The Terrestrial Biodiversity Compliance Statement for the Harmony Mispah 1 TSF Reclamation and Proposed Pipelines Project

North-West Province and Free State Province, South Africa

January 2023

CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial biodiversity (fauna and flora) baseline assessment for the proposed Harmony Mispah 1 TSF Reclamation and Proposed Pipelines Project.

Mine Waste Solutions (MWS), also known as Chemwes (Pty) Ltd (Chemwes), a subsidiary of Harmony Gold Mining Company, been in business since 1964, and conducts its operations over a large area of land to the east of Klerksdorp, within the area of jurisdiction of the City of Matlosana and JB Marks Local Municipalities (LM), which fall within the Dr Kenneth Kaunda District Municipality (DM) in the North-West Province.

MWS want to expand their reclamation activities to the Mispah 1 TSF through the construction of a reclamation pump station and installation of additional piping infrastructure to meet the planned Life of Mine (LOM) plan. The planned infrastructure will include a new process water and slurry pipeline and reclamation pump station.

To determine the baseline ecological state of the area and to present a detailed description of the receiving environment, both a desktop assessment as well as a field survey were conducted during December 2022. Furthermore, the desktop assessment and field survey both involved the detection, identification and description of any locally relevant sensitive receptors and habitats, and the manner in which these sensitive features may be affected by the proposed development was also investigated.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020 as well as the Government Notice 1150 in terms of NEMA dated 30 October 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”.

The purpose of conducting the specialist study is to provide relevant input into the Environmental Authorisation application process, with a focus on the proposed activities and their impacts associated with the project. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Registered Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making as to the ecological viability of the proposed project.

1.2 Project description

The infrastructure planned is a new 600 mm slurry- and 500 mm low-pressure process water pipelines of almost 9 km from the East Pump Station to the Mispah 1 TSF Reclamation Pump Station, as shown in Figure 1-1. Both the slurry and process water pipeline to cross the Vaal River at Noligwa Bridge.

The slurry pipeline will be a flanged 600 mm NB steel pipeline with a concrete mortar or HDPE lining and flow rate of 472 L/s. The section across the Vaal River will be a continuous welded pipe with HDPE liner. While the low-pressure process water pipeline will be a flanged 500 mm NB steel pipeline and flow rate of 337 L/s. Both pipes will be installed on surface on prefabricated concrete plinths.

Figure 1-1 Figure illustrating the pipeline layout for the Mispah Reclamation Project

A new slurry reclamation pump station will be constructed west of the Mispah 1 TSF as shown in Figure 1-2. The area cleared for the pump station will be ~ 4 ha and consist of a series of slurry and high-pressure water pumps and associated infrastructure. The liquefied slurry from the TSF gravitate to the pump station where it is pumped to MWS processing plant, in Stilfontein, via the East pump station. From the East pump station, the slurry is pumped through the existing pipelines to MWS processing plant to extract gold before the tailings is disposed at Kareer and TSF. The pipelines will predominately follow existing pipeline corridors and vegetation clearance will be minimum.

A 100 mm NB potable waterline and 150 mm NB sewage line will also be installed to the reclamation pump station. The sewage from the change house and ablution will be pumped to the Moab Khotsong sewage work's as shown in Figure 1-2. The sewage pipeline will be flanged steel pipeline and installed above-ground on pre-cast concrete plinths and a 3.5 m wide access road, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections.

Figure 1-4 illustrates the project area, which was delineated by creating a 50 m buffer on either side of the proposed pipeline and incorporates the Mispah 1 Reclamation Site where the pump station is to be constructed. Figure 1-3 illustrates the regional context of the proposed project area.

Figure 1-2 Figure showing the reclamation site and associated infrastructure

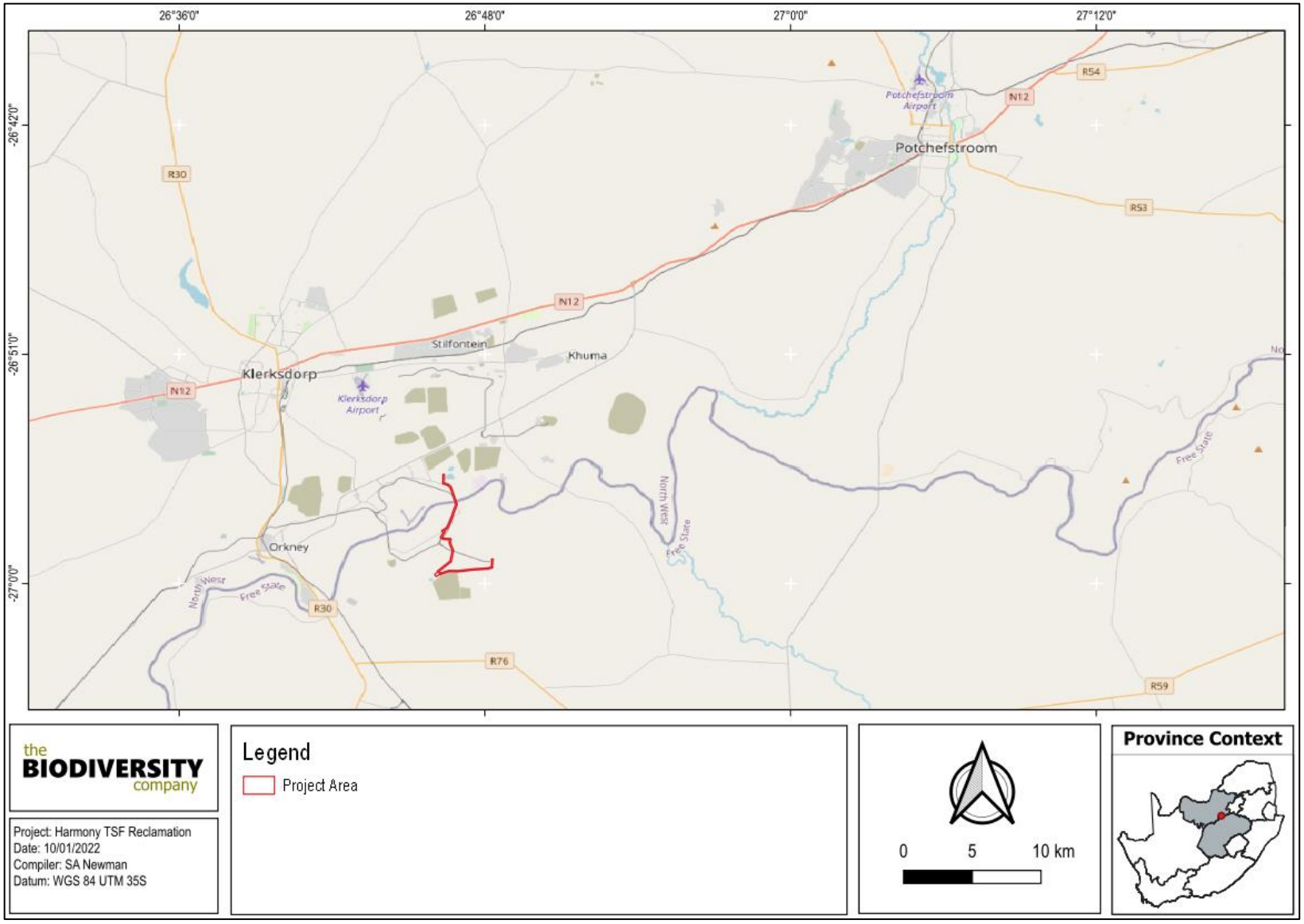


Figure 1-3 Map illustrating the regional context of the project area

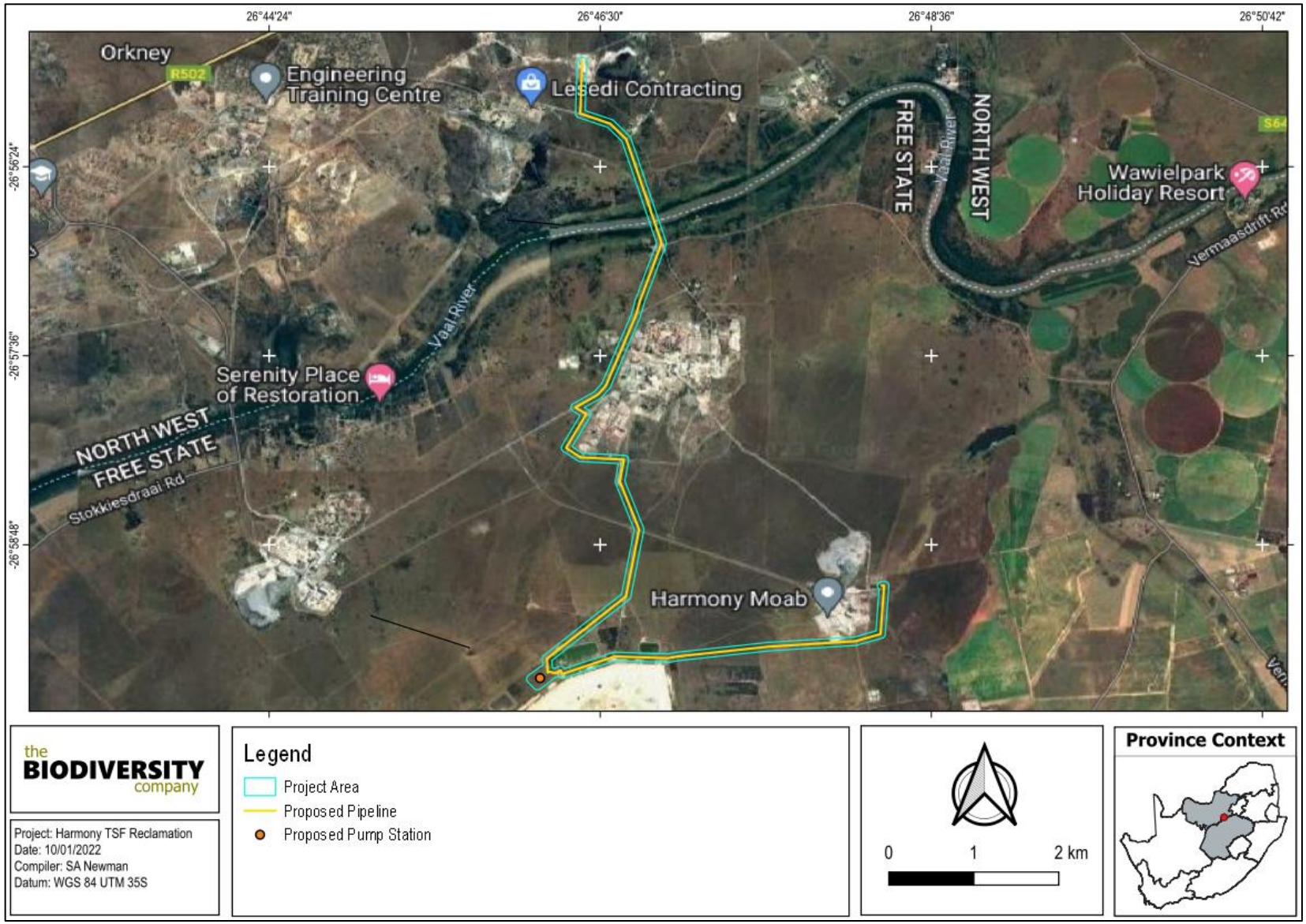


Figure 1-4 Map illustrating the project area which is made up of a 50 m buffer around the proposed pipeline

1.3 Specialist Details

Report Name	**The Terrestrial Biodiversity Compliance Statement for the Harmony Mispah 1 TSF Reclamation and Proposed Pipelines Project**
Reference	Harmony Mispah 1 TSF Reclamation
Submitted to / Client	
Fieldwork / Report Writer	Sarah Newman 
	Sarah completed a Master of Science degree in Entomology at the University of Pretoria in 2018. She has varying experience working in the fields of conservation, ecology, and biodiversity research.
Reviewer	Martinus Erasmus 
	Martinus Erasmus obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting EIAs, basic assessments and assisting specialists in field during his studies since 2015. Martinus is a specialist terrestrial ecologist and botanist which conducts floral surveys faunal surveys which include mammals, birds, amphibians and reptiles.
Reviewer	Andrew Husted 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 years' experience in the environmental consulting field.
Declaration	The Biodiversity Company 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 Environmental Impact 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.

1.4 Scope of Work

The principal aim of the assessment was to assess the current state of the terrestrial biodiversity of the project area to identify any significant and/or sensitive ecological receptors that may be impacted upon by the proposed activity. The following are the Terms of Reference that guide the project aim:

- Description of the baseline receiving environment specific to the field of expertise (including the general surrounding area as well as the site-specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (i.e., terrestrial biodiversity) that occur in the project area, and the manner in which these sensitive receptors may be affected by the activity;
- Identification of 'significant' ecological, botanical and faunal features within the project area;
- Identification of conservation significant habitats/features near the project area which might be impacted;
- Screening to identify any potential fatal flaws that may result in a rejection of the application;
- Provide a map to identify sensitive receptors in the project area, based on available maps and database information; and
- Presentation of recommend mitigation measures (outcomes to be included in the Management Plan) that should be used to mitigate or minimise negative environmental impacts from the activity.

2 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 2-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 2-1 A list of key legislative requirements relevant to biodiversity and conservation in the Northern Cape Province

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
	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)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 2014-2020, published under NEMBA

	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
Provincial	Boputhatswana Nature Conservation Act 3 of 1973
	Free State Nature Conservation Ordinance 8 of 1969
	North-West Biodiversity Sector Plan of 2015

2.1 Report Legislative Framework

In line with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity, as per Government Notice 320 published in terms of 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 in the scope of the protocol, on a site identified on the screening tool as being of 'Very High' sensitivity for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment; however
- Where the information gathered from the site sensitivity verification differs from the designation of 'Very High' terrestrial biodiversity sensitivity on the screening tool and it is found to be of a 'Low' sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.

The information obtained from a site sensitivity verification, which involved both a desktop assessment as well as a field survey, confirmed that the proposed footprint area is of a 'Low' sensitivity. Therefore, a Terrestrial Biodiversity Compliance Statement will be completed and submitted for this project.

As per sections 2 and 3 of the protocol discussed above, a Terrestrial Biodiversity Compliance Statement must contain the information as presented in Table 2-2 below.

Table 2-2 Terrestrial Biodiversity Compliance Statement information requirements as per the relevant protocol, including the location of the information within this report

Information to be Included (as per GN 320, 20 March 2020)	Report Section
Methods used to undertake the site assessment and survey, and prepare the compliance statement, including relevant equipment and modelling used	4
Description of the assumptions and any uncertainties or gaps in knowledge or data	4
A baseline profile description of biodiversity and ecosystems of the site	5
Site sensitivity verification: Desktop Analysis using satellite imagery and available information	5.1, 5.2, 5.3
A statement on the duration, date and season of the site inspection	4 & 5
Site sensitivity verification: Onsite inspection, include a description of current land use and vegetation found on-site	5.2 and 5.3
Site sensitivity verification: Photographs/evidence of environmental sensitivity	5.2 and 5.3
Screening tool confirmation/dispute: The assessment must verify the "Medium" sensitivity of the site, in terms of plant, animal, and terrestrial biodiversity themes	5.3.1
Proposed impact management outcomes or monitoring requirements for inclusion in the EMPr	7
Indicate whether or not the proposed development will have any impact on the terrestrial environment, animals and/or plants	8
A signed statement of independence by the specialist	10
Specialist details, including a CV	10

A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

2.2 Invasive Alien Plants

The National Environmental Management: Biodiversity Act, Act No. 10 of 2004, (NEM:BA) is the national legislation that incorporates the mandatory regulation of Invasive Alien Plant (IAP) species, and in September 2020 the most current lists of IAP Species were published in terms of NEM:BA (in Government Gazette No. 43726 of 18 September 2020).

The Alien and Invasive Species Regulations serve to define and regulate the various categories of Alien and Invasive Species and were recently updated and published in terms of NEM:BA in the Government Gazette No. 43735 of 25 September 2020.

The validity of the 2020 Alien and Invasive Species Regulations and Lists was recently extended as published in the Government Gazette No. 44182, 24th of February 2021.

The legislation calls for the removal and/or control of IAP species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 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 NEM:BA:

- **Category 1a:** Invasive species requiring compulsory eradication. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be 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. Species existing outside of a regulated area shall be classified as category 1b.
- **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 as these will be classified as category 1b species.

