forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

Private Bag X447, Pretoria, 0001, Environment House, 473 Steve Biko Road, Pretoria, 0002 Tel: +27 12 399 9000, Fax: +27 86 625 1042

SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

REPORT TITLE

Terrestrial Biodiversity Assessment for the Proposed Rand Water New System 1 Upgrade, 7km Sludge Pipeline Installation in Vereeniging, and 1.5km Sludge Pipeline Installation at Panfontein, all within Sedibeng District Municipality, Gauteng

Kindly note the following:

1. This form must always be used for assessment that are in support of applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting, where this Department is the Competent Authority.
2. This form is current as of August 2023. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.dffe.gov.za/documents/forms.
3. An electronic copy of the signed declaration form must be appended to all Draft and Final Reports submitted to the department for consideration.
4. The specialist must be aware of and comply with '*the Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the act, when applying for environmental authorisation - GN 320/2020)*', where applicable.

1. SPECIALIST INFORMATION

Title of Specialist Assessment	Flora and Fauna Assessment
Specialist Company Name	Eco-sentle (Pty) Ltd
Specialist Name	Musatondwa Magala
Specialist Identity Number	8911296050081
Specialist Qualifications:	B.Sc; B.Sc Hons & M.Ssc Natural Sciences
Professional affiliation/registration:	SACNASP
Physical address:	29 Swallowtail Street, Littlefalls, Roodepoort, 1725
Postal address:	Same as Physical
Postal address	Same as Physical
Telephone	Click or tap here to enter text.
Cell phone	0835370424
E-mail	musa@ecosentle.co.za

SPECIALIST DECLARATION FORM – AUGUST 2023

2. DECLARATION BY THE SPECIALIST

I, Musatondwa Magala declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols") and in Government Notice No. 1150 of 30 October 2020.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
    - any decision to be taken with respect to the application by the competent authority; and;
    - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the NEMA Act.

Signature of the Specialist

Click or tap here to enter text. Eco-Seutle (Pty) Ltd

Name of Company:

Click or tap to enter a date. 02/07/2025

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Musatondwa Magala, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

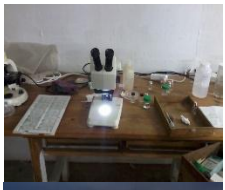
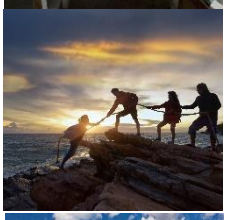
Eco-Sentle (Pty) Ltd
Name of Company

02/07/2025
Date

MAGALA ACCOUNTANTS
| Accounting | Taxation | Payroll | Compliance
Date: 02-07-2025
Tel: 073 859 6537
Practice No: SAIBA 2571
www.magalaaccountants.co.za

Signature of the Commissioner of Oaths

02-07-2025
Date





Aquatic Specialists and Environmental Consultants

Terrestrial Biodiversity Assessment for the proposed construction and maintenance of New System 1 at Rand Water Vereeniging Treatment Works, installation of approximately 7 km phase 2 sludge pipeline in Vereeniging, 1.5 km sludge line in Panfontein and associated infrastructure within the jurisdiction of Sedibeng District Municipality, Gauteng Province May 2025

Prepared by: Eco-Sentle (Pty) Ltd

Cnr Cedar & 3rd Street, Chartwell

2055,

Prepared for: Selahle Consulting AND Project (Pty) Ltd

Report Name	**Terrestrial Biodiversity Assessment for the proposed construction and maintenance of New System 1 at Rand Water Vereeniging Treatment Works, installation of approximately 7 km phase 2 sludge pipeline in Vereeniging, 1.5 km sludge line in Panfontein and associated infrastructure within the jurisdiction of Sedibeng District Municipality, Gauteng Province**	
Prepared for	**Selahle Consulting and Projects (Pty) Ltd**	
Report Writer	**Musa Magala (M. Sc; Pr. Sci.Nat)** *SACNASP Reg no: 013631*	
Report Quality Reviewer	**Zintle Fono**	
Declaration	Eco-Sentle (Pty) Ltd and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Ecological Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time, and budget) based on the principals of science.	

Declaration

I, Musa Magala declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist work relevant to this application, including knowledge of the Act (NEMA), regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Musa Magala
EMAIL: musa@ecosentle.co.za
CELL: 083 537 0424

Ecological Specialist

20 May 2025

Abbreviations

ADU	Animal Demography Unit
AIS	Alien Invasive Species
BGIS	Biodiversity Geographic Information System
BODATSA	Botanical Database of Southern Africa
CARA	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
CBAs	Critical Biodiversity Areas
CR	Critically Endangered
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act, 1989 (Act No. 73 of 1989)
EMP	Environmental Management Plan
EMPR	Environmental Management Plan Report
EN	Endangered
EO	Environmental Officer
ESAs	Ecological Support Areas
EWT	Endangered Wildlife Trust
FEPA	Freshwater Ecosystem Priority Area
IBA	Important Bird Areas
IUCN	International Union for Conservation of Nature
LC	Least Concern
LT	Least Threatened
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act
NEM:BA	NEM:BA National Environmental Management: Biodiversity Act
NT	Near Threatened
NWA	National Water Act

NWBSP	North-West Biodiversity Sector Plan
PA	Protected Area
QDGS	Quarter Degree Grid Square
SABAP	South African Bird Atlas Project
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
WMA	Water Management Area
VU	Vulnerable

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1. EXECUTIVE SUMMARY

Introduction

Selahle Consultancy and Projects (Pty) Ltd (SCP) has been appointed by Rand Water to undertake the Basic Assessment Process, Heritage Permit and Water Use Licence Application for the proposed construction and maintenance of **New System 1** at the Rand Water Vereeniging Treatment Works, including the installation of approximately **7 km of Phase 2 sludge pipeline in Vereeniging**, **a 1.5 km sludge line in Panfontein**, and associated infrastructure. The project is located within the Sedibeng District Municipality, Gauteng Province. Eco-Sentle (Pty) Ltd was appointed by SCP to conduct a biodiversity baseline assessment associated with this project as part of the requirement for an environmental authorisation application.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) under the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The methodology considered the recent Government Notice 320 issued under NEMA on 20 March 2020 and Government Notice 1150 issued under NEMA on 30 October 2020, titled "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation

Study area and Habitat Description

The proposed project spans three distinct sites, all located within the Rand Water servitude in the Sedibeng District Municipality, Gauteng Province. The area of influence for the project is primarily focused around the Vereeniging Water Treatment Works (VWTW) servitude, where the majority of construction and associated activities will occur. The general land use of the area is **industrial and urban**, with existing infrastructure from the operational water treatment works and surrounding developments having significantly transformed the landscape.

Screening Tool Comparison

The National Environmental Screening Tool identified the project areas as having **'Very High Sensitivity'** in the terrestrial biodiversity theme, and medium to high sensitivity under the Plants and Animal Species Theme, primarily due to the potential occurrence of species of conservation concern such as *Hydroprogne caspia*, *Hydrictis maculicollis*, and *Ourebia ourebi*. In contrast, the Panfontein location was classified as having low sensitivity under the same theme.

Based on the field assessment and desktop findings, it is the opinion of the specialist that the project footprint particularly the Rand Water Vereeniging Water Treatment Works (VWTW) servitude should be considered of medium ecological sensitivity. This is due to the already transformed nature of the area, characterised by existing infrastructure and human activity. However, the proximity of the Vaal River, a significant ecological feature, elevates the environmental context and necessitates careful management to avoid indirect impacts on the adjacent riparian ecosystem.

Conservation & Spatial Planning: Gauteng Conservation Plan Version 4.0 (GDARD, 2023)

The Gauteng Conservation Plan Version 4.0 (GDARD, 2023) identifies those sites that are critical for maintaining biodiversity, enabling planners, environmental professionals, and land use managers to integrate biodiversity into land use planning and decision-making.

Both Gauteng Conservation Plan versions 3.3 and 4.0 were reviewed as part of the assessment. According to C-Plan 3.3, the Vereeniging Water Treatment Works (VWTW), including the locations for the New System 1 and Phase 2 sludge servitude, fall outside of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs),

suggesting a lower conservation priority at the provincial scale. However, the updated C-Plan 4.0 indicates that these same areas now fall within a CBA, reflecting a reassessment of their ecological importance. This is contradictory, as these locations are already heavily transformed. The Panfontein sludge pipeline location remains outside of CBA boundaries in both versions, although ESAs are located in close proximity to all project locations.

Conservation & Spatial Planning: Regional Vegetation and Terrestrial Threatened Ecosystem

The proposed project servitude traverses two distinct ecosystem types: the **Soweto Highveld Grassland and Central Free State Grassland** Ecosystems**.** The NEMBA Revised National List of Threatened Ecosystems (2022) lists the **Soweto Highveld Grassland** as threatened, categorising it as Vulnerable.

Protected Areas and Important Bird Areas

A review of the **South African Protected Areas Database** confirms that no formally protected areas or declared conservation zones occur within the proposed development footprint.

There are no Important Bird Areas (IBAs) within a 30km radius of the project site, minimising potential impacts on critical bird habitats.

National Freshwater Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) database affords guidance on how many rivers, wetlands, and estuaries, and which of these, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (NWA). The main intention of the Freshwater Ecosystem Priority Areas (FEPAs) is to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEMBA) biodiversity goals informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act.

According to the National Freshwater Ecosystem Priority Areas (NFEPA) dataset, the **7 km of Phase 2 sludge pipeline in Vereeniging** lies near the Vaal River, a river system identified as an important freshwater ecosystem. The proposed project activities do not overlap with any NFEPA-designated freshwater features. However, due to the close proximity to the Vaal River, extra precautions must be taken during construction to minimise ecological damage, particularly to the riparian zone and the river itself. Direct impacts to riverine are expected to be minimal if appropriate mitigation measures are strictly implemented, especially considering the already transformed nature of the development footprint.

Results: Habitat characterisation and vegetation assessment

During the field survey conducted on 15 April 2022, it was assessed that the study area supports modified grassland vegetation with varying degrees of transformation across the project sites. Although no floral species of conservation concern were recorded during the field survey, the dominance of alien invasive species in some areas and the proximity to water bodies such as the Vaal River require careful management.

Habitat Units:
Four habitat units were identified and assessed:

- **Habitat Unit 1** is a modified depression resembling an incomplete aeration basin at the New System 1 location. It contains wetland-like conditions with water-loving vegetation within the depression and alien-invaded grassland on the periphery.

- **Habitat Unit 2** comprises grassland with scattered trees and shrubs, affected by dried sludge stockpiles and potential sand mining activities. It lies near the Vaal River and has high conservation importance due to its proximity to ecologically valuable features.
- **Habitat Unit 3** is dominated by grassland with tree species along the Vaal River. The area is impacted by urban development, including roads, illegal dumping, and industrial activities, resulting in moderate functional integrity.
- **Habitat Unit 4**, located in Panfontein, consists of low shrub and grassland surrounding sludge dams and is situated in an area transformed by agricultural and water treatment activities, thus holding low ecological value.

Results – Fauna Assessment

During the field survey, no mammal species were recorded in the study area. The web-based screening tool identified the study area as having potentially sensitive features. Despite this, Species of Conservation Concern (SCC) mammal species were assessed to have a low probability of occurrence based on habitat suitability assessments. No faunal species of conservation concern were encountered on-site during the field survey.

Habitat Assessment and Sensitivity

The Site Ecological Importance (SEI) of the identified habitat units in the study area was evaluated using the SANBI (2020) protocol.

Habitat sensitivity varies across the four habitat units, with Units 2 and 3 considered more sensitive due to their proximity to the Vaal River and partial ecological connectivity. Units 1 and 4 are assessed as having low ecological sensitivity due to high levels of transformation and limited functional habitat.

Conclusion

Although the project is located within a vulnerable ecosystem, the development footprint has already been significantly transformed by the existing activities of the Vereeniging Water Treatment Works and related infrastructure. The impact significance assessment indicates that, with the implementation of mitigation measures outlined in this report, biodiversity-related impacts will remain low.

In the specialist's opinion, development within the confirmed servitude/route area can be considered favourably. However, it is crucial that the mitigation measures outlined in this report are strictly implemented to minimise environmental impact and preserve biodiversity.

2. INTRODUCTION

2.1. BACKGROUND AND PROJECT DESCRIPTION

Selahle Consultancy and Projects (Pty) Ltd (SCP) has been appointed by Rand Water to undertake the Basic Assessment Process, Heritage impact assessment and Water Use Licence Application for the proposed construction of New System 1 at the Rand Water Vereeniging Treatment Works, including the installation of approximately 7 km of Phase 2 sludge pipeline in Vereeniging, a 1.5 km sludge line in Panfontein, and associated infrastructure. The project is located within the Sedibeng District Municipality, Gauteng Province. The proposed project consists of the following locations and proposed activities:

1. Construction of the **New System 1 at Rand Water Vereeniging Treatment Works**. The Vereeniging New System 1 at Rand Water Vereeniging Treatment Works will consist of the following infrastructure:
    - Construction of a new 250 MLD flocculator and 225 MLD sedimentation tank.
    - Installation of the de-sludge bridge.
    - Construction of access roads.
    - Installation of a raw water pipeline.
    - Installation of a sludge pipeline.
    - Demolition of System 1 tank (90 MLD) to allow for the installation of a new automated system capable of producing 1400 MLD.
    - Construction of a Laboratory and
    - The installation of a new Carbon Dioxide dosing Carbonisation Bay.
2. Installation of approximately 7 km of **Phase 2 sludge pipeline in Vereeniging Water Treatment Works:**
    - Phase 2 of the sludge pipeline begins at the sludge pumping station within the Vereeniging Water Treatment Works and extends through a predominantly industrial area in southern Vereeniging.
    - The proposed pipeline runs alongside and intersects existing services, including Rand Water's bulk water pipelines leading to the Vaal River crossing.
    - Approximately 7 km of 1000 mm nominal internal diameter steel sludge pipeline, with an 8 mm wall thickness, will be installed from the Vereeniging Pumping Station to the Vaal River crossing.
3. Installation of a **1.5 km sludge pipeline in Panfontein:**
    - The Panfontein Sludge Pipeline will consist of the installation of a new interconnection sludge pipeline with approximately 1.5km in length and 800mm in diameter.

This project involves activities listed under the National Environmental Management Act 107 of 1998, 2014, as amended, which necessitate an EIA (Basic Assessment) by an Environmental Impact Assessment Practitioner to apply for Environmental Authorisation.

To ensure compliance with the Act, Rand Water has engaged SCP as an Independent Environmental Practitioner. They will assist with meeting the requirements of the National Environmental Management Act 1998 (Act 107 of 1998) for the proposed pipeline construction activities.

Eco-Sentle (Pty) Ltd was appointed by SCP to conduct a Flora and Fauna (terrestrial biodiversity) assessment associated with the proposed pipeline construction project as part of the requirement for an environmental authorisation application.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) under the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The methodology considered the recent Government Notice 320 issued under NEMA on 20 March 2020 and Government Notice 1150 issued under NEMA on 30 October 2020, titled "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation."

The specialist study aims to offer relevant input into the Environmental Authorisation application process, concentrating on the proposed activities and their associated impacts. This report, which includes the findings and recommendations of the specialist, is intended to inform and guide the Registered Environmental Assessment Practitioner (EAP) and regulatory authorities, facilitating informed decision-making regarding the ecological viability of the proposed project.

2.2. PURPOSE AND TERMS OF REFERENCE

This specialist study concentrated on terrestrial biodiversity and was carried out following the 'Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, When Applying for Environmental Authorization', specifically following the 'Protocol for the Specialist Assessment and Minimum Content Requirements for Environmental Impacts on Terrestrial Biodiversity'. Based on the aforementioned, the purpose of this report is to:

1. Present a baseline description of terrestrial biodiversity relevant to the site and its surrounding landscape.
2. Assess the potential impacts of the proposed project on on-site biodiversity.
3. Detail appropriate management and monitoring measures to avoid or mitigate identified impacts and guide on-site biodiversity management; and
4. Provide an impact statement on the suitability of the proposed project concerning terrestrial biodiversity conservation.

The terms of reference, therefore, included:

- Reviewing and summarising relevant biodiversity information from ecological, conservation, and biodiversity datasets and literature.
- The description of terrestrial biodiversity and ecosystems within the proposed development area should cover the following aspects:
    - Dominant vegetation types of the present;
    - Threatened ecosystems, including those officially listed and any locally significant habitat types;
    - Ecological connectivity, levels of habitat fragmentation, key ecological processes, and fine-scale habitat features; and
    - Identified species, their distribution, critical habitats (such as feeding or nesting areas), and movement patterns
- Conducting a field survey of the project site to gather field data to verify the ecosystem and biodiversity characteristics of the site and the surrounding landscape.
- Identifying and assessing potential negative impacts on terrestrial biodiversity and ecosystems associated with the proposed project; and
- Recommending appropriate biodiversity mitigation, management, and monitoring measures for inclusion in the proposed project's Environmental Management Plan (EMP) and/or Biodiversity Management Plan (BMP

2.4. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this assessment:

- It is assumed that all information provided by the client and landowner is accurate.
- The specialist did not receive detailed engineering drawings related to the planned development activities; therefore, the potential impacts of these activities are based on information from the client and the landowner/developer.
- All datasets accessed and used for this assessment are considered representative of the most recent and relevant data for the intended purposes.
- The assessment area (PAOI) was determined based on the footprint areas provided by the client. Any changes to the area or missing GIS information related to the assessment area would have affected the surveyed area and the assessment results.
- The area was surveyed during a single site visit, so this assessment does not account for temporal trends (the data collected is considered sufficient to establish a meaningful baseline).
- The single site visit was conducted in the wet season on 16 April 2025.
- The GPS used in the assessment has an accuracy of 5 meters, so any spatial features may be offset by up to 5 meters
- The absence or non-recording of a specific plant or animal species, at a particular time, does not necessarily indicate that: a) the species does not occur there; b) the species does not utilise resources in that area; or c) the area does not play an ecological support role in the life-history of that species.
- Data collection in this study relied heavily on data from representative, homogenous sections, as well as general observations, analysis of satellite imagery from the past until the present, generic data and desktop analysis.
- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such, there is high confidence in the information provided.

2.5. ENVIRONMENTAL SCREENING TOOL

As outlined in Government Notice 320 under NEMA, dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, the infrastructure footprint of the proposed project was evaluated at a desktop level using the National Web-based Environmental Screening Tool.

