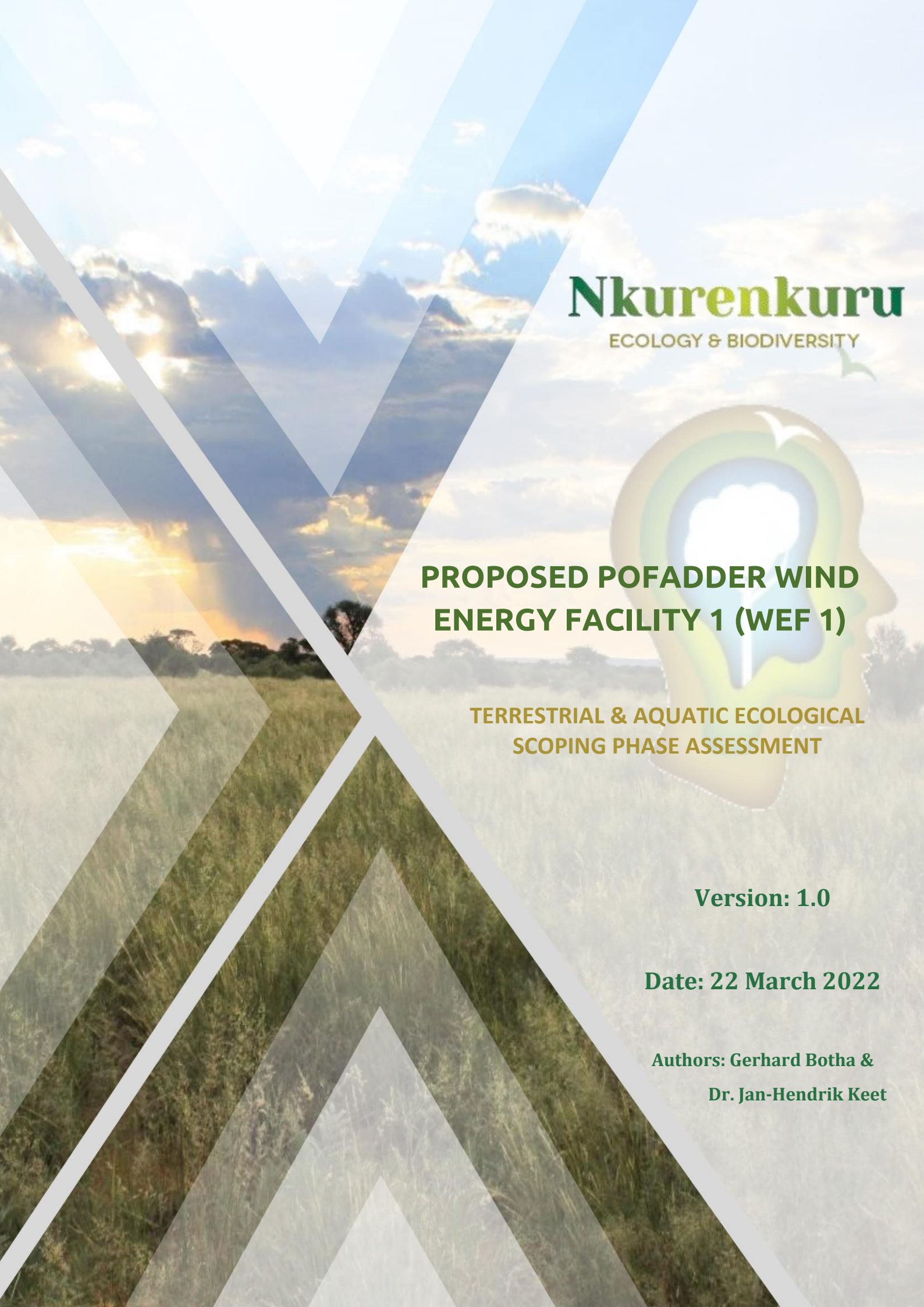

Nkurenkuru
ECOLOGY & BIODIVERSITY

PROPOSED POFADDER WIND ENERGY FACILITY 1 (WEF 1)

TERRESTRIAL & AQUATIC ECOLOGICAL SCOPING PHASE ASSESSMENT

Version: 1.0

Date: 22 March 2022

Authors: Gerhard Botha &
Dr. Jan-Hendrik Keet

Report Title: Pofadder Wind Energy Facility 1, Northern Cape Province: Terrestrial Ecological (Fauna and Flora) Study and Assessment

Authors: Mr. Gerhard Botha and Dr. Jan-Hendrik Keet

Project Name: Pofadder Wind Energy Facility 1, Northern Cape Province

Status of report: Version 1.0

Date: 22 March 2022

Prepared for: Pofadder Wind Energy Facility 1 (Pty) Ltd.

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I. DECLARATION OF CONSULTANT INDEPENDENCE

The consultants hereby declare that they:

- act/ed as the independent specialists in this application;
- regard the information contained in this report as it relates to specialist input/study to be true and correct at the time of publication;
- do not, and will not, have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA Environmental Impact Assessment Regulations, 2014, and any specific environmental management Act;
- do not, and will not, have any vested interest(s) in the proceedings of the proposed activities;
- have disclosed, to the applicant, EAP, and competent authority(-ies), any information that have, or may have, the potential to influence the decision of the competent authority(-ies) or the objectivity of any report, plan, or document required in terms of the NEMA Environmental Impact Assessment Regulations 2014, and any specific environmental management Act;
- are fully aware of, and meet, the responsibilities in terms of the NEMA Environmental Impact Assessment Regulations 2014 (specifically in terms of regulation 13 of GN No. R. 326), and any specific environmental management Act, and that failure to comply with these requirements may result in disqualification;
- have provided the competent authority(-ies) with access to all necessary information at their disposal at the time of publication regarding the application, whether such information is favourable to the applicant or not; and
- are aware that a false declaration is an offense in terms of regulation 48 of GN No. R. 326.

REPORT AUTHORS:

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BSc (Hons) Zoology and Botany; MSc Botany (Phytosociology) from 2011 to present.

March 2022

Jan-Hendrik Keet

Fields of Expertise: Botany; Biogeography; Terrestrial Biodiversity; Invasive Alien Plant Identification, Management, and Monitoring; Biological Sciences; Experimental Design & Analysis; Geographic Information Systems.

BSc Chemistry with Physics and Biology; BSc (Hons) Botany; MSc Botany (Invasive Plant Species and Risk Assessment); PhD Botany (Invasive Plant Species and Impacts).

March 2022

II. STATEMENT OF WORK

» This study has been executed in accordance with and meet the responsibilities in terms of:
  - NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326);
  - Procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998, when applying for Environmental Authorisation:
    - 3(c): Protocol for the assessment and reporting of environmental impacts on terrestrial animal species.
    - 3(d): Protocol for the assessment and reporting of environmental impacts on terrestrial plant species.

REPORT AUTHORS:

Gerhard Botha Pr.Sci.Nat 400502/14 (Botanical and Ecological Science)

March 2022

Jan-Hendrik Keet

March 2022

III. LIST OF ABBREVIATIONS

CARA: Conservation of Agricultural Resources Act (Act 43 of 1983)

CBA: Critical Biodiversity Area

CIS: Conservation Important Species (species listed within IUCN and South African Red Lists, or that are protected within relevant international, national, and provincial legislation)

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

CR: Critically Endangered (threat status)

DAFF: Department of Agriculture, Forestry, and Fisheries

DDD: Data Deficient — Insufficient Information (threat status)

DDT: Data Deficient — Taxonomically Problematic (threat status)

DEA: Department of Environmental Affairs

DEADP:WC: Department of Environmental Affairs and Development Planning: Western Cape Province.

EA: Environmental Authorisation

ECO: Environmental Control Officer

EIA: Environmental Impact Assessment: EIA regulations promulgated under section 24(5) of NEMA and published in Government Notice R. 543 in Government Gazette 33306 of 18 June 2010

EMPr: Environmental Management Programme

EN: Endangered (threat status)

ESA: Ecological Support Area

EW: Extinct in the Wild (threat status)

EX: Extinct (threat status)

FEPA: Freshwater Ecosystem Priority Area

IAPs: Invasive Alien Plant species

LC: Least Concern (threat status)

MAP: Mean Annual Precipitation

MAT: Mean Annual Temperature

NE: Not Evaluated (threat status)

NEM:BA National Environmental Management: Biodiversity Act (Act No. 10 of 2004)

NEMA: National Environmental Management Act (Act 107 of 1998)

NFA: National Forest Act 1998 (No. 84 of 1998)

NFEPA: National Freshwater Ecosystem Priority Areas, identified to meet national freshwater conservation targets (CSIR, 2011)

NT: Near Threatened (threat status)

PES:	Present Ecological State, referring to the current state or condition of an environmental resource in terms of its characteristics, and reflecting a change from its reference condition
RE:	Regionally Extinct (threat status)
SANBI:	South African National Biodiversity Institute
TOPS:	Threatened and Protected Species; in terms of section 56 of the National Environment: Biodiversity Act (NEM:BA) of 2004 (Species list as published within Gazette No. 30568, 14 December 2007)
VU:	Vulnerable (threat status)

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1. INTRODUCTION

1.1. Applicant

Pofadder Wind Energy Facility 1 (Pty) Ltd.

1.2. Project

The project will be known as Pofadder WEF 1.

1.3. Proposed Activity

The applicant Pofadder Wind Energy Facility 1 (Pty) Ltd is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure on a site located approximately 20km South East of Pofadder within the Kai !Garib Local Municipality and the Z F Mgcawu District Municipality in the Northern Cape Province.

A preferred project site with an extent of approx. 3000ha has been identified as a technically suitable area for the development of the Pofadder WEF 1, which will comprise of up to 30 turbines with a combined contracted capacity of up to 200MW. The project site is located on the following properties:

- The Farm Ganna-Poort 202;
- The Farm Lovedale 201; and
- Portion 3 of the Farm Sand Gat 150.

Two additional WEF's are concurrently being considered on the properties and are assessed by way of separate impact assessment processes contained in the 2014 Environmental Impact Assessment Regulations (GN No. R982, as amended) for listed activities contained Listing Notices 1, 2 and 3 (GN R983, R984 and R985, as amended). These projects are known as Pofadder Wind Energy Facility 2 and Pofadder Wind Energy Facility 3The Pofadder WEF 1 project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 200MW:

» Up to 30 wind turbines with a maximum hub height of up to 200m;
» A transformer at the base of each turbine;
» Concrete turbine foundations and turbine hardstands;
» Temporary laydown areas which will accommodate the boom erection, storage and assembly area;
» Cabling between the turbines, to be laid underground where practical;
» An on-site substation of up to 1.25ha in extent to facilitate the connection between the wind farm and the electricity grid;
» An internal overhead 132kV power line, with a servitude of 32m, to connect the wind farm to the collector substation;

- » Access roads to the site and between project components inclusive of stormwater infrastructure. A 12 m road corridor may be temporary impacted during construction and rehabilitated to 6m wide after construction.
- » Pofadder WEF 1 will have a total road network of about 50 km.
- » A temporary concrete batching plant; and
- » Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

In order to evacuate the energy generated by the WEF's to supplement the national grid, Pofadder Grid (Pty) Ltd is proposing two grid connection alternatives which will be assessed in a separate Integrated Grid BAR.

The EA applications for the three wind farm projects and gridline are being undertaken in parallel as they are co-dependent, i.e. one will not be developed without the other.

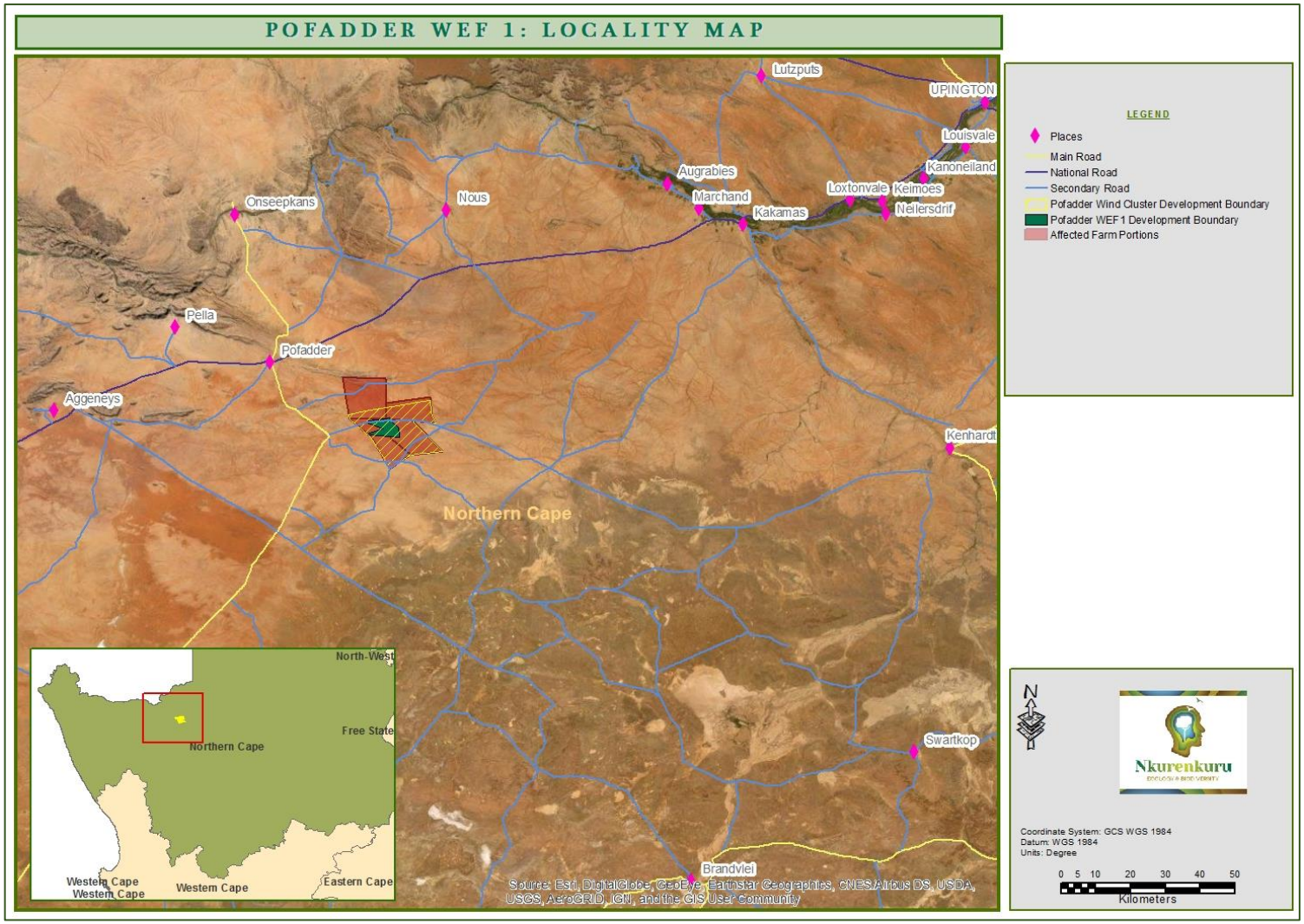


Figure 1: Locality of the project site earmarked for the development of the Pofadder WEF1 south-east of the town Pofadder in the Northern Cape Province. Inset map shows the main map extent (red square) within the Northern Cape.