Note that according to the regulations, any person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing;
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the NEM:BA;
    - The relevant local invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the NEM:BA.

3 Definitions

3.1 Species of Conservation Concern

In accordance with the National Red List of South African Plants website, managed and maintained by the South African National Biodiversity Institute (SANBI), a Species of Conservation Concern (SCC) is a species that has a high conservation importance in terms of preserving South Africa's rich biodiversity. This classification covers a range of red list categories as illustrated in Figure 3-1 below.

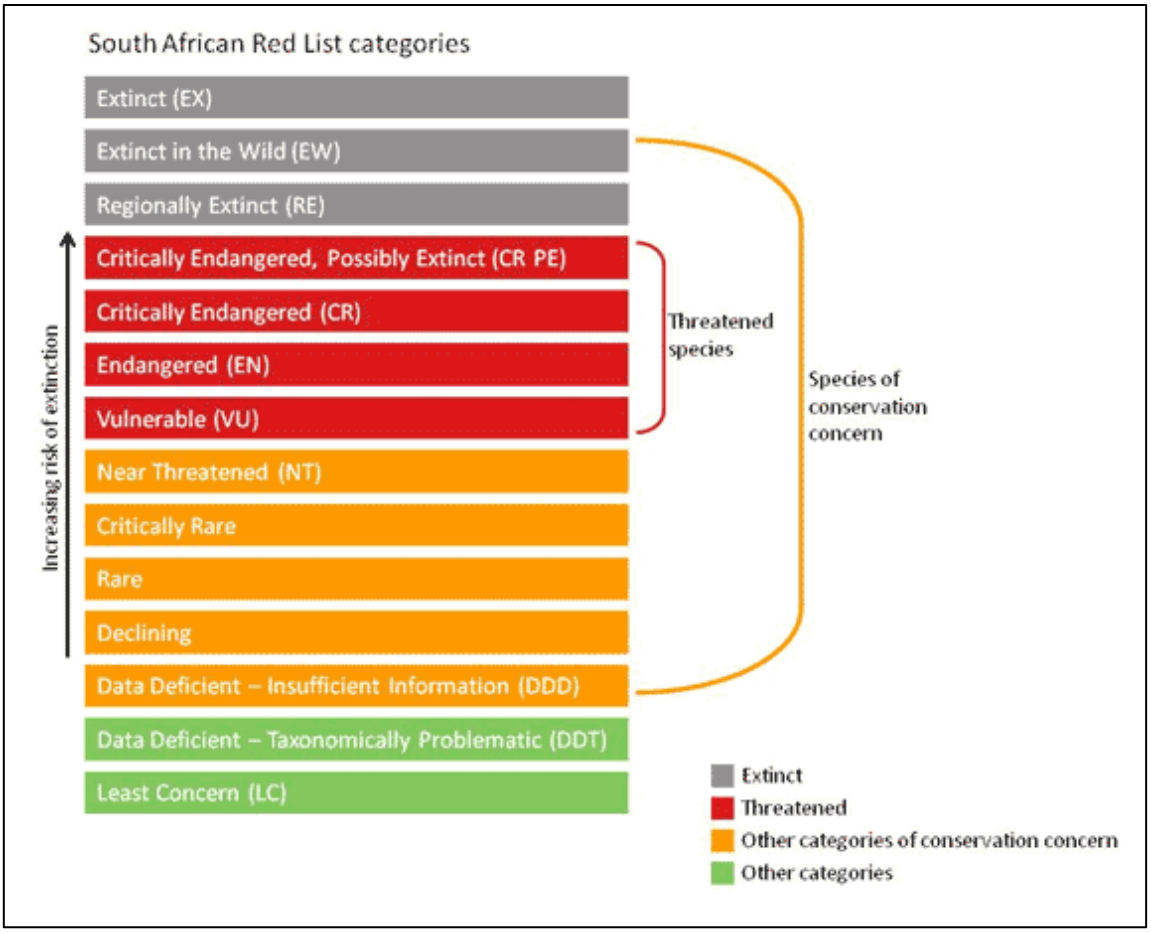


Figure 3-1 Threatened species and Species of Conservation Concern (SANBI, 2016)

South Africa uses the internationally endorsed International Union for Conservation of Nature (IUCN) Red List Categories and Criteria (IUCN, 2012). This scientific system is designed to measure species' risk of extinction and its purpose is to highlight those species that are in need of critical conservation action. As this system has been adopted from the IUCN, the definition of an SCC as described and categorised above is extended to all red list classifications relevant to fauna as well as the IUCN categories, for the purposes of this report.

3.2 Protected Species

Protected species include both floral and faunal species that are protected according to some form of relevant legislation, be it provincial, national, or international. Provincial legislation may include that published in the form of a provincial ordinance, bill, or act, and national legislation includes that which is published in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) or the National Forest Act (Act No. 84 of 1998). Relevant international legislation includes the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2021).

4 Methods

4.1 Desktop Assessments

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets to develop digital cartographs and species lists. These datasets and their respective dates of publishing are provided below.

4.1.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- North-West Biodiversity Sector Plan (READ, 2015);
- Terrestrial Critical Biodiversity Area for Free State (DESTEA, 2015);
- 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);
- 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, 2011); and
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).

Descriptions of these datasets, and their associated relevance to terrestrial biodiversity, are provided below.

4.1.1.1 Provincial Conservation Plan

4.1.1.1.1 North-West Biodiversity Sector Plan

The North-West Department of Rural, Environment, and Agricultural Development (READ), as custodian of the environment in the North West, is the primary implementing agent of the Biodiversity Sector Plan. The spatial component of the Biodiversity Sector Plan is based on systematic biodiversity planning undertaken by READ. The purpose of a Biodiversity Sector Plan is to inform land use planning, environmental assessments, land and water use authorisations, as well as natural resource management, undertaken by a range of sectors whose policies and decisions impact on biodiversity. This is done by providing a map of biodiversity priority areas, referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), with accompanying land use planning and decision-making guidelines (READ,2015).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (READ,2015).

Ecological Support Areas (ESAs) are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of restriction on land use and resource use in these areas may be lower than that recommended for CBAs (READ,2015).

4.1.1.1.2 Free State Terrestrial CBA Plan

It is important to note that the Critical Biodiversity Areas (CBA) map accounts for terrestrial fauna and flora only. The inclusion of the aquatic component was limited to the Freshwater Ecosystem Priority Areas (FEPA) catchments (included in the cost layer and for the identification of Ecological Support Areas (ESAs)) and wetland clusters (included in the ESAs only).

A CBA is considered a significant and ecologically sensitive area and needs to be kept in a pristine or near-natural state to ensure the continued functioning of ecosystems (SANBI, 2017). A CBA represents the best choice for achieving biodiversity targets. ESAs are not essential for achieving targets, but they play a vital role in the continued functioning of ecosystems and often are essential for proper functioning of adjacent CBAs.

4.1.1.2 National Biodiversity Assessment 2018

The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the then Department of Environmental Affairs (DEA), and other stakeholders including scientists and biodiversity management experts throughout the country over a three-year period (Skowno *et al.,* 2019).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The two headline indicators assessed in the NBA are Ecosystem Threat Status and Ecosystem Protection Level (Skowno et al., 2019).

- **Ecosystem Threat Status (ETS)** outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in a good or healthy ecological condition (Skowno et al., 2019). CR, EN, or VU ecosystem types are collectively referred to as threatened ecosystems.
- **Ecosystem Protection level (EPL)** informs on whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected (NP), Poorly Protected (PP), Moderately Protected (MP) or Well Protected (WP), based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al.,* 2019). NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

4.1.1.3 South Africa Protected and Conservation Areas

The South African Protected Areas Database (SAPAD) and the South Africa Conservation Areas Database (SACAD) contains spatial data critical for the conservation of South Africa's natural resources. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection, such as conservation areas. These databases are updated regularly and form the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act (Act 57 of 2003).

Formally protected areas are categorised according to several different types, and each type is subject to specific legislative restrictions and management guidelines, many of which restrict development to some degree. Generally, these areas are assigned a buffer of influence of between 5 and 10 km (the latter pertaining to National Parks and World Heritage Sites), within which certain laws and management actions may apply. Many of the protected area types are further classified into sub-types as well. Formally protected area types include:

- National Parks;
- Nature Reserves;
- Special Nature Reserves;
- Mountain Catchment Areas;
- World Heritage Sites;
- Protected Environments;
- Forest Nature Reserves and Forest Wilderness Areas;
- Specially Protected Forest Areas; and
- Marine Protected Areas.

4.1.1.3.1 National Protected Areas Expansion Strategy

The Department of Environmental Affairs (now the Department of Forestry, Fisheries and the Environment) led the development of the National Protected Areas Expansion Strategy (NPAES) in consultation with the protected area agencies and other key private and public sector stakeholders. The need for the development of the NPAES was established in the National Biodiversity Framework in 2009. The NPAES is a 20-year strategy with 5-year implementation targets aligned with a 5-year revision cycle. (DEA, 2016).

South Africa's protected area network currently falls far short of representing all ecosystems and maintaining healthy functioning ecological processes. In this context, the goal of the NPAES is to achieve cost effective protected area expansion thus enabling better ecosystem representation, ecological sustainability, and resilience to climate change. A comprehensive set of priority areas was compiled based on the priorities identified by provincial and other agencies in their respective protected area expansion strategies. These focus areas are generally large, intact and unfragmented and are therefore of high importance for biodiversity, climate resilience and freshwater protection (DEA, 2016).

4.1.1.4 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are sites of international significance for the conservation of the world's birds, and other conservation significant species, as identified through multi-stakeholder processes using globally standardised, quantitative, and scientifically agreed criteria. These sites are also Key Biodiversity Areas; sites that contribute significantly to the global persistence and health of biodiversity (Birdlife, 2020).

The selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge on the sizes and trends of bird populations. The criteria ensures that sites selected as IBAs have true significance for the international conservation of bird populations, and it also ensures classification consistency among sites at all geographic levels.

IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. Approximately 60% of the IBA network is unprotected, leaving these sites vulnerable to habitat

transformation and mismanagement. Additionally, habitats within many IBAs are poorly managed - which is leading to habitat degradation, especially in unprotected sites. (BirdLife SA, 2022)

4.1.1.5 Aquatic Habitats

Three inland aquatic habitat datasets are used to identify the ecological sensitivity of the project area with regards to local aquatic habitat, which is critical for the healthy functioning of both aquatic and terrestrial biodiversity. The presence of aquatic ecosystems is often a strong indicator for the presence of unique flora as well as the regular presence of fauna, and many national SCC are found within or near to aquatic habitat.

- **The South African Inventory of Inland Aquatic Ecosystems (SAIIAE):** Established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.

- **National Freshwater Ecosystem Priority Areas, Rivers and Wetlands (NFEPA):** In an attempt to better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and it is envisioned that they will guide the effective implementation of measures to achieve the National Environment Management: Biodiversity Act's biodiversity conservation goals (Nel *et al.,* 2011).

- **Strategic Water Source Areas (SWSAs):** SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

4.1.2 Desktop Flora Assessment

The desktop flora assessment encompassed an assessment of all the vegetation units and habitat types within the project area as well as the identification of expected plant species and any locally occurring flora SCC.

The Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2006) and the 2018 Terrestrial & Freshwater Assessment by SANBI (2018) was used to identify the vegetation types that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA, 2019) database was accessed to compile a list of expected flora species within the project area (Figure 4-1). The Red List of South African Plants website (SANBI, 2016) was used to provide the most current account of the national conservation status of flora.

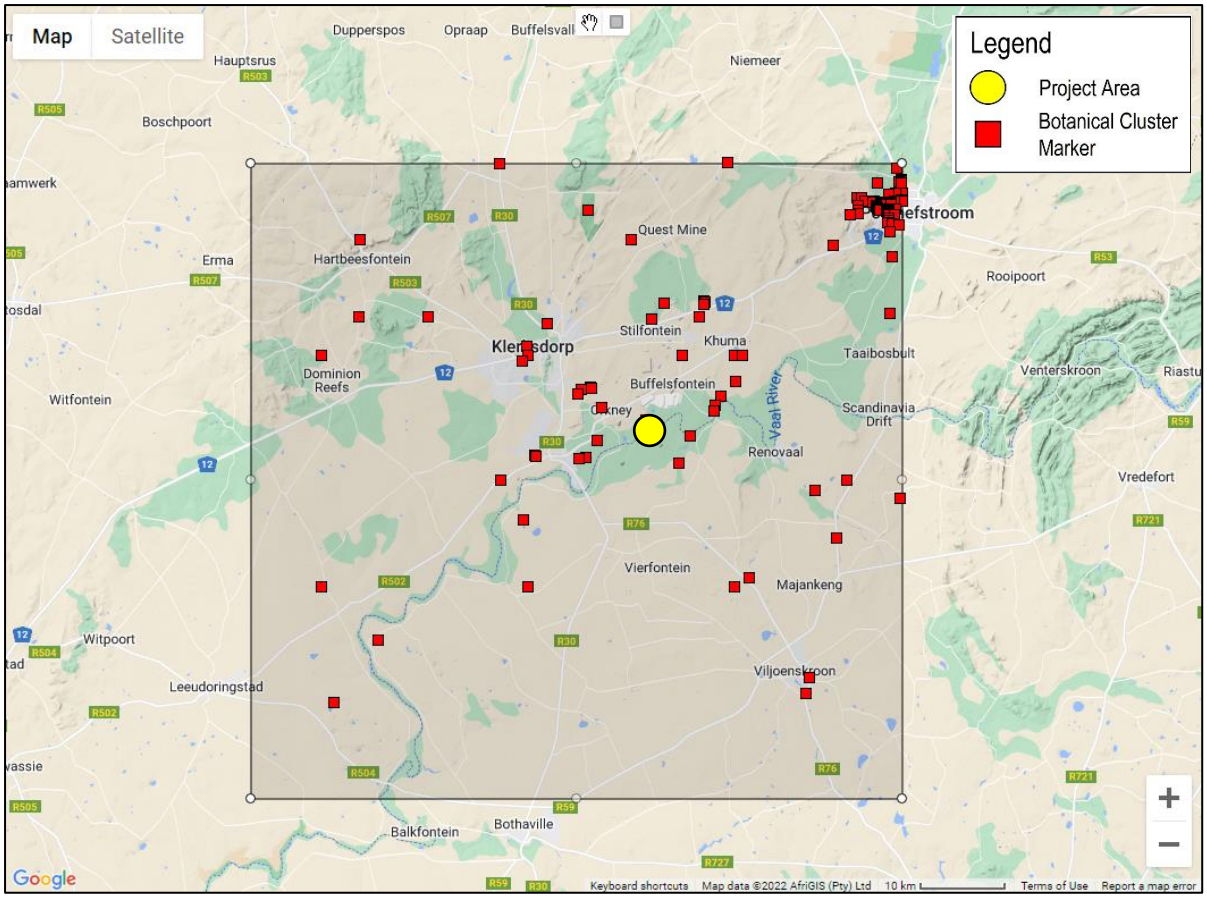


Figure 4-1 ***Map illustrating the extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. The yellow dot indicates the approximate location of the Project area of Interest. The red squares are cluster markers of botanical records as per POSA data***

The latest information regarding provincially, and nationally protected flora was obtained from the following published legislative sources:

- Provincially Protected Plant Species (Schedules 1 and 2 of the Northern Cape Nature Conservation Act 9 of 2009); and
- List of Nationally Protected Tree Species (DEFF, 2022).

4.1.3 Desktop Fauna Assessment

The faunal desktop assessment involved the compilation of expected species lists and the identification of any protected and/or SCC fauna potentially occurring in the area. The respective species lists, and international Red-List statuses, were obtained from the IUCN spatial dataset (2017), in addition to the following sources:

- Avifauna list: Generated from the Southern African Bird Atlas Project (SABAP2) dataset (SABAP, 2022) using pentads: 2700_2650, 2700_2645, 2700_2640, 2655_2650, 2655_2645, 2655_2640, 2650_2650, 2650_2645 and 2650_2640;
- Mammal list: Generated from the ADU MammalMap database using the 2626 Degree Square (ADU, 2020);
- Reptile list: Generated from ADU ReptileMap database using the 2626 Degree Square (ADU, 2020a); and

- Amphibian list: Generated from ADU FrogMap database using the 2626 Degree Square (ADU, 2020b).