All the project locations were assessed against the DFFE screening tool. According to the sensitivity report, as shown in Figure 2 the “Terrestrial Biodiversity” Theme for the proposed New System 1 at Rand Water and the Installation of approximately 7 km of Phase 2 sludge pipeline is rated overall as **'Very High Sensitivity'** due to the presence of the following features:

- Critical Biodiversity Area 1
- Ecological support Areas 1 and 2;
- Vulnerable Soweto Highveld Grassland
- National Protected Area Expansion Strategy (NPAES)

As shown in Figure 3, The “Terrestrial Biodiversity” Theme for the proposed installation of a 1.5 km sludge pipeline in Panfontein, east of the Rand water, Vereeniging water treatment works, was rated as 'Very High Sensitivity' due to the presence of the following features:

- Ecological support Areas 1 and 2;
- Vulnerable Soweto Highveld Grassland
- National Protected Area Expansion Strategy (NPAES)

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	CBA 1
Very High	VU_Soweto Highveld Grassland

FIGURE 1: SENSITIVITY MAP FOR NEW SYSTEM 1 PER DFFE SCREENING TOOL

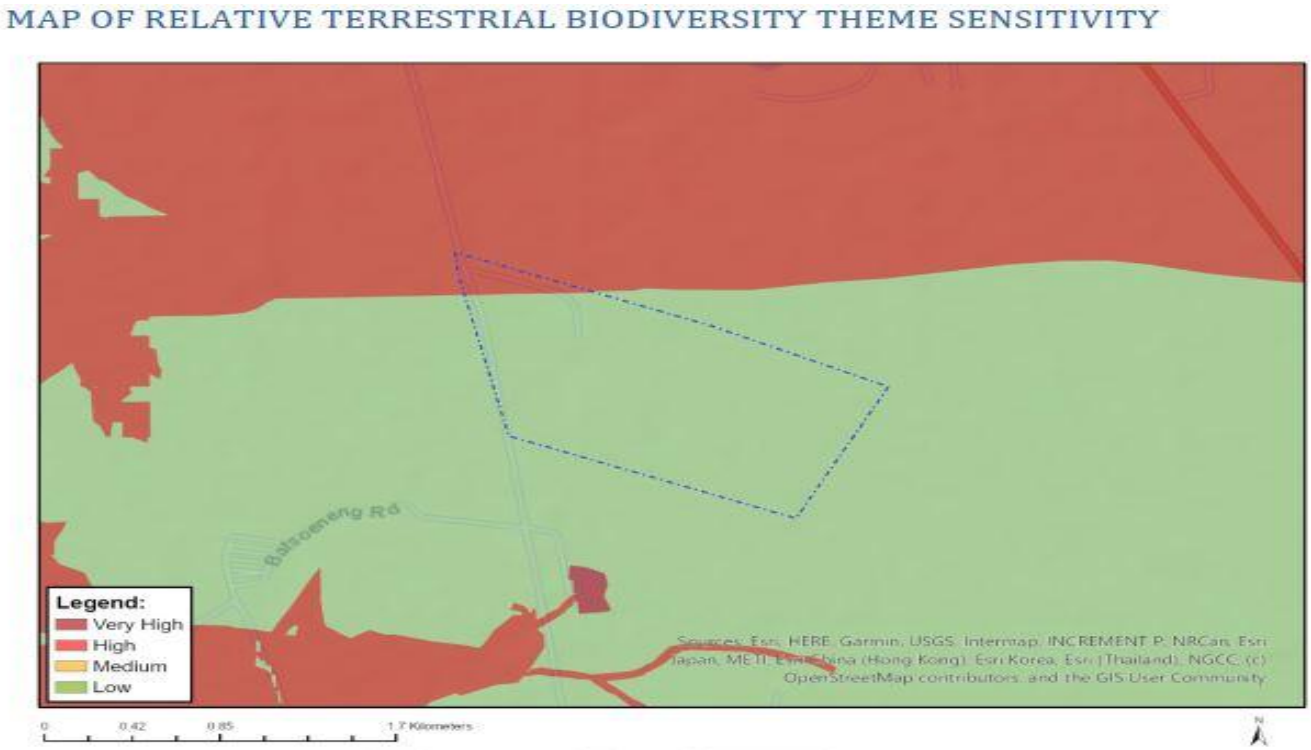
MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	CBA 1
Very High	CBA 2
Very High	ESA 1
Very High	ESA 2
Very High	National Protected Area Expansion Strategy (NPAES)
Very High	VU_Soweto Highveld Grassland

FIGURE 2: SENSITIVITY MAP FOR THE PHASE 2 SLUDGE PIPELINE PER DFFE SCREENING TOOL



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	ESA 1
Very High	ESA 2
Very High	VU_Soweto Highveld Grassland

FIGURE 3: SCREENING TOOL SENSITIVITY MAP FOR PANFONTEIN

2.6. RELEVANT LEGISLATION

2.6.1. LEGISLATIVE FRAMEWORK BIODIVERSITY ASSESSMENT

Following the protocol for specialist assessment and the minimum report content requirements for environmental impacts on terrestrial biodiversity, as outlined in Government Notice 320 under NEMA, dated 20 March 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation" – section 3, subsection 1:

- An applicant intending to undertake an activity identified within the protocol's scope on a site designated as 'Very High' sensitivity for terrestrial biodiversity by the screening tool must submit a Terrestrial Biodiversity Specialist Assessment.

- If the site sensitivity verification, which includes both a desktop assessment and a field survey, determines that the site is of 'Low' sensitivity rather than the 'Very High' sensitivity indicated by the screening tool, then a Terrestrial Biodiversity Compliance Statement must be submitted.

As per sections 2 and 3 of the protocol, the Terrestrial Biodiversity Compliance Statement must include the information presented in Table 1 below.

TABLE 1: INFORMATION REQUIREMENTS FOR THE TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT AS PER THE RELEVANT PROTOCOL, INCLUDING WHERE THIS INFORMATION CAN BE FOUND WITHIN THIS REPORT

Information to be Included (as per GN 320, 20 March 2020)	Report Section
Methodology used to undertake the site assessment and survey, and prepare the compliance statement, including relevant equipment and modelling used	Section 3
Description of the assumptions and any uncertainties or gaps in knowledge or data	Section 2.4
A baseline profile description of biodiversity and ecosystems of the site	Section 4
Site sensitivity verification: Desktop Analysis using satellite imagery and available information	Section 4
A statement on the duration, date and season of the site inspection	Section 5.2
Site sensitivity verification: Onsite inspection, include a description of current land use and vegetation found on-site	Section 6
Site sensitivity verification: Photographs/evidence of environmental sensitivity	Section 5.2.2 and Section 6
Screening tool confirmation/dispute: The assessment must verify the “low” sensitivity of the site, in terms of plant, animal, and terrestrial biodiversity themes	Section 2.5
Proposed impact management outcomes or monitoring requirements for inclusion in the EMPr	Section 7
Indicate whether or not the proposed development will have any impact on the terrestrial environment, animals and/or plants	Section 7
A signed statement of independence by the specialist	Above Exec summary
Specialist details, including a CV	Appendix 2

2.6.2. KEY LEGISLATION

All legal implications should be considered before the commencement of any development activities as such, the following National and Regional legislation, policies and guidelines requirements were considered applicable to the project.

- Constitution of the Republic of South Africa (Act No. 108 of 1996)
- National Environmental Management Act (NEMA) (Act No. 107 of 1998)
- National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004)
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
- Threatened or Protected Species Regulations and lists (No. R. 152 of Government Gazette No. 29657 of 23 February 2007, and No. R. 1187 of Government Gazette No. 30568 of 14 December 2007)
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43110 (March 2020); and GNR 1150 of Government Gazette 43855 (October 2020)
- National Water Act (NWA) (Act No. 36 of 1998)
- Alien and Invasive Species Regulations and Alien and Invasive Species List 2014-2020, published under NEMBA
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA)

2.7. STUDY LOCATION

2.7.1. PROJECT AREA OF INFLUENCE

The proposed project covers three distinct locations, all situated within the Rand Water servitude in the Sedibeng District Municipality, Gauteng Province, South Africa.

According to the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43110 (March 2020); and GNR 1150 of Government Gazette 43855 (October 2020), Where the nature of the activity is expected to have an impact on Species of Conservation Concern (SCC) beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist following Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

Given the nature of the proposed project as a pipeline and associated infrastructure and the high sensitivity rating for the biodiversity theme, as indicated by the National Web-based Environmental Screening Tool, the project area of influence was determined by adding a 250-meter buffer along the pipeline route. This buffer was established because the anticipated impacts are expected to be localised.

2.7.2. PROJECT STUDY AREA

As indicated above, the proposed project covers three distinct locations, all situated within the Rand Water servitude in the Sedibeng District Municipality, Gauteng Province, South Africa. The proposed project consists of three locations with various activities. The coordinates for each site are provided below and can be referenced on the accompanying locality maps.

1. **New System 1 Vereeniging**

The location of the proposed New System 1 is presented in Table 2 and the locality map in Figure 4.

TABLE 2: VEREENIGING NEW SYSTEM 1 LOCATION

Project Location	
Province	Gauteng
District	Sedibeng District Municipality
Local Municipalities	Emfuleni Local Municipality
Ward Numbers	15
Nearest Town Vereeniging	Vereeniging
Farm Names and Numbers	LEEUWKUIL 596 IQ
Portion Numbers	Portion 111 of 596

Co-ordinates	26°41´15.46″ S 27°55´06.63″

FIGURE 4: LOCALITY MAP OF THE NEW SYSTEM 1 (COURTESY OF GOOGLE)

2. Phase 2 Sludge Pipeline in Vereeniging

The location of the proposed New System 1 is presented in Table 3 and the locality map in Figure 5.

TABLE 3: PHASE 2 SLUDGE PIPELINE

Project Location	
Province	Gauteng
District	Sedibeng District Municipality
Local Municipalities	Emfuleni Local Municipality
Ward Numbers	15
Nearest Town Vereeniging	Vereeniging
Farm Names and Numbers	LEEUWKUIL 596 IQ KLIPPLAATDRIFT 601 IQ USCO 603 IQ UITVLUGT 434 IR
Portion Numbers	Portion 0 of 596 and Portion 60 of 596 Portion 81 of 596 Portion 98 of 596 Portion 117 of 596 Portion 122 of 596 Portion 111 of 596 Portion 160 of 596 Portion 251 of 596 Portion 255 of 596 Portion 260 of 596 Portion 0 of 601 Portion 72 of 601 Portion 0 of 603 Portion 77 of 434
Co-ordinates	Start Point: 26° 41´27.50″ S 27° 54´41.83″ E Middle Point: 26° 41´55.80″S 27°54´51.63″ E and End Point: 26°40´55.90″S 27°56´13.15″E

FIGURE 5: LOCALITY MAP OF THE PHASE 2 PIPELINE

3. 1.5km Panfontein Sludge Pipeline

The location details of the Panfontein sludge pipeline are presented in Table 4 and the locality Map in Figure 6.

TABLE 4: PANFONTEIN LOCATION DETAILS

Project Location	
Province	Gauteng
District	Sedibeng District Municipality
Local Municipalities	Emfuleni Local Municipality
Ward Numbers	1
Nearest Town Vereeniging	Panfontein
Farm Names and Numbers	PANFONTEIN
Portion Numbers	Portion 6 of 436
Co-ordinates	Start Point: 26° 42´ 15.72″ S 28° 01´40.08″E Middle Point: 26° 42´51.76″ S 28°02´ 08.18″ E End Point: 26° 42´32.01″ S 28° 02´ 05.84″E

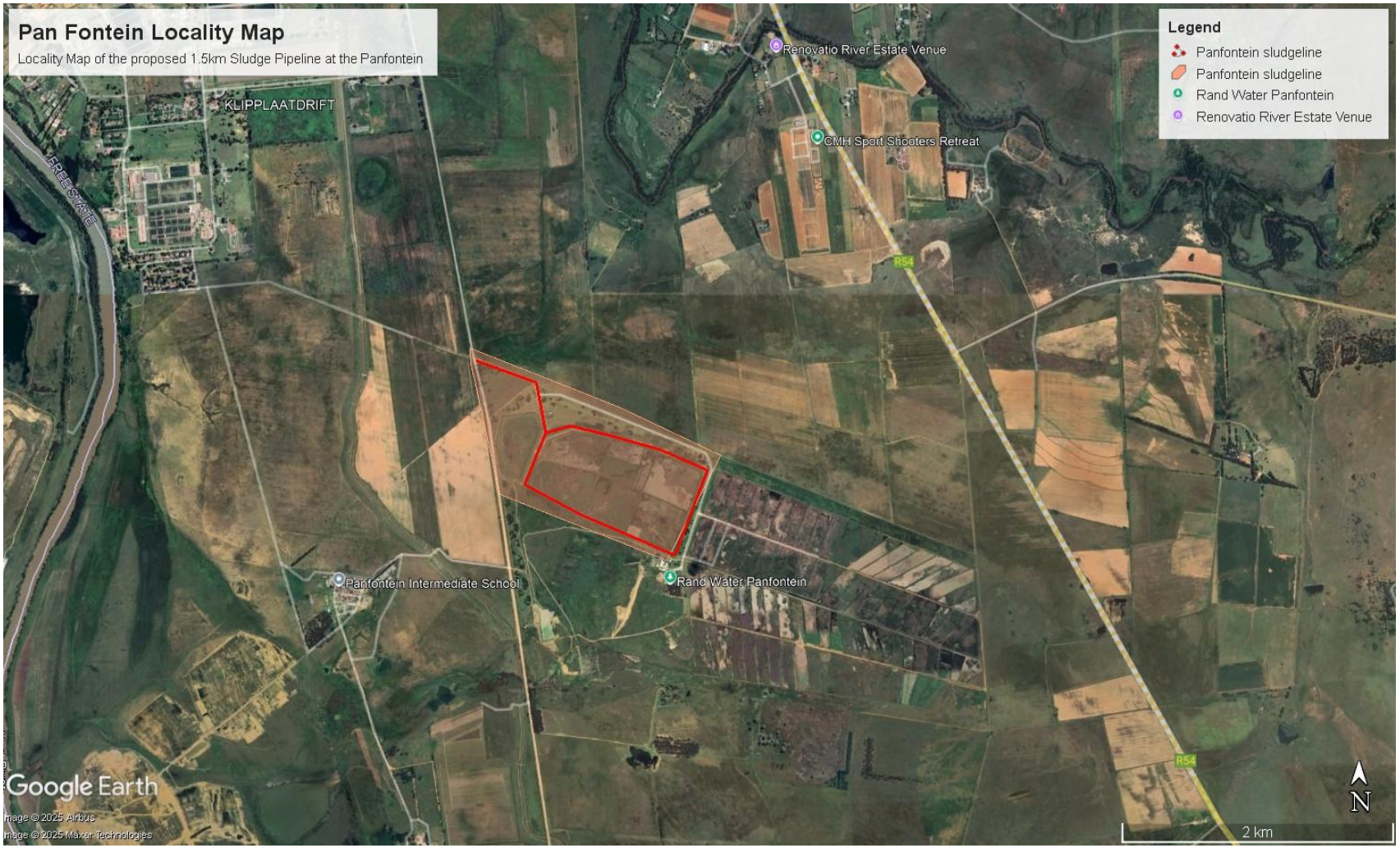


FIGURE 6: PANFONTIEN LOCALITY MAP

3. METHODOLOGY

3.1. TERRESTRIAL ECOLOGICAL ASSESSMENT

3.1.1. DESKTOP ASSESSMENT AND LITERATURE REVIEW

The desktop assessment primarily utilized a Geographic Information System (GIS) to access the most recent spatial datasets, which were used to create digital maps and species lists. Existing ecologically relevant data layers were integrated into GIS software to determine how the proposed project might interact with any ecologically significant entities. Emphasis was placed on the following spatial datasets:

- Gauteng Conservation Plan (C-Plan v4.0 2023)
- 2018 National Biodiversity Assessment (NBA, 2018) (Skowno *et al*., 2019)
- Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018)
- South Africa Protected and Conservation Areas Databases, 2022 (DFFE, 2022 & DFFE, 2022a)
- The National List of Threatened Ecosystems (NEMBA Threatened Ecosystems, 2011 & 2021)
- National Protected Areas Expansion Strategy, 2016 (DEA, 2016)
- Important Bird and Biodiversity Areas, 2015 (Marnewick et al., 2015)
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Awuah, 2018 & Van Deventer et al., 2019)
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel *et al*., 2011)

Descriptions of these datasets, and their associated relevance to terrestrial biodiversity, are provided in the relevant sections where each.

3.1.1.1. DESKTOP VEGETATION TYPES AND PLANT SPECIES ASESSMENT

The Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2011) were utilized to identify the vegetation types that would have existed under natural or pre-anthropogenic conditions. Additionally, the Plants of Southern Africa (POSA, 2019) database was accessed to compile a list of expected flora species within the Study area. The Red List of South African Plants website (SANBI, 2016) was used to provide the most up-to-date account of the national conservation status of flora.

The desktop flora assessment included an evaluation of all vegetation units and habitat types within the study area, along with the identification of expected plant species and any locally occurring species of conservation concern.

A preliminary delineation of vegetation/habitat units was undertaken at a desktop level using available satellite imagery and land cover data from SANBI BGIS tool. Namely, the National Vegetation Map, SANBI (2018); the National Protected Areas Expansion Strategy (NPAES, 2010) and the List of Threatened Terrestrial Ecosystems (2011). A list of plant species that are likely to occur in the broader study area was compiled using the South African National Biodiversity Institute's BODATSA (2016) database.

The most recent data on provincially and nationally protected flora was acquired from the following published legislative sources:

- Provincially Protected Plant Species (Schedule 2 of the Northwest Biodiversity Management Act, No.4 of 2016); and
- List of Nationally Protected Tree Species (DFFE, 2022)

3.1.2. FIELD SURVEY APPROACH

The field programme comprised targeted surveys that aimed to characterise natural habitats in the project site that may be affected by proposed infrastructure upgrade and identify potential negative impacts. As such, single fieldwork focused primarily on assessing on-site vegetation and faunal communities. A field visit was conducted on 16th April 2025. which constitutes a wet season survey, to determine the presence of any local SCC and to achieve the delineation of local habitat types and their associated sensitivities. All the different habitat types within the study area were covered.

3.1.2.1. FLORAL SURVEYS

The wet season fieldwork encompassed the entire study area, conducting a rapid vegetation and ecological assessment. Homogeneous vegetation units were subjectively identified using satellite imagery and existing land cover maps, a process confirmed during the field survey. The assessment included evaluating floristic diversity and searching for protected plants and flora of conservation concern (SCC) throughout the study area.

During the field survey, observations were noted regarding current impacts such as fences, compacted areas, and developed areas, and dominant vegetation species were subjectively recorded. Additionally, opportunistic observations were made while traversing the area.

Several reference works were used for identification purposes, relevant field guides and texts consulted included:

- Field Guide to the Wildflowers of the Highveld (van Wyk & Malan, 1998)
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014)
- Medicinal Plants of South Africa (Van Wyk et al., 2013)
- Guide to Grasses of southern Africa (van Oudtshoorn, 2012)
- Field guide to trees of Southern Africa, Struik Publishers (Van Wyk & Van Wyk, 1997)
- Problem Plants and Alien Weeds of Southern Africa (Bromilow, 2018)

3.1.2.2. FAUNA SCREENING

Fauna survey focused on mammal and bird communities within the project site and was based primarily on opportunistic observations of mammals and birds during the field visits. The fauna field survey utilised a variety of sampling techniques, including but not limited to:

- Visual and auditory searches: This involves strategic meandering and the use of binoculars and
- specialist camera equipment to view species from a distance without them being disturbed.
- Active hand-searches: Used for species that shelter in or under particular micro-habitats (typically
- rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.).
- The identification of tracks and signs, listening to species calls; and utilization of local knowledge.