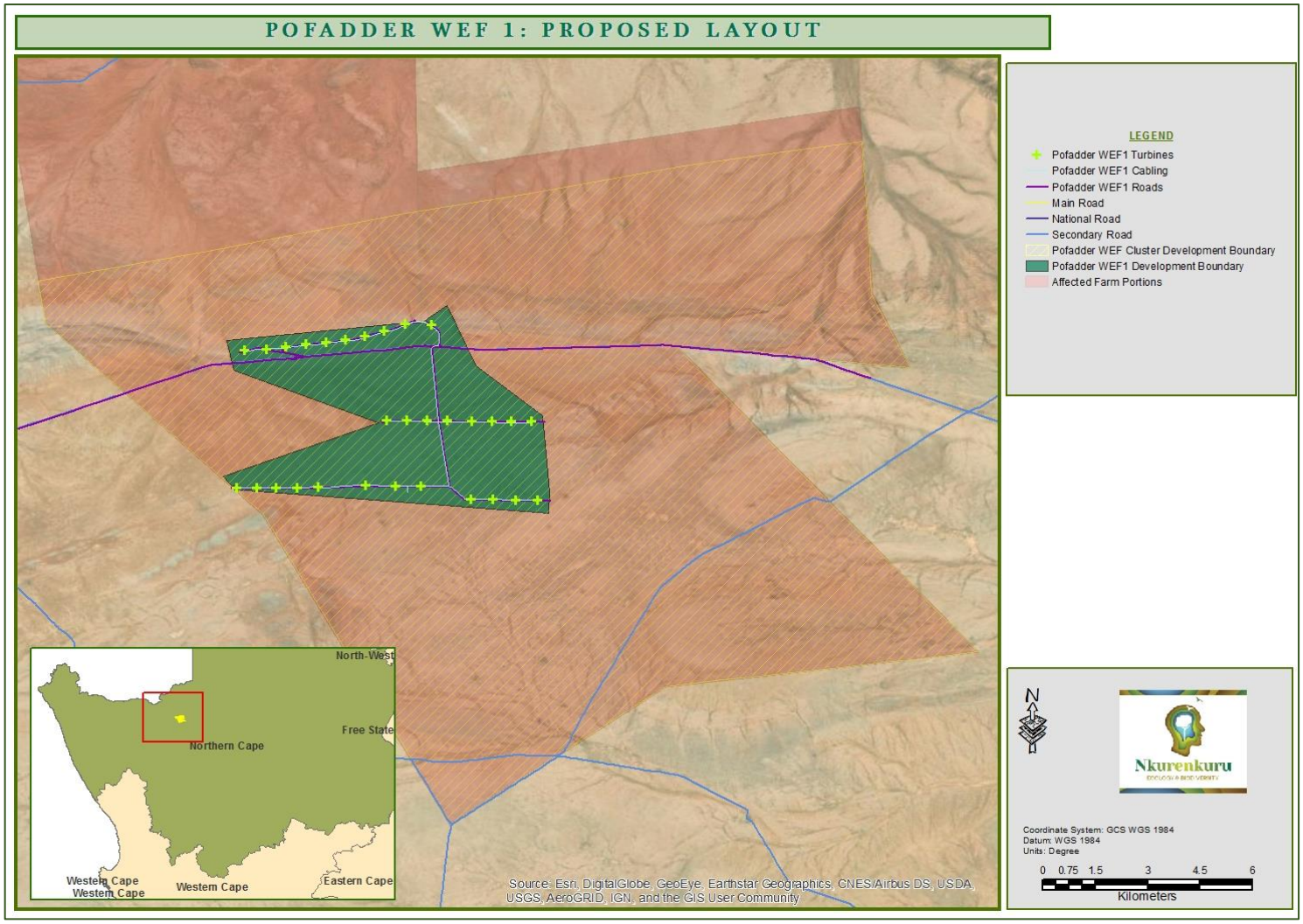


Figure 2: Proposed layout of the Pofadder WEF 1. There are two access roads: one to the west coming from the direction of Pofadder, and one to the east coming from the direction of Kenhardt.

1.4. Terms of Reference (ToR)

To conduct a detailed site terrestrial and aquatic biodiversity sensitivity assessment, including the following:

- Desktop terrestrial biodiversity analysis
- On-site fauna and flora screening survey investigation
- Desktop identification and delineation of potential freshwater resource areas potentially affected by the proposed development, or occurring within a 500m radius of the proposed development using available imagery, contour information and spatial datasets in a Geographical Information System (GIS);
- Site-based (detailed in-field) delineation of the outer boundary of wetland/watercourse areas within the project focal area and which were flagged during the desktop screening/risk assessment;
- Detailed compilation of a site screening / sensitivity report which adheres to the following (this list is not exhaustive):

    - An Initial Site Sensitivity Verification report meeting the requirements for environmental themes in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
    - Identification of any discrepancies with the environmental sensitivity as identified on the national web based environmental screening tool;
    - Refine / confirm the delineation of the CBA;
    - Identification of sensitive areas to be avoided (including corresponding spatial data);
    - Identification of sensitive species that occur on site;
    - Recommendations regarding potential development areas for wind energy within the project site (including acceptable footprint limit); and
    - Recommendations regarding the scope and timeframe for further assessment.

1.5. Conditions of this Report

All findings, recommendations, and conclusions provided in this report are based on the authors best scientific and professional knowledge at the time of compilation, as well as information available at the time of compilation. This report, or any part of form thereof, may not be amended or extended in any way without the prior written consent of the authors. Any recommendations, statements, or conclusions drawn from, or based on, this report must clearly cite or make reference to this report. Whenever such recommendations, statements, or conclusions form part of another report, whether main or other, relating to the current investigation, this report must be included in its entirety.

1.6. Relevant Legislation: Terrestrial Biodiversity

The following legislation was taken into account whilst compiling this report:

1.6.1. Provincial

Northern Cape Nature Conservation Act No. 9 of 2009, with special reference to:

- Schedule 1: Specially Protected Species.
- Schedule 2: Protected Species.
- Schedule 6: Invasive Species.

The above-mentioned Nature Conservation Act is regarded by Northern Cape Provincial Legislature, as the legally binding provincial document, providing regulations, guidelines, and procedures for the sustainable utilisation of wild animals, aquatic biota and plants, the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and also, the general conservation of flora and fauna, and the destruction of problematic (vermin and invasive) species.

1.6.2. National

» National Environmental Management Act / NEMA (Act No 107 of 1998), and all amendments and supplementary listings and/or regulations.
» Environment Conservation Act (ECA) (No 73 of 1989) and amendments.
» National Environmental Management Act: Biodiversity Act / NEMA:BA (Act No. 10 of 2004) and amendments.
» National Forest Act 1998 / NFA (No 84 of 1998).
» National Veld and Forest Fire Act (Act No. 101 of 1998).
» Conservation of Agricultural Resources Act / CARA (Act No. 43 of 1983) and amendments.

1.6.3. International

» Convention on International Trade in Endangered Species of Fauna and Flora (CITES; https://cites.org/eng).
» The Convention on Biological Diversity (CBD; https://www.cbd.int/).
» The Convention on the Conservation of Migratory Species of Wild Animals (CMS; https://www.cms.int/).

1.7. Relevant Legislation: Aquatic Biodiversity

The link between ecological integrity of freshwater resources and their continued provision of valuable ecosystem goods and services to burgeoning populations is well-recognised,

both globally and nationally (Rivers-Moore et al., 2007). In response to the importance of freshwater aquatic resources, protection of wetlands and rivers has been campaigned at national and international levels. A strong legislative framework which backs up South Africa's obligations to numerous international conservation agreements creates the necessary enabling legal framework for the protection of freshwater resources in the country. Relevant environmental legislation pertaining to the protection and use of aquatic ecosystems (i.e. wetlands and rivers) in South Africa has been summarized below.

1.7.1. South African Constitution 108 of 1996

Section 24 of Chapter 2 of the Bill of Rights No. 108 of 1996 states that everyone has the right to:

(a) to an environment that is not harmful to their health or well-being; and
(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that—
    (i) prevent pollution and ecological degradation;
    (ii) promote conservation; and
    (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

1.7.2. National Environmental Management Act 107 of 1998

Wetlands and other watercourses defined in the NWA are also protected in the National Environmental Management Act (Act 107 of 1998), (NEMA). The act lists several activities that require authorisation before they can be implemented. NEMA lists various activities that require authorisation when located within 32 m or less from the edge of a wetland or other watercourse type.

1.7.3. National Water Act (Act No. 36 of 1998)

According to the National Water Act (Act No. 36 of 1998), a water resource is defined as: "a watercourse, surface water, estuary, or aquifer. A watercourse in turn refers to

(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse. Reference to a watercourse includes, where relevant, its bed and banks."

A wetland is defined as: "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances support or would support vegetation typically adapted to life in saturated soil."

Chapter 4 of the Act deals with the regulation of the use of water and the requirements for controlled activities, general authorisations, and licenses. In general, a water use must be licensed unless: it is listed in Schedule 1 of the Act as an existing lawful water use, or is permissible under a general authorisation, or if a responsible authority waives the need for a license.

According to the Department of Water and Sanitation (DWS), any activity that falls within the temporary zone of a wetland or the 1:100 year floodline (whichever is greater) qualifies as a Section 21 water use activity (depending on the use) and will thus require either a general authorization or Water Use License (WUL). According to the NWA, an application for a WUL should be submitted to the DWS if any of the above activities are to be undertaken.

Section 21 of the National Water Act (NWA Act No. 36 of 1998) covers the following activities, which might be applicable to the proposed project. According to Section 21 of the NWA and in relation to the river ecosystem, the following activity is considered a use, and therefore requires a water use license:

- 21 (c) impeding or diverting the flow of water in a watercourse;
- 21 (i) altering the bed, banks, course or characteristics of a watercourse;

In terms of Section 22 (1), a person may only undertake the abovementioned water uses if it is appropriately authorised:

22(1) A person may only use water

(a) without a licence
  (i) if that water use is permissible under Schedule 1;
  (ii) if that water use is permissible as a continuation of an existing lawful use; or
  (iii) if that water use is permissible in terms of a general authorisation issued under section 39;
(b) if the water use is authorised by a licence under this Act; or
(c) if the responsible authority has dispensed with a licence requirement under subsection (3).

1.7.4. Other Relevant Legislation

- The National Forests Act No. 84 of 1998;
- The Natural Heritage Resources Act No. 25 of 1999;
- The National Environmental Management: Protected Areas Act No. 57 of 2003;
- Minerals and Petroleum Resources Development Act No. 28 of 2002;

2. METHODOLOGY

2.1. Assessment Approach and Philosophy

2.1.1. Terrestrial Biodiversity

The assessment was conducted according to the 2014 EIA Regulations, as amended 7 April 2017, as well as within the best-practice guidelines and principles for biodiversity assessment (Brownlie et al., 2006; de Villiers et al., 2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e., Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans), and Freshwater Ecosystem Priority Areas.
- Demonstrate how the proponent intends on complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should, in order of priority aim to:
    - Avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and
    - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic, or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by NEMA.

In order to adhere to the above principles and best-practice guidelines, the basis for the study approach and assessment philosophy included baseline data collection, desktop studies, and site walkovers/field surveys of the property, describing:

- The broad botanical characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size,

relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of pattern, the following was studied:

Community and ecosystem level:

» The main vegetation types and plant communities (Dayaram et al., 2018; Mucina and Rutherford, 2006), their aerial extents, and interaction with neighbouring types, soils, or topography.
» Threatened or Vulnerable ecosystems (cf. new South African vegetation map/National Spatial Biodiversity Assessment1, fine-scale systematic conservation plans, etc) (South African National Biodiversity Institute, 2019).