South Africa's official site for Species Information and National Red Lists (SANBI, 2022) was used to provide the most current national Red-List status of fauna. The latest information regarding provincially, and nationally protected fauna was obtained from the following published legislative lists:

- Provincially Protected Wildlife Species (Schedules 1 and 2 of the Northern Cape Nature Conservation Act 9 of 2009); and
- Nationally Protected Wildlife species (The 2007 lists of Threatened or Protected Species (TOPS), published in terms of Section 56(1) of the NEM:BA No. 10 of 2004).

4.2 Biodiversity Field Survey

A single season field survey was undertaken on the 16th of November 2022, which constitutes a dry season survey, to determine the presence of any local SCC and to achieve the delineation of local habitat types and their associated sensitivities. Effort was made to cover all the different habitat types within the project area.

4.2.1 Flora Survey

The dry season fieldwork and sample sites were placed within targeted areas (i.e., target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps (confirmed during the field survey). The floristic diversity and search for protected plants and flora SCC were conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis was placed on sensitive habitats, especially those overlapping with the project area.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting protected plants and flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling observed flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al*. (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g., roads, erosion etc.), and this included the subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, rock outcrops etc.). In addition, opportunistic observations were made while navigating through the area.

Relevant field guides and texts consulted for identification purposes included the following:

- A field guide to Wild flowers (Pooley, 1998), and Field Guide to the Wild Flowers of the Highveld (van Wyk & Malan, 1998);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al*., 2013);

- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016), and Aquatic and Wetland Plants of Southern Africa (van Ginkel & Cilliers, 2020);
- Identification guide to southern African grasses (Fish et al., 2015);
- Field guide to trees of Southern Africa, Struik Publishers (Van Wyk & Van Wyk, 1997); and
- Problem Plants and Alien Weeds of Southern Africa (Bromilow, 2018).

4.2.2 Fauna Survey

The faunal component of this report pertains only to avifauna, mammals and herpetofauna (reptiles and amphibians). 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 utilisation of local knowledge.

The relevant field guides and texts consulted for identification purposes included the following:

- Roberts Bird Guide, Second Edition (Chittenden *et al*., 2016);
- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Spiders of Southern Africa (Leroy & Leroy, 2003);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Tortoises, Terrapins, and Turtles of Africa (Branch, 2008);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart & Stuart, 2000).

4.3 Terrestrial Site Ecological Importance

The different habitat types within the project area were delineated and identified based on observations made during the field survey, and information from available satellite imagery. These habitat types 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).

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor. The criteria for the CI and FI ratings are provided in Table 4-1and Table 4-2 respectively.

Table 4-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR species that have a global extent of occurrence (EOO) of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of Near Threatened (NT) species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 4-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts, with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts, with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts, with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 4-3.

Table 4-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

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 fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor, as summarised in Table 4-4.

Table 4-4 Summary of Receptor Resilience (RR) criteria

Resilience	Fulfilling 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.

After the determination of BI and RR, the SEI can be ascertained using the matrix as provided in Table 4-5.

Table 4-5 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 4-6.

Table 4-6 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.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

4.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- It is assumed that all information received from the client and landowner is accurate;
- The specialist was provided with detailed engineering drawings with regards to the planned development activities and as such the potential impacts arising from these activities are based on information received from the client and the landowner/developer;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The assessment area (project area) was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- The area was only surveyed during a single site visit and therefore this assessment does not consider temporal trends (note that the data collected is considered sufficient to derive a meaningful baseline);
- Whilst every effort was made to cover as much of the project area as possible, representative sampling is completed, and by its nature it is possible that some plant and animal species that are present within the project area were not recorded during the field investigations; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by up to 5 m.

5 Results & Discussion

5.1 Desktop Assessments

5.1.1 Ecologically Important Landscape Features

Table 5-1 below has been produced as a result of the spatial data collected and analysed (as provided by various sources such as the national and provincial environmental authorities and SANBI). It presents a summative breakdown of the ecological boundaries considered and the associated relevance that each has to the region or project area. Where a feature is regarded as relevant it is considered an ecologically important landscape feature and discussed further as part of the sub-sections that follow.

Table 5-1 Summary of the spatial relevance of the project area to local ecologically important landscape features

Desktop Information Considered	Relevant?	Reasoning	Section
Provincial Conservation Plan	Yes	Project area intercepts a terrestrial ESA for both provincial conservation plans and a Free State CBA1	5.1.1.1
NBA 2018: Ecosystem Threat Status	Yes	Project area overlaps an 'Endangered' and 'Least Concern' ecosystem	5.1.1.2
NBA 2018: Ecosystem Protection Level	Yes	Project area overlaps a 'Not Protected' ecosystem	5.1.1.2
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Yes	Project area intercepts a 'CR' river, and a 'LC' and 'Unclassified' wetland	5.1.1.3
Protected and Conservation Areas (SAPAD & SACAD)	Yes	Project Area falls within the 'Mispah Game Farm'	5.1.1.4
National Protected Areas Expansion Strategy (NPAES)	Yes	The project area falls within a 'Protected Area' and within 5 km of a 'Priority Focus Area'	5.1.1.5
Important Bird and Biodiversity Areas (IBA)	No	Project Area does not overlap an IBA	-
National Freshwater Ecosystem Priority Areas	Yes	An unclassified FEPA river and category '0' FEPA wetlands occur within the project area	5.1.1.6
Strategic Water Source Areas	No	Project area does not overlap with a SWSA	-

5.1.1.1 Provincial Conservation Plan

The conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

The purpose of the North-West Biodiversity Sector Plan and Free State Terrestrial CBA Plan is to inform land-use planning and development on a provincial scale and to aid in natural resource management. One of the outputs is a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely CBA1 areas, CBA2 areas, ESA areas, Protected Areas and Other Natural Areas (ONAs) based on biodiversity characteristics, spatial configuration, and requirements for meeting targets for both biodiversity patterns and ecological processes.

Figure 5-1 and Figure 5-2 below present a map of the project area superimposed on the North-West Critical Biodiversity Areas dataset and Free State Critical Biodiversity Areas dataset respectively. According to this, the project area overlaps a terrestrial ESA for both conservation plans, and a small portion of a Free State CBA 1.

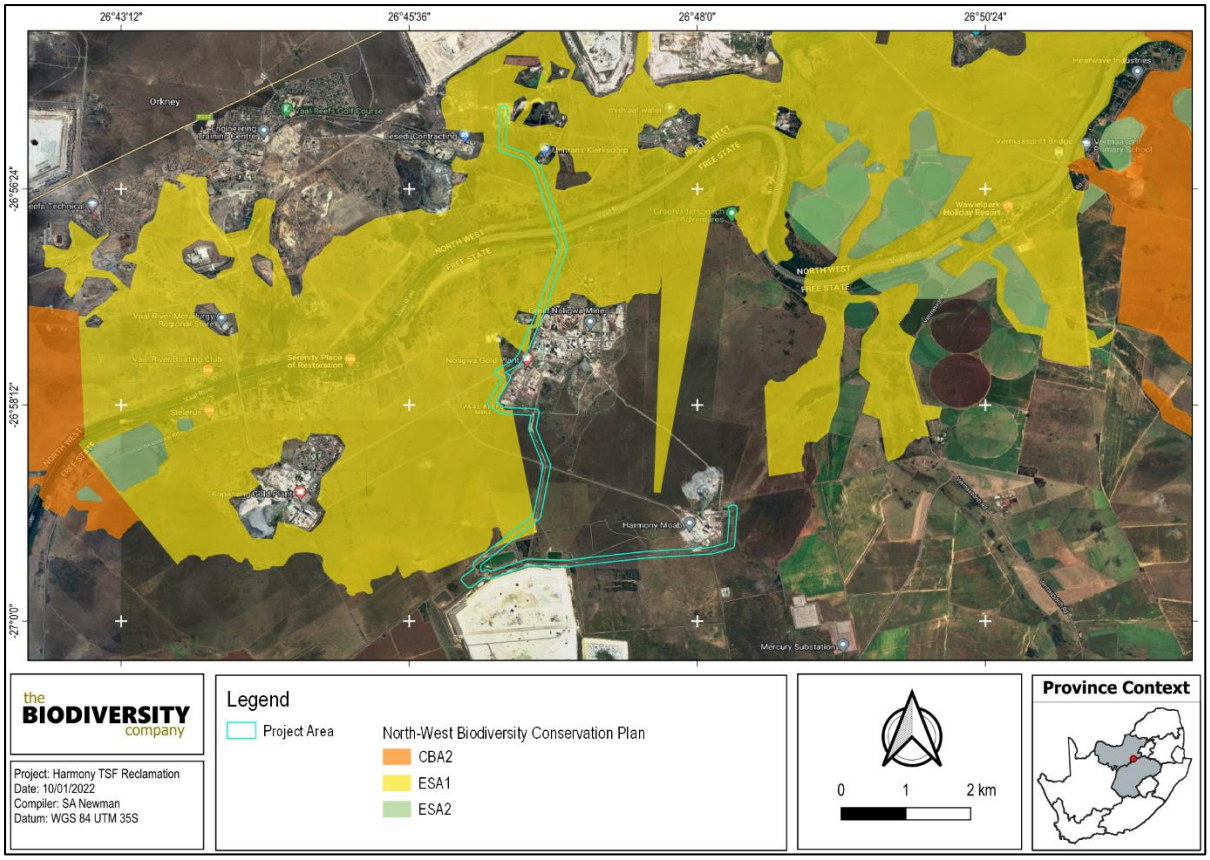


Figure 5-1 Map illustrating the North-West Critical Biodiversity Areas dataset relevance

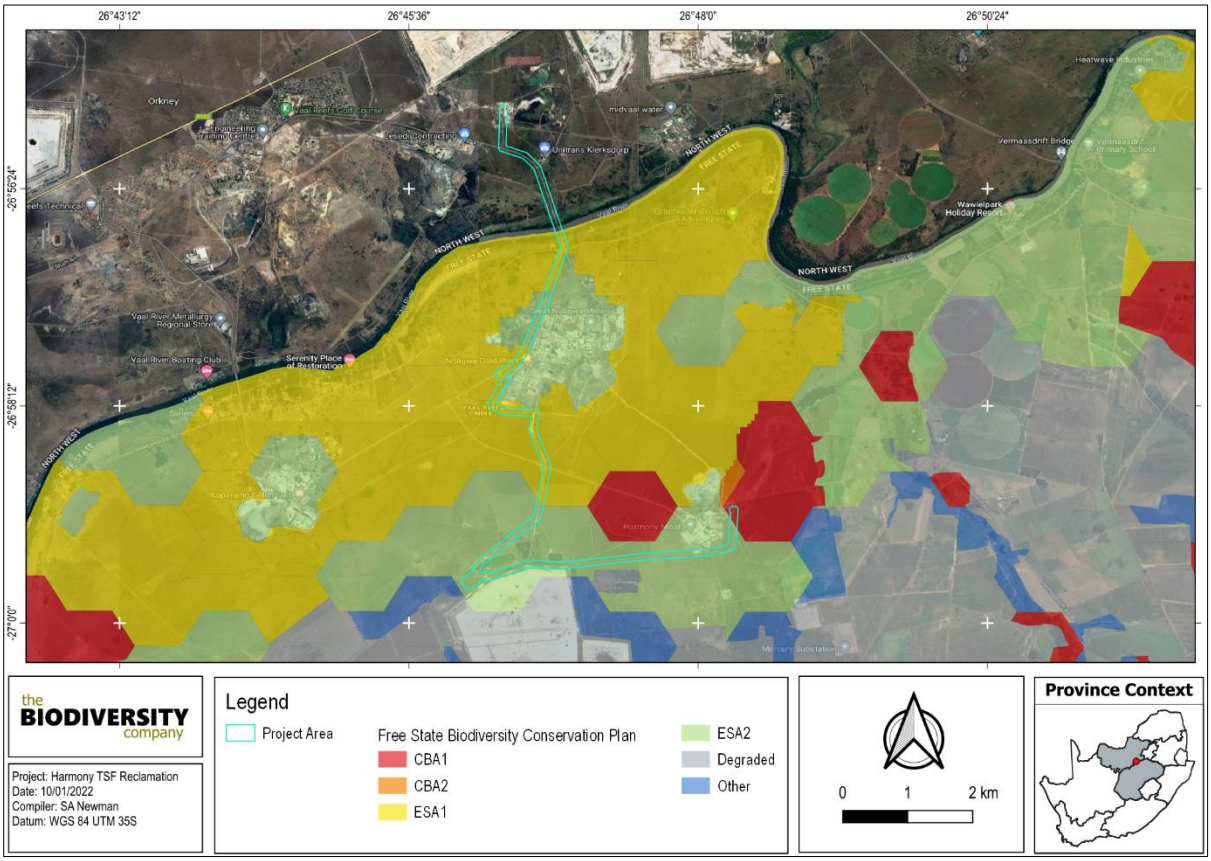


Figure 5-2 Map illustrating the Free State Critical Biodiversity Areas dataset relevance

5.1.1.2 National Biodiversity Assessment

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.

Ecosystem Protection Level an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

According to the 2018 NBA spatial dataset, the project area overlaps both a 'Least Concern' and 'Endangered' ecosystem (Figure 5-3). It also overlaps a 'Not Protected' ecosystem (Figure 5-4).

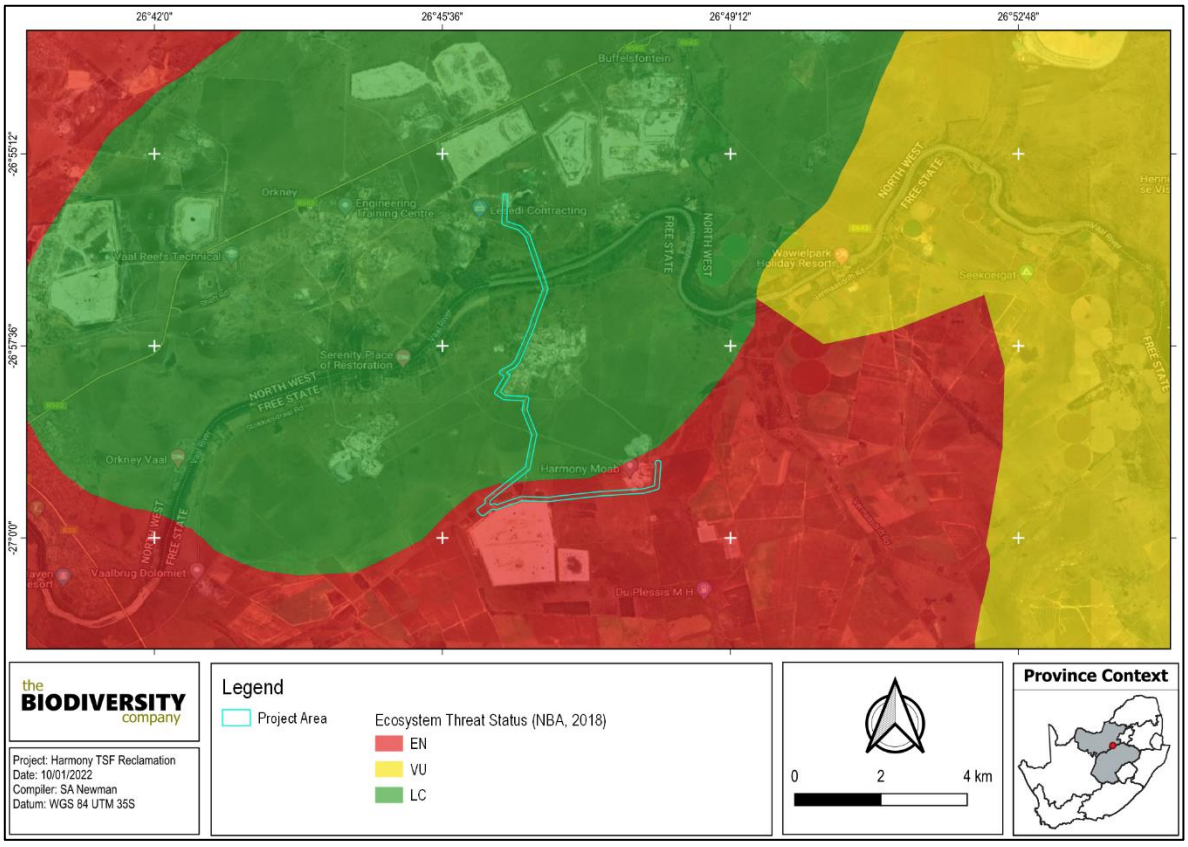


Figure 5-3 Map illustrating the Ecosystem Threat Status associated with the region

