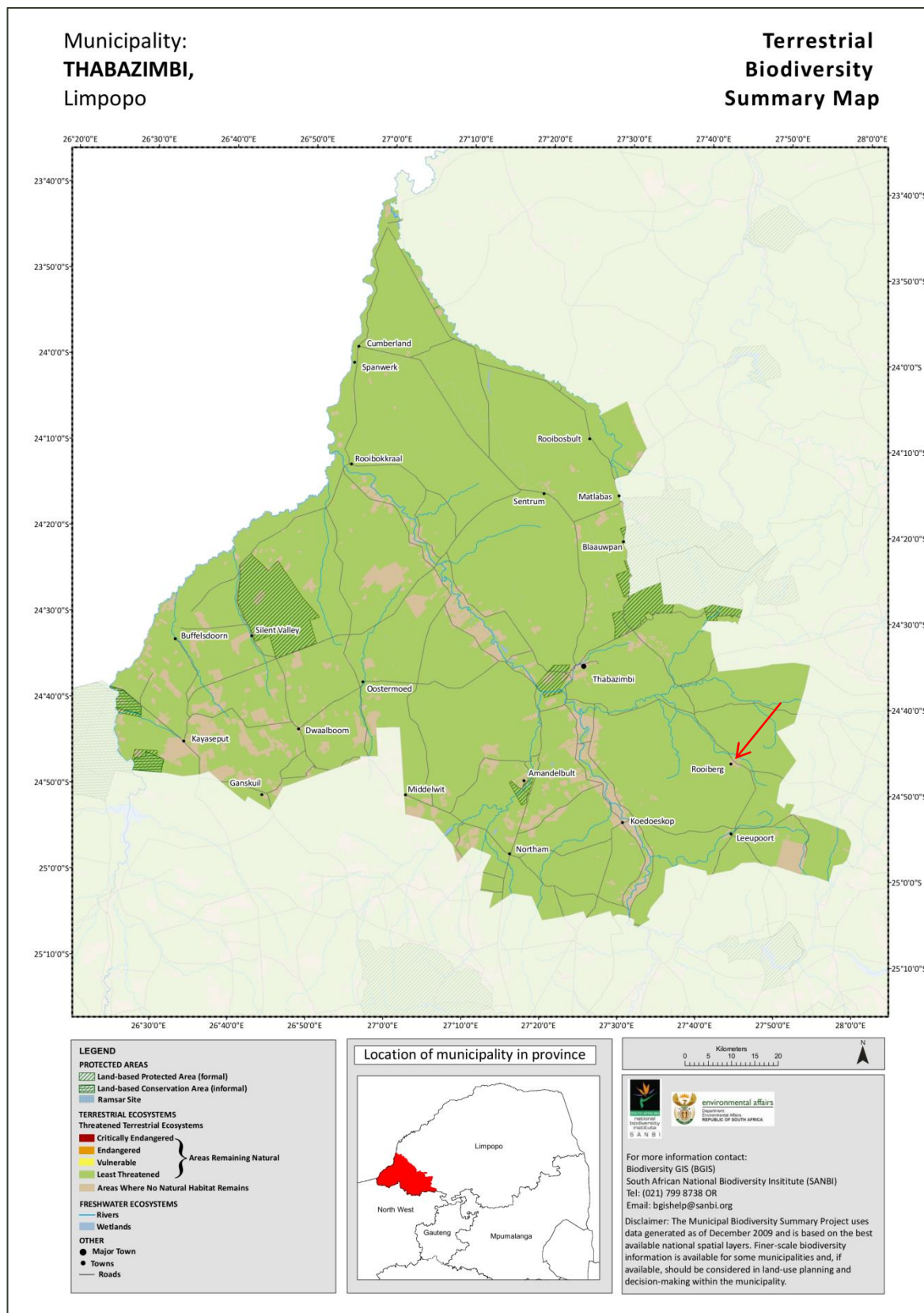


Figure 1 Study Area and Biodiversity Priority Areas

1.4 Methodology

It is widely recognised that the successful management of water resources is essential in achieving sustainable development. The ongoing co-operation between the United Nations Environment Programme - Division of Technology, Industry and Economics - International Environmental Technology Centre (UNEP-DTIE-IETC) and the United Nations Educational, Scientific, and Cultural Organization - International Hydrological Programme (UNESCO-IHP) resulted in the development of a novel, environmental management approach that led to the concept of Eco-hydrology. Eco-hydrology is an improvement on the existing context of Integrated Watershed Management (IWM) by integrating two components – hydrology and ecology. By means of regulating the hydrological, biotic and landscape interactions and processes, the integration of ecology and hydrology has shown to improve ecosystems' resistance to stress (**Figure 2**).