Species-level:

» Species of Conservation Concern (SoCC: Red List and protected species), giving GPS location, if possible (Raimondo et al., 2009).
» Estimated population sizes and viabilities of SoCC present on site (including the degree of confidence in prediction based on availability of information and specialist knowledge; i.e., High = 70 – 100% confident, Medium = 40 – 70% confident, Low = 0 – 40% confident).
» Probability of other SoCC occurring in the region of the site (include degree of confidence).

Other pattern issues:

» Any significant landscape features, or rare or important vegetation associations, such as seasonal wetlands, alluvium, seeps, sandstone outcroppings, steep southern aspects, drainage lines etc. in the vicinity.
» The extent of alien plant cover within the site, and whether any infestations are the result of prior soil disturbance, such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than an infestation of undisturbed sites).
» The condition of the site in terms of current or previous land uses.

In terms of process, the following was studied:

» The key ecological "drivers" of ecosystems on the site and in the vicinity.
» Any mapped spatial components of ecological processes that may occur on site or in the vicinity (i.e., corridors such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and vegetation boundaries such as edaphic interfaces, upland-lowland interfaces, or biome boundaries).

» Any possible changes in key processes e.g., increased fire frequency or drainage/artificial recharge of aquatic systems.

Any further studies that may be required during or after the EIA process will be outlined, together with all relevant legislation, permits, and standards that would apply to the development.

The opportunities and constraints for development is described and shown graphically on an aerial photograph, satellite image, or map delineated at an appropriate level of spatial accuracy.

2.1.2. Aquatic Biodiversity

The delineation and classification of freshwater resources were conducted using the standards and guidelines produced by the DWS (DWAF, 2005 & 2007) and the South African National Biodiversity Institute (SANBI, 2009).

In addition to these guidelines, the general approach to freshwater habitat assessment was furthermore based on the proposed framework for wetland assessment as proposed within the Water Research Commission's (WRC) report titled: "Development of a decision-support framework for wetland assessment in South Africa and a Decision-Support Protocol for the rapid assessment of wetland ecological condition" (Ollis et. al., 2014). A schematic illustration of the proposed decision-support framework for wetland assessment in South Africa is provided in Figure 3 below.

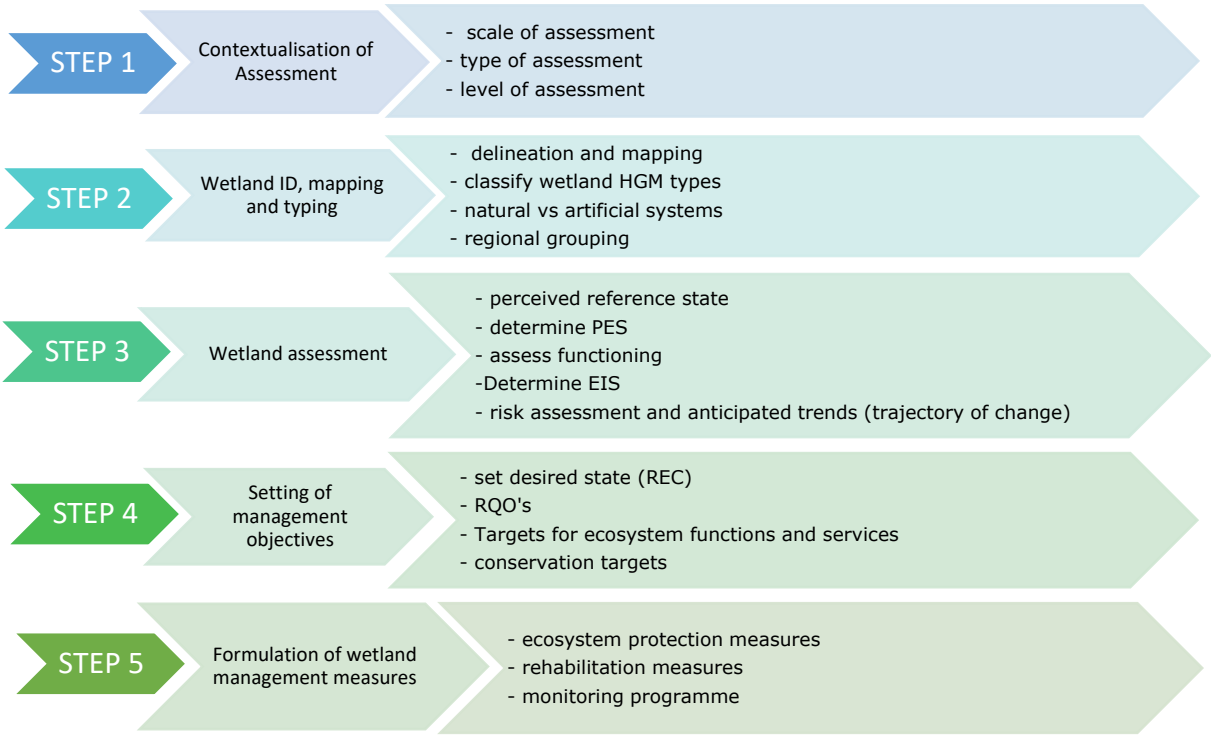


Figure 3: Proposed decision support framework for wetland assessment in South Africa (after Ollis et al., 2014)

2.2. Data Exploration and Review

Data sources from the literature and GIS spatial information was consulted and used where necessary in the study and include the following (see Figure 4 for the area used to compile a plant and animal species list, and Aquatic Resources***:***

The assessment was initiated with a survey of the pertinent literature, past reports and the various conservation plans that exist for the study region. The desktop delineation of all freshwater resources (rivers / streams and wetlands) within 500m (DWS regulated area) of the proposed project site was undertaken by analysing available 10m contour lines and colour aerial photography supplemented by Google EarthTM imagery where more up to date imagery was needed. Digitization and mapping were undertaken using ArcGis software. All of the mapped freshwater resources were then broadly subdivided into distinct resource units (i.e. classified as either riverine or wetland systems / habitat). This was undertaken based on aerial photographic analysis and professional experience in working in the region.

Following the desktop identification and mapping exercise, freshwater resource features where confirmed and their boundaries refined in-field

Table 1 for a summary):

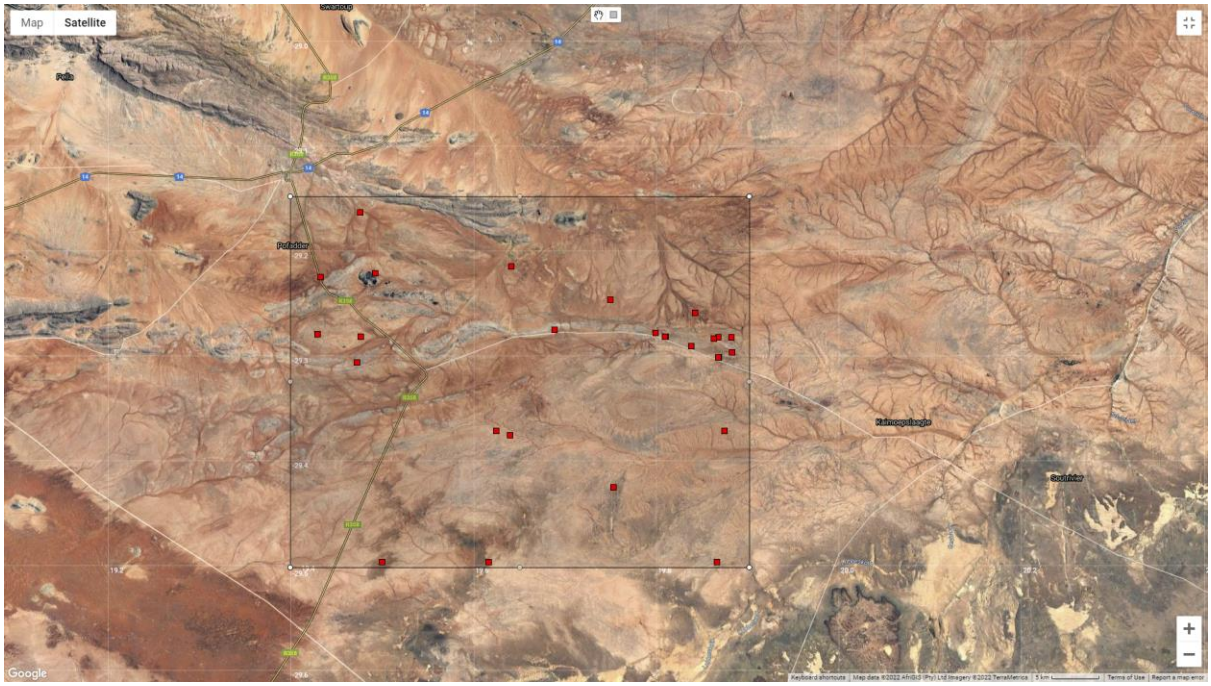


Figure 4: Site locality (red) and area indicating the extent of data extraction from POSA. Extracted data was used to compile a list of plant species that may potentially occur within the site, as well is the surrounding area, and provide an indication of potential Species of Conservation Concern that may be found within this area

Vegetation:

- » South African National Vegetation Map (SANBI, 2018); (Mucina & Rutherford, 2006) and National List of Threatened Ecosystems (NEM:BA, 2011): vegetation types and their respective conservation statuses. The latest version of the National Vegetation Map was also consulted to check for any updates of the respective regions (Dayaram, et al., 2019); (SANBI, 2018).
- » Botanical Database of Southern Africa (BODATSA), hosted by the South African National Biodiversity Institute (SANBI; https://posa.sanbi.org; also referred as POSA: Plants of Southern Africa): information on plant species recorded for the Quarter Degree Squares 2919BA, 2919BB, 2919BD and 2920AA. This is a larger area than required and is a conservative approach that ensures all species possibly occurring within the site have been represented. It also accounts for the fact that the site itself might not be well represented in national databases.
- » Threatened Species Programme, Red List of South African Plants (SANBI, 2021): The IUCN conservation statuses of all listed species were extracted from this database.

Ecosystem:

- » Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment (Nel, et al., 2011). This includes rivers, wetlands, and catchments defined in the study area.

- » Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (Government of South Africa, 2008).
- » Critical Biodiversity Areas for the site and surroundings (CBA Map for Northern Cape; obtained from SANBI Biodiversity GIS (BGIS), specifically http://bgis.sanbi.org/Projects/Detail/203.

Fauna:

The list of mammal and herpetofauna species predicted to occur in the region and their respective likelihood of occurrence within the study area was generated based on known distributions and habitat suitability, based on online and literature sources such as MammalMap, ReptileMap, FrogMap and the ReptileAtlas as well as field guides such as, Skinner & Chimimba (2005), Apps (ed. 2012), Stuart & Stuart (1998), Bates *et al* (2014), Minter *et al*. (2004), Branch (2009) and Du Preez and Carruthers (2009). The literature study focussed on querying the online database to generate species lists for the relevant Quarter Degree Squares (QDS).

The predicted list is typically heavily influenced by factors other than just distribution or biome type. Factors such as habitat suitability, current land use, current levels of disturbance and structural integrity of the habitats all influence the potential for predicted species to occur in the vicinity of the study area. There is a high likelihood that not all mammal species known to occur within the region will be located within the study area and surrounding areas. Therefore, a 'Likelihood of Occurrence' (LOO) and a 'Species of Conservation Concern' review will be applied to any potential omissions in the data set. For the LOO analysis, a full summary of Red List faunal species (IUCN, 2021); (SANBI, 2021), as well as other SCC will be tabulated, with a LOO applied.

Likelihood of Occurrences will be based upon available spatial imagery and will be based on:

- » Habitat suitability;
- » Overlap with known distributions;
- » Rarity of the species; and
- » Current Impacts.

Mammal distribution data were obtained from the following sources:

- » The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- » The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (www.ewt.org.za) (EWT, 2016);
- » Animal Demography Unit (ADU) - MammalMap Category (MammalMap, 2017) (mammalmap.adu.org.za);
- » Stuarts' Field Guide to Mammals of Southern Africa – Including Angola, Zambia & Malawi (Suart & Stuart, 2015)

- A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013).
- Smither's Mammals of Southern Africa (Apps, ed. 2012)

Herpetofauna distribution and species data were obtained from the following sources:

- South African Reptile Conservation Assessment (SARCA) (sarca.adu.org);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Atlas and Red list of Reptiles of South Africa, Lesotho and Swaziland (Bates et al.,
- 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009);
- Animal Demography Unit (ADU) - FrogMAP (frogmap.adu.org.za);
- Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Mintner et
- al., 2004); and
- Ensuring a future for South Africa's frogs (Measey, 2011).

Aquatic Resources:

The assessment was initiated with a survey of the pertinent literature, past reports and the various conservation plans that exist for the study region. The desktop delineation of all freshwater resources (rivers / streams and wetlands) within 500m (DWS regulated area) of the proposed project site was undertaken by analysing available 10m contour lines and colour aerial photography supplemented by Google EarthTM imagery where more up to date imagery was needed. Digitization and mapping were undertaken using ArcGis software. All of the mapped freshwater resources were then broadly subdivided into distinct resource units (i.e. classified as either riverine or wetland systems / habitat). This was undertaken based on aerial photographic analysis and professional experience in working in the region.