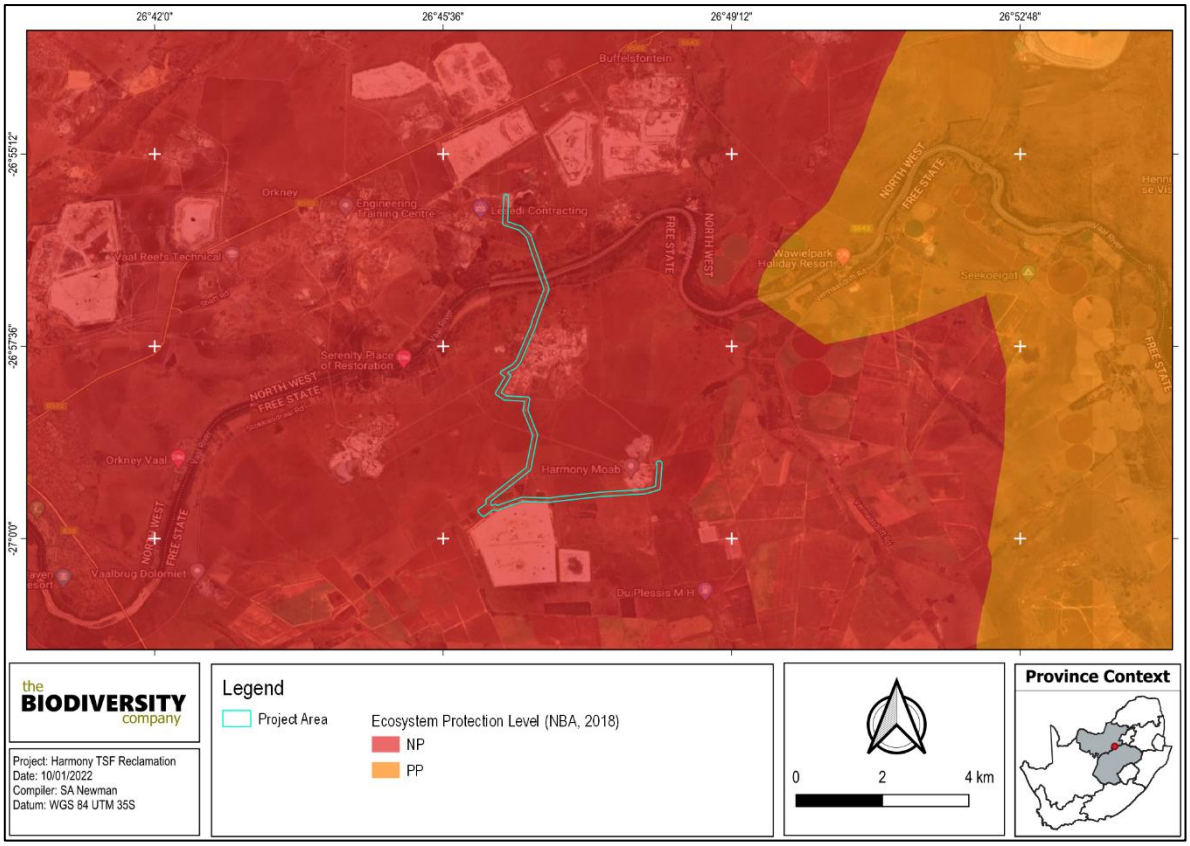


Figure 5-4 Map illustrating the Ecosystem Protection Level associated with the region

5.1.1.3 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). According to the SAIIAE dataset, the project area is intercepted by a CR river, and LC and unclassified wetlands fall within the project area (Figure 5-5).

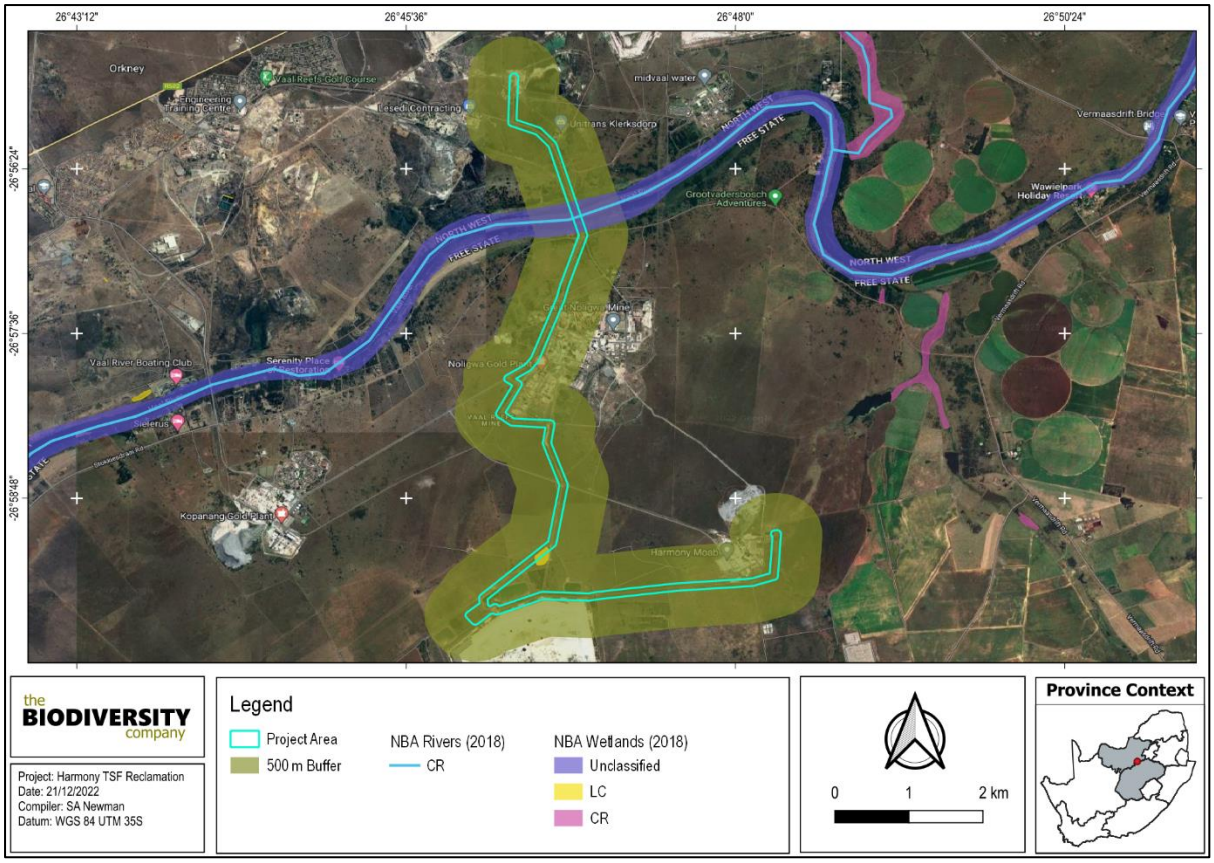


Figure 5-5 Map illustrating the project area in relation to the SAIIAE dataset

5.1.1.4 Protected Areas

According to the protected area spatial datasets from SAPAD (2022) and SACAD (2022), the project area overlaps with the Mispah Game Farm (Figure 5-6). The SAPAD spatial database forms the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act (Act 57 of 2003).

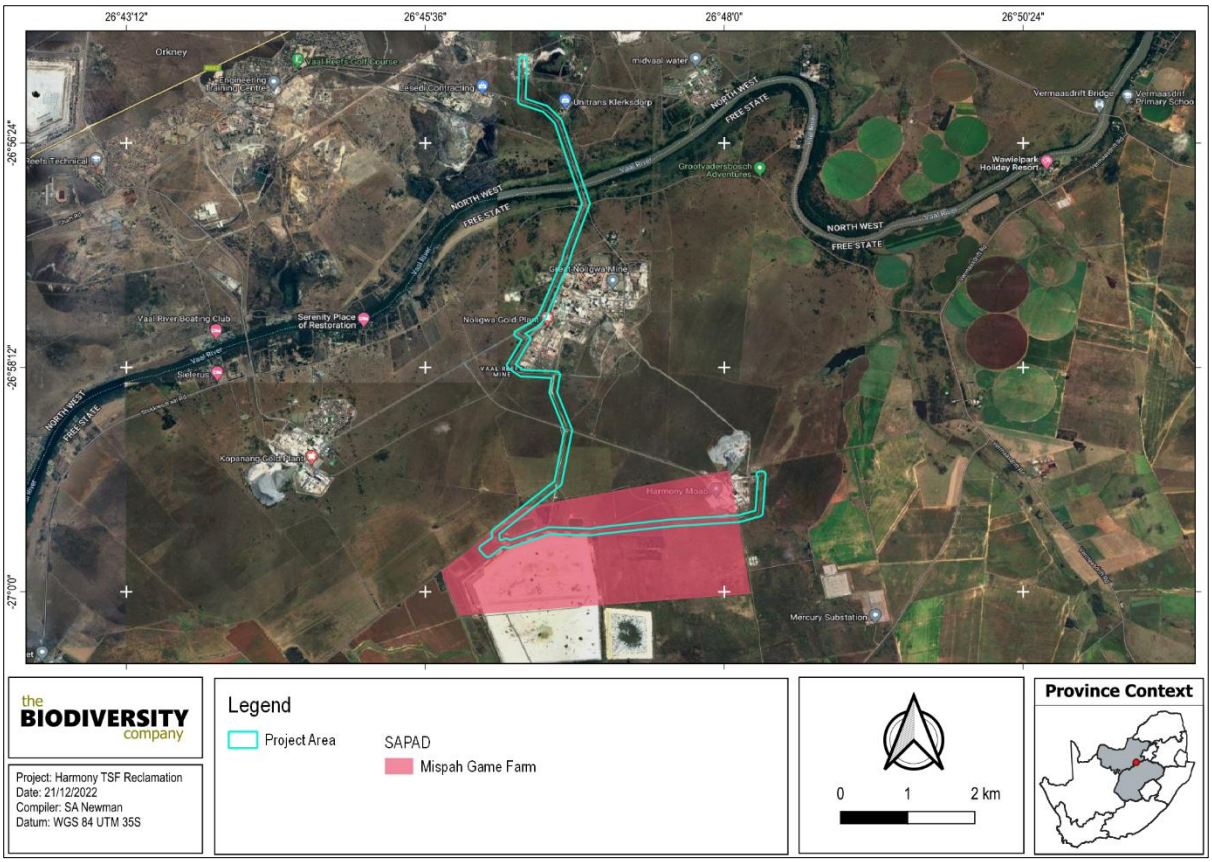


Figure 5-6 The project area in relation to the protected areas

5.1.1.5 National Protected Areas Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016). According to the NPAES (2016) dataset, the project area falls within a Protected Area (Figure 5-7).

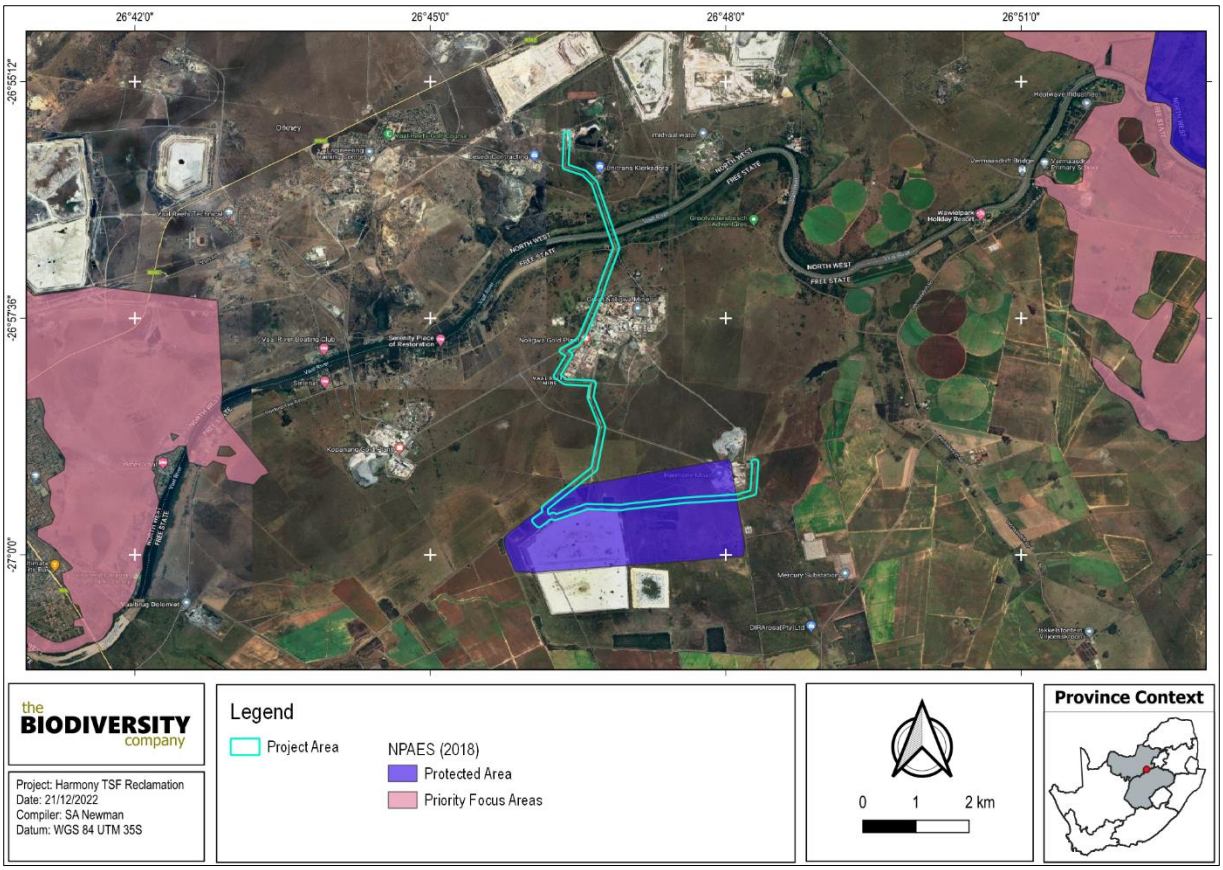


Figure 5-7 Map illustrating the project area in relation to the National Protected Areas Expansion Strategy (2018)

5.1.1.6 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify National Freshwater Ecosystem Priority Areas (NFEPAs) (Driver *et al.,* 2011). The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

Error! Reference source not found. shows that the project area overlaps with a Floodplain NFEPA wetland and a NFEPA Fish Corridor.