Pollution has been traditionally perceived as being the main link to freshwater degradation, but the modern view is that increasing anthropogenic activities within a catchment have much more profound impacts on environmental quality. Therefore, the approach taken in this desktop assessment is in line with the basic concepts of eco-hydrology and care has been taken to give a holistic overview of the study area from the basin level through to the site level. For the generation of species lists, the 2427DC quarter degree grid was used as the area of search.

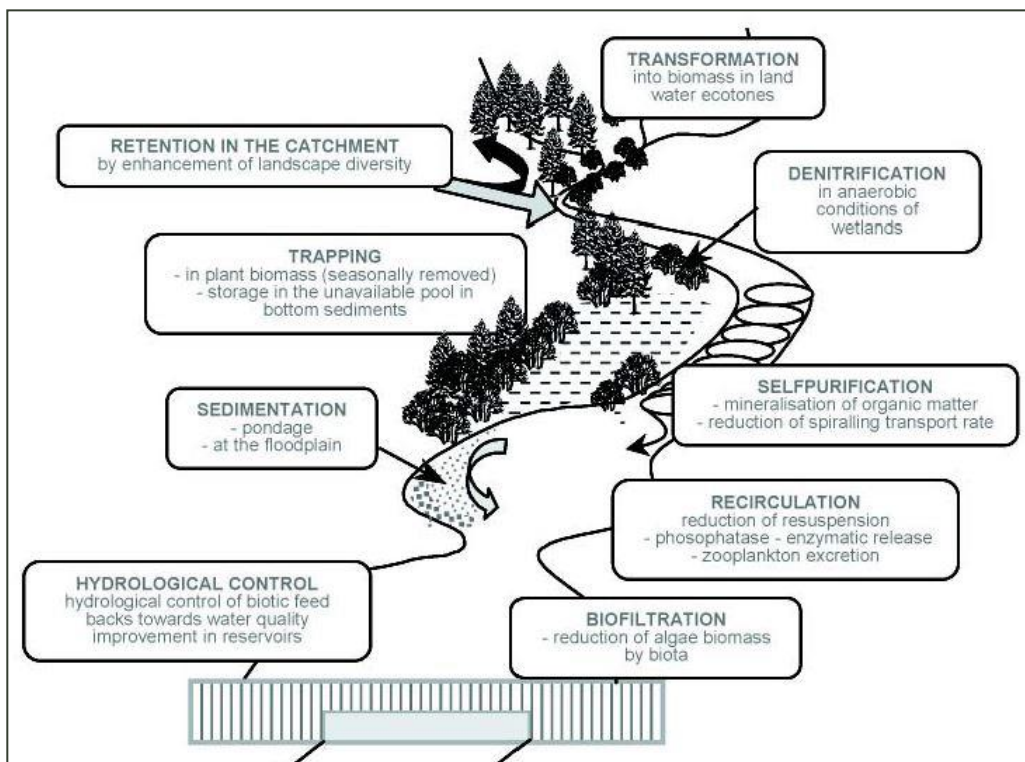


Figure 2 Eco-hydrology as part of IWM¹

The following databases and literature was used to provide an overview of the hydrological and ecological environment linked to the study area:

- South African National Biodiversity Institute (SANBI)
- National Freshwater Ecosystem Priority Areas Atlas (NFEPA Atlas)