The relevant field guides and texts consulted for identification purposes included the Mammals of Southern Africa and their Tracks & Signs (Gutteridge & Liebenberg, 2021).

3.1.3. BIODIVERSITY DESCRIPTIONS AND MAPPING

Based on the collected data during the field survey and an interpretation of aerial imagery, vegetation communities were mapped and described according to structure, composition, and any disturbance characteristics. Edwards (1983) was broadly used to guide the structural classification.

3.1.3.1. ECOLOGICAL SENSITIVITY ANALYSIS

Ecological Importance (sensitivity) in the project area was determined by subjectively assessing the ecological integrity and conservation importance of identified vegetation communities using the protocol for evaluating site ecological importance (SEI) as published in SANBI's Species Assessment Guideline (SANBI, 2020. The habitat types in the study area were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of SCC and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present in the project area) and Receptor Resilience (RR) (its resilience to impacts) as per SEI=BI+RR.

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor, as per BI=CI+FI

The criteria for the CI and FI ratings are provided in

Table 5 to Table 8.

Table 5: Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

- **Conservation Importance**: This refers to the significance of a site in supporting biodiversity features of conservation concern, such as populations of species listed as threatened or near threatened by the International Union for Conservation of Nature (IUCN) (categories CR, EN, VU, and NT), rare species, range-restricted species, globally significant populations of congregator species, and areas of threatened ecosystem types, primarily through natural processes (SANBI, 2020).
- **Functional Integrity**: This is a measure of the ecological condition of an impact receptor, determined by its remaining intact and functional area, its connectivity to other natural areas, and the degree of current persistent ecological impacts (SANBI, 2020).
- **Receptor Resilience**: This refers to the inherent capacity of the receptor to withstand major damage from disturbances and/or to recover to its original state with minimal or no human intervention (SANBI, 2020).

Biodiversity Importance		Conservation Importance				
		Very high	High	Medium	Low	Very low
Functional Integrity	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

The criteria for assessing RR are determined by the estimated time needed to restore a significant portion of functionality to the receptor, as outlined in Table 6 below. After the determination of BI and RR, the SEI can be ascertained using the matrix as provided in Table 7.

TABLE 6: SUMMARY OF RESILIENCE CRITERIA

Resilience	Criteria
Very high	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to: (i) remain at a site even when a disturbance or impact is occurring, or (ii) return to a site once the disturbance or impact has been removed.

TABLE 7: MATRIX USED TO DERIVE SITE ECOLOGICAL IMPORTANCE FROM RECEPTOR RESILIENCE (RR) AND BIODIVERSITY IMPORTANCE (BI)

Site Ecological Importance		Biodiversity Importance				
		Very high	High	Medium	Low	Very low
Receptor Resilience	Very Low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed project is provided in Table 8.

TABLE 8: GUIDELINE FOR INTERPRETING SITE ECOLOGICAL IMPORTANCE IN THE CONTEXT OF PROPOSED ACTIVITIES

Site Ecological Importance	Interpretation in relation to proposed development activities
Very high	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

3.1.3.2. SPECIES OF CONSERVATION CONCERN

The conservation status of faunal species based on the IUCN Red List Categories and Criteria version 3.1 (2013) (See Figure 7) and the threatened and protected status of floral and faunal species occurring, or potential occurring, in the study area was based on the following:

- Regional/National Red List Status, as per the International Union for the Conservation of Nature (IUCN) assessment criteria - specifically:
    - Red List of South African Plants Version (SANBI, 2017-1);
    - Red List of Mammals of South Africa, Lesotho, and Swaziland (EWT, 2016);
    - Regional Red List for Birds of South Africa, Lesotho, and Swaziland (BirdLife South Africa, 2015);
    - Atlas and Red List of the Reptiles of South Africa, Lesotho, and Swaziland (Bates et al., 2014);
    - The IUCN Threatened Species Website (IUCN, 2018-1) was used for amphibians; and
    - The conservation status of butterflies was based on Henning et al., (2009).
- National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004) - Threatened or Protected Species List (Notice 389 of 2013) (NEMBA ToPS List, 2013).

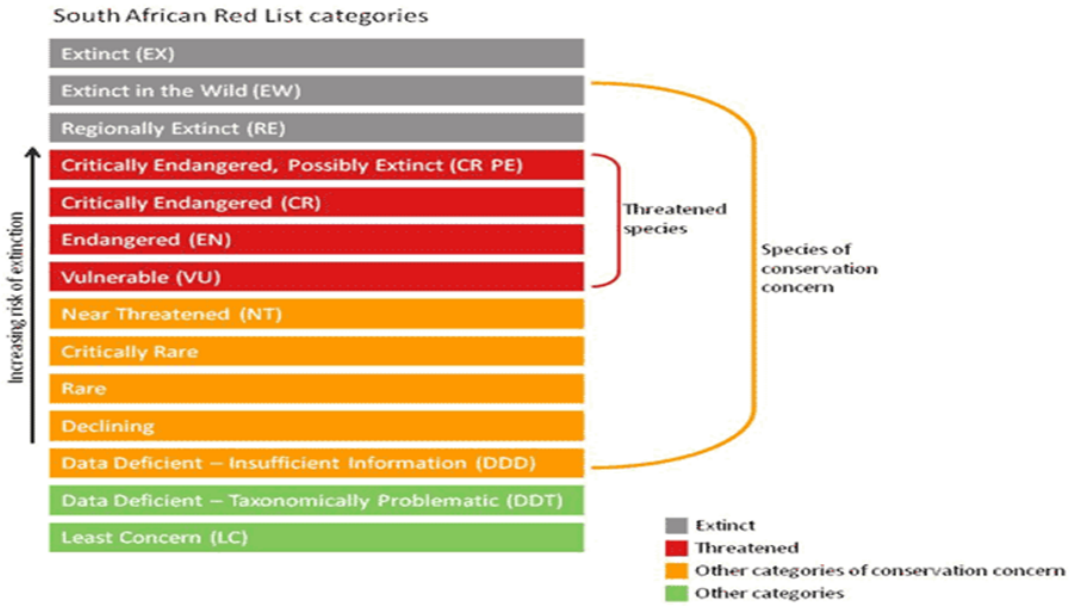


FIGURE 7: SCHEMATIC REPRESENTATION OF THE SOUTH AFRICAN RED LIST CATEGORIES (TAKEN FROM HTTP://REDLIST.SANBI.ORG/REDCAT.PHP)

3.1.4. ALIEN INVASIVE PLANT SPECIES

Alien invasive plant species were categorised according to the following listings:

- Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983) (CARA, 1983); and/or
- National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004) - 2016 listing (NEMBA Alien and Invasive Species Lists, 2016).

4. DESKTOP BASELINE ECOLOGICAL CHARACTERISATION

4.1. SUMMARY ECOLOGICAL LANDSCAPE FEATURES

The following in Table 9 breakdown has been generated from the spatial data gathered and analysed, sourced from various entities including national and provincial environmental authorities and SANBI. This breakdown provides a summary of the ecological boundaries taken into account and their relevance to the region or study area. If a feature is deemed relevant, it is recognized as an ecologically significant landscape feature and is further explored in the subsequent subsections.

TABLE 9; SUMMARY OF THE RELEVANCE OF THE STUDY AREA TO LOCAL ECOLOGICALLY IMPORTANT LANDSCAPE FEATURES

Desktop Information Considered	Relevant?	Reasoning
Provincial Conservation Plan (Gauteng Conservation Plan (C-Plan v4.0 - 2023)	Yes	Project footprint intercepts freshwater, both CBA and ESA.
NBA 2018: Ecosystem Threat Status	yes	The project area overlaps with an 'Vulnerable' ecosystem
Protected and Conservation Areas (SAPAD & SACAD)	No	No protected Areas in the vicinity at least 50Km of the proposed project locations.
Important Bird and Biodiversity Areas (IBA)	No	No officially important bird areas with 50Km radius from the proposed project locations
National Freshwater Ecosystem Priority Areas	Yes	The project is near the Vaal River, an NFEPA river.

4.2. GENERAL LAND USE

The proposed **New System 1 and some part of Phase 2 sludge pipeline** are situated within the servitude of the Vereeniging Water Treatment Works, an area dedicated to infrastructure essential for the treatment and management of wastewater. This zone includes various operational facilities such as pumping stations, pipelines, sludge handling infrastructure, and other associated components. The treatment works is strategically positioned to serve surrounding urban and industrial areas, and the proposed developments will be integrated within this already-disturbed, service-oriented footprint. The project area lies within a heavily modified environment where existing services and utility lines, including Rand Water's bulk water pipelines, are already present.

The surrounding landscape comprises a mix of land uses, reflecting both ecological and human influences. To the immediate vicinity flows the Vaal River, a National Freshwater Ecosystem Priority Area (NFEPA), which is of high ecological importance. The broader surroundings include active and legacy mining activities, evidenced by mine dumps and tailings storage facilities, as well as residential areas to the north.

The Panfontein section of the project area is characterised primarily by sludge dams and pans, forming part of the extended wastewater treatment system. Beyond these core infrastructure zones, the land transitions into relatively undisturbed grassland and agricultural holdings, supporting farming activities and retaining significant natural habitat value. This contrast highlights the need for careful environmental management to minimise potential impacts on the adjacent sensitive ecosystems.

4.3. GAUTENG CONSERVATION PLAN (C-PLAN V4.0 2023)

The Gauteng Conservation Plan Version 4.0 (C-Plan 4.0), developed by the Gauteng Department of Agriculture and Rural Development (GDARD), serves as a strategic framework for biodiversity conservation within the province. This latest iteration builds upon previous versions to provide updated spatial data and refined methodologies for identifying Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). C-Plan 4.0 aims to guide land-use planning, environmental assessments, and conservation initiatives by delineating areas essential for maintaining ecological integrity and ecosystem services.

The Gauteng Conservation Plan Version 4.0 (GDARD, 2023) identifies those sites that are critical for maintaining biodiversity, enabling planners, environmental professionals, and land-use managers to integrate biodiversity into land-use planning and decision-making.

The final spatial outcome of the systematic conservation planning process is a map that delineates biodiversity priority areas for conservation and sustainable land use management. The map, which is commonly referred to as a Critical Biodiversity Area or CBA Map, identifies biodiversity priority areas in several major categories:

- Protected Areas (PA)
- Critical Biodiversity Areas (CBA)
- Ecological Support Area (ESA)
- Other Natural Areas (ONA)

Protected Areas (PA) include Protected areas and conservation areas:

- Protected Areas are legally designated or formally managed areas established primarily for the conservation of biodiversity. They play a central role in systematic conservation planning by contributing to biodiversity targets. By identifying what proportion of key biodiversity features are already protected, Protected Areas help determine the remaining gaps that need to be addressed to meet conservation goals.

Critical Biodiversity Areas (CBAs):

- CBAs are areas of natural or near-natural terrestrial and aquatic ecosystems identified as essential for conserving biodiversity. These areas are selected based on their biodiversity value, spatial configuration, and their role in achieving both biodiversity pattern and ecological process targets. CBAs include:
    - CBA1: Irreplaceable sites where no alternative exists to meet biodiversity targets.
    - CBA2: Optimal sites that form an efficient and sustainable network with minimal conflict with other land uses.
    - Some CBAs may be degraded or modified but are still necessary for specific ecological functions, such as supporting threatened species or maintaining connectivity. See Section 2 for biodiversity features defining CBAs and Section 5.2 for criteria used in their identification.

Ecological Support Areas (ESAs):

- ESAs are natural, near-natural, or even modified landscapes that must be kept in a functional ecological state to support the health and resilience of Critical Biodiversity Areas and Protected Areas. They sustain the ecological processes—such as water flow, species movement, and pollination—on which these core conservation areas depend. Although some ESAs may be irreversibly transformed, they still provide

essential ecological functions. See Section 3 for biodiversity features representing ESAs and Section 5.2 for ESA selection criteria.

Other Natural Areas (ONA):

- These are areas with natural or near-natural habitats that were not classified under any of the previously mentioned categories. With ongoing habitat loss, these sites might be reclassified as a CBA or ESA in the future. Additionally, site assessments related to development applications may reveal that ONA sites should be designated as CBAs based on on-the-ground verification of biodiversity and site conditions.

4.3.1. STUDY AREA IN RELATION TO C-PLAN V4.0 2023

Figure 8 illustrates the proposed project locations superimposed on the Gauteng C-PLAN V4.0 2023. All three proposed development locations are located within CBA1. According to the C-PLAN V4.0, these are locations are described as irreplaceable sites where no alternative exists to meet biodiversity targets. It is concerning that this area is categorised as irreplaceable area in the latest version of the Gauteng C-Plan V4.0 while it's already transformed.

Based on the Gautrain C-PLAN V3.3 presented in figure x, all proposed locations only partially overlap with ESAs and only the phase 2 sludge pipeline partially overlaps with CBA.

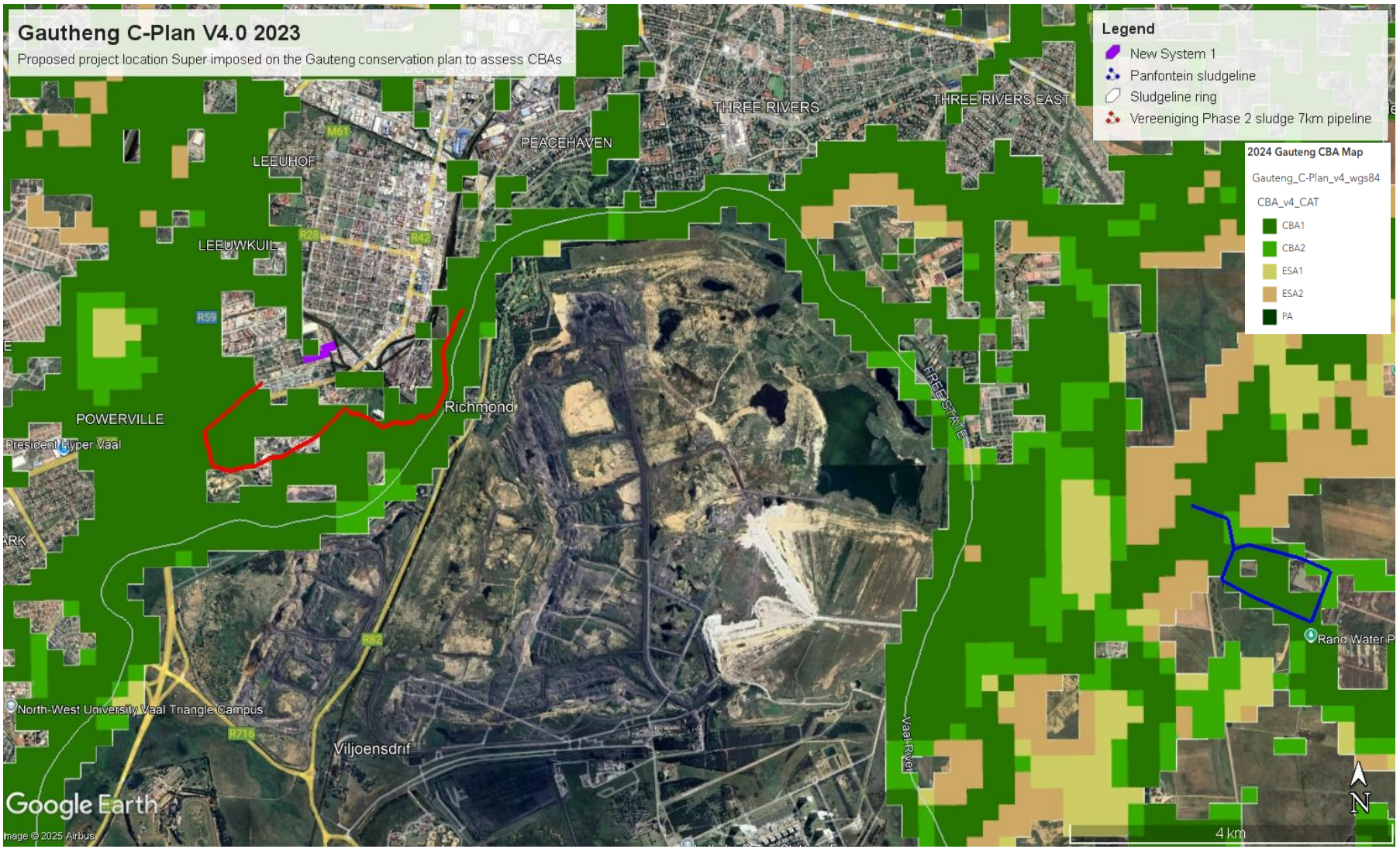


FIGURE 8: PROPOSED PROJECT LOCATION IN RELATION TO THE GAUTENG C-PLAN V4.0 2023

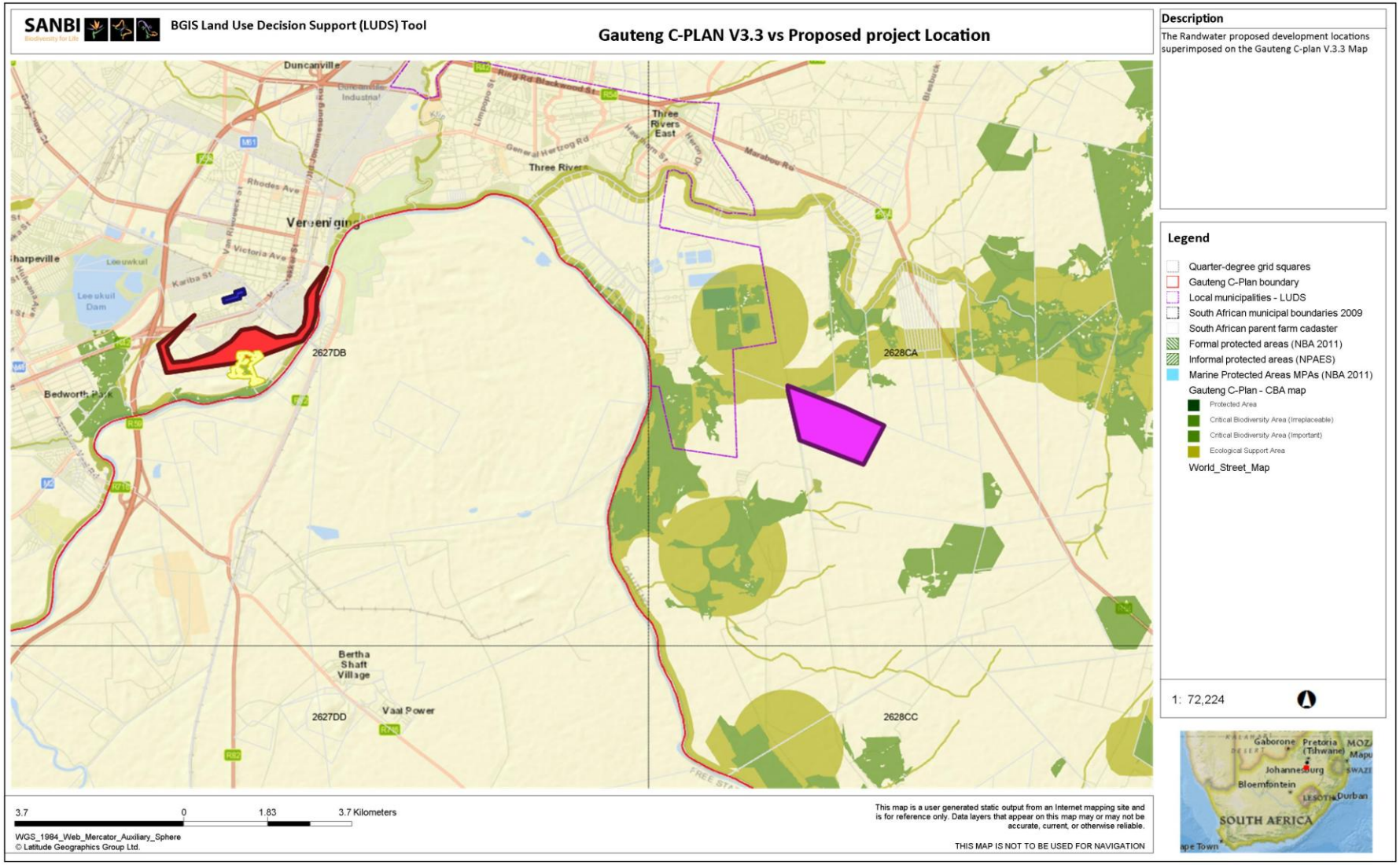


FIGURE 9: PROJECT LOCATIONS SUPERIMPOSED IN THE GAUTENG C-PLAN V3.3

4.4. NATIONAL ECOSYSTEM THREAT STATUS

The proposed construction activities intersect two distinct ecosystem types. The New System 1 and Phase 2 sludge pipeline are within the **Soweto Highveld Grassland ecosystem**. This ecosystem is characterised by a mix of grassland species and is considered vulnerable due to extensive historical transformation. In contrast, the 1.5 km sludge pipeline in Panfontein is situated within the **Central Free State Grassland ecosystem,** which is generally more intact but still subject to pressure from surrounding land uses. The intersection of these developments with both ecosystems highlights the importance of careful planning and mitigation to minimise potential ecological impacts.