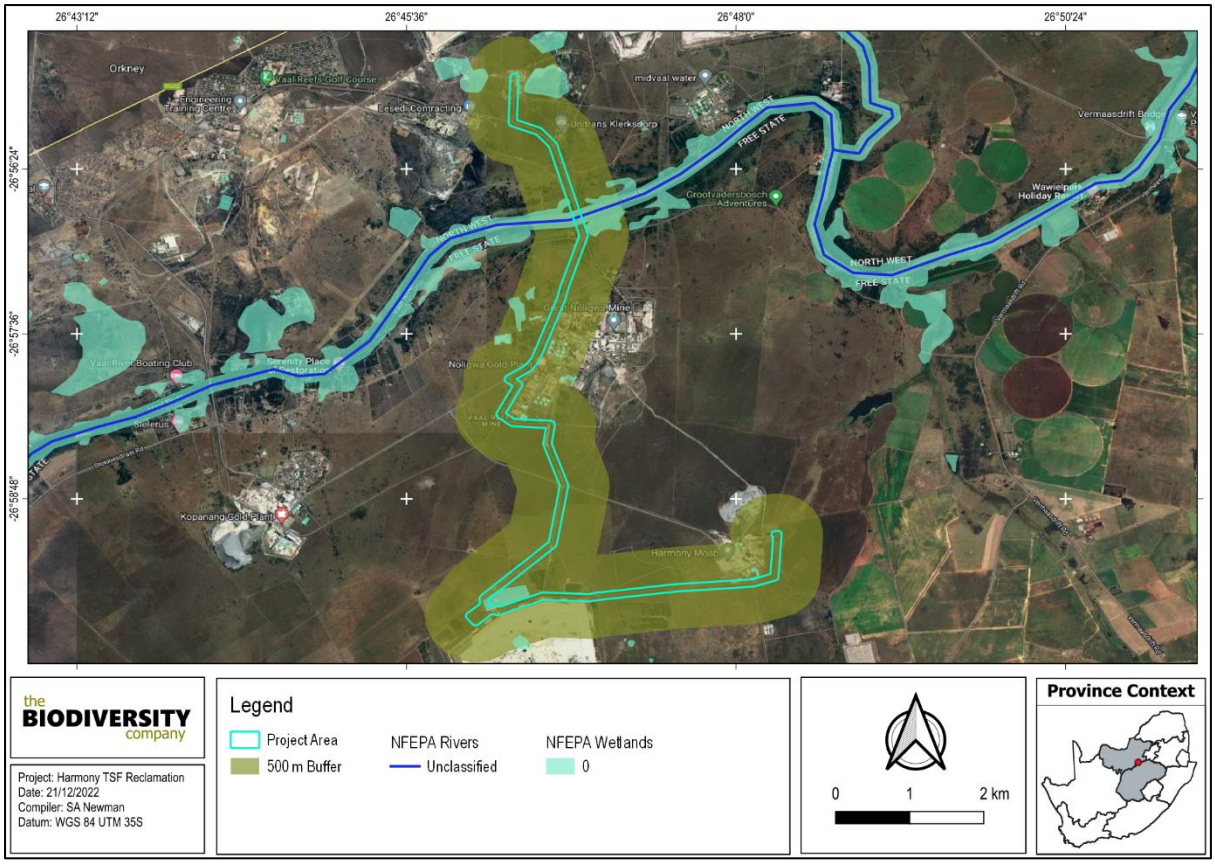


Figure 5-8 The project area in relation to the National Freshwater Ecosystem Priority Areas

5.1.2 Flora Assessment

This section is divided into a description of the local vegetation type that would be expected under natural conditions, and the expected flora species.

5.1.2.1 Vegetation Type

The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

a) Seasonal precipitation; and
b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

The project area is situated within the Vaal Reefs Dolomite Sinkhole Woodland and Vaal-Vet Sandy Grassland vegetation types of this biome (Figure 5-9).

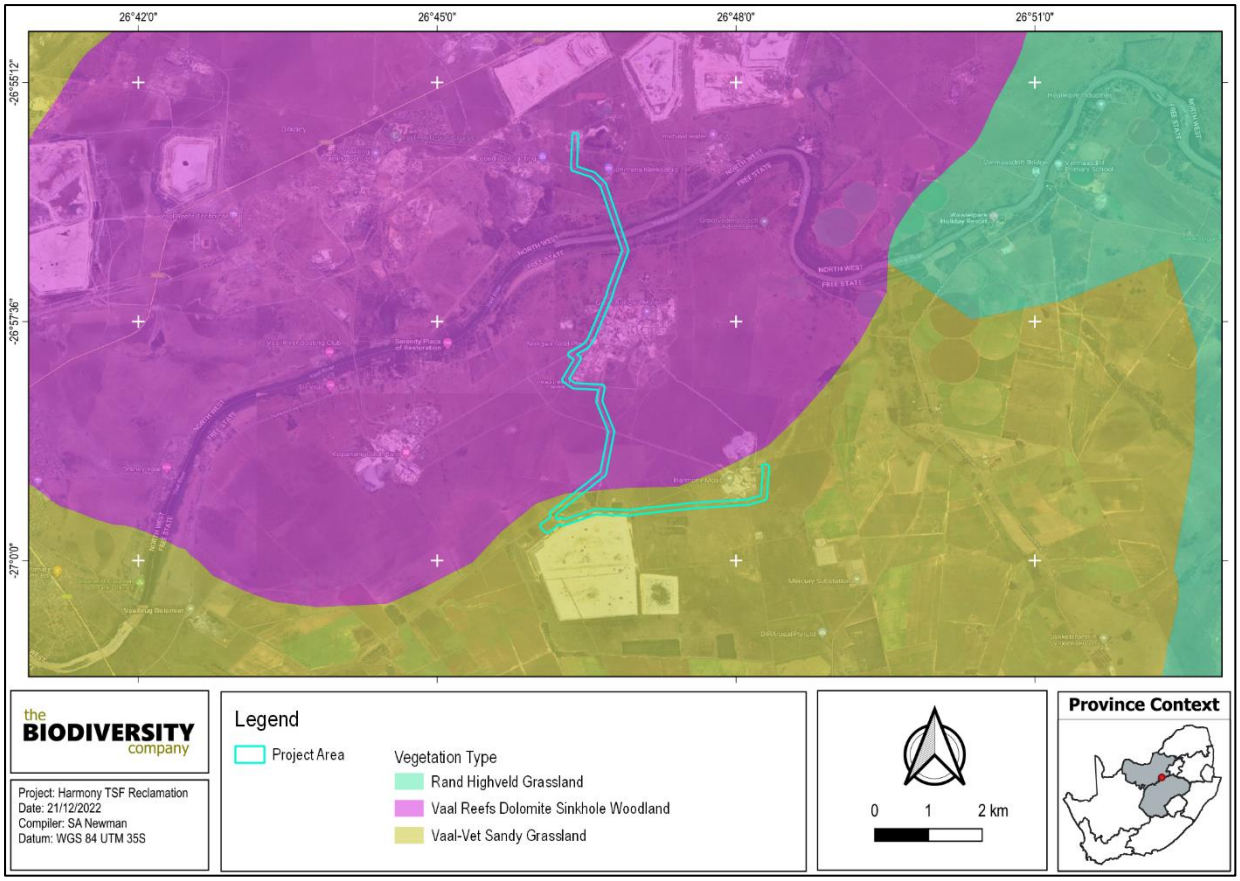


Figure 5-9 Map illustrating the vegetation types associated with the region

5.1.2.1.1 Vaal Reefs Dolomite Sinkhole Woodland

This vegetation type is a slightly undulating landscape dissected by prominent rocky chert ridges and supporting grassland-woodland vegetation complex. It is a small area associated with dolomite sinkholes in and around Stilfontein and Orkney (Vaal Reefs). The characteristic vegetation feature is woodland, which naturally occurs in clumps around sinkholes, especially in places of dolomite outcrops.

Important Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the Vaal Reefs Dolomite Sinkhole Woodland vegetation type:

Small Trees: *Celtis Africana, (d), Searsia lancea (d), Senegalia caffra, Vachellia erioloba (d). V. karroo, V. robusta subsp. clavigera*.

Tall Shrubs: *Diospyros lycioides subsp. lycioides (d), Ehretia rigida (d), Grewia flava (d).*

Low Shrubs: *Asparagus suaveolens (d), Gymnosporia heterophylla (d), Pavonia burchellii (d), Sida dregei (d). Anthospermum hispidulum, Asparagus laricinus, Diospyros pallens, Felicia muricata, Indigofera heterotricha, Menodora africana, Phyllanthus incurvus, Triumfetta sonderi, Ziziphus zeyheriana. Geoxylic Suffrutex: Elephantorrhiza elephantina.*

Woody Climber: *Asparagus africanus*

Graminoids: *Aristida congesta (d), Digitaria eriantha (d), Eragrostis biflora (d), E. curvula (d), Themeda triandra (d), Anthephora pubescens, Aristida canescens, Bewsia biflora, Brachiaria nigropedata, B. serrata, Chloris pycnothrix, Cymbopogon caesius, C. pospischilii, Cynodon dactylon, Cyperus*

margaritaceus, Diheteropogon amplectens, Elionurus muticus, Eragrostis chloromelas, E. lehmanniana, E. racemosa, E. superba, Eustachys paspaloides, Heteropogon contortus, Melinis repens subsp. repens, Panicum coloratum, Setaria sphacelata, Triraphis andropogonoides.

Herbs: *Commelina africana (d), Barleria macrostegia, Chamaecrista mimosoides, Chamaesyce inaequilatera, Chascanum hederaceum, Crabbea angustifolia, Cyanotis speciosa, Dicoma anomala, Hermannia depressa, Indigofera daleoides, L torulosa var. angustiloba, Ipomoea obscura, Justicia anagalloides, Nidorel/a hottentotica, Osteospermum muricatum subsp. longiradiatum, Pollichia campestris, Pterodiscus speciosus, Vemonia oligocephala*.

Geophytic Herb: *Albuca setosa.*

Conservation status

This vegetation type is classified as Vulnerable according to Mucina and Rutherford (2006). The conservation target for this vegetation type is 24% with only a small portion statutorily conserved around the Sterkfontein Caves. The proposed 'Highveld National Park' is supposed to conserve a considerable area of this vegetation unit. Almost a quarter has already been transformed, predominantly by mining, cultivation, urban sprawl and roadbuilding.

5.1.2.1.2 Vaal-Vet Sandy Grassland

This vegetation type is a plains-dominated landscape with some scattered, slightly undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element occurs here. Dominance of *Themeda triandra* is an important feature of this vegetation unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus*, *Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall (Mucina & Rutherford, 2006).

Important Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the Vaal Vet Sandy Grassland vegetation type:

Graminoids: *Anthephora pubescens* (d), *Aristida congesta* (d), *Chloris virgata* (d), *Cymbopogon caesius* (d), *Cynodon dactylon* (d), *Digitaria argyrograpta* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. lehmanniana* (d), *E. plana* (d), *E. trichophora* (d), *Heteropogon contortus* (d), *Panicum gilvum* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Tragus berteronianus* (d), *Brachiaria serrata*, *Cymbopogon pospischilii*, *Digitaria eriantha*, *Eragrostis curvula*, *E. obtusa*, *E. superba*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*.

Herbs: *Stachys spathulata* (d), *Barleria macrostegia*, *Berkheya onopordifolia* var. *onopordifolia*, *Chamaesyce inaequilatera*, *Geigeria aspera* var. *aspera*, *Helichrysum caespititium*, *Hermannia depressa*, *Hibiscus pusillus*, *Monsonia burkeana*, *Rhynchosia adenodes*, *Selago densiflora*, *Vernonia oligocephala*.

Geophytic Herbs: *Bulbine narcissifolia*, *Ledebouria marginata*. Succulent Herb: *Tripteris aghillana* var. *integrifolia*.

Low Shrubs: *Felicia muricata* (d), *Pentzia globosa* (d), *Anthospermum rigidum* subsp. *pumilum*, *Helichrysum dregeanum*, *H. paronychioides*, *Ziziphus zeyheriana*.

Endemic Taxon

Herb: *Lessertia phillipsiana*.

Conservation status

This vegetation type is classified as Endangered according to Mucina and Rutherford (2006). The conservation target for this vegetation type is 24% with only 0.3% statutorily conserved in the Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit and Soetdoring Nature Reserves. More than 63%has been transformed for cultivation (ploughed for commercial crops) and the rest under strong grazing pressure from cattle and sheep.

5.1.2.2 Expected Flora Species

The POSA database indicates that over 494 species of plants could be expected to occur within and around the project area, and two of the expected species are classified as SCC, based on their conservation status' (Table 5-2). A number of protected plants could also be expected to occur in the project area (

Table 5-3).

Table 5-2 SCC flora species that may occur within the project area

Family	Species	Author	SANBI Red-List Status	Ecology
Fabaceae	*Lessertia phillipsiana*	Burtt Davy	DDD	Indigenous; Endemic
Fabaceae	*Pearsonia bracteata*	(Benth.) Polhill	NT	Indigenous; Endemic

Table 5-3 Protected flora species that may occur within the project area

Family	Species	Author	SANBI Red-List Status	Status
Fabaceae	*Lessertia phillipsiana*	Burtt Davy	DDD	Provincially Protected Species (North-West)
Iridaceae	*Dierama reynoldsii*	I.Verd.	LC	Provincially Protected Genus (Free State)
Asteraceae	*Helichrysum argyrosphaerum*	DC.	LC	Provincially Protected Genus (Free State)
Asteraceae	*Helichrysum nudifolium*	(L.) Less.	LC	Provincially Protected Genus (Free State)
Amaryllidaceae	*Gethyllis transkarooica*	D.Mull.-Doblies	LC	Provincially Protected Genus (Free State)
Fabaceae	*Erythrina zeyheri*	Harv.	LC	Provincially Protected Species (Free State)
Asteraceae	*Helichrysum paronychioides*	DC.	LC	Provincially Protected Genus (Free State)
Asteraceae	*Helichrysum callicomum*	Harv.	LC	Provincially Protected Genus (Free State)
Acanthaceae	*Blepharis angusta*	(Nees) T.Anderson	LC	Provincially Protected Species (North-West)
Euphorbiaceae	*Euphorbia inaequilatera*	Sond.	LC	Provincially Protected Genus (Free State)
Amaryllidaceae	*Nerine krigei*	W.F.Barker	LC	Provincially Protected Genus (Free State)
Asteraceae	*Helichrysum zeyheri*	Less.	LC	Provincially Protected Genus (Free State)
Iridaceae	*Gladiolus permeabilis*	D.Delaroche	LC	Provincially Protected Genus (Free State)
Asphodelaceae	*Kniphofia ensifolia*	Baker	LC	Provincially Protected Genus (Free State)
Amaryllidaceae	*Crinum bulbispermum*	(Burm.f.) Milne-Redh. & Schweick.	LC	Provincially Protected Genus (Free State)
Iridaceae	*Gladiolus crassifolius*	Baker	LC	Provincially Protected Genus (Free State)

Asteraceae	*Helichrysum caespititium*	(DC.) Harv.	LC	Provincially Protected Genus (Free State)
Orchidaceae	*Bonatea antennifera*	Rolfe	LC	Provincially Protected Family (Free State)
Asteraceae	*Helichrysum rugulosum*	Less.	LC	Provincially Protected Genus (Free State)
Asteraceae	*Helichrysum dregeanum*	Sond. & Harv.	LC	Provincially Protected Genus (Free State)
Amaryllidaceae	*Nerine frithii*	L.Bolus	LC	Provincially Protected Genus (Free State)
Euphorbiaceae	*Euphorbia indica*	Lam.	NE	Provincially Protected Genus (Free State)
Euphorbiaceae	*Euphorbia serpens*	Kunth	NE	Provincially Protected Genus (Free State)

5.1.3 Fauna Assessment

Largely based on the South African Bird Atlas Project Version 2 (SABAP, 2019), IUCN Digital Distribution Maps (IUCN, 2017), and the Animal Demography Unit (ADU) databases,

Table 5-4 summarises the total number of animal species that have the potential to occur in or around the project area, and the corresponding number of SCC.

Table 5-4 Total number of potential fauna species present, and corresponding SCC

Fauna Type	Total Potential No.	Total SCC
Avifauna	301	17
Mammals	92	13
Herpetofauna (Reptiles and Amphibians)	63	1

5.1.3.1 Amphibians

Based on the IUCN Red List Spatial Data and FrogMap, 20 amphibian species are expected to occur within the project area. One amphibian SCC is expected to occur within the project area (Table 5-5).

Table 5-5 Threatened amphibian species that are expected to occur within the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Pyxicephalus adspersus	Giant Bull Frog	NT	LC	High

5.1.3.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 43 reptile species are expected to occur within the area. None of the species are regarded as SCCs.

5.1.3.3 Mammals

The IUCN Red List Spatial Data and MammalMap, 92 mammal species could be expected to occur within the area. This list excludes large mammal species that are normally restricted to protected areas. Thirteen of these expected species are regarded as threatened (Table 5-6).

Table 5-6 Threatened mammal species that are expected to occur within the project area

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Aonyx capensis	Cape Clawless Otter	NT	NT	High
Atelerix frontalis	Southern African Hedgehog	NT	LC	Moderate
Crocidura maquassiensis	Makwassie musk shrew	VU	LC	Low

Crocidura mariquensis	Swamp Musk Shrew	NT	LC	High
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	High
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	High
Leptailurus serval	Serval	NT	LC	Moderate
Mystromys albicaudatus	African White-tailed Rat	VU	EN	Low
Otomys auratus	Southern African Vlei Rat (Grassland type)	NT	NT	Moderate
Panthera pardus	Leopard	VU	VU	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Redunca fulvorufula	Mountain Reedbuck	EN	EN	Moderate

5.1.3.4 Avifauna

The SABAP2 Data lists 210 avifauna species that could be expected to occur within the area. Eighteen of these expected species are regarded as threatened (Table 5-7).