Following the desktop identification and mapping exercise, freshwater resource features where confirmed and their boundaries refined in-field

Table 1: Information and data coverages used to inform the ecological assessment.

	Data/Coverage Type	Relevance	Source
Biophysical Context	**Colour Aerial Photography**	Desktop mapping of habitat/ecological features	National Geo-Spatial Information (NGI)
	Latest Google Earth™ imagery	To supplement available aerial photography	Google Earth™ On-line
	1:50 000 River Line (GIS Coverage)	Highlight potential on-site and local rivers and wetlands and map local drainage network.	CSIR (2011)
	National Land-Cover	Shows the land-use and disturbances/transformations within and around the impacted zone.	DEA (2015)
	South African Vegetation Map (GIS Coverage)	Classify vegetation types and determination of reference primary vegetation	Mucina & Rutherford (2012; 2018); Dayaram et al., 2018
	NFEPA: river and wetland inventories (GIS Coverage)	Highlight potential on-site and local rivers and wetlands	CSIR (2011)
Conservation and Distribution Context	**National Biodiversity Assessment – Threatened Ecosystems** (GIS Coverage)	Determination of national threat status of local vegetation types	SANBI (2011)
	Northern Cape Biodiversity Conservation Plan (GIS Coverage)	Determination of provincial terrestrial/freshwater conservation priorities and biodiversity buffers	SANBI (2016)
	SANBI's PRECIS (National Herbarium Pretoria Computerized Information System) electronic database	Determination of plant species composition within the region as well as potential conservation important plants.	http://posa.sanbi.org 2020-01-20_181608464-BRAHMSOnlineData
	Red Data Books (Red Data Lists of Plants, Mammals, Reptiles, and Amphibians	Determination of endangered and threatened plants, mammals, reptiles and amphibians	Various sources
	Animal Demography Unit	Determination of faunal species composition within the region as well as potential conservation important faunal species.	ADU, 2019
	Smither's Mammals of Southern Africa	Compilation of a species list.	Apps (ed.) 2012
	The Mammals of the Southern African Subregion	Compilation of a species list.	Skinner & Chimimba (2005)
	Field guide to snakes and other reptiles of southern Africa	Compilation of a species list.	Branch (1998)

2.3. Criteria used to Assess the Site Sensitivity during the Scoping Phase

The broad-scale scoping phase ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature

and various spatial databases (e.g. SIBIS, BGIS). The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

Table 2: Explanation of sensitivity rating

Sensitivity	Factors contributing to sensitivity	Examples of qualifying features
VERY HIGH	Indigenous natural areas that are highly positive for any of the following: ▪ Critical habitat for range restricted species of conservation concern that have a distribution range of less than 10 km^2 ▪ Presence of species of conservation concern listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare ▪ Habitats/Vegetation types with high conservation status (low proportion remaining intact, highly fragmented, habitat for species that are at risk). ▪ Protected habitats (areas protected according to national/provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas, Lake Areas Development Act). These areas/habitats are irreplaceable in terms of species of conservation concern May also be positive for the following: ▪ High intrinsic biodiversity value (high species richness and/or turnover, unique ecosystems) ▪ High value ecological goods and services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value) ▪ Low ability to respond to disturbance (low resilience, dominant species very old).	▪ CBA 1 areas ▪ Remaining areas of vegetation type listed in Draft Ecosystem List of NEM:BA as Critically Endangered, Endangered, or Vulnerable. ▪ Protected forest patches. ▪ Confirmed presence of populations of species of conservation concern (Critically Endangered, Endangered, Vulnerable & Rare)
HIGH	Indigenous natural areas that are positive for any of the following: ▪ High intrinsic biodiversity value (moderate/high species richness and/or turnover). ▪ Confirmed habitat highly suitable for species of conservation concern (Those species listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or	▪ CBA 2 "critical biodiversity areas". ▪ Confirmed habitat where species of conservation concern could potentially occur (habitat is suitable, but no confirmed records). ▪ Habitat containing individuals of extreme age.

Sensitivity	Factors contributing to sensitivity	Examples of qualifying features
	Vulnerable according to the IUCN Red List 3.1. Categories and Criteria). ▪ Moderate ability to respond to disturbance (moderate resilience, dominant species of intermediate age). ▪ Moderate conservation status (moderate proportion remaining intact, moderately fragmented, habitat for species that are at risk). ▪ Moderate to high value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value). These areas/habitats are unsuitable for development due to a very likely impact on species of conservation concern May also be positive for the following: ▪ Protected habitats (areas protected according to national/provincial legislation, e.g. National Forests Act, Draft Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act)	▪ Habitat with low ability to recover from disturbance. ▪ Habitat with exceptionally high diversity (richness or turnover). ▪ Habitat with unique species composition and narrow distribution. ▪ Ecosystem providing high value ecosystem goods and services.
Medium	Indigenous natural areas that are positive for: ▪ Suspected habitat for species of conservation concern based either on there being records for this species collected I the past prior to 2002 or being a natural area included in a habitat suitability model (Those species listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria). Indigenous natural areas that are positive for one or two of the factors listed below, ▪ Moderate intrinsic biodiversity value (moderate species richness and/or turnover). ▪ Moderate to moderate low ability to respond to disturbance (moderate resilience, dominant species of intermediate age). ▪ Moderate conservation status (moderate proportion remaining intact, moderately fragmented, habitat for species that are at risk). ▪ Moderate value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value).	▪ CBA 2 "corridor areas", ESA 1 and ESA2. ▪ Habitat with moderate diversity (richness or turnover). ▪ Suspected habitat for species of conservation concern.
Low	Degraded or disturbed indigenous natural vegetation	

Sensitivity	Factors contributing to sensitivity	Examples of qualifying features
	No Natural habitat remaining	

*** Please not that this is only a preliminary ecological sensitivity map, and the sensitivity assessment and mapping will be finalised during the EIA phase.**

2.4. Scoping Phase Impact Assessment

The Scoping Phase Impact Assessment will include:

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project;
- a description and evaluation of environmental issues and potential impacts (including direct, indirect, cumulative impacts and residual risks) that have been identified
- Direct, indirect, cumulative impacts and residual risks of the identified issues must be evaluated within the Scoping Report in terms of the following criteria:
    - the nature, which shall include a description of what causes the effect, what will be affected and how it will be affected, for each impact anticipated;
    - the extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. See Table on the next page.
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- a comparative evaluation of the identified feasible alternatives, and **nomination of a preferred alternative** for consideration in the EIA phase
- Identification of potentially significant impacts **to be assessed** within the EIA phase and details of the methodology to be adopted in assessing these impacts. This should be detailed enough to include within the **Plan of Study for EIA** and must include a **description of the proposed method** of assessing the potential environmental impacts associated with the project. This must also include any gaps in knowledge at this point of the study and further recommendations for the EIA Phase. Consideration of areas that would constitute "acceptable and defendable loss" should be included in this discussion.

Example of Impact table summarising the evaluation of Potential Impacts Associated with the Construction of the Facility at the Scoping phase

Impacts
Description of the expected impacts. Areas anticipated to be affected.
Desktop Sensitivity Analysis of the Site:
Sensitivity analysis in terms of the impacts expected. Discuss areas of high concern.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
i.e. Disturbance to and loss of indigenous natural vegetation	Discussion of the consequences of the construction of the facility to the issue/impact considered in column 1.	i.e. Local/Regional/ National	No-Go areas would include the larger drainage lines, and Duneveld.
Gaps in knowledge & recommendations for further study »			

2.5. Assumptions and Limitations

This report deals exclusively with a specifically defined area, and the impacts upon plant and animal biodiversity and natural terrestrial and aquatic/freshwater resource ecosystems in that area. As such:

- All relevant project information provided by the applicant and engineering design team to the ecological specialist was correct and valid at the time that it was provided.

Furthermore, information used to inform the assessment was limited to desktop data and GIS coverage's available for the province and district municipality at the time of the assessment as well as available existing specialist studies undertaken within the region.

3. NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL

Introduction and summary of the Screening Tool and the link between this tool and the newly gazetted Protocols for specialists.

The Screening Tool, developed by the Department of Environmental Affairs ("DEA"), now Department Forestry and Fisheries of Environment, (DFFE), is a geospatial web-enabled application that aims to provide readily available information, known as 'spatial datasets', which enables applicants for Environmental Authorisation to screen their proposed site for environmental sensitivities.

The Screening Tool provides site specific information to assist an applicant throughout the EIA process. The information provided includes, for example, zoning identification, applicable Environmental Management Frameworks or bio-regional plans, project specific requirements such as specialist studies, and the minimum information to be included in the EIA report.

On 5 July 2019, the Minister of Environment, Forestry and Fisheries, Barbara Dallas Creecy, published a notice requiring that when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the Environmental Impact

Assessment Regulations, 2014 (as amended) (the "EIA Regulations"), the applicant must submit the report generated by the National Web Based Screening Tool (the "Screening Tool") with the application. This notice came into effect in October 2019.

The South African National Biodiversity Institute (SANBI), through its Biodiversity and Land Use (BLU) Project and the Council for Scientific and Industrial Research (CSIR) has, since 2017, been supporting the Department of Environment Forestry and Fisheries (DEFF) in integrating biodiversity information into DEFF's web-based National Environmental Screening Tool (hereafter referred to as 'screening tool') and developing a set of biodiversity related protocols that an applicant needs to adhere to in the Environmental Authorisation (EA) process.

On 20 March 2020 the Minister of Forestry, Fisheries and the Environment gazetted Terrestrial and Aquatic Biodiversity Protocols for national implementation purposes.

The Screening Tool consists of a number of themes including agriculture, avifauna, terrestrial and aquatic biodiversity, plant and animal species, noise, defence and civil aviation. Each of the themes consists of spatial datasets that correspond to the respective theme. Each dataset within the respective theme has been assigned a sensitivity level. Most of the themes within the Screening Tool make use of a four-tier sensitivity system, where delineated areas and features are assigned a sensitivity level of either "low (L)", "medium (M)", "high (H)" or "very high (VH)". Table 3 below describes the four sensitivity classes and their definitions.

Table 3: Summary of the sensitivity classes.

Assessment	Description
VERY HIGH	Area is rates as being extremely sensitivity to development and the risk of finding sensitive biodiversity features at the site is very high. Consequently, the area will either have very high conservation or socio-economic value.
High	Area is rated as being highly sensitive to development and the risk of finding sensitive biodiversity features at the site is high. Consequently. The area will either have high conservation or socio-economic value
Medium	Area is rated as being of medium sensitivity to development and there is a medium to moderate risk of finding sensitive biodiversity features at the site. Consequently, the area will either have medium conservation or socio-economic value.
Low	Area is considered to have low levels of sensitivity and there is low risk of finding sensitive biodiversity features at the site. Consequently, the area has a low conservation or socio-economic value.

A number of datasets were used for the biodiversity related themes. Table 4 identifies the datasets that underpin the various biodiversity related themes in the Screening Tool. For the Aquatic and Terrestrial Biodiversity Themes, all features that have known mapped features of sensitive biodiversity features are assigned a "very high" sensitivity. Where there are no known sensitive biodiversity features, a "low" sensitivity is assigned. Subsequently a two-tier sensitivity system has been applied to the Terrestrial Biodiversity Themes ("very high" and "low") and are based on the presence or absence of known sensitive biodiversity features respectively. In essence the "very high" and "low"

sensitivity ratings should be interpreted as there being a greater and lower risk of finding important biodiversity in these areas respectively. It is important to note that all the "very high" delineated areas and features are sensitive but the degree to which these areas can be impacted upon is different for the different "very high" delineated areas and features, depending on the development type. The degree of impact on these areas can only be assessed with the EIA process.

Table 4: Summary of the datasets used to underpin the aquatic and terrestrial biodiversity themes and the sensitivity rating of these features.

Terrestrial & Aquatic Biodiversity Themes Datasets Used	**Sensitivity**
Protected Areas (Terrestrial)	**Very High**
Critical Biodiversity Areas – CBAs (Terrestrial and Aquatic)	**Very High**
Ecological Support Areas – ESAs (Terrestrial and Aquatic)	**Very High**
Strategic Water Source Areas (Terrestrial & Aquatic)	**Very High**
National Freshwater Priority Areas (FEPA) catchments (Terrestrial & Aquatic)	**Very High**
Priority Areas for Protected Area Expansion (Terrestrial)	**Very High**
Indigenous Forest (Terrestrial)	**Very High**
Rivers (Aquatic)	**Very High**
Wetlands (Aquatic)	**Very High**
Estuaries (Aquatic)	**Very High**
Absence of above listed features	**Low**

As for the Animal and Plant Species Themes, the four-tier sensitivity system have been implemented to the various data layers underpinning these themes, namely "Low", "Medium", "High" and "Very High". Species data have been separated from ecosystem/ landscape level data to provide for huge complexities in the species data, in addition to the high numbers of threatened species within South Africa that would need to be processed for inclusion into the screening tool. As such, it was decided to keep the species data separate for simpler integration within the Screening Tool. It should also be noted that the species guilds that will be covered in the Animal Species Protocol include mammals, reptiles, amphibians, butterflies and birds. A summary of the datasets used to underpin the Animal and Plant themes and their sensitivity rating are provided in Table 5 below.

Table 5: Summary of the datasets used to underpin animal and plant themes and the sensitivity rating of these features.