The NEMBA Revised National List of Threatened Ecosystems (2022) lists the **Soweto Highveld Grassland ecosystem type** as threatened, categorising it as **Vulnerable.** NEMBA Revised National List of Threatened Ecosystems (2022) has also not listed the **Central Free State Grassland ecosystem** as threatened.

4.5. PROTECTED AREAS AND IMPORTANT BIRD AREAS

Protected Areas are legally designated or formally managed areas established primarily for the conservation of biodiversity, ensuring the long-term protection of ecosystems, species, and ecological processes. These areas form the backbone of biodiversity conservation and are key to achieving national and international conservation targets. The National Protected Area Expansion Strategy (NPAES) is a strategic framework developed to guide the expansion of South Africa's protected area network in a cost-effective and ecologically representative manner. It identifies priority areas for expansion to improve the ecological sustainability and connectivity of the protected area system.

As part of this assessment, shown in Figure 10, Protected Areas and NPAES focus areas were reviewed using spatial data from the South African National Biodiversity Institute (SANBI). Based on the SANBI map analysis, there are no Protected Areas or NPAES focus areas within a 30 km radius of any of the three proposed project locations.

Additionally, we assessed the presence of Important Bird and Biodiversity Areas (IBAs), which are sites recognised internationally for their significance in the conservation of bird populations and associated biodiversity. These areas are critical for supporting threatened species, large congregations of birds, and species with restricted ranges.

The spatial analysis confirmed that there are no IBAs located within 30 km of the proposed New System 1, Phase 2 sludge pipeline, or the Panfontein sludge pipeline sites.

4.6. NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS (NFEPA)

The National Freshwater Ecosystem Priority Areas (NFEPA) database forms part of a comprehensive approach for the sustainable and equitable development of South Africa's scarce water resources. The database affords guidance on how many rivers, wetlands, and estuaries, and which of these, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (NWA). This directly applies to the NWA, which feeds into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives (Nel *et al.* 2011).

The main intention of the Freshwater Ecosystem Priority Areas (FEPAs) is to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEMBA) biodiversity goals informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al.,* 2011).

As part of the terrestrial biodiversity assessment, the three project locations were evaluated against the National Freshwater Ecosystem Priority Areas (NFEPA) map using spatial data from the South African National Biodiversity Institute (SANBI) shown in Figure 11. All three sites fall within the Upper Vaal Water Management Area (WMA), specifically within quaternary catchment C22F, with the Panfontein location also intersecting catchment C21G. The Upper Vaal catchment is of national importance, serving as a key source of water for domestic, industrial, and agricultural use across Gauteng and beyond. It supports a dense population and a highly industrialised region, making it vital for both ecological functioning and socio-economic development.

Notably, the Phase 2 sludge pipeline is located in close proximity to a **NFEPA-flagship river, the Vaal River**, specifically within its riparian zone. The Vaal River is a critical water resource in South Africa, essential not only for water supply and economic activity but also for supporting aquatic and riparian biodiversity.

From an ecological perspective, the Vaal River is classified as Class D, indicating that it is largely modified, with significant alteration from its natural state. Despite this, its ecological and water security functions remain crucial, and any development near its banks must be carefully managed to prevent further degradation and to protect its role in the broader freshwater ecosystem network.

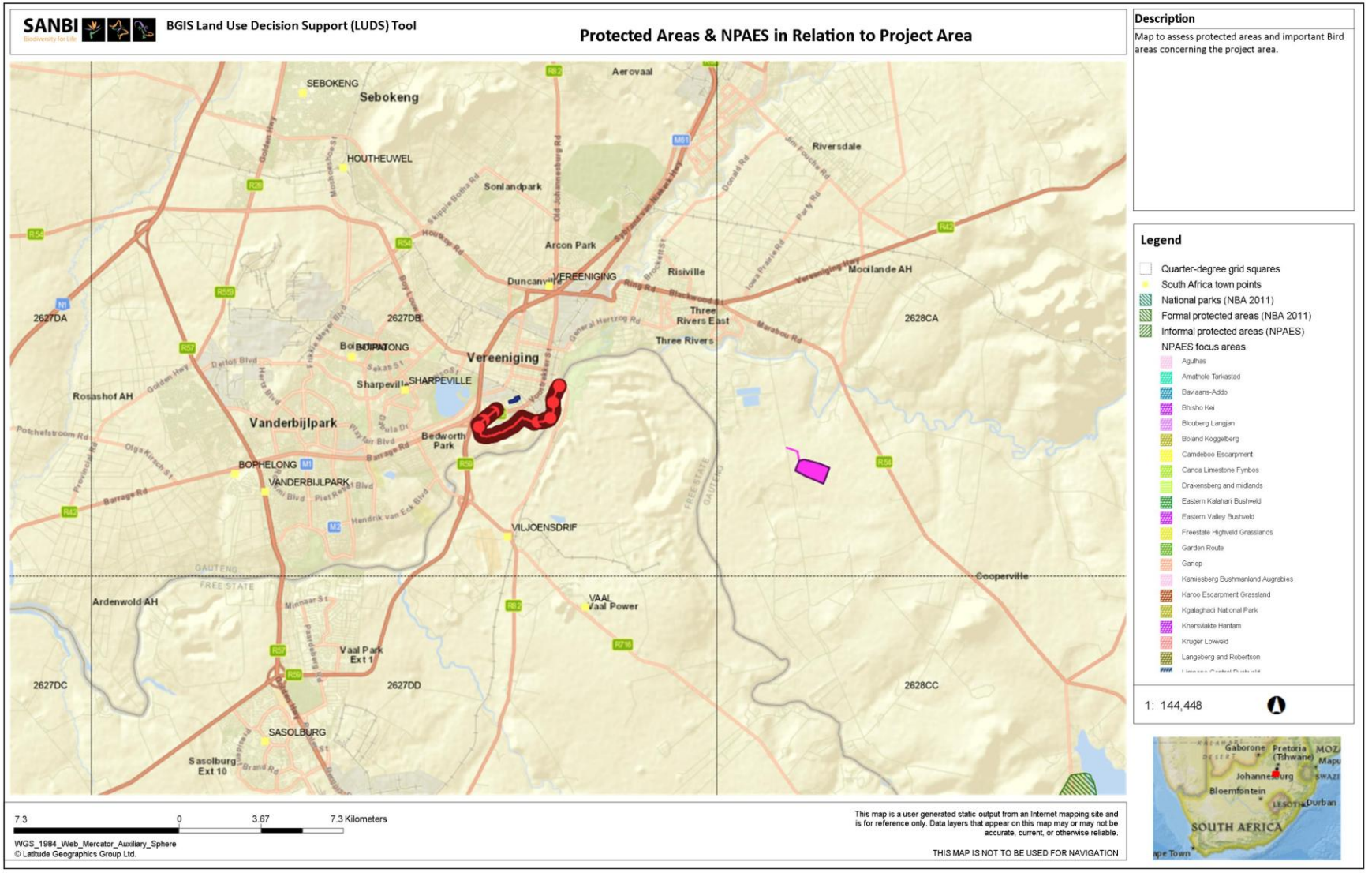


FIGURE 10: MAP ILLUSTRATING PROTECTED AREAS IN RELATION TO PROPOSED LOCATIONS

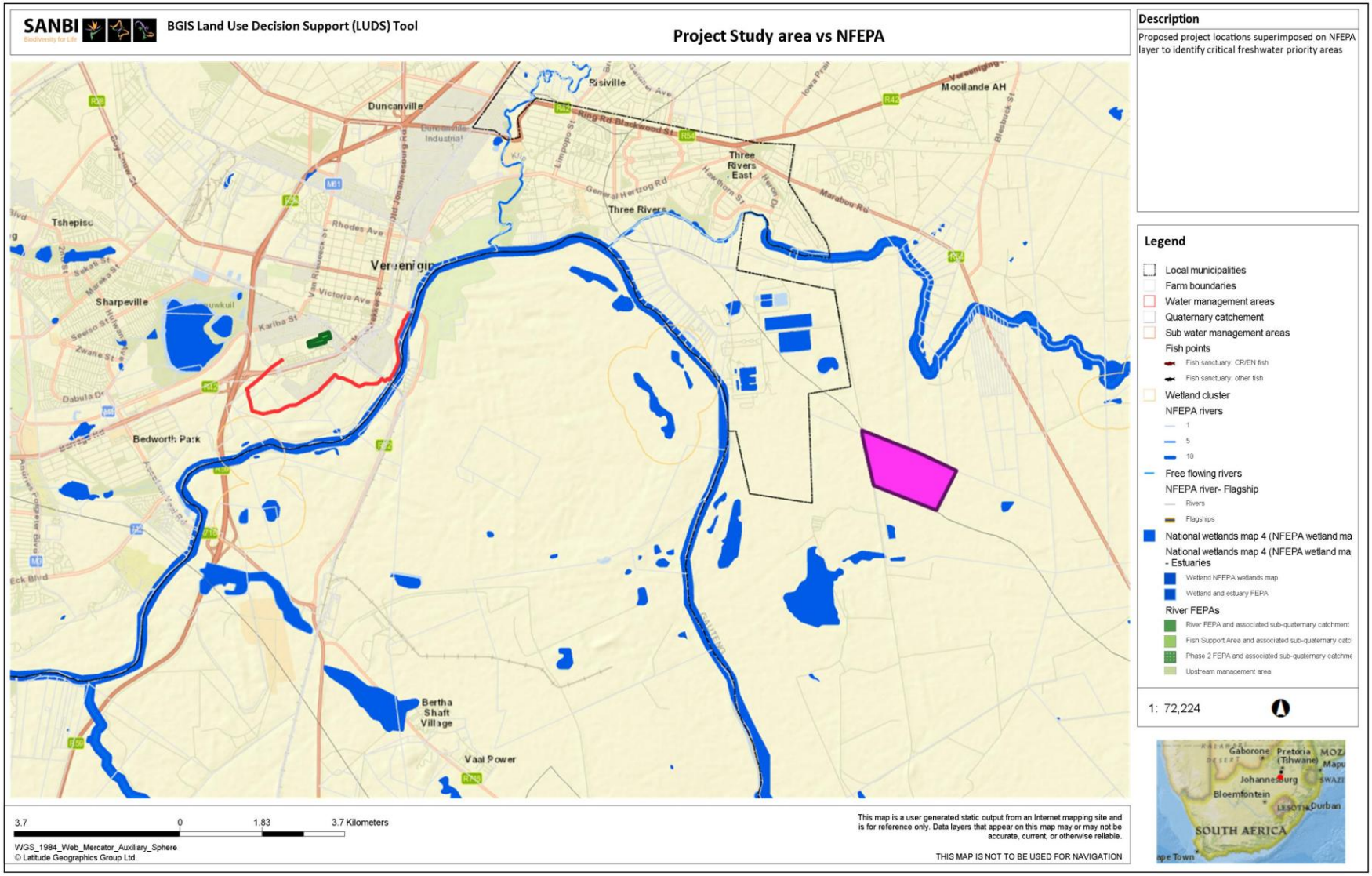


FIGURE 11: NFEPA MAP IN RELATION TO PROJECT LOCATIONS

5. RESULTS AND DISCUSSION

5.1. DESKTOP ASSESSMENT

5.1.1. VEGETATION ASSESSMENT

The proposed construction activities intersect two distinct vegetation types. The New System 1 and Phase 2 sludge pipeline are located within the Vereeniging Water Treatment Works, which falls within the S**oweto Highveld Grassland ecosystem.** In contrast, the 1.5 km sludge pipeline in Panfontein is situated within the **Central Free State Grassland ecosystem**.

Refer to Figure 12 for the Map illustrating vegetation types in relation to the proposed project area. The general characteristics of the vegetation types are elaborated upon in the sub-sections below.

The grassland biome, covering about 28% of South Africa, is the predominant biome of the central plateau and inland regions of the eastern subcontinent (SANBI, 2013). These grasslands are typically found in moist, summer rainfall areas with annual precipitation ranging from 400 mm to 2000 mm. The vegetation primarily consists of a dominant field layer of grasses and herbaceous perennials, with minimal woody plants.

South Africa's grassland ecosystems are divided into five groups, with the study area falling within the Mesic Highveld Grasslands group (SANBI, 2013). Mesic Highveld Grasslands are located at mid-altitudes, experiencing warm, wet summers (MAP 700-1200 mm) and cold winters. These grasslands are typically highly productive sourveld grasslands, dominated by long-lived perennial grasses (SANBI, 2013).

The general characteristics of the vegetation types are elaborated upon in the following sections.

5.1.1.1. VEGETATION TYPE: SOWETO HIGHVELD GRASSLAND

The **Soweto Highveld Grassland** is a vegetation type within the Grassland Biome, specifically part of the Mesic Highveld Grassland Group, as detailed in Mucina and Rutherford's (2006). This grassland is characterised by short to medium-height, dense, tufted grasslands on gently undulating plains, typically found at elevations between 1,400 and 1,800 meters above sea level. The typical vegetation species in the vegetation type include the following.

The graminoid layer is dominated by species such *as Arundinella nepalensis, Themeda triandra (Red Grass), Eragrostis curvula, Heteropogon contortus, Tristachya leucothrix, and Elionurus muticus*. Additional grass species include *Andropogon appendiculatus,Hyparrhenia hirta, Cymbopogon pospischilii,Eragrostis racemosa, Eragrostis chloromelas, Eragrostis plana, Hyparrhenia hirta, Setaria sphacelata, and Digitaria diagonalis.*

The herbaceous layer comprises species such as *Helichrysum rugulosum, Vernonia oligocephala, Hypoxis rigidula, Wahlenbergia undulata, Dicoma anomala, Euryops gilfillanii, Geigeria aspera, Haplocarpha scaposa, Justicia anagalloides, Lippia scaberrima, Rhynchosia effusa, Senecio coronatus, and Hilliardiella oligocephala.* ***Geophytic herbs*** *like Haemanthus humilis subsp. hirsutus and H. montanus* are also present.

Low shrubs such as *Anthospermum hispidulum, Berkheya annectens, Felicia muricata, and Ziziphus zeyheriana* occur sporadically, particularly on rocky outcrops.

The Soweto Highveld Grassland is classified as Vulnerable due to extensive transformation from urbanization, industrial development, agriculture, and mining activities. Less than 1.5% of this vegetation type is formally conserved, with significant portions lost to infrastructure development and land-use change. The remaining fragments are often degraded and isolated, leading to reduced ecological functionality and biodiversity loss. Conservation efforts are critical to preserve the remaining patches and maintain the biodiversity and ecological processes associated with this grassland type.

5.1.1.2. VEGETATION TYPE: CENTRAL FREE STATE GRASSLAND

The **Central Free State Grassland** (Gh6) is a vegetation type within the **Grassland Biome**, predominantly found in the central Free State Province of South Africa, with small extensions into parts of Gauteng. It occurs on gently undulating plains and low hills, typically on deep, fertile clay and loamy soils. The climate is semi-arid, with summer rainfall and cold, dry winters.

This vegetation type is characterised by a short to medium-height, dense **grass layer,** with dominant species including Themeda triandra (Red Grass), *Eragrostis curvula, Heteropogon contortus, Elionurus muticus, and Tristachya leucothrix.* Other common grasses include *Eragrostis plana*, *Cymbopogon pospischilii*, *Setaria sphacelata*, and *Hyparrhenia hirta*.

*The **herbaceous layer** is diverse, with forbs such as Helichrysum rugulosum, Vernonia oligocephala, Hypoxis rigidula, Dicoma anomala, Haplocarpha scaposa, Geigeria aspera, and Wahlenbergia undulata.*

Geophytes*,* including *Haemanthus humilis and Ledebouria ovatifolia, are also present.*

Shrubs and dwarf shrubs*,* although not dominant, *include Ziziphus zeyheriana, Felicia muricata, and Anthospermum hispidulum, particularly on rocky patches or outcrops.*

Geophytic herbs like *Haemanthus humilis* subsp. *hirsutus* and *H. montanus* are also present.

Low shrubs such as *Anthospermum hispidulum*, *Berkheya annectens*, *Felicia muricata*, and *Ziziphus zeyheriana* occur sporadically, particularly on rocky outcrops.