Table 5-7 Threatened avifauna species that are expected to occur within the project area

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Brunhilda erythronotos	Waxbill, Black-faced	VU	VU	High
Calidris ferruginea	Sandpiper, Curlew	LC	NT	Moderate
Ciconia abdimii	Stork, Abdim's	NT	LC	Low
Circus ranivorus	Harrier, African Marsh	EN	LC	Moderate
Coracias garrulus	Roller, European	NT	LC	Low
Crithagra mozambica	Canary, Yellow-fronted	NT	NT	High
Falco biarmicus	Falcon, Lanner	VU	LC	High
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Low
Gyps africanus	Vulture, White-backed	CR	CR	Low
Hydroprogne caspia	Tern, Caspian	VU	LC	Moderate
Mirafra cheniana	Lark, Melodious	LC	NT	Moderate
Mycteria ibis	Stork, Yellow-billed	EN	LC	Moderate
Oxyura maccoa	Duck, Maccoa	NT	VU	Moderate
Phoenicopterus roseus	Flamingo, Greater	NT	NT	Moderate
Polemaetus bellicosus	Eagle, Martial	EN	EN	Low
Sagittarius serpentarius	Secretarybird	VU	EN	Low
Spatula hottentota	Teal, Blue-billed	VU	LC	Low
Spatula smithii	Shoveler, Cape	VU	LC	Moderate

5.2 Biodiversity Field Survey

The following sections discuss the results from the field survey that was conducted for the proposed project, which was undertaken on the 8th of December 2022.

5.2.1 Flora Survey

In total, 69 species of flora were recorded within the project area. These species can be found listed in ***Table 5-8***.

Table 5-8 Flora species recorded within the project area

Family	Species	SANBI Red-List Status	Ecology	Status
Alliaceae	*Tulbaghia acutiloba*	LC	Not Endemic	
Amaranthaceae	*Aerva leucura*	LC	Not Endemic	
Amaranthaceae	*Gomphrena celosioides*		Naturalised Exotic Weed	
Amaryllidaceae	*Boophone disticha*	LC	Not Endemic	Provincially Protected Genus (Free State)
Anacardiaceae	*Searsia lancea*	LC	Not Endemic	
Anacardiaceae	*Searsia pyroides*	LC	Not Endemic	
Apocynaceae	*Gomphocarpus fruticosus*	LC	Not Endemic	
Asparagaceae	*Asparagus laricinus*	LC	Not Endemic	
Asteraceae	*Arctotis arctotoides*	LC	Not Endemic	
Asteraceae	*Argemone mexicana*			NEMBA Category 1b
Asteraceae	*Felicia muricata*	LC	Not Endemic	
Asteraceae	*Helichrysum rugulosum*	LC	Not Endemic	Provincially Protected Genus (Free State)
Asteraceae	*Nidorella resedifolia*	LC	Not Endemic	
Asteraceae	*Polydora angustifolia*	LC	Not Endemic	
Asteraceae	*Seriphium plumosum*	DD	Endemic	
Asteraceae	*Xanthium strumarium*			NEMBA Category 1b
Asteraceae	*Conyza canadensis*		Naturalised Exotic Weed	
Asteraceae	*Conyza bonariensis*		Naturalised Exotic Weed	
Asteraceae	*Hypochaeris albiflora*		Naturalised Exotic Weed	
Asteraceae	*Flaveria bidentis*			NEMBA Category 1b
Asteraceae	*Helichrysum nudifolium*	LC	Not Endemic	Provincially Protected Genus (Free State)
Brassicaceae	*Cleome rubella*	LC	Not Endemic	
Campanulaceae	*Wahlenbergia undulata*	LC	Not Endemic	
Commelinaceae	*Commelina africana*	LC	Not Endemic	
Commelinaceae	*Commelina livingstonii*	LC	Not Endemic	
Convolvulaceae	*Ipomoea crassipes*		Naturalised Exotic Weed	
Cucurbitaceae	*Citrullus naudinianus*	LC	Not Endemic	
Cyperaceae	*Cyperus esculentus*	LC	Not Endemic	
Cyperaceae	*Cyperus obtusiflorus var. obtusiflorus*	LC	Not Endemic	
Cyperaceae	*Fimbristylis dichotoma*	LC	Not Endemic	
Fabaceae	*Chamaecrista mimosoides*	LC	Not Endemic	
Fabaceae	*Elephantorrhiza elephantina*	LC	Not Endemic	
Fabaceae	*Indigofera daleoides var. daleoides*	LC	Not Endemic	

Fabaceae	*Vachellia karroo*	LC	Not Endemic	
Family indet.				
Family indet.				
Family indet.				
Family indet.				
Hyacinthaceae	*Ledebouria luteola*	LC	Not Endemic	
Hypoxidaceae	*Hypoxis hemerocallidea*	LC	Not Endemic	
Lamiaceae	*Stachys hyssopoides*	LC	Not Endemic	
Malvaceae	*Triumfetta sonderi*	LC	Endemic	
Malvaceae	*Sida rhombifolia*	LC	Not Endemic	
Malvaceae	*Grewia flava*	LC	Not Endemic	
Myrtaceae	*Eucalyptus grandis*			NEMBA Category 1b
Onagraceae	*Oenothera rosea*		Naturalised Exotic Weed	
Papaveraceae	*Papaver aculeatum*	LC	Not Endemic	
Poaceae	*Aristida congesta*	LC	Not Endemic	
Poaceae	*Brachiaria serrata*	LC	Not Endemic	
Poaceae	*Cortaderia selloana*			NEMBA Category 1b
Poaceae	*Cymbopogon nardus*	LC	Not Endemic	
Poaceae	*Eragrostis chloromelas*	LC	Not Endemic	
Poaceae	*Heteropogon contortus*	LC	Not Endemic	
Poaceae	*Hyparrhenia hirta*	LC	Not Endemic	
Poaceae	*Imperata cylindrica*	LC	Not Endemic	
Poaceae	*Melinis repens*	LC	Not Endemic	
Poaceae	*Panicum coloratum*	LC	Not Endemic	
Poaceae	*Setaria sphacelata var. sphacelata*	LC	Not Endemic	
Poaceae	*Sporobolus sp.*			
Polygalaceae	*Polygala hottentotta*	LC	Not Endemic	
Polygonaceae	*Oxygonum dregeanum*	LC	Not Endemic	
Ranunculaceae	*Clematis villosa subsp. stanleyi*	LC	Not Endemic	
Rhamnaceae	*Ziziphus mucronata*	LC	Not Endemic	
Scrophulariaceae	*Selago densiflora*	LC	Not Endemic	
Scrophulariaceae	*Selago c.f. welwitchii*	LC	Not Endemic	
Solanaceae	*Solanum elaeagnifolium*			NEMBA Category 1b
Tamaricaceae	*Tamarix ramosissima*			NEMBA Category 1b
Verbenaceae	*Verbena bonariensis*			NEMBA Category 1b

5.2.1.1 Indigenous Flora

The project area was found to contain largely indigenous flora, with no recordings of flora SCC. However, three species of flora that fall within provincially protected genera of the Free State were observed. These species are listed in ***Table 5-8***, along with all the other species of indigenous flora observed within the project area.

Figure 5-10 presents photographs of some of the indigenous species observed within the project area.

Figure 5-10 ***Photographs of some recorded indigenous flora species: a) Selago c.f. welwitchii., b) Searsia pyroides, c) Vachellia karroo, d) Arctotis arctotoides, e) Boophone disticha and f) Selago densiflora.***

5.2.1.2 Invasive Alien Plants

Eight listed IAP species were recorded in the project area (Table 5-8), namely *Gomphrena celosioides, Argemone mexicana, Xanthium strumarium, Flaveria bidentis, Eucalyptus grandis, Solanum elaeagnifolium, Tamarix ramosissima* and *Verbena bonariensis.* Some of these species can been seen pictured in Figure 5-11.

Figure 5-11 Photographs illustrating the category 1b invasive alien plant species recorded in the project area: a) Argemone Mexicana, b) Flaveria bidentis, c) Solanum elaeagnifolium and d) Xanthium strumarium

5.2.2 Fauna Survey

Only seven species of common avifauna were recorded during the survey; Pied Crow (*Corvus albus*), Southern Red Bishop (*Euplectes orix*), Long-tailed Widowbird (*Euplectes progne*), European Bee-eater (*Merops apiaster*), Helmeted Guineafowl (*Numida meleagris*), Southern Masked Weaver (*Ploceus velatus*) and Laughing Dove (*Spilopelia senegalensis*). No amphibians or reptiles were observed during the survey. The only mammals observed were domesticated cattle.

No SCC were observed, however, more fauna species are expected to occur within the project area and longer-term multi-season surveys would be required in order to obtain this additional data.

5.3 Habitat Assessment and Site Ecological Importance

Five habitat types were identified across the project area, initially based on satellite imagery and then corroborated with field coverage and data collected during the survey (Figure 5-12). The habitat types have been classified as: transformed, critically modified grassland, modified grassland, Vaal River and flat wetland.

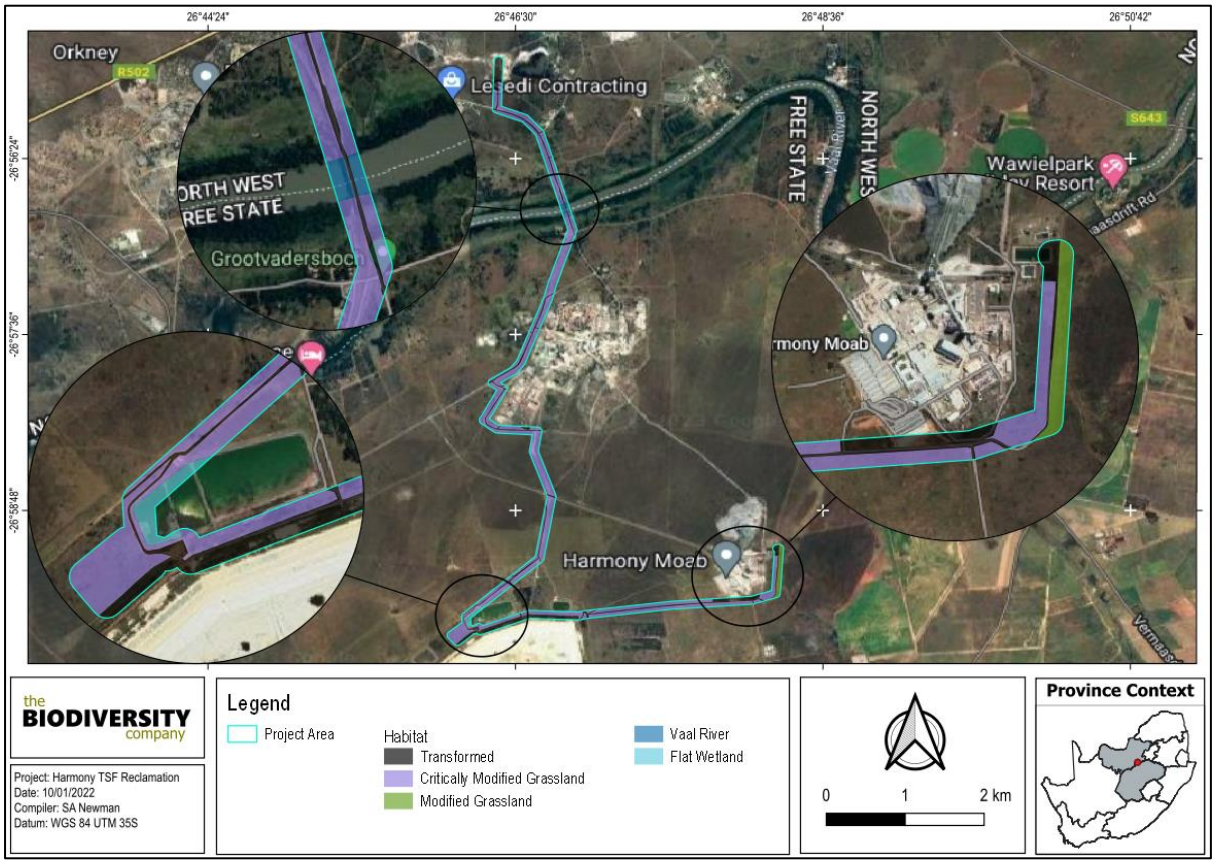


Figure 5-12 Map illustrating the main habitat types delineated across the project area

The transformed habitat unit includes all areas that maintain very little to no functional vegetation, such as roads and the areas utilised for mining activity. An example of this transformed habitat can be seen in Figure 5-13. The critically modified grassland is the predominant habitat type within the project area (Figure 5-14)Figure 5-13. It is made up of areas that fall adjacent to transformed areas and were historically natural grasslands but now support species of exotic and invasive flora and have experienced degradation due to human activity and the grazing of livestock However, these systems do maintain some level of ecosystem functionality.

Figure 5-13 Representative photographs of the transformed habitat

Figure 5-14 Representative photographs of the critically modified grassland habitat

The Modified grassland habitat unit remains largely intact but has experienced some level of degradation due to the nearby mining activities and associated infrastructure (Figure 5-15).

Figure 5-15 Representative photograph of the modified grassland habitat

The Vaal River passes through the project area and is an important habitat due to its potential to support SCCs. It has also experienced degradation at the hand of human activity but is still a functional ecosystem. The flat wetland habitat unit is classified as such based on the NFEPA dataset. It too has experienced serious degradation due to its proximity to mining activities

Figure 5-16 Representative photograph of the flat wetland habitat

Based on the criteria provided in section 4.3 of this report, the delineated habitat types have been allocated a sensitivity category, or SEI, and this breakdown is presented in Table 5-9 below. In order to identify and spatially present sensitive features in terms of the relevant specialist discipline, the sensitivity of the habitat type was delineated within the project area and mapped in Figure 5-17 below.

It is important to note that this map does not replace any local, provincial, or national government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

Table 5-9 Sensitivity summary of the habitat types delineated within the Project area of Influence

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Low	Very Low	**Very Low**	Very Low	**Low**
Critically Modified Grassland	Low	Medium	**Low**	Low	**Medium**
Modified Grassland	Low	High	**Medium**	Low	**High**
Vaal River	High	High	**High**	Medium	**High**
Flat Wetland	Low	Low	**Low**	Low	**Medium**

Consider the following guidelines when interpreting SEI in the context of any proposed development or disturbance activities (noted in conjunction with provincial guidelines pertaining to CBA and ESA areas):

- Very Low: Minimisation mitigation – Development activities of medium to high impact acceptable and restoration activities may not be required.
- Low: Minimisation and restoration mitigation – Development activities of medium to high impact acceptable followed by appropriate restoration activities.
- Medium: Minimisation and restoration mitigation – Development activities of medium impact acceptable followed by appropriate restoration activities.
- 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.