¹ Figure taken from *UNEP-UNESCO Integrated Watershed Management – Ecohydrology & Phytotechnology Implementation Manual 2004*

- Department of Water Affairs (DWA) River Health Programme Database
- DWA Water Management Systems (WMS) Database
- Water Resources of South Africa (WR 2005)

A desktop analysis was performed using the latest information resources available from SANBI. The following databases were queried to generate species lists for the 2427DC quarter degree square (QDS):

- SABIF (South African Biodiversity Information Facility)
- SARCA (South African Reptile Conservation Assessment)
- SANSA (South African National Survey of Arachnids)
- SABCA (South African Butterfly Conservation Assessment)
- POSA (Plants of Southern Africa)
- BGIS (Biodiversity Geographic Information System)

2. Eco-hydrological Desktop Overview

2.1 Hydrological Overview

2.1.1 Water Management Area

The study area is situated within the Lower Crocodile sub-water management area (WMA) of the Crocodile West Marico WMA. The main factors affecting the hydrology of the Crocodile West Marico WMA are given in **Table 1** and **Table 2**.

Table 1 Basin Land Use of the Crocodile West Marico WMA

Catchment Area (km ²)	Forestry (km ²)	Alien Vegetation (km ²)	Irrigation (km ²)	Combined Farm Dams	
				(km ²)	(mcm)
Crocodile West Marico WMA					
43235.00	-	170.70	733.44	171.71.00	36.03

Table 2 Basin Hydrology of the Crocodile West Marico WMA

MAE WR 2005 (mm)	MAE WR 90 (mm)	MAP (mm)	MAR WR 2005 (mcm)	MAR WR 90 (mcm)	Change in MAR (%)
Crocodile West Marico WMA					
1833.418	1833.286	591.28	697.2	738.3	-5.6

2.1.2 Quaternary Catchment

The study area is situated within the A24H quaternary catchment. The main factors affecting the hydrology of the A24H quaternary catchment are given in **Table 3** and **Table 4**.

Table 3 Basin Land Use of the A24H quaternary catchment

Catchment Area (km ²)	Forestry (km ²)	Alien Vegetation (km ²)	Irrigation (km ²)	Combined Farm Dams	
				(km ²)	(mcm)
A24H Quaternary Catchment					

Catchment Area (km ²)	Forestry (km ²)	Alien Vegetation (km ²)	Irrigation (km ²)	Combined Farm Dams	
				(km ²)	(mcm)
A24H Quaternary Catchment					
1339.00	-	-	-	0.05	0.09

Table 4 Basin Hydrology of the A24H quaternary catchment

MAE WR 2005 (mm)	MAE WR 90 (mm)	MAP (mm)	MAR WR 2005 (mcm)	MAR WR 90 (mcm)	Change in MAR (%)
A24H Quaternary Catchment					
1750	1750	639	30.05	36.0	-16.5

2.1.3 Sub-quaternary catchments

The scale of the delineation of sub-quaternary catchments associated with the study area is varied depending on the source. The National Freshwater Ecosystem Priority Area (NFEPA) Atlas delineated one sub-quaternary catchment (national scale).

The NFEPA status (national) for the sub-quaternary catchment associated with the study area is classified as a “Freshwater Ecosystem Priority Area” (FEPA), which is considered as the highest priority ranking for freshwater ecosystems in South Africa.

2.1.4 Rivers and Streams

An ephemeral tributary of the Vaalwaterspruit flows approximately two hundred (200) metres on the eastern side of the study area. The perennial river within the study area is the Vaalwaterspruit which flows from east to west approximately two and a half kilometres north of the study area.

The Vaalwaterspruit is classified as a CLASS D: LARGELY MODIFIED River according to the desktop modified PES (1999) done for the NFEPA Atlas.