The **Central Free State Grassland** is classified as Least Concern due to widespread transformation, primarily from **cultivation, mining, urban expansion**, and **overgrazing**. Less than 2% of this vegetation type is formally conserved, and many remaining areas are degraded. Despite this, it still supports a high diversity of grassland species and plays an important role in ecological functioning, making its protection and restoration a conservation priority.

5.1.1.3. EXPECTED FLORA SPECIES

Botanical Database of Southern Africa (BODATSA) is a database that contains the official plant name data records. The data collected covers observational data, species checklists, specimen information, species description, literature, and collector information from three SANBI herbaria and two botanical garden herbaria for analysis of southern African plants. This is to maintain the most current, scientifically accurate assessments of southern African plants. The Botanical Database of Southern Africa (BODATSA) was utilised to assess the typical plant records associated with the broader project site, with the primary aim of identifying endangered plant species.

A total of 22 records were identified and assessed against the Red List of South African Plants, version 2024. One species of conservation concern listed as Endangered was identified in the area. Table 10 below provides a list of the species identified from the database.

TABLE 10: SPECIES IDENTIFIED PER BODOTSA DATABASE

Scientific Name	National Red List categories
Senecio oxyodontus	LC
Argyrolobium molle	LC

Satyrium hallackii	EN
Arctotis arctotoides	LC
Delosperma herbeum	LC
Eulophia hians	LC
Senecio sp.	LC
Dicoma macrocephala	LC
Senecio laevigatus	LC
Gladiolus longicollis	LC
Pentzia incana	LC
Orthochilus welwitschia	LC
Argyrolobium pauciflorum	LC
Aponogeton rehmannii	LC
Dicoma anomala	LC
Scirpoides burkei	LC
Riocreuxia polyantha	LC
Sporobolus fimbriatus	LC
Pseudopegolettia tenella	LC
Nemesia fruticans	LC
Boophone disticha	LC
Chironia purpurascens	LC

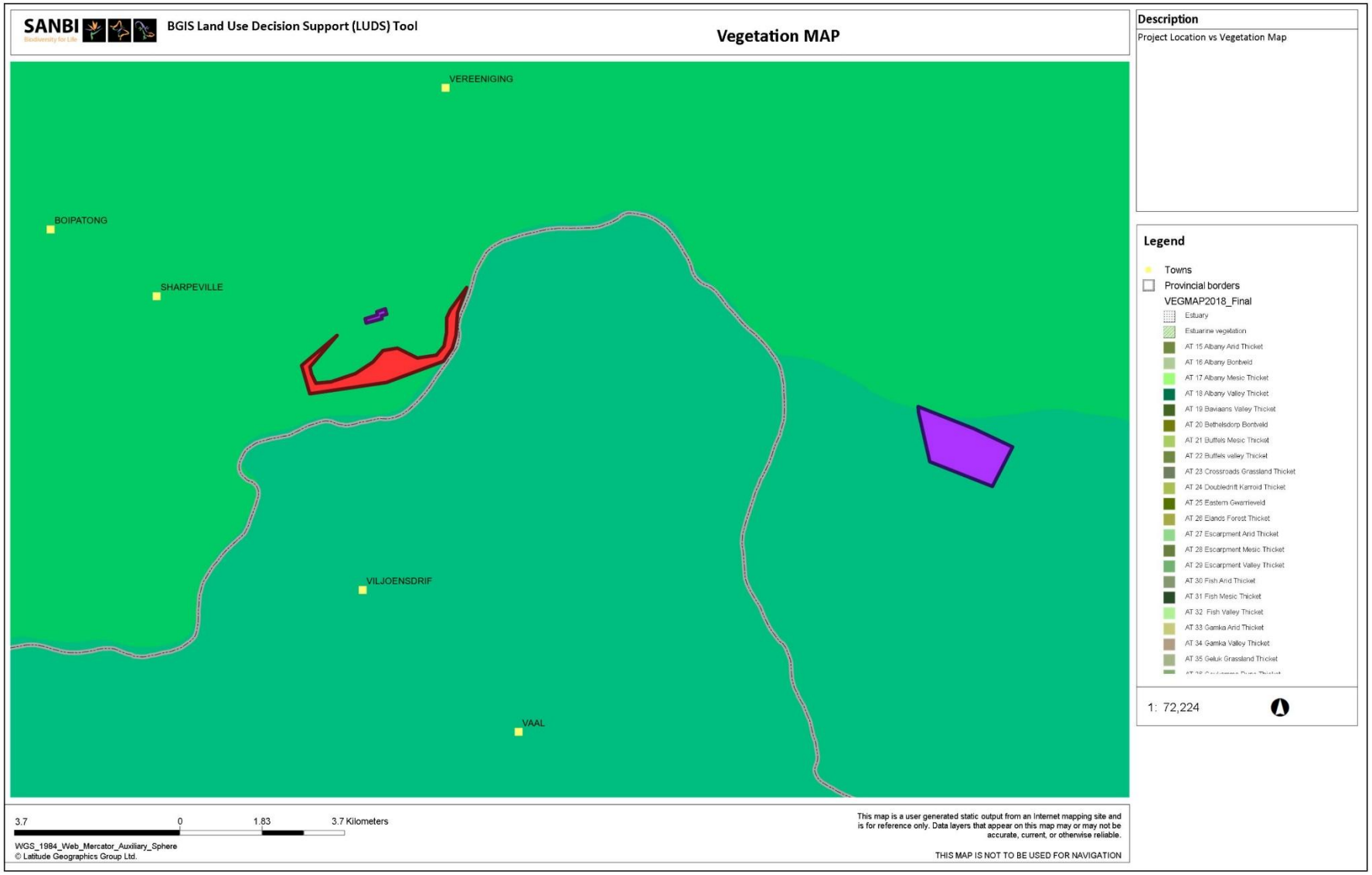


FIGURE 12: STUDY AREA IMPOSED ON VEGETATION MAP (SANBI, 2018)

5.1.2. DESKTOP FAUNAL ASSESSMENT

Several South African desktop databases and atlas mapping resources that are typically consulted for faunal assessments, such as those hosted by the FitzPatrick Institute of African Ornithology's Virtual Museum, are no longer publicly accessible. These platforms previously provided valuable records on the potential occurrence of amphibians, herpetofauna (reptiles), and mammals within defined geographical areas and have been widely used for desktop-level screening. As a result of their current unavailability, a comprehensive desktop assessment of faunal species expected in the study area could not be completed. Consequently, a thorough field-based faunal survey was required to identify and confirm the presence of fauna within the proposed project locations.

Based on the Screening Tool Report, the area surrounding the Vereeniging Water Treatment Works has been identified as sensitive under the Animal Biodiversity Theme. This classification is due to the potential presence of several species of conservation concern. These include the ***Caspian Tern* (*Hydroprogne caspia*)**, which is considered a high-sensitivity bird species, as well as two medium-sensitivity insect species: ***Lepidochrysops procera*** *and* ***Orachrysops mijburghi***. In addition, two medium-sensitivity mammal species were flagged: the **Spotted-necked Otter (*Hydrictis maculicollis*)** and the **Oribi (*Ourebia ourebi ourebi*)**.

In contrast, the Panfontein area was classified as **low sensitivity** under the Animal Biodiversity Theme, indicating a lower likelihood of occurrence of species of conservation concern in that location based on available desktop data. Refer to Figure 13 below.

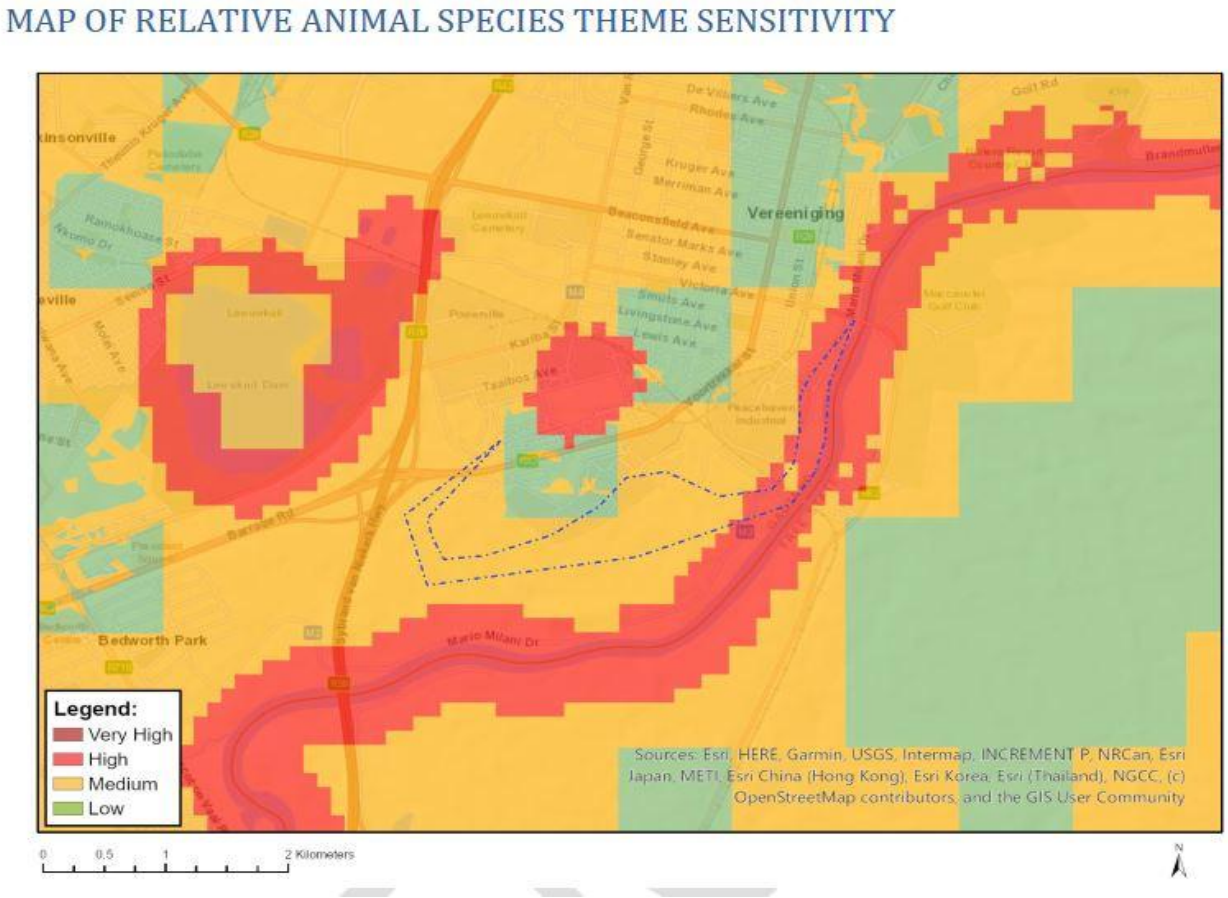


FIGURE 13: ANIMAL SPECIES SENSITIVITY THEME OF PROJECT AREA

However, the occurrence of bird species (avifauna) in the three locations was assessed using the Southern African Bird Atlas Project 2 (SABAP2), a reliable database managed in collaboration with BirdLife South Africa. This database provides records of bird species observed in specific pentads (grid cells), allowing for a reasonably accurate indication of expected avifaunal diversity. The results from the SABAP2 data search are presented in the section below.

5.1.2.1. DESKTOP AVIFAUNAL ASSESSMENT

SABAP2 data suggests that up to 189 bird species may potentially occur within the vicinity of the three proposed locations and secondary PAOI. A full list of these species is provided in Appendix 1. Among them, only 5 species are classified as priority species, i.e., Species of Conservation Concern (SCC), as listed on the South African Red List (BirdLife South Africa Checklist of Birds in South Africa 2024). Of these priority species,

Table 11 below outlines all priority species and the likelihood of occurrence in the proposed project of each. The following abbreviations and acronyms are used: EN = Endangered, VU =Vulnerable, and NT = Near Threatened

TABLE 11: EXPECTED AVIFAUNA SPECIES OF CONSERVATION CONCERN

Species Name	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI,2016)	IUCN (2024)	
Polemaetus bellicosus	Martial eagle	EN	EN	Low
Falco biarmicus	Lanner falcon	VU	LC	Low
Falco vespertinus	Red-footed falcon	NT	VU	Low
Coracias garrulus	European roller	NT	LC	Moderate
Hydroprogne caspia	Caspian Tern	VU	LC	Moderate

Given the nature of the proposed project, primarily involving pipeline installation within areas that are already transformed and disturbed, i.e., within the Rand Water servitude, the potential impact on avifauna is expected to be minimal. However, localised impacts may occur to more sensitive faunal groups such as amphibians and small mammal species, particularly in areas where construction activities intersect with natural features like wetlands, drainage lines, or grassland patches, especially near the Panfontein location and riparian zones of the Vaal River.

5.2. FIELD SURVEY

A single field survey of the Study Area (flora and fauna) was conducted on 16 April 2025, which represents the wet season (Summer) survey. During the field survey, the floral and faunal communities in the study area were assessed. The study area was surveyed on foot, which included spot checks in pre-selected areas along the length of the proposed project servitude.

Photographs were recorded during the site visits, and some are provided under this section of the report. All site photographs are available on request. The field survey was conducted at the peak of the wet season; therefore, the species recorded to date can by no means be regarded as comprehensive and successive surveys across entire seasons and phonological cycles will greatly supplement the baseline data gathered to date.

5.2.1. HABITAT CHARACTERISATION

5.2.1.1. HABITATS UNITS OBSERVED

This section addresses the overall habitat delineations established based on the desktop assessment and field survey.

The primary habitat types across the project area were initially identified using aerial imagery. These habitat types were further refined based on field coverage and data collected during the survey. The delineated habitats are illustrated in Figure 14 and Figure 15. Special emphasis was placed on limiting timed meander searches to natural habitats, which have a higher potential for hosting species of conservation concern (SCC).

Habitat units were grouped according to each location for the proposed construction activities under the application. The identified habitat units are described below:

Proposed Construction Activity/Location	Habitat Unit # and Description
New System 1 at Rand Water Vereeniging Treatment Works	**Habitat Unit 1**, located at the proposed New System 1 site, is best described as a **modified habitat**. The proposed New System 1 site is situated within a large depression that appears to be the incomplete construction of aeration basins. This depression has created wetland-like conditions, supporting a dominance of water-loving plant species. Outside of the depression, a grass layer dominates the landscape. During the field survey, it was noted that the area supports largely natural vegetation; however, it is significantly dominated by **alien invasive plant species**, which have outcompeted much of the indigenous flora. Vegetation was also observed growing over old infrastructure and incomplete or abandoned construction elements. The habitat is bordered by existing infrastructure associated with the Vereeniging Water Treatment Works, contributing to its transformed condition. Although some ecological function remains, the presence of invasive species and extensive surrounding development reduces the habitat's overall biodiversity value and integrity.

Phase 2 sludge pipeline in Vereeniging	**Habitat Unit 2: Phase 2 sludge pipeline within the Vereeniging** **Habitat Unit 2** is associated with the Phase 2 sludge pipeline. Phase 2 sludge pipeline starts from within the VWTW, but only a portion of it is inside the station, while the other sections is outside, is characterised by **grassland with scattered trees and shrubs**. During the field visit, this area was observed to be significantly impacted by **anthropogenic activities**, particularly stockpiles of sand likely mined from nearby areas, as well as **accumulations of dried sludge** from the wastewater treatment process. There is clear evidence of **surface run-off from the sludge piles**, which has visibly affected the surrounding environment. The cumulative impact of these activities has likely led to reduced habitat quality and **lower faunal diversity**, with ecosystem services such as soil stability, water filtration, and biodiversity support likely compromised. The proximity to active treatment infrastructure further limits the habitat's ecological integrity.
	Habitat Unit 3: Phase 2 sludge pipeline within the Vereeniging **Habitat Unit 3** is also dominated by a **grass layer**, but transitions into more **riparian vegetation** closer to the Vaal River, where **tree species become more prominent**. While this area supports a mix of indigenous and alien vegetation, the ecological condition is degraded by **urban pressures**, including **illegal dumping of waste, road infrastructure**, and nearby **industrial and leisure developments**. Despite the presence of some natural features, the cumulative effect of human disturbance has altered the habitat structure and function, making it less suitable for sensitive faunal species and potentially disrupting ecological processes along the river corridor.
1.5 km sludge pipeline in Panfontein	**Habitat Unit 4: 1.5 km sludge pipeline in Panfontein** **Habitat Unit 4**, associated with the 1.5 km sludge pipeline in the Panfontein area, is characterised by a **grass layer interspersed with low-growing shrubs**. The dominant feature of this habitat unit is the presence of **sludge or settlement pans**, which form part of the operational process of the adjacent **wastewater treatment works**. These pans have significantly altered the natural landscape, limiting the availability of intact or ecologically functional habitat. While some vegetation persists, it is largely influenced by operational activities and periodic disturbance. **Agricultural activities** are also evident in the surrounding areas, further contributing to the transformation of the habitat and reducing its suitability for supporting a diverse range of fauna and flora. Overall, the area represents a **highly modified and functionally limited habitat**.