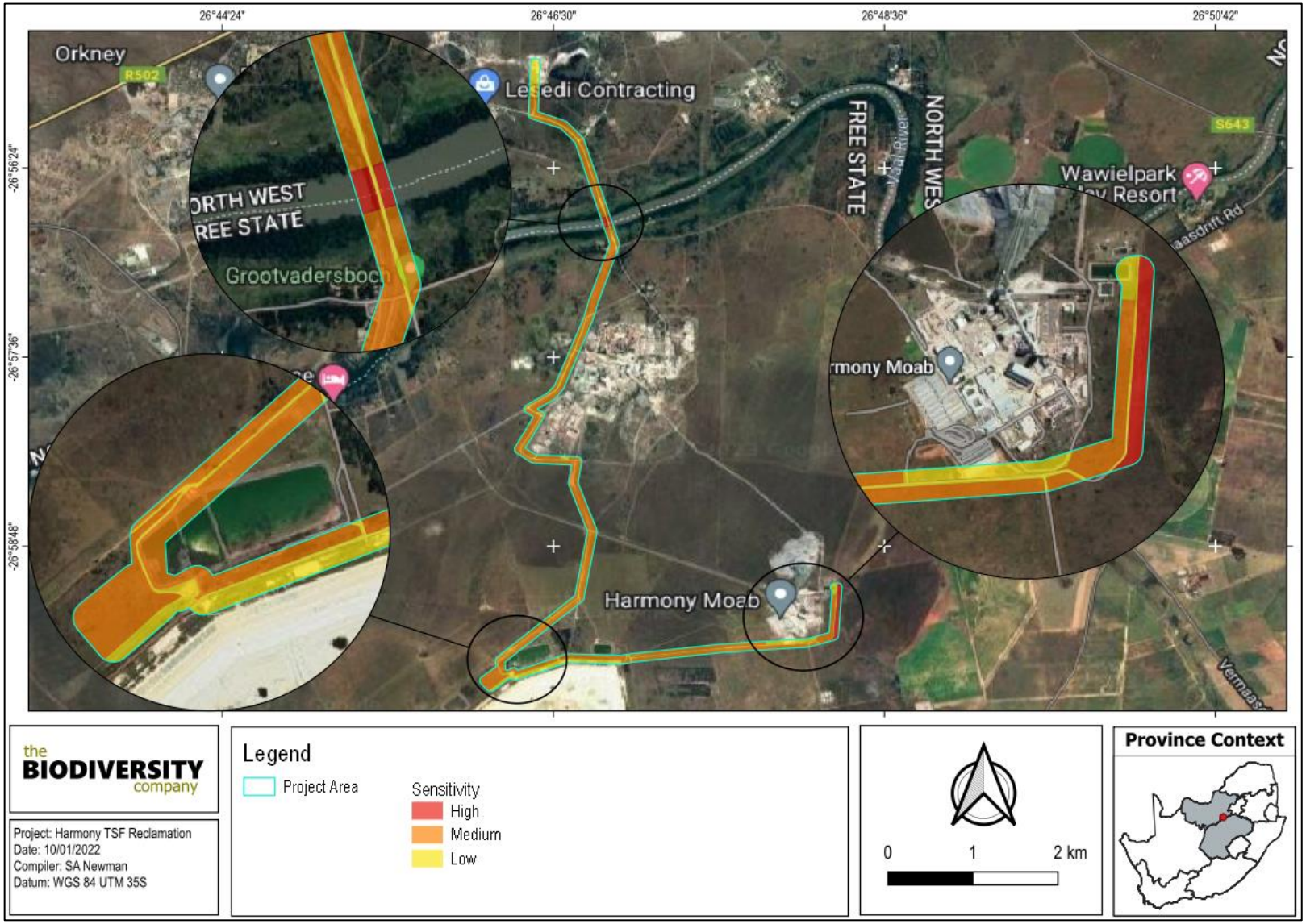
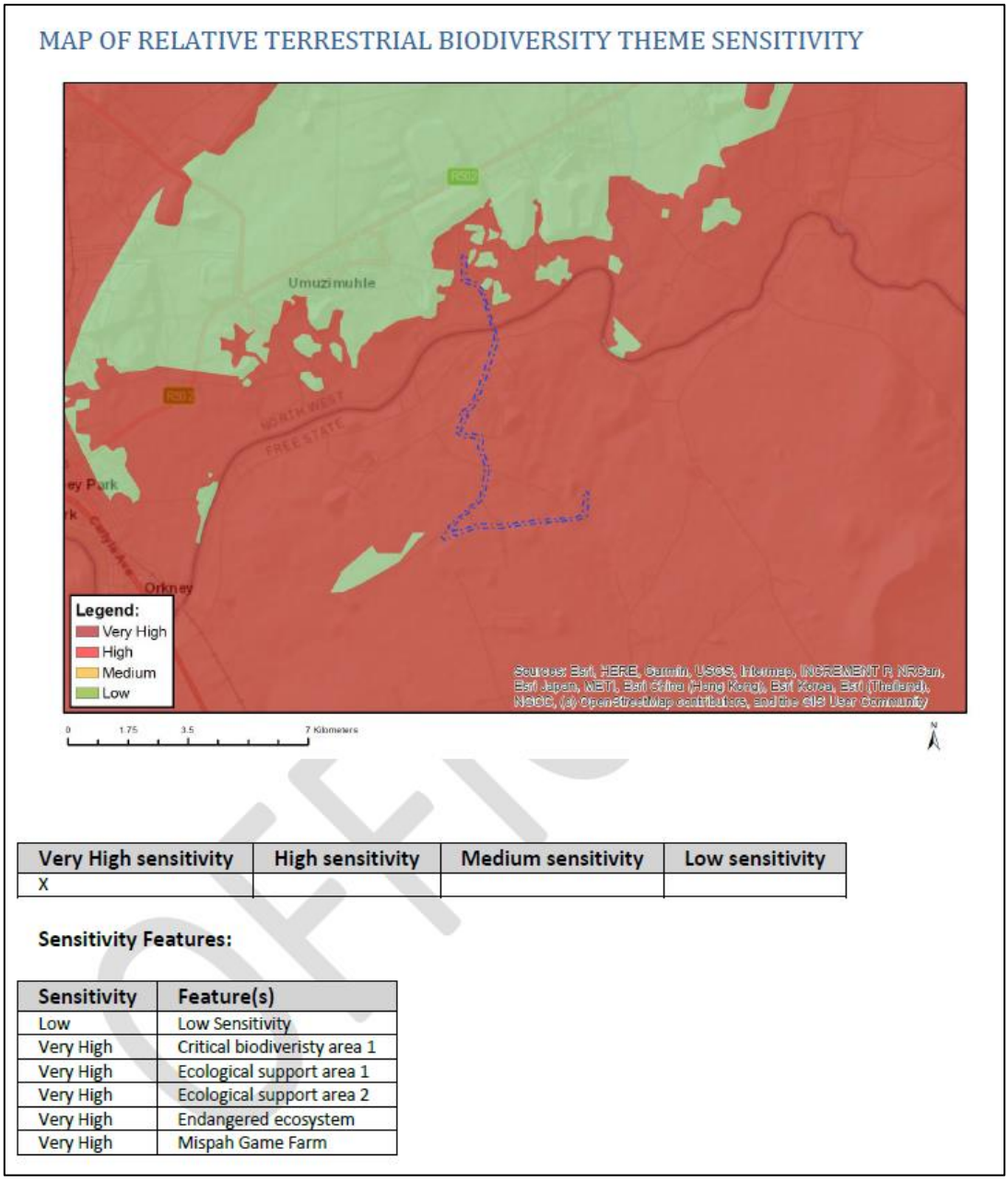


Figure 5-17 Map illustrating the sensitivity of the habitats delineated within the project area

5.3.1 Screening Tool Comparison

The terrestrial biodiversity theme sensitivity as indicated by the screening tool report for the project area was derived to be 'Very High' (Figure 5-18), due to the presence of a CBA, an ESA, an endangered ecosystem and a protected area.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiveristy area 1
Very High	Ecological support area 1
Very High	Ecological support area 2
Very High	Endangered ecosystem
Very High	Mispah Game Farm

Figure 5-18 Terrestrial Biodiversity Theme Sensitivity for the project area (National Environmental Screening Tool, 2022)

The completion of the terrestrial desktop and field studies disputes the 'Very High' sensitivity presented by the screening report, as relevant to the proposed footprint areas. The proposed footprint area is largely degraded and as such, is assigned an overall sensitivity of medium.

The screening report classified the animal theme sensitivity as being of 'High' sensitivity and classified the relative plant theme sensitivity as being of 'Medium' sensitivity. Following the field survey findings, the animal species theme sensitivity should be classified as 'Medium' due do to the presence of the Vaal River in the project area, and the plant species theme sensitivity should be classified as 'Low".

This is due to the fact that the frequent occurrence of sensitive SCC is considered unlikely within the local habitats as they maintain low level of functionality.

6 Biodiversity Risk Assessment

6.1 Present Impacts to Biodiversity

The proximity of the project area to mining activities and the associated infrastructure means that several significant negative impacts are currently present across the area. These include:

- Historic land modification largely in the form of road and path clearing and the establishment of mining activities;
- Air, water and noise pollution;
- Invasive Alien Plants and weeds; and
- Human and vehicle ingress and the associated disturbances.

Throughout much of the project area, an existing pipeline and its associated servitudes are present, which in itself poses negative environmental impacts such as the impacts associated with vegetation clearing, including the establishment of invasive alien plant species, and the pollution and erosion associated with leaks (Figure 6-1).

Figure 6-1 Photograph showing evidence that the existing pipeline has been leaking into the surrounding environment

6.2 Loss of Irreplaceable Resources

The proposed activities are likely to be of a medium impact and will result in the loss of the following important ecological resources:

- A portion of a CBA and a protected area; and

- Indigenous vegetation.

The habitat within the project area has experienced high levels of disturbance due to mining activities in the area and is largely degraded. This has resulted in it only maintaining a low level of functionality. However, the recommendations put forward by the specialist at the end of this report must be implemented and mitigations must be put in place and implemented to prevent the total destruction and loss of all local natural resources.

7 Impact Management and Mitigation Plan

The aim of the management outcomes is to present mitigation actions in such a way that they can be incorporated into the Environmental Management Programme (EMPr), and possible biodiversity management programme, for the project, which should in turn allow for a more successful implementation and auditing of the mitigations and monitoring guidelines. Table 7-1 presents the recommended mitigation measures and the respective time frames, targets, and performance indicators relative to the terrestrial assessment.

The focus of mitigation measures is to reduce the significance of the likely impacts associated with the development, and thereby:

- Prevent the further loss and fragmentation of vegetation communities within the CBA areas in the vicinity of the project area;
- Reduce the negative fragmentation effects of the development and enable the safe movement of fauna species;
- Prevent the direct and indirect loss and disturbance of flora and fauna species and communities; and
- Adequately follow the guidelines for interpreting the Site Ecological Importance ratings assigned to the project area.

Table 7-1 Project specific mitigation measures including requirements for timeframes, roles and responsibilities

Management outcome: Vegetation and Habitats				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
A site walkthrough must be conducted prior to the construction phase. Ideally, the walkthrough must be conducted between October and March by a suitably qualified ecologist, specifically for the 'High' sensitivity areas. A walkthrough prior to construction being undertaken (irrespective of the season) is suitable for the 'Low' and 'Medium' sensitivity habitats. Priority must be the identification of any listed flora and fauna species.	Planning Phase, Pre-Construction	Project manager, Environmental Officer & Contractor	Plant & animal species	Once off
Any individual protected plant that may be observed needs a relocation or destruction permit for any individual that may be removed or destroyed as a result of the activities. Preferably, the plants should be relocated to an area that will not be impacted on by future activities.	Planning Phase, Pre-Construction	Project manager, Environmental Officer & Contractor	Plant species	Once off
Development activities should as far as possible take place only within the 'Low' & 'Medium' sensitivity areas.. The proposed pipeline should be constructed within the existing road/pipe servitude or in close relation to the existing roads/pipelines. **Restrict all laydown, material storage, cement mixing, earth deposition and storage etc. aspects and activities to 'Low' sensitivity areas.**	Planning Phase, Construction Phase	Project manager, Environmental Officer	Construction footprint	During phase
Any indigenous woody material that is removed during construction can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent erosion. Large wooded stumps or branches may be used to enhance the local habitat features and encourage herpetofauna.	Operational and Decommissioning phase	Environmental Officer & Contractor	Woody material around footprint	During Phase
Areas of dense and healthy indigenous vegetation, even secondary communities outside of the direct project footprint, should not be fragmented or disturbed further. This is particularly relevant to the wetland habitats (see the relevant wetland report).	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Areas to be developed/disturbed must be specifically demarcated so that during the construction/activity phase, only the demarcated areas are to be impacted upon.	Pre-Construction, Construction Phase	Project manager, Environmental Officer	Developing within demarcated areas	During phase
All vehicles and personnel must make use of the existing roads and walking paths, especially construction/operational vehicles.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	During phase

All laydown, chemical toilets etc. must be restricted to 'Low' sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the area once the construction/closure phase has been concluded.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas and material storage & placement	During phase
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds and to support the adjacent habitat. This will also reduce the likelihood of encroachment by more alien invasive plant species.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
All disturbed areas are to be rehabilitated and appropriately landscaped. Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to the areas' vegetation type. Progressive rehabilitation of cleared areas will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Rehabilitation	Quarterly monitoring
No plant species whether indigenous or exotic may be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
Rocks removed during the construction can be used in designated areas where erosion control needs to be performed. These areas must be identified by a rehabilitation plan. Alternatively, they may be piled in 'Medium' sensitivity grassland habitat to create useful habitat features for herpetofauna.	Operational phase	Environmental Officer & Contractor	Rock piles	During Phase
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. • **The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site;** • **Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use;** • **No servicing of equipment is to take place on site unless necessary;** • **All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers; and** • **It is important to appropriately contain any diesel storage tanks and/or machinery spills (e.g., accidental spills of hydrocarbons, oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.**	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping	Ongoing

A fire management plan needs to be compiled and implemented to restrict the impact that fire would have on remaining natural and newly rehabilitated areas. Natural areas remaining adjacent to the development footprint should be left to naturally regenerate. Fire and cutting control methods must be authorised to clear areas containing natural indigenous vegetation.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Fire Management and Control	During Phase
Precautions must be taken against the erosion damage that would be caused by unplanned pipe leaks. Lek detection measures must be informed by the design engineers.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Erosion Management and Control/ Leaks	During Phase and Ongoing Monitoring
Management outcome: Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this. These actions are illegal in terms of provincial environmental legislation.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
A qualified environmental control officer must be on site when clearing begins. The area must be walked though prior to construction to ensure that no faunal species remain in the habitat and get killed. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.	Pre-Construction, Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal species	During phase
Any holes/deep excavations must be dug in a progressive manner in order to allow burrowing animals time to move off and to prevent trapping. Should the holes remain open overnight they must be covered temporarily to ensure no fauna species fall in.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Should any SCC fauna be observed in active nests within the proposed footprint area before or during construction, all activities must cease immediately. A relevant faunal specialist must be consulted in order to facilitate the capture or removal of any SCC animals	Life of Operation	Environmental Officer, Contractor, and estate manager	SCC fauna	Ongoing
The areas to be developed (or activity areas) must be specifically demarcated to prevent the movement of staff or equipment/vehicles into the surrounding environments. Signs must be put up to enforce this.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into surrounding areas	During phase
The duration of the construction should be minimized to as short a term as possible, to reduce the period of disturbance on fauna.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction timeframe	During phase
In the event that outside lighting is required outside lighting should be designed and limited to minimise impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light	During phase

All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited. Speed limit signage must be visible to traffic.	Construction Phase	Health and Safety Officer	Compliance to the training	During phase
Noise must be kept to a minimum during the evenings/ at night to minimise all possible disturbances to amphibian species and nocturnal mammals and birds.	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
Schedule activities and operations during the least sensitive periods, to avoid migration, nesting, and breeding seasons as far as possible.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day	Ongoing
Any significant heat generated from any source must be monitored to ensure that it does not negatively affect the local fauna.	Life of operation	Environmental Officer & Contractor	Heat generation	Ongoing
Signs must be put up in order to show the importance and sensitivity of surrounding areas and their functions. This especially pertains to the partially functional wetland areas.	Life of operation	Environmental Officer	Presence and condition of signs	Ongoing
Only use environmentally friendly dust suppressant products.	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Management outcome: Alien species				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
The implementation of an Alien Invasive Plant management plan is very important, especially because of the invasive species identified on site which, if left unchecked, will continue to grow and spread prolifically leading to further and more significant deterioration to the health of the natural environment within and nearby to the footprint area. The plan must especially pertain to any recently cleared areas.	Life of operation	Project manager, Environmental Officer & Contractor	Assess and control presence and encroachment of alien vegetation	Quarterly monitoring
The construction footprint area should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Road footprints must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	During phase
It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests from entering the site and proliferating.	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
A pest control plan for rodents (for example) must be put in place and implemented; it is imperative that poisons not be used.	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Life of operation

Management outcome: Dust				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and be strictly adhered to, particularly for all dirt roads and any earth dumps. This includes the wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated. Only environmentally friendly suppressants may be used to avoid the pollution of water sources. Speed limits must be put in place to reduce erosion.	Construction Phase and Life of operation	Contractor	Dustfall	Ongoing, as per a dust monitoring program
Management outcome: Waste management				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • **Refuse bins must be emptied and secured;** • **Temporary storage of domestic waste shall be in covered waste skips; and** • **Maximum domestic waste storage period must be 10 days.**	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
Any litter, spills, fuels, chemical and human waste in and around the project area must be removed and disposed of timeously and responsibly.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
It must be made an offence to litter or dump any material outside of specially demarcated and managed zones. Signs and protocols must be established to explain and enforce this.	Life of operation	Contractor, Environmental Officer & Health and Safety Officer	Presence of Waste and Dumping	Daily, Ongoing
A minimum of one toilet must be provided per 10 persons. Portable toilets must be regularly serviced to ensure that the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility.	Life of operation	Environmental Officer & Health and Safety Officer, Contractor	Availability of bins and the collection of waste	Ongoing
Under no circumstances may domestic waste be burned on site. Waste may never be stored in an open pit where it is susceptible to the elements such as wind and rain.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of waste	Ongoing
Management outcome: Environmental awareness training				

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on all sensitive environmental receptors near to the project area to inform contractors and site staff of the presence of sensitive habitat features, such as wetland areas, and management requirements in line with the Environmental Authorisation and within the EMPr.	Life of operation	Environmental Officer, Health and Safety Officer	Compliance to the training	Ongoing
Contractors and employees must all undergo an environmental induction and be made aware of the sensitive habitats nearby to the project area.	Life of operation	Environmental Officer, Health and Safety Officer	Compliance to the training	Ongoing
All staff should receive an Environmental Awareness programme which also covers the surrounding area. This programme must be used to inform of the importance of wetland areas and their conservation.	Life of operation	Environmental Officer	Environmental Awareness	Ongoing

8 Conclusion and Impact Statement

No portion of the project area represents an intact vegetation type, and the areas listed as CBA and 'protected areas' exist in a modified state as they have experienced degradation due to grazing by livestock, the invasion of alien species and the additional related effects of nearby agricultural and mining activity. No SCC flora or fauna were recorded during the field survey, however, it is noted that certain SCC fauna may move through the area infrequently due to the abundance of wetland systems in the region and the presence of the Vaal River. Three provincially protected plant species as classified by the Free State province (

Table 5-3) were recorded in the project area. These must be left undisturbed or relocated, as outlined in the mitigation measures (Table 7-1).