Plant and/or Animal Species Theme Data Sets Used	**Sensitivity**
Critical habitat for range restricted species of conservation concern that have a global range of less than 10km^2.	**Very High**
Confirmed habitat for species of conservation concern.	**High**
Suspected habitat for species of conservation concern based either on there being records for this species collected in the past prior to 2020 or being a natural area included in a habitat suitability model.	**Medium**
Areas where no natural habitat remains.	**Low**

3.1. Description/discussion of the sensitive features found within the project site, as identified within the screening tool and based on the findings of a site visit.

According to the Screening Report generated on the 20th of February 2022 (12:50:16) the following sensitivities (pertaining to terrestrial biodiversity) were identified within the project area:

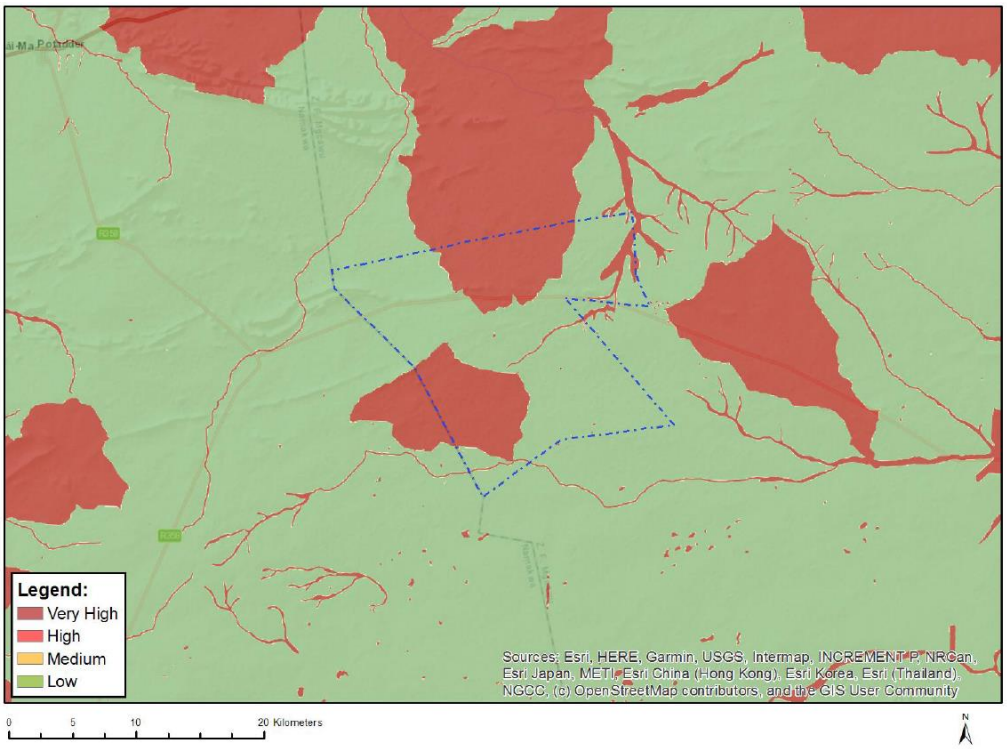
Table 6: Summary of the development site's environmental sensitivities.

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Aquatic Biodiversity Theme	X			
Animal Species Theme		X		
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

A description of the various applicable themes and their sensitivities are provided below as well the confirmation or refute of these sensitivities within the project site based on the findings of the site visit. Take note that this study and report addresses the terrestrial themes, however some of the terrestrial biodiversity themes relate to aquatic features such NFEPA rivers and sub-quaternary catchments and as such these aspects are addressed to some extent where relevant.

Aquatic Biodiversity Theme: Sensitivity

Feature	Sensitivity
Low Sensitivity	**Low Sensitivity**
Rivers	**Very High Sensitivity**
Wetland and Estuaries	**Very High Sensitivity**
Freshwater ecosystem priority area quinary catchment	**Very High Sensitivity**



DISCUSSION OF SENSITIVITY FEATURES BASED ON ON-SITE FINDINGS (FOLLOWING A SITE-VISIT)

The majority of the "Very High Sensitive" areas identified within the affected properties are based primarily on the NFEPA coverage (mainly FEPA and Upstream Catchments) and SANBI's 2018 National Wetland Map 5 and 2018 National River Map.

The underlying features associated with the Very High sensitive areas within the development site can be summarised as follow:

Table 7: Reasons underlying the CBA1 and CBA2 status of the affected property.

Feature	Very High	High	Medium	Low	Remarks
Larger River Features identified within the NBA River Map (2018) (1:500 000)	**X**				» Four river features have been mapped within namely the Kaboep River draining the central-eastern and north eastern portion of the project site and three smaller unnamed rivers draining the central-western and south-western portion of the project site. » All four river have been classified as Endangered aquatic ecosystems » According to the current layout, none of these rivers will be directly impacted by the proposed development.
Wetlands identified within the NBA Wetland Map 5 (2018) (1:5000)	**X**				» Eight depression wetlands have been mapped, mostly located within the eastern and southern portion of the project site. » Two riverine wetlands (previously classified as valley floor wetland) have been mapped, and is associated with the Kaboep River the east and north-east of the project site. » All eight of these wetlands have been classified as Critically Endangered aquatic ecosystem. » According to the current layout, none of these rivers will be directly impacted by the proposed development.
Sub-Quaternary Catchment of FEPA-Rivers	**X**				» Two FEPA 1 prioritized sub-quaternary catchments include portions of the project site (one in the north and the other in the south-west). » Only five wind turbines and a limited extent of access roads and cabling are planned within these catchments.

These freshwater resource features underlying the affected property as well as acceptable development recommendations are furthermore discussed in sections 6.2.3 and 6.2.5.

With meticulous implementation of recommended mitigation measures the proposed development of the Pofadder 1 WEF will not have an impact on these freshwater resource features.

Recommendations and additional requirements:

» An in-field delineation and classification of all freshwater resource features was done and the results are illustrated in Figure 11. The larger ephemeral washes and wetland features were either classified as Very High or High sensitive, whilst the smaller drainage systems were classified as Medium Sensitive. Furthermore, appropriate buffer areas for the freshwater resource features have been determined and area as follows:

- Primary and large ephemeral washes (including associated alluvial floodplains: 100m buffers from the outer edge of the freshwater resource features.
- Minor ephemeral washes: 50m buffers from the outer edge of the freshwater resource features.
- Endorheic depression wetlands (pans): 50m buffers from the outer edge of the freshwater resource features.
- Small drainage lines: 35m buffers.

» All ephemeral washes and alluvial floodplains with their buffer areas should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):
- only activities relating to the route access and cabling:
  - the use/upgrade of existing roads and watercourse crossings are the preferred options;
  - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
  - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

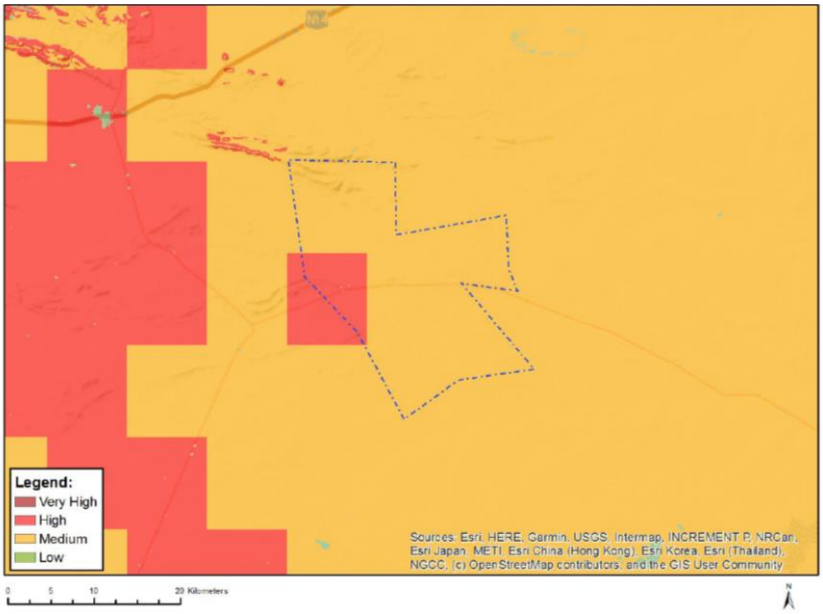
» All depression wetlands with their buffer areas should be regarded as "No-Go" areas for all activities associate with the proposed development.

» All drainage lines with their buffer areas should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):
- only activities relating to the route access and cabling:
  - the use/upgrade of existing roads and watercourse crossings are the preferred options;
  - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
  - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

» In terms of activities and infrastructure planned within the FEPA1 prioritized sub-quaternary catchments: Mitigation measures should be considered for the development of the WEF, as careless and uncontrolled activities may lead to indirect negative impacts on the lower lying watercourses. Thus, the following mitigation measures should be considered;
- During the planning and design phase the following aspects should be considered and addressed:
  - Natural runoff patterns within the catchments: Provide mitigation measures that will manage/simulate these natural runoff patterns and prevent erosion.

- Natural/normal water inputs, flow patterns and flood peaks associated with the lower lying watercourses: Provide mitigation measures in order to maintain these hydrological characteristics (drivers).
- Landscape/Ecological Connectivity: Provide mitigation measures that will prevent the fracturing of landscape (maintain connectivity between upland terrestrial habitats and downstream freshwater resource features)
- Recommended Ecological Categories (RECs) of downstream freshwater resource features: Maintain these RECs.

Animal Species Theme: Sensitivity



Feature	Sensitivity
Aves: *Neotis ludwigii* (Ludwig's Bustard, Ludwigse Pou)	**High**
Aves: *Neotis ludwigii* (Ludwig's Bustard, Ludwigse Pou)	**Medium**
Aves: *Aquila verreauxii* (Verreaux's Eagle)	**Medium**
Aves: *Saggitarius serpentarius* (Sektretarisvoël, Secretarybird)	**Medium**
Low	**Low Sensitivity**

DISCUSSION OF SENSITIVITY FEATURES BASED ON ON-SITE FINDINGS (FOLLOWING A SITE-VISIT)

Take note that the avifaunal aspect of this theme did not form part of this specific study as a separate avifaunal monitoring programme will be conducted wherein the presence of avifaunal SCC will be investigated/determined.

Apart from the avifaunal SCC that may potentially inhabit the project site, no other faunal SCC have been listed within Screening Report that may potentially inhabit the project site. Only one faunal species of conservation concern (SCC) was observed during the site-visit

namely; Bushmanland Tent Tortoise - *Psammobates tentorius verroxii* (Near Threatened). In terms of the likely impacts of the development on these tortoise species, habitat loss is not likely to be highly significant as the direct footprint of the development is not likely to exceed a few hundred hectares and this would not be significant in context of the relatively homogenous and intact surrounding landscape. In some situations, the loss of vegetation cover associated with roads and grid line construction and other cleared areas can generate potential impact on these species as they may be vulnerable to predation while crossing such cleared areas, but as the site is arid, plant cover is already low.

Due to a general low to moderate habitat and structural complexity as well as the fact that large tracts of land within the region being largely intact and undisturbed, the site is likely to have a moderate faunal diversity, including other potential SCC. Larger ephemeral washes associated floodplains and fringing shrubby vegetation are regarded as the most important and sensitive faunal habitats. Apart from *Psammobates tentorius verroxii,* other SCC which have a distribution that include the development site and are likely (moderate to high likelihood) to occur within the development site due to favourable habitat, include:

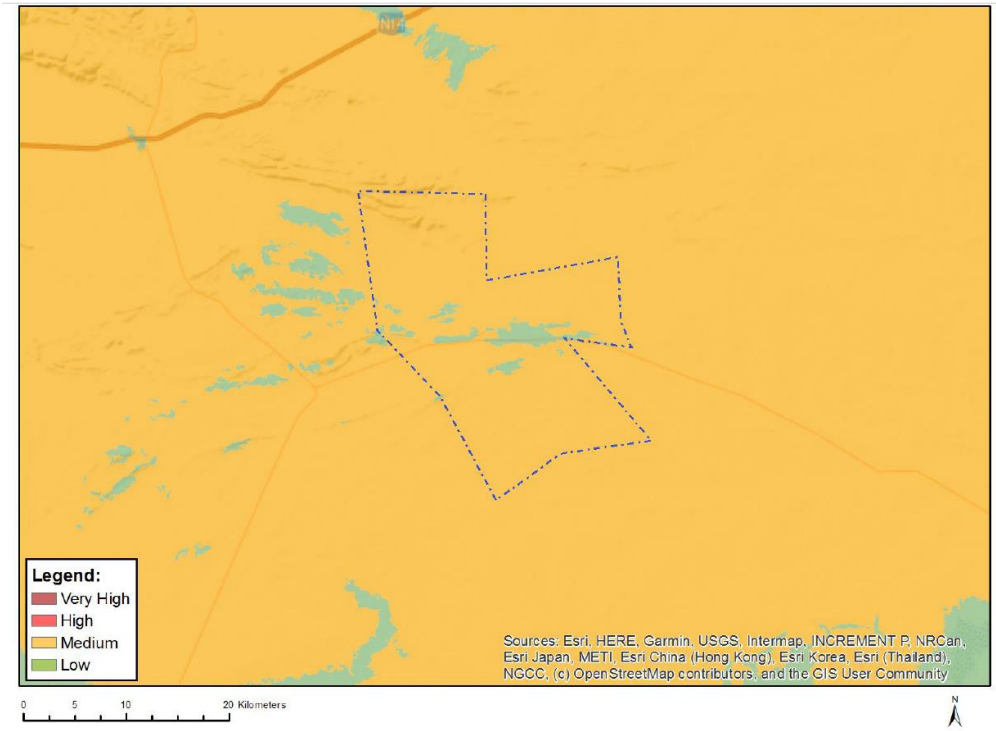
- Mammalian: Black-footed Cat – *Felis nigripes* (Near Threatened);
- Mammalian: Brown Hyena – *Parahyaena brunnea* (Near Threatened);
- Mammalian: Spectacled Dormouse – Graphiurus ocularis (Near Threatened);
- Mammalian: Littledale's Whistling Rat – Parotomys littledalei (Near Threatened);
- Reptilian: Karoo Tent Tortoise – *Psammobates tentorius tentorius* (Near Threatened); and

Based on findings of a desktop and in-field survey of the property the majority of the project area can be classified as Medium Sensitivity and provide some potential habitat for SCC. However, the larger ephemeral washes along with their associated alluvial floodplains should be considered high sensitive, due to its structural and micro-habitat complexity and uniqueness, lateral and longitudinal connectivity and the important functions and services these habitats provide towards the biodiversity of the region. This habitat has furthermore been confirmed to contain suitable habitat for the above-mentioned SCC. The quartz, boulder and rocky outcrops are furthermore considered as medium-high sensitive due to these area's moderately-high structural and micro-habitat complexity and uniqueness.