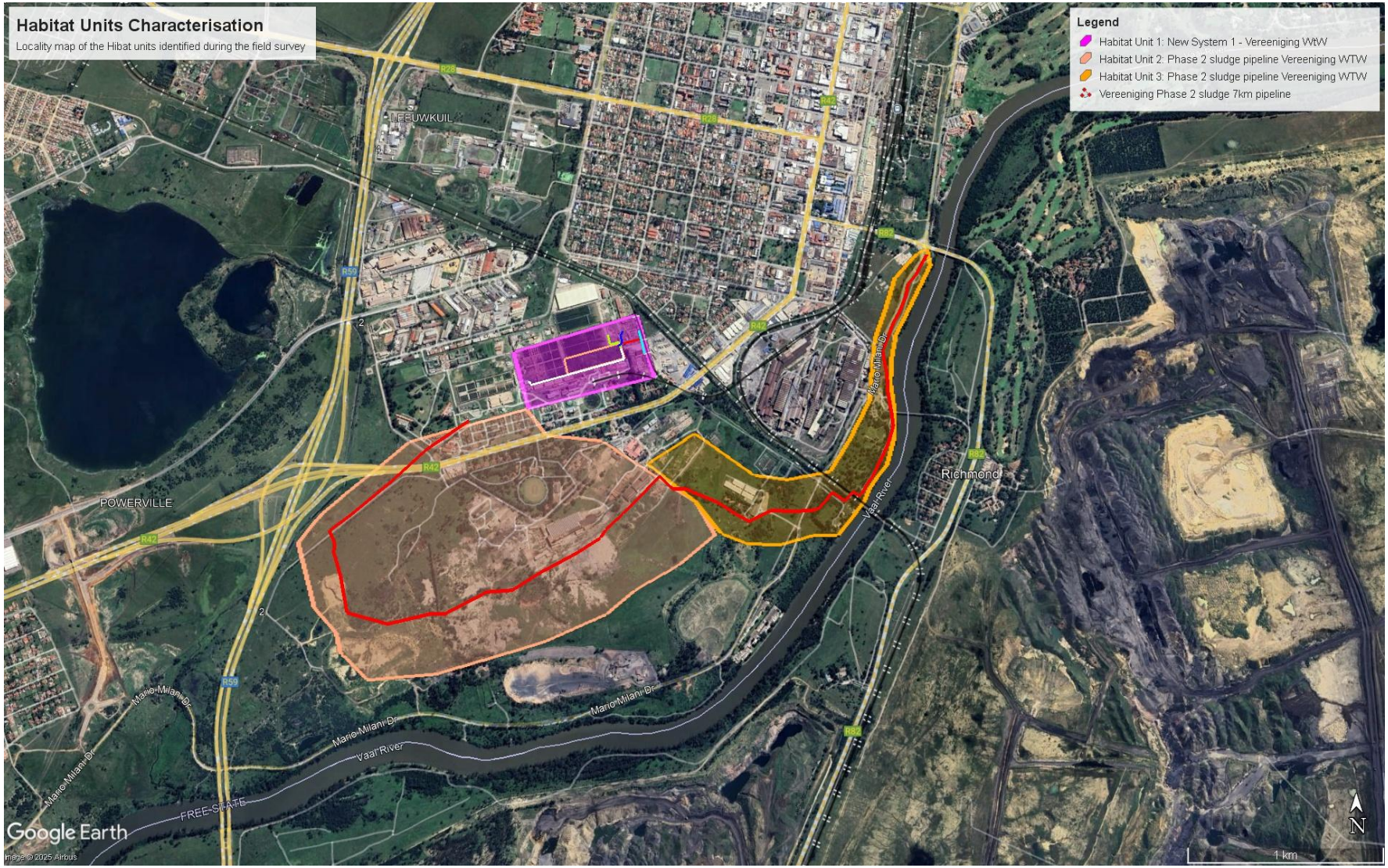


FIGURE 14: HABITAT UNIT MAP

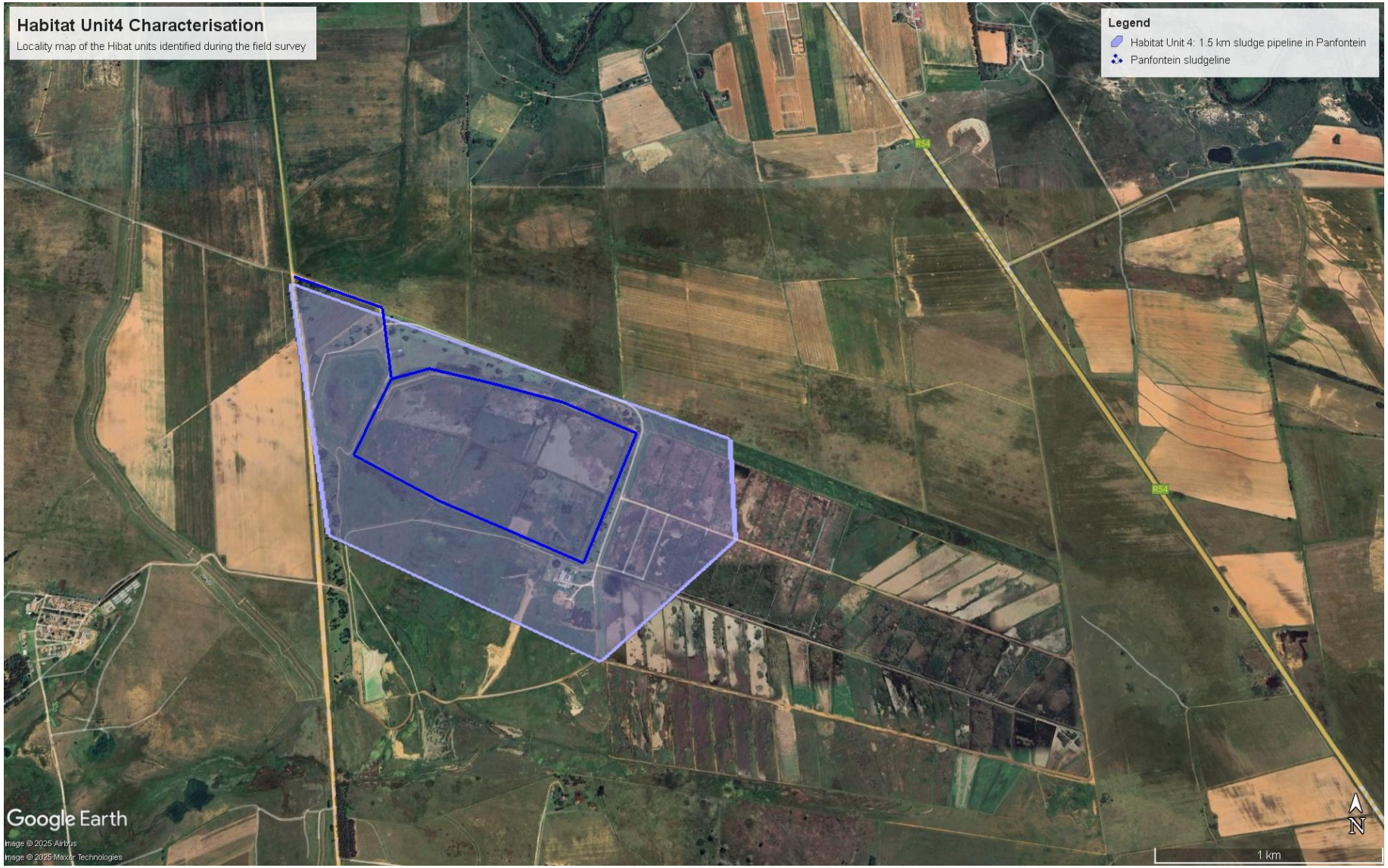


FIGURE 15: HABITAT UNIT 4 LOCALITY MAP

5.2.2. VEGETATION AND FAUNAL ASSESSMENT PER HABITAT UNIT

In this section, we describe the floral and faunal characteristics of each habitat unit based on our field survey findings.

5.2.2.1. HABITAT UNIT 1: NEW SYSTEM 1 AT RAND WATER VEREENIGING TREATMENT WORKS

Habitat Unit 1: associated with the New System 1 at Rand Water Vereeniging Treatment Works is located within the Grassland biome and corresponds to the Gauteng Soweto Highveld vegetation type. This habitat unit is characterised by a diverse layer of grasses and short trees, creating a complex and rich ecosystem. Refer to Figure 16.

Vegetation

In terms of vegetation composition, grass species recorded in this habitat unit during the field survey include: *Eragrostis curvula, Digitaria diagonalis. Themeda triandra*, *Cymbopogon pospischilii*, *Hyparrhenia dregeana and Digitaria eriantha subsp. Eriantha, and Cynodon dactylon.*

Recorded tree and shrub layer features species like *Searsia lancea, Pinus palustris, Phragmites australis, Vachellia Sp., Vachellia karroo, Diospyros lycioides, Combretum molle, Asparagus laricinus, Asparagus suaveolen, Indigofera comosa.* The herds later consisted of *Helichrysum nudifolium, Senecio venosus*

Faunal assessment

No mammal species were observed during the site visit; however, due to the shape and structure of this habitat unit, it appears to retain water and has formed a **wetland-like environment**, which supported an abundance of **bird species**, particularly those that **nest in Phragmites reeds**, such as weavers and other water-associated avifauna including *Phylloscopus trochilus, Ploceus velatus and Euplectes orix* were observed on site.

Although no amphibian species were recorded during the survey, the presence of standing water and suitable vegetation suggests a **high likelihood of amphibian occurrence**, especially during wetter periods or breeding seasons.

Species of Conservation Concern

No floral or faunal species of conservation concern were recorded during the field survey. The habitats assessed were largely modified or disturbed, and no rare, threatened, or protected species were observed or identified in the area at the time of the assessment at this habitat unit.

FIGURE 16: ILLUSTRATION OF HABITAT UNIT 1

5.2.2.2. HABITAT UNIT 2 AND HABITAT 3: PHASE 2 SLUDGE PIPELINE VWTW

Habitat Unit 2: associated with the Phase 2 sludge pipeline in Vereeniging Treatment Works, is situated within the grassland biome and corresponds to the Soweto Highveld Grassland vegetation type. It is predominantly characterised by a variety of grass species, with scattered small shrubs and herbs interspersed throughout. Tall trees are present, dominated by Eucalyptus trees. Refer to Figure 17.

Vegetation

The Habitat unit composition was dominated by grass species such Arundinella *nepalensis, Themeda triandra (Red Grass), Eragrostis curvula, Heteropogon contortus, Tristachya leucothrix, and Elionurus muticus*. *Andropogon appendiculatus,Hyparrheniahirta, Cymbopogon pospischilii,Eragrostis racemosa, Eragrostis chloromelas, Eragrostis plana, Hyparrhenia hirta, Setaria sphacelata, and Digitaria diagonalis*

The shrubs and herbs layer *observed included: Chamaecrista mimosoides, Senecio coronatus, Vernonia oligocephala, Riocreuxia polyantha, Bidens Pilosa* and *Anthospermum rigidum subsp. Pumilum.*

Tall trees included various *Vachellia sp*, *Salix alba*, *Peltophorum africanum* and alien plants gumtrees, *Caesalpinia decapetal, Acacia mearnsii and eucalyptus citriodora.* There were no Red List flora species noted within this habitat unit.

Fauna

While no mammal species were observed during the field survey, there was an abundance of bird species, which are detailed in Appendix 1. Additionally, evidence of small mammals was noted, with burrows observed on site. Despite significant anthropogenic impacts in this habitat unit, small mammals, reptiles, and invertebrate species are likely present.

Species of Conservation Concern

No floral or faunal species of conservation concern were recorded during the field survey. The habitats assessed were largely modified or disturbed, and no rare, threatened, or protected species were observed or identified in the area at the time of the assessment at these habitat units.

FIGURE 17: GRASSLAND HABITAT UNIT

5.2.2.3. HABITAT UNIT 4: 1.5 KM SLUDGE PIPELINE IN PANFONTEIN

Habitat Unit 3: associated with the 1.5 km sludge pipeline in Panfontein consists of the **Central Free State Grassland** (Gh6), which is a vegetation type within the **Grassland Biome**. The land has been significantly transformed by activities of the Vereeniging water treatment works, specifically sludge dams and agricultural units. As a result, little to no natural vegetation remains. The landscape is typical of grassland, with scattered shrubs and herbs. Refer to Figure 18.

Vegetation assessment

The following grass species were observed during the field visit: Cynodon dactylon, **Themeda triandra** (Red Grass) dominant*, Eragrostis curvula (Weeping Lovegrass), Eragrostis chloromelas (Curly Leaf Lovegrass), Aristida congesta, Aristida diffusa, Heteropogon contortus (Spear Grass), Panicum coloratum, Sporobolus africanus, Tragus berteronianus, Cynodon dactylon (Common Couch), Schmidtia pappophoroides and Digitaria eriantha (Finger Grass)*

Tree species include Vachellia karroo and other Vachelia Sp., Grewia flava and Rhus pyroides

Fauna Assessment

No mammal species were observed during the field survey at panfontein; however, based on the site conditions and habitat characteristics, it is highly likely that a variety of other faunal groups are present. The presence of sludge dams and settlement pans on-site creates moist and semi-aquatic microhabitats that are favourable for amphibian species, particularly frogs, which are typically associated with such wet environments. In addition, the surrounding grassland and low shrub cover may support small mammals, such as rodents and insectivores, which often inhabit underground burrows. These conditions are also suitable for various invertebrate species, including insects and arachnids that thrive in damp and vegetated environments.

Species of Conservation Concern

No floral or faunal species of conservation concern were recorded during the field survey. The habitats assessed were largely modified or disturbed, and no rare, threatened, or protected species were observed or identified in the area at the time of the assessment at this habitat unit.

FIGURE 18: HABITAT UNIT 4 AS OBSERVED ON SITE.

5.2.2.4. ALIEN AND INVASIVE PLANTS

Declared weeds and invader plant species tend to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition, and function of ecosystems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 43735, 25 September 2020. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam, or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- **Category 1a:** Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, must be combatted or eradicated from the environment. No permits will be issued.
- **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy, or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy, or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Category 1b invasive species were recorded within the project area and must therefore be removed by implementing an alien invasive plant management programme in compliance of section 75 of the Act as stated above. The NEMBA-listed species identified within the project area are presented in Table 12 below. Also refer to Figure 19.

TABLE 12: ALINE INVASIVE PLANTS NOTED AT THE STUDY AREA

Alien Invasive Plants	Common Name
Corymbia citriodora	lemon-scented gum
Caesalpinia-decapetala	Mauritius thorn
Targetes erecta	African marigold
Cortaderia selloana	Pampas grass
Datura innoxia	Downy Thorn Apple
Verbena brasiliensis	Slender Wild Verbena
Solanum mauritianum	Bugweed
Tithonia rotundifolia	Red Sunflower

FIGURE 19: EXAMPLES OF ALIEN SPECIES ON SITE (LEFT -AFRICAN MARIGOLD & RIGHT – GUM TREE

6. PROJECT SITE ECOLOGICAL IMPORTANCE (SENSITIVITY) ASSESSMENT

The site ecological importance (SEI) of the identified habitat units in the study area was assessed using the SANBI (2020) protocol. Based on the site ecological importance (SEI) assessment and the guidelines for interpretation, two habitat units were classified as having **"Low"** while two other habitat units were classified as **"Medium"** SEI. This classification indicates that minimisation mitigation measures are sufficient, meaning that development activities of medium to high impact are acceptable. Additionally, restoration activities may not be required. The results of the assessment are detailed in Table 13 below.

TABLE 13: ECOLOGICAL IMPORTANCE OF THE HABITAT UNITS IN THE PROJECT STUDY AREA

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Habitat Unit 1: New System 1 at Rand Water Vereeniging Treatment Works	**Low** No confirmed or highly likely populations of species of conservation concern (SCC). No confirmed or highly likely populations of range-restricted species. In assessing the conservation importance of Habitat Unit 1, its location within an already transformed area associated with the Vereeniging Water Treatment Works and the absence of species of conservation concern observed during the field visit indicate that this habitat is of **low conservation importance**.	**Low** High habitat connectivity serves as functional ecological corridors, with a limited road network between intact habitat patches. The functional integrity of Habitat Unit 1 is considered **low**, as it comprises a very limited area of intact and functional habitat, with minimal ecological connectivity to surrounding natural areas.	**Very Low**	**Very Low** The proposed development within Habitat Unit 1 is long-term in nature, particularly during the operational phase; as a result, the receptor resilience is rated as **very low**, and the associated impact is considered **long-term.**	**Low** Minimisation and restoration mitigation – development activities of medium to high impact are acceptable, followed by appropriate restoration activities.

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Habitat Unit 2: Phase 2 sludge pipeline in Vereeniging Treatment Works	**High** No confirmed or highly likely populations of species of conservation concern (SCC). Although no species of conservation concern (SCC) were observed during the field visit to Habitat Unit 2, desktop assessment using the Screening Tool identified the potential presence of mammal, insect, and avifauna SCC. Additionally, the location is in a threatened ecosystem therefore, the conservation importance of this habitat is rated as **high**	**Medium** In terms of functional integrity, Habitat Unit 2 exhibits a low to moderate level of intact vegetation and ecological connectivity; however, the persistent ecological disturbances within the area result in this habitat being rated as having **medium functional integrity**.	Medium	High	**Low**
Habitat Unit 3: Phase 2 sludge pipeline in Vereeniging Treatment Works	**Very high** Although no species of conservation concern (SCC) were observed during the field visit to Habitat Unit 3, desktop assessment using the Screening Tool identified the potential presence of mammal, insect, and avifauna SCC. Additionally, this habitat unit is near the Vaal River, a watercourse of high ecological importance. and located in the threatened Soweto highveld grassland ecosystem. Therefore, the conservation importance of this habitat is rated **as very high**	**Medium** Habitat Unit 3 displays a low to moderate level of intact vegetation and connectivity; however, the presence of fragmentation, roads, and other persistent ecological disturbances results in this habitat being rated as having **medium functional integrity**	High	High	**Medium**

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
	No confirmed or highly likely populations of species of conservation concern (SCC). No confirmed or highly likely populations of range-restricted species.				
Habitat Unit 4: 1.5 km sludge pipeline in Panfontein	**Low** In assessing the conservation importance of Habitat Unit 4, its location within an already transformed area associated with the Vereeniging Water Treatment Works and the absence of species of conservation concern observed during the field visit indicate that this habitat is of **low conservation importance.** In addition, the location scored Medium for both animal and plant sensitivity per the screening tool. And located in a non-threatened ecosystem i.e, Central Free state grassland.	**Low** The functional integrity of Habitat Unit 4 at Panfontein is rated as **low**, as the project area is already significantly transformed by sludge dams, and the surrounding landscape is further altered by agricultural activities, resulting in low ecological connectivity and limited habitat intactness.	Low	**Low** Based on the proposed construction activities at Panfontein, the resilience of the area is rated as low, given its already transformed condition and the long-term nature of the operational phase	**Medium**