Table 5 River Characteristics of Vaalwaterspruit

Flow	Geomorphic Zone	PES 1999	River Condition
Vaalwaterspruit Characteristics			
Permanent	Upper Foothills	Class D: Largely Modified	B: Largely Natural With Few Modifications

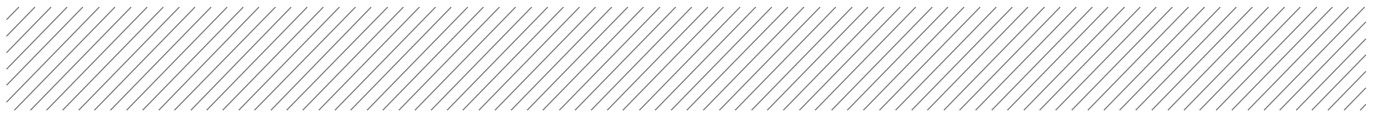
2.1.5 Water Quality

Long term water quality data was obtained from the Water Resources of South Africa 2005 Study. Long term data for the A24H quaternary catchment was used to obtain the average water quality parameters up to 2005 (Table 6).

The ideal background value for pH is 6.0-9.0. The Recommended Maximum Electrical Conductivity (EC) according to SABS standards are 70 mS/m with the Allowed Maximum conductivity limited at 300mS/m.

Table 6 Long Term Water Quality Data A24H Quaternary Catchment

pH	TDS (mg/L)	NO ₃ +NO ₂ -N (mg/L)	NH ₄ -N (mg/L)	F (mg/L)	PO ₄ -P (mg/L)	SO ₄ (mg/L)
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A24H Water Quality					
8.61	-	0.74	0.09	0.61	-

2.2 Ecological Overview

2.2.1 Vegetation Type

The proposed waste disposal facility is located within one vegetation type namely the Western Sandy Bushveld. The conservation status for the vegetation type is LEAST THREATENED. Summaries for the vegetation type are given in **Table 7**.

Table 7 Vegetation Types of the study area

Point	Category	Feature	Comments
Western Sandy Bushveld			
1.1	Distribution	<ul style="list-style-type: none"> • Limpopo and North-West Provinces 	<ul style="list-style-type: none"> • Altitude: 900 – 1200m
1.2	Vegetation and Landscape Features	<ul style="list-style-type: none"> • Tall open woodland to low woodland • Broad leaved and microphyllous trees 	<ul style="list-style-type: none"> • <i>Acacia erubescens</i> on flat areas • <i>Combretum apiculatum</i> on shallow soils • <i>Terminalia sericea</i> on deep sands
1.3	Climate	<ul style="list-style-type: none"> • Mainly summer rainfall • Dry winters 	<ul style="list-style-type: none"> • MAP: 450 mm – 650 mm • Mean monthly Max T: 36°C • Mean monthly Min T: -3.7°C • Frost incidence frequent
1.4	Conservation	<ul style="list-style-type: none"> • Least Threatened 	<ul style="list-style-type: none"> • Approximately 4% transformed • Mainly cultivation • 6% statutorily conserved • Erosion low to very low
1.5	Biogeographically Important Taxa	None	

2.2.2 National Freshwater Ecosystem Priority Area (NFEPA)

The study is located within one sub-quaternary catchment as delineated by the NFEPA Atlas. The priority status given to the sub-quaternary catchment is FRESHWATER ECOSYSTEM PRIORITY AREA according to the atlas.

2.2.3 Eco-region

The study area is located within the Western Bankenveld Eco-region.

2.2.4 Faunal Species

Species of Conservation Concern (SCC)

No SCC is known to occur within the 2427DC QDS according to the ADU's database.

2.2.5 Floral Species

Species of Conservation Concern (SCC)

One SCC is known to occur within the 2427DC QDS according to the POSA database:

Ansellia africana (leopard orchid) (DECLINING)

Protected Tree Species

One nationally protected tree species is known to occur within the 2427DC QDS according to the POSA database:

Combretum imberbe (leadwood)

2.2.6 Likelihood of Occurrence

The likelihood of occurrence of *Ansellia africana* and *Combretum imberbe* within the study area is dependent upon the present ecological condition of the study area. The current and historical satellite imagery used in the background study for this report indicates that the study area and its immediate surrounding landscape are impacted by various land uses (overgrazing, mining/quarrying etc.).