Recommendations and additional requirements: All very high and high sensitivity features should be excluded from the project footprint and be considered as No-Go Areas. A detailed survey of the development site should occur during the EIA phase. Pre-Construction Faunal Walk-Through will have to be conducted in order to identify any sensitive species (protected and SCC) that may occupy/inhabit the development footprint of the WEF and to assist in the biodiversity permitting processes.

Through the avoidance/exclusion of sensitive faunal habitats and the implementation of mitigation measures, regional faunal populations will likely not be significantly impacted and impacts on any faunal SCC should be successfully avoided.

Plant Species Theme: Sensitivity



Feature	Sensitivity
Low Sensitivity	**Low Sensitivity**
Sensitive species 1157	**Medium**
Sensitive species 854	**Medium**
Crotalaria pearsonii	**Medium**
Sensitive species 144	**Medium**

DISCUSSION OF SENSITIVITY FEATURES BASED ON ON-SITE FINDINGS (FOLLOWING A SITE-VISIT)

No floral species of conservation concern (SCC) were observed during the screening site-visit. However, due to the largely natural/undisturbed nature of the area as well as the relative wide range of environmental gradients present, creating various macro- and micro habitats, sufficient suitable habitat persists for the presence of floral SCC.

In terms of individual Plant SCC and/or important populations of Plant SCC, potential suitable habitats persist within the project site and surroundings, and as such the classification of the development area as Medium Sensitivity, in terms of Plant SCC, within the Screening Tool, is consistent with the on-site findings.

In terms of ecosystems/plant habitats/phyto-communities and general plant biodiversity, the majority of the site is considered as Medium sensitive and coincides with the Bushmanland Arid Grassland vegetation type (refer to section 7.1.1 as well as Figure 8: Map illustrating the different vegetation types, according to VegMap 2018, found on

Kluitjieskraal farm and in the general region.extent of occurrence (SANBI, 2018), and are regarded as least concern, comprising of a fairly low diversity of plants, mainly general species with a wide distribution throughout the region. Development within this plant habitat is regarded as acceptable. A total of fifteen wind turbines are planned within this vegetation type.

The larger and more prominent ephemeral washes and their alluvial floodplains have not been delineated and mapped within the national vegetation map (SANBI, 2018), however these features were determined to be largely consistent with the Namaqualand Riviere vegetation type, and are considered to be very high sensitive due to these areas being structurally more complex, contributing to plant species, habitat, and niche diversity, as well as acting as potential important biodiversity corridors. Subsequently these plant habitats along with their preliminary determined 100m buffer areas, should be considered as "No-Go" apart from the use/upgrade of existing watercourse crossings. According to the current turbine layout, only one turbine is planned within a freshwater resource feature. Preliminary buffer areas have also been recommended for all wetlands, smaller washes and drainage features. Activities allowed within these smaller, less prominent freshwater resource features as well as their associated buffer areas include;

- » the use/upgrade of existing access roads and where no viable existing access road exist, new roads may be considered; and
- » the lying of underground cabling, which should preferably occur adjacent or within the planned access routes;

for all other activities and infrastructure associated with the development, these areas should be considered as "No-Go" areas, e.g. turbines, crane pads, substations, laydown areas and any building infrastructure.

The vegetation of the more undulating hills, slopes, outcrops and inselberg areas coincides with the Bushmanland Inselberg Shrubland, Bushmanland Basin Shrubland, Eastern Gariep Rocky Desert and Namaqualand Klipkoppe Shrubland vegetation types (refer to section 7.1.1 as well as Figure 8). These vegetation types have a patchy distribution within the Bushmanland Arid Grassland (SANBI, 2018). Even though these vegetation types, combined, only cover a fairly small portion of the affected properties, a fair amount of the turbines are planned within some patches of these vegetation types (ten turbines planned within a narrow quartz ridge consistent with Bushmanland Inselberg Shrubland as well five turbines planned within a broken plain consistent with Bushmanland Basin Shrubland). These undulating areas are considered as medium-highly sensitive due to these areas' moderately high structural complexity, creating various small and fairly unique micro-habitats for "habitat specialist" plant species, especially geophytes and succulents. It is important to keep in mind that not all areas/micro-habitats within these undulating patches are regarded equally structurally complex, species diverse and ecologically sensitive. Areas that slope more gradually, and that are less diverse and structurally complex are regarded as Medium sensitive and are suitable for development. Steeper slopes, especially south facing slopes as well as areas that are highly structurally complex are regarded as High sensitive. The placement of turbines, crane pads, access

roads and underground cabling within these Medium sensitive areas are regarded as acceptable. However, these areas are not suitable for the construction of any building infrastructure. All High sensitive areas should, on the other hand, be regarded as "No-Go" areas for all activities apart from the use/upgrade of existing access routes.

A more in-depth/extensive assessment during the EIA phase may confirm the presence of SCC and the size and vitality of potential populations. However, the presence of these species/populations will likely not result in the abandonment of this development within the inspected area, as "sensitive" areas with associated buffers/corridors, as identified during the EIA phase, can be successfully avoided and impacts on SCC successfully mitigated.

Recommendations and additional requirements: The entire project site has been preliminary surveyed, and during this screening survey no plant SCC were identified within the project site. However, a more in-depth/extensive assessment during the EIA phase may confirm the presence of SCC within the development footprints. The following activities are allowed/not allowed within the identified habitat features:

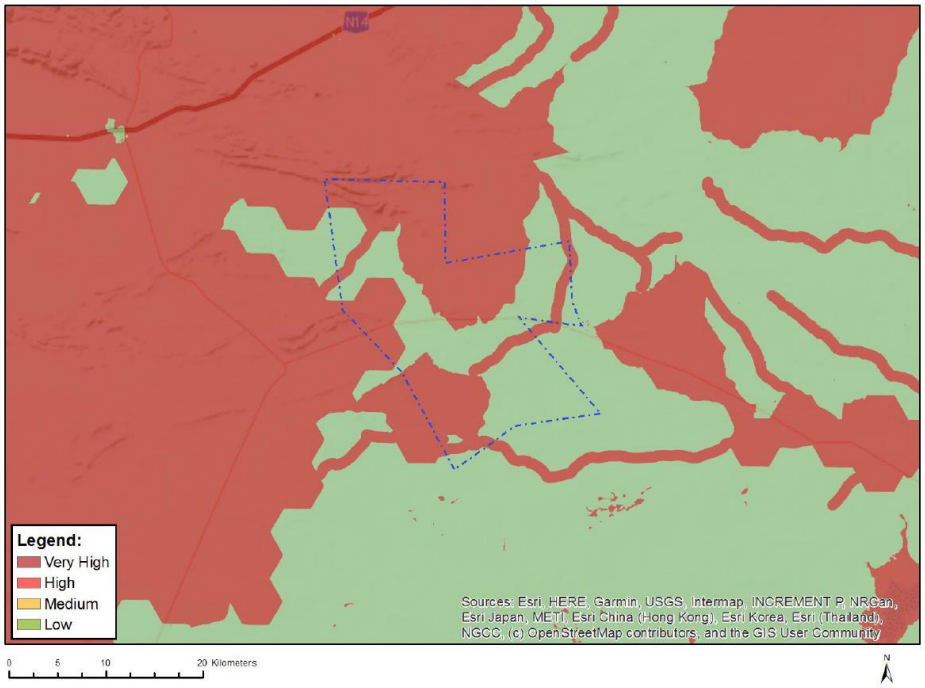
- Plains covered by the Bushmanland Arid Grassland (Medium Sensitive): This habitat is regarded as the most suitable for the proposed development and all activities associated with the development of the proposed WEF is acceptable within this habitat.
- Primary ephemeral washes and alluvial floodplains along with buffer areas (Very High Sensitive): "No-Go" area for activities apart from the use/upgrade of existing access routes.
- Larger ephemeral washes and alluvial floodplains along with buffer areas (High Sensitive): "No-Go" area for activities apart from the use/upgrade of existing access routes, the construction of new access routes where no viable existing route exists and the laying of underground cabling (only allowed along or within access routes).
- Small ephemeral washes and drainage features along with buffer areas (Medium Sensitive): "No-Go" area for activities apart from the use/upgrade of existing access routes, the construction of new access routes where no viable existing route exists and the laying of underground cabling (only allowed along or within access routes).
- More gradual sloping and less structurally complex and diverse outcrops, hills, inselbergs and broken plains (Bushmanland Inselberg Shrubland and Bushmanland Basin Shrubland vegetation types) (Medium Sensitive): The placement of turbines, crane pads, access roads and underground cabling are regarded as acceptable. However, the construction of any building infrastructure may not be allowed within these areas.
- Steeper slopes, south facing aspects and more structurally complex and diverse portions of outcrops, hills and inselbergs (Bushmanland Inselberg Shrubland and Eastern Gariep Rocky Desert and Namaqualand Klipkoppe vegetation types) (High Sensitive): "No-Go" area for activities apart from the use/upgrade of existing access routes, the construction of new access routes where no viable existing route

exists and the laying of underground cabling (only allowed along or within access routes).

A Pre-Construction Botanical Walk-Through will furthermore have to be conducted in order to determine the numbers/population sizes of sensitive plant species (protected and SCC) that may occupy/inhabit the development footprints of the SEFs and to assist in the biodiversity permitting processes.

Through the avoidance/exclusion of sensitive floral habitats and the implementation of mitigation measures, regional plant populations will likely not be significantly impacted and impacts on any plant SCC should be successfully avoided.

Terrestrial Biodiversity Theme: Sensitivity



Feature	Sensitivity
Low Sensitivity	**Low Sensitivity**
Critical Biodiversity Area 1	**Very High Sensitivity**
Critical Biodiversity Area 2	**Very High Sensitivity**
Ecological Support Area	**Very High Sensitivity**
FEPA Sub-catchments	**Very High Sensitivity**
Protected Areas Expansion Strategy	**Very High Sensitivity**

DISCUSSION OF SENSITIVITY FEATURES BASED ON ON-SITE FINDINGS (FOLLOWING A SITE-VISIT)

The majority of the "Very High Sensitive" areas identified within the affected properties are based primarily on the NFEPA coverage (mainly FEPA and Upstream Catchments) and Northern Cape CBA coverage (mainly ESA and CBA2).

The underlying features associated with the CBAs and ESAs within the property can be summarised as follow:

Table 8: Reasons underlying the CBA1 and CBA2 status of the affected property.

Feature	CBA 1	CBA 2	ESA	Other	Remarks
Larger River Features (1:500 000) and 500m Buffers			X		» The Non-FEPA river flowing in a north-eastern direction (across the eastern portion of the project site), as well as its 500m buffer areas. » According to the current layout, very limited infrastructure is planned within this ESA, as well as any other freshwater resource features: • Only one pylon planned within the non-FEPA (ESA) watercourse; and • Only one pylon planned within the associated 500m buffer area. » Furthermore, a small portion of ESA will be impacted through the use/construction of access routes and the lying of underground cabling.
FEPA-River and 500m Buffers	X			»	» The large ephemeral wash to the south-west, listed as a FEPA-River as well as a 500m buffer area. » According to the current layout, very limited infrastructure is planned within this CBA1; • No pylons or crane pads planned within this watercourse as well as the 500m buffer area; • The only infrastructure planned within this CBA1 include a small section of access road (crossing) and underground cabling.
Sub-Quaternary Catchment of FEPA-Rivers		X		X	» The bulk of the FEPA1 prioritized and Upstream catchments have been classified as Other Natural Areas whilst approximately 50% of the FEPA1 prioritized catchment associated with the FEPA-river to the south-west of the project site have been classified as CBA2. • Most of the development will occur outside of these FEPA1 prioritized catchments, whilst no activities and infrastructure are planned within the portion of the FEPA1 prioritized catchment classified as CBA2.
Wetlands (Non-FEPA)			X		» All Non-FEPA Wetlands have been classified as ESAs.