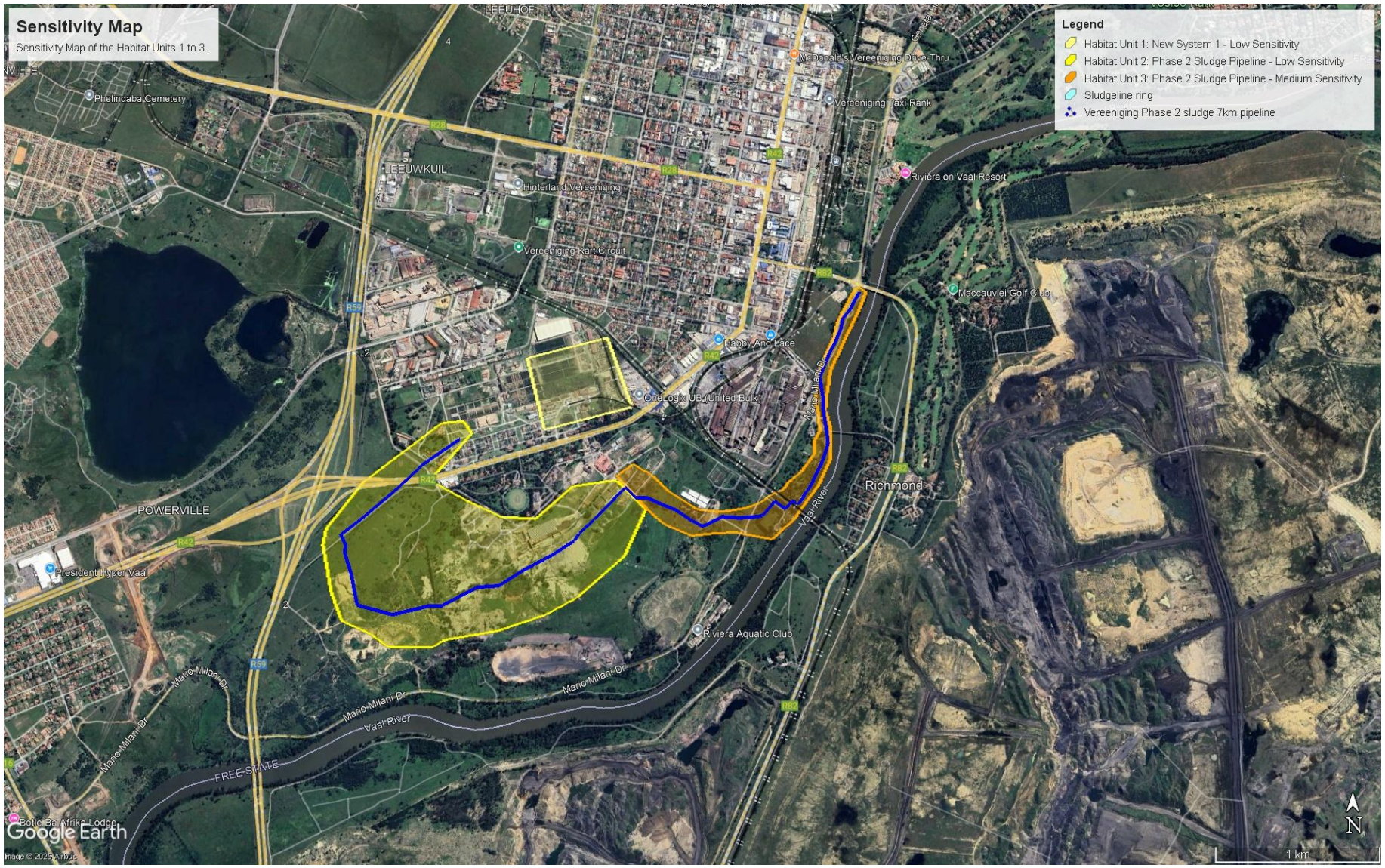


FIGURE 20: SITE ECOLOGICAL IMPORTNCE OF PROJECT AREA

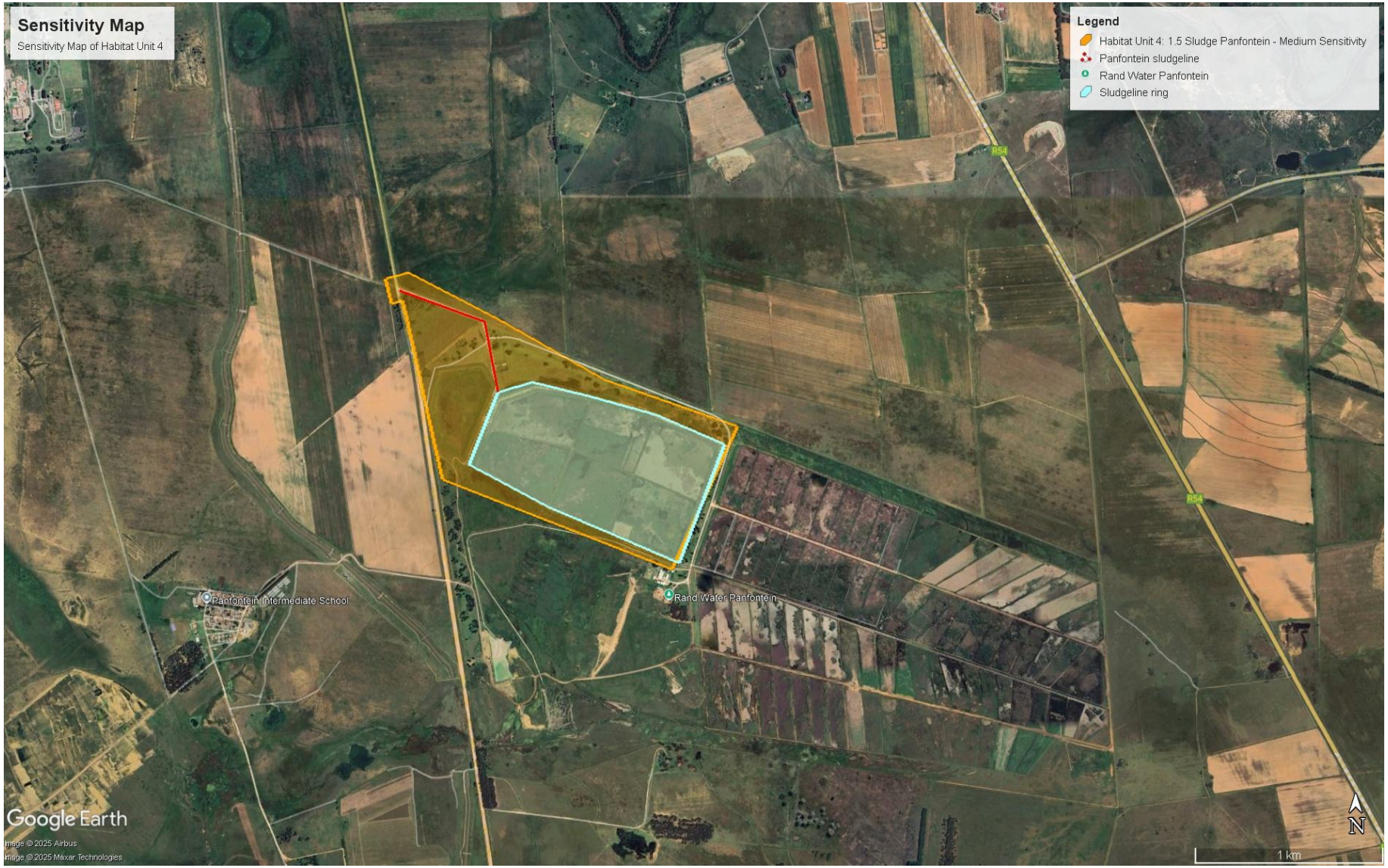


FIGURE 21: SENSITIVITY MAP OF THE HABITAT UNIT 4

7. IMPACT ASSESSMENT, MANAGEMENT AND MITIGATION PLAN

Overview

An environmental impact risk assessment was undertaken to evaluate the potential environmental risks associated with the construction and installation activities at the three project locations: the New System 1 development at Rand Water Vereeniging Treatment Works, the Phase 2 sludge pipeline installation in Vereeniging, and the sludge pipeline installation in Panfontein. Each component of the project involves infrastructure development that may result in varying degrees of environmental disturbance, depending on the sensitivity of the surrounding habitats and the nature of construction activities. The assessment was guided by the principles of sustainability and aimed at identifying key areas of environmental concern.

In the sections that follow, we outline the specific environmental aspects and potential impacts identified for each project component. These include, but are not limited to, soil erosion, water contamination, habitat loss, the spread of invasive species, and disruption to biodiversity. A risk assessment matrix was developed to assess each impact in terms of its likelihood, duration, reversibility, and magnitude, among other criteria. This systematic approach enables the evaluation of the significance of each impact and informs the development of appropriate mitigation measures to reduce environmental harm during both construction and operational phases.

7.1.1. DESCRIPTION OF POTENTIAL IMPACTS AND MITIGATION MEASURES

The table below provides anticipated impacts and their associated mitigation measures. These mitigation measures should be considered as part of the environmental Management Plan for the proposed project.

#.	Environmental Impact	Project Activity Triggering Impact	Possible Mitigation Measures
1	**Soil erosion and sedimentation**	Excavation and earthworks for the construction of tanks, pipelines, and access roads	• Implement erosion and sediment control measures (e.g., silt fences, sediment traps) • Rehabilitate disturbed areas promptly • Minimise vegetation clearance
2	**Surface and groundwater contamination**	Installation and operation of sludge pipelines; demolition of old infrastructure	• Store and handle hazardous materials appropriately • Use spill prevention systems • Line containment areas and inspect pipelines regularly
3	**Biodiversity disturbance and habitat loss**	Construction of infrastructure near natural or semi-natural habitat (e.g., grassland, Vaal River zone, Panfontein)	• Avoid unnecessary vegetation clearance • Monitor biodiversity during construction • Implement rehabilitation plans using indigenous species
4	**Air pollution and dust generation**	Demolition, excavation, and vehicle movement	• Water down dusty areas regularly • Cover material during transport • Minimise the time between excavation and backfilling
5	**Noise and vibration disturbance to nearby communities and fauna**	Heavy machinery and demolition near sensitive areas	• Restrict construction hours to daylight - Maintain equipment to reduce noise • Use noise barriers where necessary
6	**Interruption of existing services and traffic flow**	Installation of pipelines near or across roads and existing utilities	• Coordinate with authorities and service providers • Provide alternate access and clear signage • Inform stakeholders in advance

7	**Spread of alien and invasive plant species**	Movement of construction machinery and soil disturbances	• Clean vehicles and equipment before entering the site • Monitor for alien species post-construction - Remove invasive plants and replant with indigenous species
8	**Loss of vegetation and topsoil from construction vehicles**	Repeated movement of vehicles over unpaved areas	• Limit vehicle access to designated paths
9	**Reduced ecological functioning (e.g., connectivity, wetland function)**	Construction is located close to riparian zones and wetland-like habitats	• Establish buffer zones Maintain ecological corridors where possible Avoid placing structures within wetland zones
	Waste generation and poor waste management during construction	General construction activities, including demolition and site clearing	• Provide adequate waste storage and disposal facilities • Separate recyclable materials • Train staff on waste handling and disposal procedures

7.1.2. IMPACT ASSESSMENT

The impact and mitigation assessment evaluates the potential extent and significance of impacts on identified receptors and resources based on defined criteria. It aims to develop and describe measures to avoid, minimise, or compensate for any adverse environmental impacts, enhance positive impacts, and report the significance of residual impacts after mitigation.

The primary objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project and to propose a significance ranking. Issues and aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities, aspects, resources, and receptors. Table 14 shows the impact significance assessment methodology.

The impact assessment undertaken considered the three locations of the proposed development. This comprehensive evaluation ensured that all potential environmental and social impacts were thoroughly analysed.

TABLE 14: IMPACT SIGNIFICANT METHODOLOGY

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).

2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		

1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY/ MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.

2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.

51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

ENVIRONMENTAL RATING SIGNIFICANCE KEY:

TABLE 15: NEGATIVE IMPACTS RATING KEY

SIGNIFICANCE	RATING	FINAL RATING SCORE / VALUE RANGE
Very Significant	Very High	74 – 96
Significant	High	51 – 73
Increasing Significance	Medium	29 – 50
Insignificant	Low	6 – 28

TABLE 16: POSITIVE IMPACT RATING KEY

SIGNIFICANCE	RATING	FINAL RATING SCORE / VALUE RANGE
Very Significant	Very High	74 – 96
Significant	High	51 – 73
Increasing Significance	Medium	29 – 50
Insignificant	Low	6 – 28

TABLE 17: IMPACT ASSESSMENT SCORING FOR TERRESTRIAL BIODIVERSITY ASSESSMENT PRE MITIGATION

Nature	Geographical Extent	Probability	Reversibility	Irreplaceable loss of resources	Duration	Cumulative Impact	Magnitude	Significance Score	Impact Significance Rating
Soil erosion and sedimentation	1	4	1	1	2	2	3	33	Negative Medium impact
Surface and groundwater contamination	1	3	4	2	1	1	3	36	Negative Medium impact
Biodiversity disturbance and habitat loss	1	3	2	2	2	3	3	39	Negative Medium impact
Air pollution and dust generation	1	3	1	1	1	1	1	8	Negative Low impact
Noise and vibration disturbance to nearby communities and fauna	1	3	1	1	1	1	1	8	Negative Low impact
Spread of alien and invasive plant species	1	3	2	1	3	2	2	24	Negative Low impact
Loss of vegetation and topsoil from construction vehicles	1	3	2	3	2	3	3	42	Negative Medium impact
Reduced ecological functioning (e.g., connectivity)	1	2	2	1	1	2	1	9	Negative Low impact
Waste generation and poor waste management during construction	1	2	1	2	1	2	2	18	Negative Low impact

TABLE 18: RISK ASSESSMENT IMPACT RATING AFTER MITIGATION

Nature	Geographical Extent	Probability	Reversibility	Irreplaceable loss of resources	Duration	Cumulative Impact	Magnitude	Significance Score	Impact Significance Rating
Soil erosion and sedimentation	1	2	1	1	2	2	3	27	Negative Low impact
Surface and groundwater contamination	1	2	4	2	1	1	2	22	Negative Low impact
Biodiversity disturbance and habitat loss	1	3	2	2	2	3	2	26	Negative Low impact
Air pollution and dust generation	1	3	1	1	1	1	1	8	Negative Low impact
Noise and vibration disturbance to nearby communities and fauna	1	3	1	1	1	1	1	8	Negative Low impact
Spread of alien and invasive plant species	1	2	2	1	3	2	2	22	Negative Low impact
Loss of vegetation and topsoil from construction vehicles	1	2	2	2	2	2	2	22	Negative Low impact
Reduced ecological functioning (e.g., connectivity)	1	2	2	1	1	2	1	9	Negative Low impact
Waste generation and poor waste management during construction	1	2	1	1	1	2	2	16	Negative Low impact

8. CONCLUSION

New System 1 and portions of the Phase 2 sludge pipeline (approximately 7 km) are located within a threatened ecosystem classified as Vulnerable. However, the broader area, particularly around the Vereeniging Water Treatment Works (VWTW), has already undergone significant transformation due to prolonged anthropogenic activities, including the operational footprint of the VWTW itself. Consequently, the natural habitat in the area has been extensively altered, resulting in reduced ecological integrity. Similarly, the Panfontein area is already disturbed, with limited ecological functioning and low species diversity.

The site sensitivity for all proposed construction areas has been assessed as medium. From a biodiversity perspective, the potential environmental impact is considered to be minimal. Based on both the desktop assessment and field survey, the specialist concludes that the proposed development is environmentally acceptable. Nevertheless, strict adherence to the recommended mitigation measures outlined in this report is essential to further reduce any residual risks and to preserve remaining ecological functions in the area.

8.1.1. IMPACT STATEMENT

An impact significance assessment was undertaken to evaluate the potential effects of the proposed project activities on the flora and fauna (biodiversity) within the identified project locations. This assessment considered both the direct and indirect impacts of the proposed infrastructure developments, including construction and operational activities, on local ecological features. Particular attention was given to the ecological importance of the Vaal River, which is in proximity to some sections of the proposed development.

The risk assessment identified low to medium negative impacts on biodiversity, with all impacts reducing to low significance levels following the implementation of appropriate mitigation measures. No floral or faunal species of conservation concern were recorded during the field surveys across all project sites. Given these findings, and provided that all mitigation and management measures outlined in this report are properly implemented, the biodiversity-related risks associated with the proposed project can be reduced to acceptable levels.

Therefore, it is the opinion of the specialist that the project may be favourably considered for environmental authorisation, on the condition that the prescribed mitigation measures and supporting recommendations are fully adhered to throughout the project lifecycle.

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APPENDIX 1 AVIFAUNA SPECIES

Scientific Name	Common species	*Scientific Name*	Common species	*Scientific Name*	Common species
Telophorus zeylonus	Bokmakierie	***Muscicapa striata***	Muscicapa striata	***Tringa glareola***	Wood
Scopus umbretta	Hamerkop	***Scleroptila gutturalis***	Scleroptila gutturalis	***Crithagra gularis***	Streaky-headed
Cisticola fulvicapilla	Neddicky	***Alopochen aegyptiaca***	Alopochen aegyptiaca	***Tadorna cana***	South African
Ortygospiza atricollis	Quailfinch	***Plectropterus gambensis***	Plectropterus gambensis	***Tadorna tadorna***	Common
Calidris pugnax	Ruff	***Tachybaptus ruficollis***	Tachybaptus ruficollis	***Lanius collurio***	Red-backed
Apalis thoracica	Bar-throated	***Tringa nebularia***	Tringa nebularia	***Circaetus pectoralis***	Black-chested
Recurvirostra avosetta	Pied	***Numida meleagris***	Numida meleagris	***Passer melanurus***	Cape
Lybius torquatus	Black-collared	***Chroicocephalus cirrocephalus***	Chroicocephalus cirrocephalus	***Passer domesticus***	House
Trachyphonus vaillantii	Crested	***Ardea melanocephala***	Ardea melanocephala	***Passer diffusus***	Southern Grey-headed
Merops apiaster	European	***Ardea goliath***	Ardea goliath	***Plocepasser mahali***	White-browed
Merops hirundineus	Swallow-tailed	***Ardea cinerea***	Ardea cinerea	***Accipiter melanoleucus***	Black
Merops bullockoides	White-fronted	***Ardea purpurea***	Ardea purpurea	***Accipiter minullus***	Little
Euplectes afer	Yellow-crowned	***Ardeola ralloides***	Ardeola ralloides	***Accipiter ovampensis***	Ovambo
Pycnonotus nigricans	African Red-eyed	***Butorides striata***	Butorides striata	***Platalea alba***	African
Pycnonotus tricolor	Dark-capped	***Indicator indicator***	Indicator indicator	***Pternistis swainsonii***	Swainson's
Emberiza tahapisi	Cinnamon-breasted	***Indicator minor***	Indicator minor	***Lamprotornis nitens***	Cape
Buteo buteo	Common	***Upupa africana***	Upupa africana	***Lamprotornis bicolor***	Pied

Pernis apivorus	European Honey	***Threskiornis aethiopicus***	Threskiornis aethiopicus	***Onychognathus morio***	Red-winged
Buteo rufofuscus	Jackal	***Plegadis falcinellus***	Plegadis falcinellus	***Creatophora cinerea***	Wattled
Crithagra atrogularis	Black-throated	***Bostrychia hagedash***	Bostrychia hagedash	***Himantopus himantopus***	Black-winged
Crithagra flaviventris	Yellow	***Vidua purpurascens***	Vidua purpurascens	***Calidris minuta***	Little
Crithagra mozambica	Yellow-fronted	***Vidua chalybeata***	Vidua chalybeata	***Saxicola torquatus***	African
Myrmecocichla formicivora	Ant-eating	***Falco naumanni***	Falco naumanni	***Ciconia ciconia***	White
Oenanthe familiaris	Familiar	***Megaceryle maxima***	Megaceryle maxima	***Chalcomitra amethystina***	Amethyst
Cisticola textrix	Cloud	***Corythornis cristatus***	Corythornis cristatus	***Cinnyris afer***	Greater Double-collared
Cisticola aridulus	Desert	***Ceryle rudis***	Ceryle rudis	***Cinnyris talatala***	White-bellied
Cisticola tinniens	Levaillant's	***Halcyon senegalensis***	Halcyon senegalensis	***Hirundo rustica***	Barn
Cisticola lais	Wailing	***Elanus caeruleus***	Elanus caeruleus	***Cecropis cucullata***	Greater Striped
Cisticola ayresii	Wing-snapping	***Afrotis afraoides***	Afrotis afraoides	***Petrochelidon spilodera***	South African Cliff
Cisticola juncidis	Zitting	***Vanellus senegallus***	Vanellus senegallus	***Hirundo albigularis***	White-throated
Fulica cristata	Red-knobbed	***Vanellus armatus***	Vanellus armatus	***Cypsiurus parvus***	African Palm
Microcarbo africanus	Reed	***Vanellus coronatus***	Vanellus coronatus	***Apus horus***	Horus
Phalacrocorax lucidus	White-breasted	***Mirafra fasciolata***	Mirafra fasciolata	***Apus affinis***	Little
Corvus albus	Pied	***Calandrella cinerea***	Calandrella cinerea	***Apus caffer***	White-rumped
Chrysococcyx caprius	Diederik	***Mirafra africana***	Mirafra africana	***Anas erythrorhyncha***	Red-billed