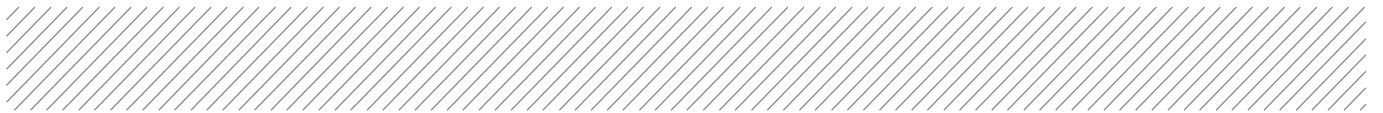
3. General Issues

3.1 Environmental Issues and Goals in Waste Disposal²

Table 8 General Environmental Waste Disposal Guidelines

Issue	Cause	Goal	Implementation
Water Pollution	Leachate from waste disposal poses a risk to surface and ground water	Waste disposal facility design	Control leachate within the waste disposal facility site
		Waste disposal Monitoring	Monitoring must be conducted to allow for early detection of ground/surface water pollution
		Waste disposal Remediation	Pollution needs to be remediated immediately
Air Pollution	Methane and Carbon Dioxide emissions. Methane poses an explosion risk	Waste disposal Design	Gas should be prevented from reaching explosive concentrations Utilise Waste disposal gas sustainably Emissions must comply with national standards
		Waste disposal Monitoring	Monitoring must be conducted to allow for early detection of high emissions concentrations
		Waste disposal Remediation	Uncontrolled emissions need to be remediated immediately
Land Management and Conservation	Waste disposal sites are unsustainable if not managed properly	Waste Quality	Only licensed waste are allowed on the site
		Record keeping	All waste received must be known and recorded
		Minimise Space	Space must be used optimally
		Maximise recycling	Recycling plan should be put in place at each license renewal
		Remediate	Ensure that management of Waste disposal site renders the site beneficial for activities

² Environmental Guidelines: Solid Waste Landfills, NSW



Issue	Cause	Goal	Implementation
			post closure of the site
Hazards	Fire, birds, dust, odour, pests, vermin, litter are considered potential hazards and amenity impacts associated with Waste disposal	Prevent unauthorised entry	No unauthorised entry
		Prevent degradation of local amenity	Control odours, dust, vermin and weeds on-site
		Prevent noise pollution	Noise must comply with noise control standards

3.2 Recommendations

The following recommendations are made:

- All potential wet/riparian areas towards the east of the site be delineated and regarded as “no-go” areas with a brief site visit
- A brief site visit to be conducted to determine the likelihood of occurrence of threatened species and species of conservation concern within the study area
- The following pollution control systems are recommended:
 - capping system;
 - leachate management system;
 - surface water collection and storage system; and
 - fixed monitoring points for settlement, groundwater quality, surface water quality and leachate sampling.

4. Conclusion

The main concerns regarding the waste disposal facility are related to potential impacts from leachate of the waste disposal facility on the Vaalwaterspruit located downstream of the study area. The Vaalwaterspruit is listed as a national freshwater priority river and as such should remain in a good condition in order to contribute to national biodiversity goals. The water quality in the Vaalwaterspruit tributary flowing on the east of the study area should be managed in such a way as to support the functioning of the Vaalwaterspruit. Strong mitigation, sustainable design standards and management are critical to ensuring that leachate is minimised and contained within the limits of the waste disposal facility.

The main desktop findings regarding the ecological habitat

- Two protected species and/or species of conservation concern (SCC) have previously been recorded within the 2427DC quarter degree square (QDS).
- The presence and locations of SCC should be determined based on available habitat and/or positive field identification within the study area.
- Based on aerial imagery, the majority of the site appears to be largely modified when compared to other natural sites surrounding the study area.

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