					» A few Wetland ESAs have been mapped within the south-western portion of the project site. » According to the current layout, no infrastructure is planned within any of these wetland features.
NPAES Focus Areas			**X**	**X**	» Portions of the project site are included within two NPAES Focus Areas. » The majority of these Focus Areas have been classified as Other Natural Areas whilst, only very small portions (within the project site) have been classified as ESAs. » Almost the entire project site will occur outside of these ESAs.
Important structural and landscape elements and areas of moderate to high climate resilience (SKEP & NDBSP:CBA1&2)		**X**			» The inselberg located within the top right corner of the project site has been listed as an important structural landscape element, important for biodiversity within both the Succulent Karoo Ecosystem Plan (SKEP, 2003) as well as the Namakwa District Biodiversity Sector Plan (2008). Within the Namakwa DBSP this inselberg has been listed as CBA2. » Subsequently this feature has been incorporated into the Northern Cape Critical Biodiversity Map (2016), where it is similarly listed as a CBA2. » According to the current layout, no activities or infrastructure is planned within this habitat.

The CBAs and ESAs underlying the affected property as well as acceptable development recommendations are also furthermore discussed in section 6.2 more specifically section 6.2.5.

With the exclusion of sensitive areas, as specified within the above-mentioned sections, and with the meticulous implementation of mitigation measures the proposed development of the Pofadder 1 WEF will not have an impact on the province's biodiversity targets.

Recommendations and additional requirements:

» The following buffer areas have been recommended, and are regarded as suitable for maintaining the freshwater resource features REC (Recommended Ecological Category) allowing the persistence of the current present ecological status as well as their functions and services.
  - Primary and large ephemeral washes (including associated alluvial floodplains: 100m buffers from the outer edge of the freshwater resource features.
  - Minor ephemeral washes: 50m buffers from the outer edge of the freshwater resource features.
  - Endorheic depression wetlands (pans): 50m buffers from the outer edge of the freshwater resource features.
  - Small drainage lines: 35m buffers.

» All ephemeral washes and alluvial floodplains with their buffer areas have been classified as either Very High- or High sensitive and should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):
  - only activities relating to the route access and cabling:
    - the use/upgrade of existing roads and watercourse crossings are the preferred options;
    - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
    - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

» All depression wetlands with their buffer areas have been classified as High sensitive and should be regarded as "No-Go" areas for all activities associate with the proposed development.

» All drainage lines with their buffer areas have been classified as Medium sensitive and should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):
  - only activities relating to the route access and cabling:
    - the use/upgrade of existing roads and watercourse crossings are the preferred options;
    - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
    - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

» In terms of activities and infrastructure planned within the FEPA1 prioritized- and Upstream Catchments: Even though no activities and infrastructure are planned within these areas that have been classified as CBA2, mitigation measures should still be considered for the development of the WEF within the remaining catchment portions, as careless and uncontrolled activities may lead to indirect negative impacts on the lower lying watercourses. Thus, the following mitigation measures should be considered;
  - During the planning and design phase the following aspects should be considered and addressed:
    - Natural runoff patterns within the catchments: Provide mitigation measures that will manage/simulate these natural runoff patterns and prevent erosion.
    - Natural/normal water inputs, flow patterns and flood peaks associated with the lower lying watercourses: Provide mitigation measures in order to maintain these hydrological characteristics (drivers).

  - Landscape/Ecological Connectivity: Provide mitigation measures that will prevent the fracturing of landscape (maintain connectivity between upland terrestrial habitats and downstream freshwater resource features)
  - Recommended Ecological Categories (RECs) of downstream freshwater resource features: Maintain these RECs.

» The inselberg regarded as an important structural element within and classified as a CBA2 within the NC-CBA Map (also within SKEP and Namaqua District Biodiversity Spatial Plan (NDBSP)) should be regarded as a "No-Go" area apart from the following activities;
  - the use of existing roads.

» In terms of activities and infrastructure planned within the NPAES Focus Areas: Even though no activities and infrastructure are planned within these Focus Areas that have been classified as ESA, mitigation measures should still be considered for the development of the WEF within the remaining portion of the focus areas, as these areas may still be considered as valuable and contribute to the national conservation targets (even with the development of the WEF): Thus, the following management plans and mitigation measures should be considered;
  - Storm Water and Erosion Management Plan;
  - A Plant Rehabilitation and Invasive Alien Plant Management Plan;
  - Mitigation measures that allow/maintain landscape connectivity.

4. THE IMPORTANCE OF BIODIVERSITY AND CONSERVATION

The term "biodiversity" is used to describe the wide variety (richness and abundance) of plant and animal species occurring in their natural environment or "habitat". Biodiversity not only encompasses all living things but also the series of interactions that sustain them, which are termed "ecological processes". South Africa's biodiversity provides an important basis for economic growth and development; keeping biodiversity intact is thus vital for ensuring the on-going provision of ecosystem services, for example the production of clean water through comprehensive catchment management practices. The role of biodiversity in combating climate change is also well recognised and further emphasises the key role that biodiversity management plays on a global scale (South African National Biodiversity Institute, 2019). Typical pressures that natural ecosystems face from human activities include the loss and degradation of natural habitat, invasive alien species, pollution and waste, and climate change (South African National Biodiversity Institute, 2019). High levels of infrastructural and agricultural development typically restrict the connectivity of natural ecosystems, and maintaining connectivity is considered critical for the long-term persistence of both ecosystems and species, in the face of human development and global climate change. Biodiversity loss places aspects of South Africa's economy and quality of life at risk, and reduces socioeconomic options for future generations. In essence, then, sustainable development is not possible without a healthy biodiversity.

5. CONSERVATION AND FUNCTIONAL IMPORTANCE OF AQUATIC ECOSYSTEMS

Water affects every activity and aspiration of human society and sustains all ecosystems. "Freshwater ecosystems" refer to all inland water bodies whether fresh or saline, including rivers, lakes, wetlands, sub-surface waters, and estuaries (Driver et al., 2011). South Africa's freshwater ecosystems are diverse, ranging from sub-tropical in the north-eastern part of the country, to semi-arid and arid in the interior, to the cool and temperate rivers of the fynbos. Wetlands and rivers form a fascinating and essential part of our natural heritage and are often referred to as the "kidneys" and "arteries" of our living landscapes and this is particularly true in semi-arid countries such as South Africa (Nel et al., 2013). Rivers and their associated riparian zones are vital for supplying freshwater (South Africa's most scarce natural resource) and are important in providing additional biophysical, social, cultural, economic, and aesthetic services (Nel et al., 2013). The health of our rivers and wetlands is measured by the diversity and health of the species we share these resources with. Healthy river ecosystems can increase resilience to the impacts of climate change, by allowing ecosystems and species to adapt as naturally as possible to the changes and by buffering human settlements and activities from the impacts of extreme weather events (Nel et al., 2013). Freshwater ecosystems are likely to be particularly hard hit by rising temperatures and shifting rainfall patterns, and yet healthy, intact freshwater ecosystems are vital for maintaining resilience to climate change and mitigating its impact on human wellbeing by helping to maintain a consistent supply of water and for reducing flood risk and mitigating the impact of flash floods. We, therefore, need to be mindful of the fact that without the integrity of our natural river systems, there will be no sustained long-term economic growth or life (DEA et al., 2013).

Freshwater ecosystems, including rivers and wetlands, are also particularly vulnerable to anthropogenic or human activities, which can often lead to irreversible damage or longer-term, gradual/cumulative changes to freshwater resources and associated aquatic ecosystems. Since channelled systems such as rivers, streams, and drainage lines are generally located at the lowest point in the landscape; they are often the "receivers" of wastes, sediment, and pollutants transported via surface water runoff as well as subsurface water movement (Driver et al., 2011). This combined with the strong connectivity of freshwater ecosystems means that they are highly susceptible to upstream, downstream, and upland impacts, including changes to water quality and quantity as well as changes to aquatic habitat & biota (Driver et al., 2011). South Africa's freshwater ecosystems have been mapped and classified into National Freshwater Ecosystem Priority Areas (NFEPAs). This work shows that 60% of our river ecosystems are threatened and 23% are critically endangered. The situation for wetlands is even worse: 65% of our wetland types are threatened, and 48% are critically endangered (Driver et al., 2011). Recent studies reveal that less than one-third of South Africa's main rivers are considered to be in an ecologically 'natural' state, with the principal threat to freshwater systems being human activities, including river regulation, followed by catchment transformation (Rivers-Moore & Goodman, 2009). South Africa's freshwater fauna also display high levels of threat: at least one-third of freshwater fish indigenous to South Africa are reported as threatened, and a recent southern African study on the conservation status of major

freshwater-dependent taxonomic groups (fishes, molluscs, dragonflies, crabs, and vascular plants) reported far higher levels of threat in South Africa than in the rest of the region (Darwall et al., 2009). Clearly, urgent attention is required to ensure that representative natural examples of the different ecosystems that make up the natural heritage of this country for current and future generations to come. The degradation of South African rivers and wetlands is a concern now recognized by Government as requiring urgent action and the protection of freshwater resources, including rivers and wetlands, is considered fundamental to the sustainable management of South Africa's water resources in the context of the reconstruction and development of the country.

6. DESKTOP ANALYSIS

6.1. Land Use

Land use within the project site is mostly for farming. Farming practices consist of livestock farming (sheep) farming with some "free" roaming small game.

Due to the aridity of the area large tracts of land is still fairly natural. Infrastructure are mostly in the form of powerlines, earthen dams, kraals, water points, boreholes, fences, twin tracks, larger dirt roads and small dwellings.

The site lies in an area considered to be a Hot Desert Climate (BWh according to Köppen-Geiger Climate Classification). The site thus falls within arid area, with a mean annual temperature of 19.4°C and a mean annual precipitation of 108mm (predominantly late summer with its peak in March).

6.2. Conservation Planning / Context

Understanding the conservation context and importance of the study area and surroundings is important to inform decision making regarding the management of the aquatic resources in the area. In this regard, available national, provincial, and regional conservation planning information was used to obtain an overview of the study site (

Table 9).

Table 9: Information and data coverages used to inform the ecological assessment.

Conservation Planning Dataset		Relevant Conservation Feature	Location in Relationship to Project Site	Conservation Planning Status
NATIONAL LEVEL CONSERVATION PLANNING	**National Protected Areas Expansion Strategy**	Focus Area	Two NPAES Focus Areas include portions of the project site: » A total of 43% of the project site falls within the focus areas. » However, according to the current layout only a small portion will be directly impacted by the Pofadder WEF1 Development.	Both NPAES Focus Areas classified as: Kamiesberg-Bushmanland-Agurabies Focus Areas
	Protected Areas and Conservation Areas (PACA) Database	South African Conservation Area (SACA) and South African Protected Area (SAPA)	Well outside of any SACA and SAPA: » Nearest SAPA (Augrabies Falls National Park) located approximately 74 km to the north-east. » Nearest SACA (Hantam National Botanical Garden) located approximately 215 km to the south.	Not Classified
	Vegetation Types	Bushmanland Arid Grassland	Vegetation of Study Area	Least Threatened
		Bushmanland Basin Shrubland		Least Threatened
		Bushmanland Inselberg Shrubland		Least Threatened
		Namaqualand Klipkoppe Shrubland		Least Threatened
	Threatened Ecosystems	Not listed	N/A	N/A
	Strategic Water Source Areas for groundwater and surface water.	Areas with high groundwater availability and of national importance	Well outside of any Strategic Water Source Area	Not Classified
	National Freshwater Ecosystem Priority Area	River FEPAs (priority sub quaternary catchment areas)	Two FEPA1 Priority Quaternary Catchments » The portions of these catchments that are located within the project site are very small. » These catchments cover only 1.7% of the project site. » Only 5 turbines and a limited extent of access roads and cabling located within these catchments	2x FEPA 1 Priority Catchments
			» Bulk of the project site located within Upstream Quaternary Catchments (five catchments). » 98.3% of project site is located within the five Upstream Quaternary Catchments	5X Upstream FEPA Catchments

Conservation Planning Dataset		Relevant Conservation Feature	Location in Relationship to Project Site	Conservation Planning Status
		Kaboep River (FEPA ID: 3929) – Upstream FEPA River	» The Kaboep River flows in a north-eastern direction, across the central-eastern and north-eastern portions of the project site.	FEPA 1 Priority River
		Unknow River (FEPA ID: 4108) – FEPA1 Priority River	» The unknow FEPA 1 priority river flows in a south and south eastern direction, across the south-western portion of the project site.	Upstream FEPA River
		Wetlands	The natural wetland flat identified within the development site is classified as a Non-FEPA Wetland	Non-FEPA Wetland
Conservation and Distribution Context	**NCBSP: Critical Biodiversity Areas**	Ecological Support Areas ESA1	» Portions of NPAES Focus Areas; » Non-FEPA Wetlands; » Larger Non-FEPA River Features and 500m buffer areas. » A total of 12.2% of the project site is classified as ESA. » Only tree turbines and a limited extent of access roads and cabling located within ESA.	ESA
	NCBSP: Critical Biodiversity Areas	Critical Biodiversity Areas CBA2	» Portions of FEPA1 prioritized catchments; » Important structural element (Inselberg) as classified previously within SKEP and NDBSP (CBA1&2). » A total of 7.9% of the project site is classified as CBA2. » No activities and infrastructure planned within CBA2	CBA2
		Critical Biodiversity Areas CBA1	» FEPA River and 500m buffer area. » A total of 3.5% of the project site is classified as CBA1. » Only a limited extent of access roads and cabling located within CBA1	CBA1
		Other Natural Areas	» Natural vegetation representative of • Bushmanland Arid Grassland; • Bushmanland Basin Shrubland; • Remaining extent of Bushmanland Inselberg Shrubland not included within the CBA1. » Remainder of the project site	Other

6.2.1. National Protected Areas Expansion Strategy

Land-based protected area expansion targets include large, intact, and unfragmented areas of high importance for biodiversity representation and ecological persistence, which are suitable for the creation or expansion of large protected areas. Such areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). 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 terrestrial and freshwater ecosystems (FEPA: Freshwater Ecosystem Priority Areas). These areas should not be seen as future boundaries of protected areas, since in many cases only a portion of a particular focus area would be required to meet the protected area targets set in 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.