Cuculus solitarius	Red-chested	***Chersomanes albofasciata***	Chersomanes albofasciata	***Hydroprogne caspia***	Caspian
Anhinga rufa	African	***Macronyx capensis***	Macronyx capensis	***Chlidonias hybrida***	Whiskered
Spilopelia senegalensis	Laughing	***Lonchura cucullata***	Lonchura cucullata	***Chlidonias leucopterus***	White-winged
Oena capensis	Namaqua	***Neophedina cincta***	Neophedina cincta	***Burhinus capensis***	Spotted
Streptopelia semitorquata	Red-eyed	***Riparia paludicola***	Riparia paludicola	***Turdus smithi***	Karoo
Streptopelia capicola	Ring-necked	***Ptyonoprogne fuligula***	Ptyonoprogne fuligula	***Motacilla capensis***	Cape
Columba livia	Rock	***Riparia riparia***	Riparia riparia	***Acrocephalus baeticatus***	African Reed [x]
Anas sparsa	African Black	***Gallinula chloropus***	Gallinula chloropus	***Curruca subcoerulea***	Chestnut-vented
Dendrocygna viduata	White-faced Whistling	***Urocolius indicus***	Urocolius indicus	***Acrocephalus scirpaceus***	Common Reed
Anas undulata	Yellow-billed	***Colius striatus***	Colius striatus	***Acrocephalus gracilirostris***	Lesser Swamp
Lophaetus occipitalis	Long-crested	***Acridotheres tristis***	Acridotheres tristis	***Bradypterus baboecala***	Little Rush
Polemaetus bellicosus	Martial	***Nycticorax nycticorax***	Nycticorax nycticorax	***Phylloscopus trochilus***	Willow
Bubo africanus	Spotted	***Pandion haliaetus***	Pandion haliaetus	***Uraeginthus angolensis***	Blue
Ardea intermedia	Intermediate	***Struthio camelus***	Struthio camelus	***Estrilda astrild***	Common
Egretta garzetta	Little	***Asio capensis***	Asio capensis	***Amandava subflava***	Orange-breasted
Bubulcus ibis	Western Cattle	***Columba arquatrix***	Columba arquatrix	***Sporopipes squamifrons***	Scaly-feathered
Falco amurensis	Amur	***Columba guinea***	Columba guinea	***Ploceus velatus***	Southern Masked
Falco biarmicus	Lanner	***Anthus cinnamomeus***	Anthus cinnamomeus	***Amblyospiza albifrons***	Thick-billed

Falco vespertinus	Red-footed	***Charadrius tricollaris***	Charadrius tricollaris	***Oenanthe pileata***	Capped
Amadina erythrocephala	Red-headed	***Netta erythrophthalma***	Netta erythrophthalma	***Myrmecocichla monticola***	Mountain
Lagonosticta rhodopareia	Jameson's	***Prinia flavicans***	Prinia flavicans	***Zosterops virens***	Cape
Lagonosticta senegala	Red-billed	***Prinia subflava***	Prinia subflava	***Vidua macroura***	Pin-tailed
Lanius collaris	Southern	***Coturnix coturnix***	Coturnix coturnix	***Euplectes progne***	Long-tailed
Haliaeetus vocifer	African	***Quelea quelea***	Quelea quelea	***Euplectes ardens***	Red-collared
Terpsiphone viridis	African Paradise	***Euplectes orix***	Euplectes orix	***Euplectes albonotatus***	White-winged
Stenostira scita	Fairy	***Cossypha caffra***	Cossypha caffra	***Phoeniculus purpureus***	Green
Melaenornis silens	Fiscal	***Coracias garrulus***	Coracias garrulus	***Dendropicos fuscescens***	Cardinal
		Actitis hypoleucos	Actitis hypoleucos	***Jynx ruficollis***	Red-throated

APPENDIX 2: SPECIALIST CV

Eco-Sentle (PTY)LTD
Specialist Details

Curriculum Vitae of Musa Magala

Cell: +27 83 537 0424 | Email: musa@ecosentle.co.za
Address: 29 Swallowtail St, Little falls, Johannesburg, South Africa

PROFESSIONAL PROFILE

I am a positive and hardworking individual with a proven track record of delivering on commitments to the highest standard possible. With over 8 years of experience in undertaking aquatic ecological assessments and terrestrial biodiversity assessments, I have developed a deep understanding of the complexities and nuances involved in environmental impact assessments. I hold a B.Sc. and B.Sc. Honours degree in Natural Sciences from the University of Limpopo and an M.Sc. in Aquatic Health from the University of Johannesburg.

As a specialist in Aquatic Ecology, I conduct comprehensive evaluations of freshwater ecosystems, assessing water quality, habitat conditions, and the health of aquatic organisms. This involves the identification and analysis of biological and chemical indicators to determine the ecological status and potential impacts of environmental changes or human activities. In the realm of Terrestrial Biodiversity and Ecology, my work focuses on assessing the variety and abundance of species in terrestrial habitats, evaluating the impacts of developments on these ecosystems, and devising strategies for biodiversity conservation and management. This includes conducting field surveys, habitat mapping, and ecological modeling to predict and mitigate the effects of land-use changes, infrastructure projects, and other anthropogenic activities.

SKILLS & COMPETENCES

- **Species Identification:** Ability to accurately identify various species of plants, animals, and microorganisms in both aquatic and terrestrial environments.
- **Ecological Surveying:** Proficiency in conducting field surveys to assess biodiversity, including methods like transects, quadrats, and remote sensing.
- **Data Analysis**: Skilled in analysing ecological data using statistical software to interpret biodiversity trends and patterns.
- **GIS and Mapping:** Competence in Geographic Information Systems (GIS) to create and interpret maps that display ecological data and biodiversity distributions.
- **Habitat Assessment:** Expertise in evaluating the quality and health of different

habitats to determine their suitability for various species.

- Aquatic Assessment: Expertise in assessing the health and quality of aquatic ecosystems, including water quality testing and aquatic species monitoring.
- Understanding of South Africa’s National Environmental Regulations: Knowledge of South Africa's environmental laws and regulations related to terrestrial biodiversity, including the National Environmental Management: Biodiversity Act (NEMBA).
- Knowledge of the South African Water Act: Familiarity with the National Water Act of South Africa, including regulations on water resource management, protection, and sustainable use.

- **Conservation Planning:** Ability to develop and implement conservation strategies aimed at protecting and restoring biodiversity.
- **Field Sampling Techniques:** Knowledge of various sampling techniques for collecting biological, chemical, and physical data from different environments.
- **Environmental Impact Assessment:** Skilled in assessing the potential impacts of development projects on biodiversity and recommending mitigation measures.

WORK EXPERIENCE

Eco-Sentle (Pty) Ltd

1. Biodiversity Assessments

- Conduct comprehensive field surveys and ecological assessments for various aquatic and terrestrial habitats.
- Identify, classify, and map species, communities, and ecosystems.
- Monitor biodiversity and ecosystem health through regular sampling and data collection.

2. Impact Assessments

- Perform Environmental Impact Assessments (EIA) and Biodiversity Impact Assessments (BIA) for development projects.
- Evaluate potential impacts of proposed developments on local biodiversity and ecosystems.
- Prepare detailed reports and recommendations to mitigate negative impacts on biodiversity.

3. Data Analysis and Reporting

- Analyze ecological data using statistical tools and geographic information systems (GIS).
- Produce high-quality technical reports, maps, and presentations to communicate findings to clients, stakeholders, and regulatory authorities.
- Ensure data integrity and maintain comprehensive records of all assessments.

4. Regulatory Compliance

- Stay updated with local, national, and international biodiversity regulations and guidelines.
- Ensure all projects comply with relevant environmental laws and policies.
- Liaise with regulatory bodies to obtain necessary permits and approvals.

5. Client and Stakeholder Engagement

- Collaborate with clients to understand their needs and project goals.
- Communicate findings and recommendations to clients, stakeholders, and the public.
- Develop and maintain strong relationships with key stakeholders, including government agencies, non-governmental organizations, and community groups.

6. Project Management

- Plan, coordinate, and manage biodiversity assessment projects from inception to completion.
- Develop project scopes, timelines, and budgets.
- Oversee field teams and subcontractors to ensure high-quality and timely delivery of services.

7. Mitigation and Conservation Planning

- Develop and implement biodiversity management and conservation plans.
- Design and recommend mitigation measures to minimize project impacts on biodiversity.
- Monitor the effectiveness of mitigation measures and adapt them as necessary.

The Biodiversity Consultancy (United Kingdom)

In this role, my duties were to support clients identify, measure, and manage their biodiversity footprint and risks to the business as well as integrate biodiversity strategies to existing carbon reduction and ESG programmes as they transit their organizations in response to changing sustainability environment and new trends in sustainability management and Reporting.

Core responsibilities and skills include the following:

- Supported clients in identifying, measuring, and managing their biodiversity footprint and risks.
- Integrated biodiversity strategies with existing carbon reduction and ESG programmes.
- Conducted biodiversity footprinting using tools like the Global Biodiversity Score (GBS).
- Performed biodiversity footprint assessments, policy reviews, KPI development, and action planning.
- Benchmarked client positioning against ESG & biodiversity standards.
- Developed biodiversity strategies and set carbon and biodiversity targets using SBTN & SBTI.
- Assisted clients in understanding TCFD & TNFD requirements.
- Conducted biodiversity impact assessments and ESG due diligence.
- Supported clients in understanding responsible sourcing and certifications.

Environmental Impact Management Services (PTY) LTD – Environmental Consultant

2013 – 2017 In this role I provided expert assessment and advisory services on matters pertaining to the management of Environmental and Social issues.

Core responsibilities and skills include the following:

- Provided expert assessment and advisory services on environmental and social issues.
- Executed both field and desk-based scientific research.
- Produced detailed scientific reports for non-technical audiences.
- Conducted Environmental Assessments to identify risks and monitored compliance.
- Liaised with regulatory bodies regarding environmental issues.
- Conducted Specialist Aquatic Assessments including ecological and water quality assessments.
- Applied environmental legislation across various sectors such as mining, construction, and infrastructure development.

University of Limpopo – Junior Laboratory Assistant

2011 –2012 Core responsibilities and skills include the following:

- Guiding undergraduate students through their practical modules, ensuring they adhere to lab procedures.
- Providing academic assistance.
- Performing basic chemical and biological experiments and following laboratory procedures. Preparing and cleaning of apparatus and glassware.
- Trained and mentored undergraduate students applying strong listening and the ability to provide clear instructions.

Key Projects

Basil Read
Role: Lead Environmental Monitoring Officer
Project: Olifants River Water Resources Development Project
Details: Managed the bulk water transfer scheme in Steelpoort, ensuring compliance with environmental regulations and conducting regular environmental monitoring to assess the impact of the project on local ecosystems.

Tetra 4 (PTY) LTD
Role: Senior Environmental Consultant
Project: Helium and Methane Gas Exploration
Location: Virginia, Free State Province
Details: Conducted comprehensive baseline assessments of surface water and groundwater quality to support the exploration project, providing critical data for environmental impact evaluations.

Mooiplaats
Role: Senior Environmental Consultant
Project: Environmental Due Diligence for Underground Coal Mine
Location: Near Ermelo, Mpumalanga Province
Details: Led the environmental due diligence process for the Mooiplaats underground coal mine, assessing potential environmental impacts and ensuring regulatory compliance.

Uniper & Fortum
Role: Senior Consultant
Project: Biodiversity Footprint Assessment and Strategy Development
Details: Evaluated existing governance processes for managing biodiversity, defined the biodiversity footprint, and established prioritization and target-setting protocols to enhance biodiversity conservation efforts.

Ørsted
Role: Senior Consultant
Project: Materiality and Upstream Value Chain Assessment
Details: Conducted materiality assessments and upstream value chain assessments, supporting the Global Biodiversity Score (GBS) assessment for biodiversity footprinting.

Richemont
Role: Consultant
Project: Biodiversity Impact Assessment and Target Setting
Details: Assisted the luxury fashion brand in understanding its biodiversity impact and developing actionable biodiversity targets to promote sustainable practices.

Philip Morris
Role: Consultant
Project: Biodiversity Impact Assessment, Strategy, and Target Development
Details: Conducted assessments to identify the biodiversity impact of operations and developed strategic initiatives and targets for biodiversity conservation.

Princess Housing Development
Role: Consultant
Project: Wetland Ecological and Impact Assessment
Details: Performed wetland ecological assessments and impact evaluations to secure environmental authorization for the housing development project.

Moreleta River, Pretoria
Role: Consultant
Project: Aquatic Ecological Assessment
Details: Conducted an aquatic ecological assessment to guide the rehabilitation of a bulk water pipeline, ensuring minimal environmental disruption.

PRASA Moses Mabida Station
Role: Consultant
Project: Terrestrial Biodiversity Assessment
Details: Conducted a terrestrial biodiversity assessment to facilitate the re-installation of a boundary fence, ensuring compliance with environmental standards.

Clayville Housing Development
Role: Consultant
Project: Wetland Delineation and Impact Assessment
Details: Conducted wetland delineation and impact assessments to support the housing development project, ensuring adherence to environmental regulations.

EDUCATION

- **Master of Science (M.Sc.): Aquatic Health** - University of Johannesburg.
- **Bachelor of Science Honours: Environmental Management -** University of Limpopo.
- **Bachelor of Science: Environmental Science -** University of Limpopo.

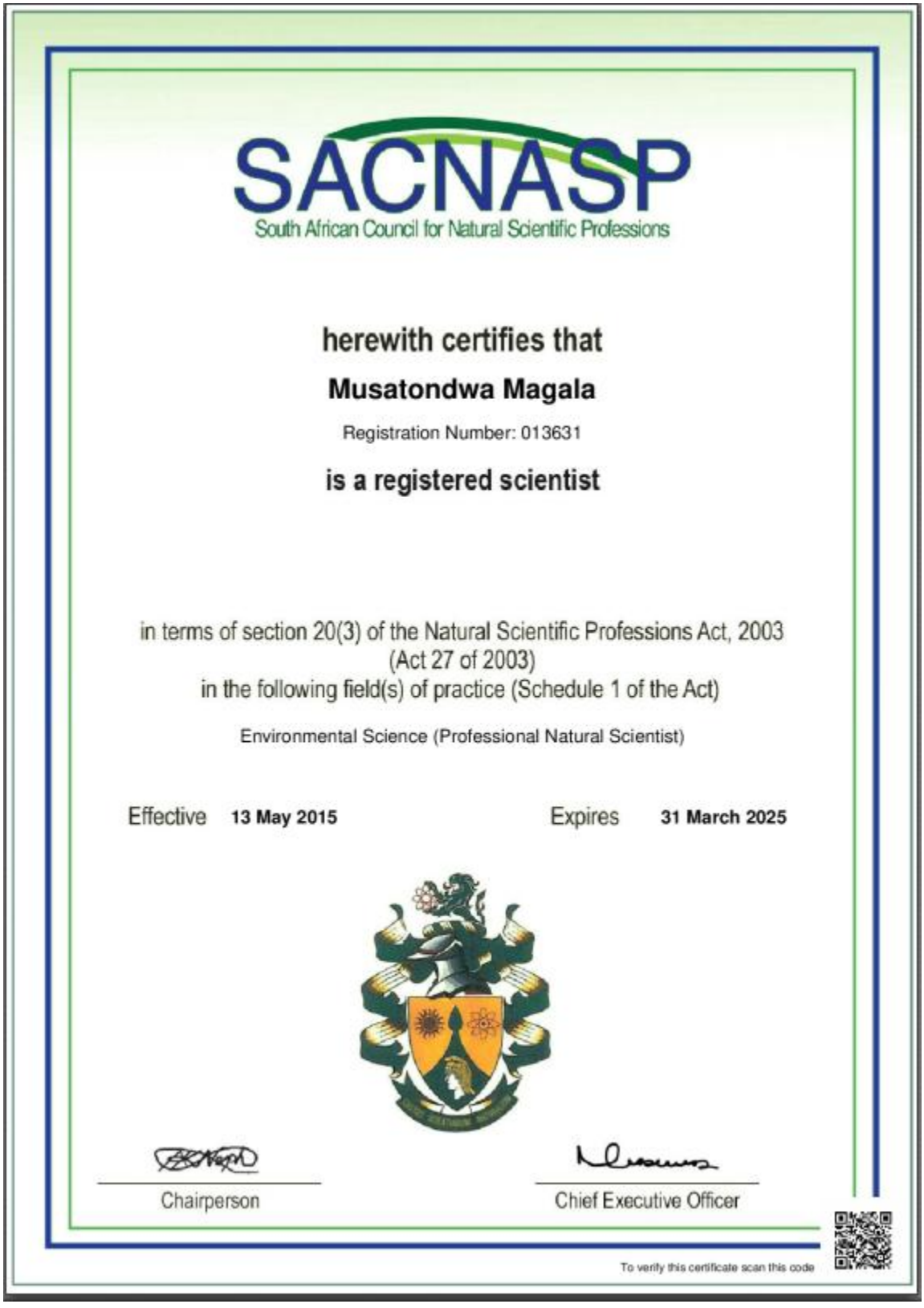
Other Training

- **IFC:** Environmental and Social Risk Management
- **IFC:** ESG Due Diligence for Private Equity – Performance Standards
- **TCFD:** Understanding the recommendations of Task Force on Climate Disclosures
- **EY:** Long-term Value Framework
- **EY:** ESG and Investing
-

Relevant Coursework of Qualifications

- Functional Freshwater and Wetland Ecology
- Water Quality Assessment and Management (Biological and Chemical) - Eco-Classification
- Integrated Water Resources Management
- Wetlands Assessment and Delineations
- Estuaries and Marine Environment Ecology
- Environmental Law Related to Water (NEMA & NWA)
- Wetland and River Management
- Biodiversity Management
- Environmental Ecology
- Parasitology
- Wildlife Management
- Freshwater Ecology & Management

APPENDIX 3 SACNSP



SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Musatondwa Magala

Registration Number: 013631

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Environmental Science (Professional Natural Scientist)

Effective **13 May 2015** Expires **31 March 2025**

Chairperson

Chief Executive Officer

To verify this certificate scan this code