Completion of the terrestrial biodiversity assessment led to the disputing of the 'Very High' classification for the biodiversity theme sensitivity as allocated by the National Environmental Screening Tool. This proposed project area has instead been assigned an overall sensitivity of 'Low' to 'Medium' due to significant levels of historical environmental disturbance that have taken place within and immediately adjacent to the proposed project area.

8.1 Impact Statement

It is the opinion of the specialists that the project may be favourably considered, provided that the mitigation measures presented in this report be implemented, along with the recommendations below. The location and size of the ecosystem means that it is unlikely that any functional habitat or SCCs will be lost as a result of the impacts arising from the proposed activities.

8.2 Specialist Recommendations

The proposed project activities are likely to present only minor negative residual impacts to the already degraded indigenous habitat as the laydown footprint for the pipeline is relatively small, with much of it running along existing pipelines and roads. However, it is imperative that proper maintenance be conducted on the existing pipeline, as well as the new pipeline in order to address leaks (some of which already occurring) that may further degrade the habitat.

It is recommended that a site walkthrough be conducted for the project area prior to construction commencing. Ideally, the walkthrough must be conducted between October and March by a suitably qualified ecologist or an experienced Environmental Officer (EO), specifically for the 'High' sensitivity areas. A walkthrough prior to construction being undertaken (irrespective of the season) is suitable for the 'Low' and 'Medium' sensitivity habitats. All species of regionally and nationally protected plants must be relocated prior to commencement of construction activities, as outlined in the mitigation measures above. It should also be noted that this report must be considered in conjunction with the wetland assessment report and all recommendations put forward by the wetland specialist for wetlands that may be present in the project area be implemented appropriately.

The western portion of the project area, near Harmony Moab, has been classified as a "High" sensitivity area due to its proximity to a CBA. This area has only experienced minor disturbance relative to the state of the surrounding habitat. It is the recommendation of the specialist that the pipeline, which is known to have a small footprint, only be laid down along the existing road in a 'Medium' or 'Low' sensitivity habitat. It is also recommended that this 'High' sensitivity area be classified as a 'No-Go Area' (Figure 8-1) in order to maintain some level of habitat integrity and laydown activities are not to take place in this area. It must also be noted that the Vaal River is an inherently a sensitive habitat due to the nature of rivers and must be treated accordingly.

During construction of the pump station, the smallest footprint possible should be impacted upon and it is crucial that construction materials are cleared and the affected vegetation rehabilitated post construction phase.

The project area is under threat from numerous populations of category 1b invasive alien plant species, which are significantly degrading the landscape and competing with indigenous trees, shrubs and herbs. According to the latest NEM:BA legislation, category 1b species must be controlled according to an Invasive Alien Plant Management Plan. It is recommended that this plan be developed and implemented on a priority basis in conjunction with the development activities, as the extensive invasion is likely to be aggravated by the project activities and further spread across the habitat.

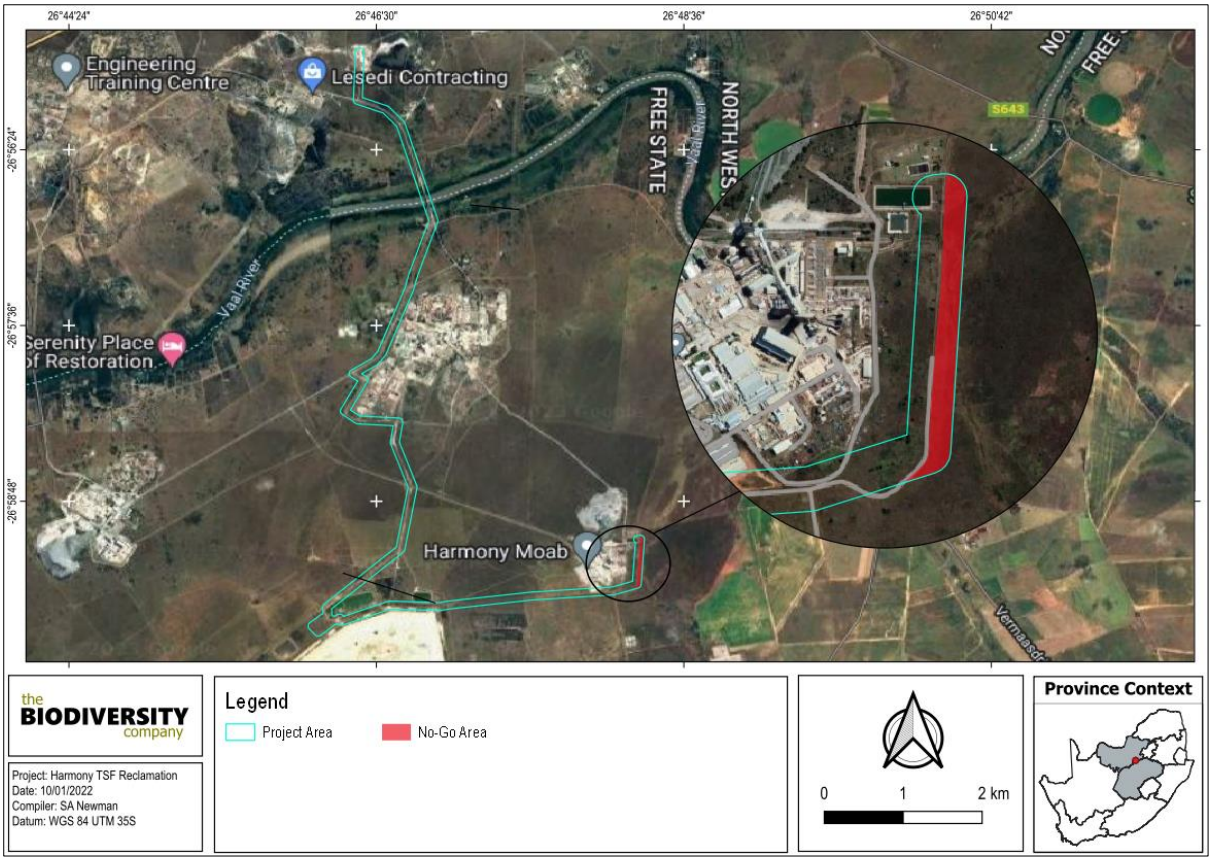


Figure 8-1 Map illustrating the recommended No-Go Area in relation to the project area

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10 Appendix Items

10.1 Appendix B: Specialist Declarations

DECLARATION

I, Sarah Newman, 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 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 71 and is punishable in terms of Section 24F of the Act.

Sarah Newman

Environmental Consultant

The Biodiversity Company

January 2023

DECLARATION

I, Martinus Erasmus, 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 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 71 and is punishable in terms of Section 24F of the Act.

Martinus Erasmus

Environmental Consultant

The Biodiversity Company

January 2023

DECLARATION

I, Andrew Husted, 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 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 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Environmental Consultant

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January 2023

10.2 Appendix C: Specialist CVs

Sarah Newman

M.Sc Entomology

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Date of birth: 17 December 1993

Profile Summary

Work experience in South Africa, Lesotho and Costa Rica.

Extensive experience working in the Sani Pass region of southern Africa investigating the patterns and drivers of ant diversity across an elevation gradient.

Experience with sea turtle monitoring and conservation in Costa Rica.

Areas of Interest

Entomology, Zoology, Biodiversity, Conservation and Community Ecology.

Key Experience

- Monitoring programmes
- Field work and research
- Taxonomic classification of insects

Country Experience

South Africa
Lesotho
Costa Rica

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

Spanish – Basic

Qualifications

- MSc Entomology (*Distinction*), University of Pretoria
- BSc (Hons) Zoology, University of Pretoria
- BSc Zoology, University of Pretoria
- Cand Sci Nat (Pending)

EMPLOYMENT EXPERIENCE

Environmental Consultant at The Biodiversity Company (Present)

Terrestrial biodiversity surveys and assessments.

Research Technician for the University of Pretoria (February 2022 – July 2022)

Taxonomic identification of invertebrates.

Sea Turtle Research Assistant for Ecology Project International at Pacuare Reserve, Costa Rica (February 2021 – November 2021)

Conducted sea turtle monitoring, conservation activities and data management, along with overseeing jaguar camera trapping surveys and performing teaching activities with visiting student groups and tourists.

Compliance and Regulatory Officer for Cell Path Services (June 2019 – November 2020)

Ensured the company adhered to all regulatory requirements outlined by the relevant regulatory bodies.

ACADEMIC QUALIFICATIONS

University of Pretoria, Pretoria (2018): Master of Science (MSc) in Entomology with *Distinction*
Title: Taxonomic and Functional Diversity of Ants Across Environmental Gradients

University of Pretoria, Pretoria (2016): Bachelor of Science Honours (BSc (Hons)) in Zoology
Title: Rolling versus tunnelling: An evolutionary history of dung relocation and burial behaviour in African dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae)

University of Pretoria, Pretoria (2015): Bachelor of Science (BSc) in Zoology

Martinus Erasmus

B-Tech Nature Conservation (*Cand Sci Nat*)

Cell: +27 82 448 1667

Email: martinus@thebiodiversitycompany.com

Identity Number: 9209035136082

Date of birth: 03 September 1992

Profile Summary

Working experience throughout South Africa as well as West Africa.

Specialist experience in exploration, mining, engineering, hydropower, private sector and renewable energy.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise includes Botany and Terrestrial Ecology.

Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Sustainability and Conservation

Key Experience

- Familiar with World Bank and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Rehabilitation Plans and Monitoring
- Botany, especially in the Limpopo, Mpumalanga, Gauteng and North-West provinces in South-Africa.
- Veld management and Veld condition

Country Experience

South Africa

Guinea

Lesotho

Liberia

Mozambique

Nigeria

Swaziland

Zambia

Zimbabwe

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient I

Qualifications

- B-Tech in Nature Conservation, Tshwane University of Technology, Pretoria, South Africa.
- National Diploma in Nature Conservation, Tshwane University of Technology, Pretoria, South Africa.
- Cand Sci Nat (118630)

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (August 2017 – Present)

The team at The Biodiversity Company have conducted stand-alone specialist studies and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

Roles include:

- Manager of the Terrestrial Unit;
- Faunal and Floral surveys for baseline, basic or impact assessments;
- Floral surveys for vegetation verifications, veld condition assessment, management plans and alien invasive species control;
- Report writing;
- Equipment management;
- Technical assistant for fieldwork for the aquatics and wetland departments; and
- Specialist inputs to the above mention services.

EMPLOYMENT: Enviro-Insight (January 2015 – July 2017)

Enviro-Insight assigned me to the role of general and field assistant. I assisted most specialists in field but also had administrative duties:

- The processing and uploading of several organisms to the ADU (Animal Demography Unit) virtual museum, which assists in obtaining spatial data concerning those species.
- Assisted with the generation of the companies' DNA database which distributes the DNA samples to the South African National Biodiversity Institute (SANBI).
- Assisted with field work involving all the different specialist work which includes mammalogy, herpetology and botany.

ACADEMIC QUALIFICATIONS

B-Tech in Nature Conservation, Tshwane University of Technology, Pretoria, South Africa:

Title: The expansion of the distribution of *Xenopus muelleri*.

National Diploma in Nature Conservation, Tshwane University of Technology, Pretoria, South Africa

Andrew Husted

M.Sc Aquatic Health (*Pr Sci Nat*)

Cell: +27 81 319 1225

Email: andrew@thebiodiversitycompany.com

Identity Number: 7904195054081

Date of birth: 19 April 1979

Profile Summary

Working experience throughout South Africa, West and Central Africa and also Armenia & Serbia.

Specialist experience in exploration, mining, engineering, hydropower, private sector and renewable energy.

Experience with project management for national and international multi-disciplinary projects.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise include Instream Flow and Ecological Water Requirements, Freshwater Ecology, Terrestrial Ecology and also Ecosystem Services.

Areas of Interest

Sustainability and Conservation.

Instream Flow and Ecological Water Requirements.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality
- Aquatic Ecological Assessments
- Aquaculture

Country Experience

Botswana, Cameroon

Democratic Republic of Congo

Ghana, Ivory Coast, Lesotho

Liberia, Mali, Mozambique

Nigeria, Republic of Armenia,

Senegal, Serbia, Sierra Leone, South Africa

Tanzania

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

German - Basic

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondi Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 (Expired) – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams

EMPLOYMENT EXPERIENCE

The Biodiversity Company (January 2015 – Present)

Director / Ecologist.

Digby Wells Environmental (August 2008 – December 2014)

Freshwater & Terrestrial Ecologist

PREVIOUS EMPLOYMENT: Econ@UJ (University of Johannesburg)

Freshwater Ecologist

ACADEMIC QUALIFICATIONS

University of Johannesburg, Johannesburg, South Africa (2009): MAGISTER SCIENTIAE (MSc) - Aquatic Health:

Title: *Aspects of the biology of the Bushveld Smallscale Yellowfish (Labeobarbus polylepis): Feeding biology and metal bioaccumulation in five populations.*

Rand Afrikaans University (RAU), Johannesburg, South Africa (2004): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

PUBLICATIONS

Desai M., Husted A., Fry C., Downs C.T., & O'Brien G.C. 2019. Spatial shifts and habitat partitioning of ichthyofauna within the middle–lower region of the Pungwe Basin, Mozambique. *Journal of Freshwater Ecology*, 34(1), 685–702. doi: 10.1080/02705060.2019.1673221

Tate R.B. and Husted, A. 2015. Aquatic Biomonitoring in the upper reaches of the Boesmanspruit, Carolina, Mpumalanga, South Africa. African Journal of Aquatic Science.

Tate R.B. and Husted A. 2013. Bioaccumulation of metals in *Tilapia zillii* (Gervai, 1848) from an impoundment on the Badeni River, Cote D'Iviore. African Journal of Aquatic Science.

O'Brien G.C., Bulfin J.B., Husted A. and Smit N.J. 2012. Comparative behavioural assessment of an established and new Tigerfish (*Hydrocynus vittatus*) population in two manmade lakes in the Limpopo catchment, Southern Africa. African Journal of Aquatic Science.

Tomschi H., Husted A., O'Brien G.C., Cloete Y., Van Dyk C., Pieterse G.M., Wepener V., Nel A. and Reisinger U. 2009. Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam near Selebi Phikwe, Botswana. EC Multiple Framework Contract Beneficiaries.8 ACP BT 13 – Mining Sector (EDMS). Specific Contract N° 2008/166788. Beneficiary Country: Botswana. By: HPC HARRESS PICKEL CONSULT AG

Husted A. 2009. Aspects of the biology of the Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*): Feeding biology and metal bioaccumulation in five populations. The University of Johannesburg (Thesis).