Two NPAES Focus Areas include portions of the project site. Both of these focus areas are classified as Kameisberg-Busmanland-Augrabies Focus Areas and are 13862- and 24933 hectares in size respectively (Figure 6). Fourt-seven- and fifteen percent of these focus areas are, respectively, located within the project site respectively. Furthermore, 43.1% of the project site falls within the focus areas. However, according to the current layout only a small portion will be directly impacted by the Pofadder WEF1 Development.

Furthermore, due to the nature of this type of development, the integrity and conservation targets set out for these Focus Areas will not be threatened.

However, mitigation measures should still be considered for the development of the WEF within these focus areas, as these areas may still be considered as valuable and contribute to the national conservation targets (even with the development of the WEF): Thus, the following management plans and mitigation measures should be considered;

- Storm Water and Erosion Management Plan;
- A Plant Rehabilitation and Invasive Alien Plant Management Plan;
- Mitigation measures that allow/maintain landscape connectivity.

In terms of Protected (SAPA) and Conservation (SACA) Areas, site is not located within any SACAs and SAPAs. The nearest SAPA (Augrabies Falls National Park) is located approximately 74 km to the north-east, whilst the nearest SACA (Hantam National Botanical Garden) is located approximately 215 km to the south.

The proposed development won't have an impact on any protected- and conservation areas and will furthermore, with the implementation of applicable mitigation measures, not have a significant impact on national conservation focus areas and targets.

6.2.2. Strategic Water Source Areas (SWSAs)

Strategic Water Source Areas (SWSAs) are defined as areas of land that either:

- supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important;
- have high groundwater recharge and where the groundwater forms a nationally important resource;
- areas that meet both criteria mentioned above.

They include transboundary Water Source Areas that extend into Lesotho and Swaziland.

The project site is located well outside of any SWSA (groundwater and surface water) and as such the proposed development will not impact such areas.

6.2.3. National Freshwater Ecosystem Priority Areas (2011) Database

The National Freshwater Ecosystems Priority Areas (NFEPA) (2011) database provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports the sustainable use of water resources. The spatial priority areas are known as Freshwater Ecosystem Priority Areas (FEPAs).

FEPAs were identified based on:

- Representation of ecosystem types and flagship free-flowing rivers.
- Maintenance of water supply areas in areas with high water yield.
- Identification of connected ecosystems.
- Preferential identification of FEPAs that overlapped with"
    - Any free-flowing river
    - Priority estuaries identified in the National Biodiversity Assessment 2011.
    - Existing protected areas and focus areas for protected area expansion identified in the National Protected Area Expansion Strategy.

FEPA maps show various different categories, each with different management implications. The categories include river FEPAs and associated sub-quaternary catchments, wetland FEPAs, wetland clusters, Fish Support Areas (FSAs) and associated sub-quaternary catchments, fish sanctuaries, phase 2 FEPAs and associated sub-quaternary catchments, and Upstream Management Areas (UMAs).

A review of the NFEPA coverage for the study area (Figure 6) revealed that two FEPA1 priority quaternary catchments include portions of the project site. Such FEPA1 priority quaternary catchments are drained by FEPA Rivers that meet biodiversity targets for river ecosystems and threatened fish species, and are currently in a good condition (A or B ecological category). Although FEPA status applies to the actual river reach within such a

sub-quaternary catchment. The mapping of the whole sub-quaternary catchment indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition (A or B ecological category) of the river reach (Nel, et al., 2011).

Approximately 16.6% and 64.3% of the two FEPA sub-quaternary catchments respectively are located within the project site. Only five wind turbines and a limited extent of access roads and cabling are planned within these catchments. Furthermore, none of the FEPA Rivers themselves as well as their associated smaller stream networks will be directly impacted by the proposed development (Nel, *et al*., 2011). Due to the nature of the development, this development will not result in a significant/detrimental transformation of these catchments and their drainage characteristic. Potential impacts on local drainage characteristics can be significantly and successfully mitigated.

Furthermore, only on FEPA river traverse the project site (associated with the FEPA sub-quaternary catchment to the south-west). This fairly short unnamed ephemeral watercourse drains in a south and south-eastern direction and is classified as a Lower Foothill River (according to geomorphological zonation) with a V4 (confined valley floodplain) and V2 flood plain confined to one side) valley form (Nel, et al., 2011). According to DWAFs 1999 Present Ecological State for mainstream rivers this watercourse was classified as Largely Natural (Class B) (Kleynhans, 2000). As mentioned, this FEPA river will not be directly impacted by the proposed Pofadder 1 WEF development.

The largest portion (±59.6%) of the project site is located within various (five) Upstream sub-quaternary catchments also known as "Upstream Management Area" (UMA). These UMAs represent sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas but do not include management areas for wetland FEPAs, which need to be determined at a finer scale (Nel, *et al*., 2011). Most of the delineated watercourses, draining these sub-quaternary catchments, will not be impacted by the proposed development. As for the few watercourses that will be impacted by the development, most of these watercourses are smaller drainage networks of the larger watercourses and will be impacted to a limited extent through route crossings and underground cabling. With the necessary mitigation measures in place, including the use of existing crossing, as far as possible, impacts on the significance of these impacts can be even furthermore reduced. Only one of the larger watercourses (Kaboep River) are likely to be impacted by the proposed development, as one wind turbine has been provisionally located within this river. However, this turbine will be located to a more acceptable location outside of this watercourse, resulting in the avoidance of any direct impacts on any of the larger watercourses.

The Kaboep River, is the only watercourse within the project site that has been listed as an Upstream river. This ephemeral watercourse drains in a primarily south-eastern direction and is also classified as a Lower Foothill River (according to geomorphological zonation) with a V4 (confined valley floodplain) and V2 flood plain confined to one side) valley form (Nel, et al., 2011). According to DWAFs 1999 Present Ecological State for

mainstream rivers this watercourse was also classified as Largely Natural (Class B) (Kleynhans, 2000).

A number of natural, predominantly small freshwater wetlands have been listed within the region, according to the NFEPA spatial coverage (Nel, et al., 2011). Almost all of these wetlands have been classified either as wetland flats or seepages. Furthermore, none of these wetlands are classified as FEPA wetlands. Only one wetland flat has been mapped within the project site (Nel, et al., 2011). According to the current layout of the proposed Pofadder 1 WEF, this wetland is located well away from any infrastructure and activities that will be associated with this development and subsequently it is highly unlikely that this wetland will be impacted. It is important to note that SANBI's 2018 wetland map indicates that there are numerous more wetland within the regions as well as within the project site. Furthermore, SANBI (2018) has classified the wetland flats as depression wetlands, and has also mapped a moderately sized alluvial wetland, associated with the Kaboep River. During the in-field wetland delineation it was confirmed that the project site contains a few depression wetlands as well as few moderately broad alluvial floodplain washes (associated with the larger ephemeral watercourses) (refer to section 8.2.1 and Figure 11). According to these maps, the current layout of the proposed Pofadder 1 WEF, will not result in any direct impacts on these wetland features.

Subsequently, no FEPA rivers and wetlands will be directly impacted by the proposed development, whilst only a small portion of the Upstream River (Kaboep) will be impacted. Furthermore, due to the nature of WEF developments, the development of the Pofadder 1 WEF will not result in any significant/detrimental transformations of the FEPA1 and Upstream prioritized sub-quaternary catchments and their associated drainage characteristic. Potential impacts on local drainage characteristics can be significantly and successfully mitigated.

6.2.4. National Level of Conservation Priorities (Threatened Ecosystems)

South Africa's vegetation types have been assigned a conservation status according to their respective degrees of transformation and rates of conservation. The conservation status of a habitat or vegetation type is based on the amount of its original area that currently remains intact relative to various thresholds. On a national scale, these thresholds are arranged from Least Threatened to Critically Endangered (Figure 5), as determined by the best available scientific approaches (Driver et al., 2005; South African National Biodiversity Institute, 2019). The level at which an ecosystem becomes Critically Endangered depends on biodiversity targets, and therefore differs from one ecosystem to another, varying from 16% to 36%.

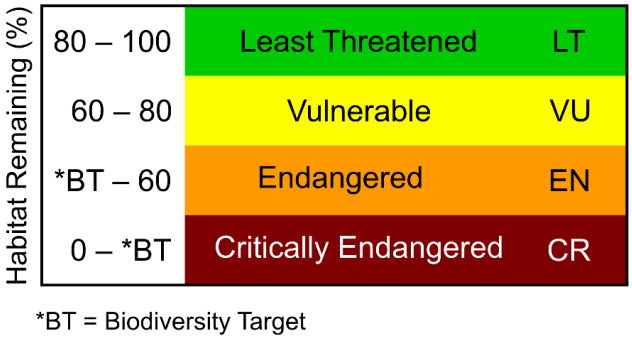


Figure 5: Ecosystem threat status categories (Driver et al., 2005). The biodiversity target represents the minimum conservation requirement.

Nationally, threatened ecosystems that are currently under threat of being transformed by other land uses have been identified and listed. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (NEM:BA National list of ecosystems that are threatened and in need of protection, G 34809, GoN 1002, 9 December 2011). The primary purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function, and composition of threatened ecosystems (SANBI, 2011). NEM:BA lists threatened or protected ecosystems in one of five categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or protected; Least Threatened ecosystems are not listed. There are four main implications of listing ecosystems:

- Planning related implications which are linked to the requirement in the Biodiversity Act (Act 10 of 2004) for listed ecosystems to be taken into account in municipal IDPs and SDFs;
- Environmental authorisation implications in terms of NEMA and the EIA regulations;
- Proactive management implications in terms of the National Biodiversity Act;
- Monitoring and reporting implications in terms of the Biodiversity Act.

The site includes four vegetation types, as currently mapped by the National Vegetation Map 2018 (see section 7.1.1 as well as Figure 8), namely;

- Bushmanland Arid Grassland,
- Bushmanland Basin Shrubland,
- Bushmanland Inselberg Shrubland, and
- Namaqualand Klipkoppe Shurbland.

All four vegetation types are listed as Least Threatened (Figure 6), and thus no listed ecosystems occur on site.

Bushmanland Arid Grassland: The unit is classified as Least Threatened with a target of protection of 21%. Very little of this vegetation unit is currently protected (0.4%),

however it is estimated that 99% of this vegetation unit is still intact. Only a small portion is statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve (Mucina & Rutherford, 2006). The rate of transformation is very low, however the invasive alien plant, Prosopis sp. is regarded as a potential significant threat. Erosion is generally very low (82%). The unit is currently mapped to cover an extensive area size of approximately 45479 km^2 (SANBI, 2018).

Bushmanland Basin Shrubland: The unit is currently classified as Least Threatened with a conservation target of 21%, with none conserved in statutory conservation areas. However, less than 1% of this vegetation type has been lost/transformed (99.5% still intact) (Mucina & Rutherford, 2006). There are no signs of serious transformation, but *Prosopis* spp. can be problematic, with some dense localised infestations within this vegetation type. This vegetation type is currently mapped to cover an extensive area size of approximately 41250 km^2 (SANBI, 2018).

Bushmanland Inselberg Shrubland: The unit is currently classified as Least Threatened with a conservation target of 34%. It has no statutorily conservation areas. There are no signs of serious large-scale transformation or invasive alien plants, with an estimated 99.8% of this vegetation type still intact (Mucina & Rutherford, 2006). This is the smallest of the vegetation types covered and is currently mapped to cover an area size of approximately 638 km^2 (SANBI, 2018).

Namaqua Klipkoppe Shrubland: The unit is currently classified as Least Threatened with a conservation target of 28%. It is a poorly protected vegetation type, with only 5.8% protected (statutorily conservation areas include, Namaqua National Park, Goegab Nature Reserve, and a small portion of Moedverloren Nature Reserve). There very limited signs of serious large-scale transformation or invasive alien plants, with an estimated 95% of this vegetation type still intact (Mucina & Rutherford, 2006). This vegetation type is currently mapped to cover a moderate size of approximately 10936 km^2 (SANBI, 2018).

Table 10: Conservation status of the vegetation type occurring in and around the study area.

Vegetation Type	Target (%)	Transformed (%)	Conserved (Statutorily & other reserves)	Conservation Status	
				Driver *et al.*, 2005; Mucina & Rutherford, 2006	National Ecosystem List (NEMA:BA)
Bushmanland Arid Grassland	21%	1%	0.4%	Least Threatened	Not Listed
Bushmanland Basin Shrubland	21%	0.5%	0%	Least Threatened	Not Listed
Bushmanland Inselberg Shrubland	34%	0.2%	0%	Least Threatened	Not Listed
Namaqualand Klipkoppe Shrubland	28%	5%	5.8%	Least Threatened	Not Listed

It is highly unlikely that this development will have an impact on the status of the Ecosystems as well as Vegetation Types.

- Due to the vast extent of intact, natural vegetation still present within all four mentioned vegetation types;
- Due to the extent and nature of the development.
- No activities and infrastructure planned within the Namaqua Klipkoppe Shrubland.

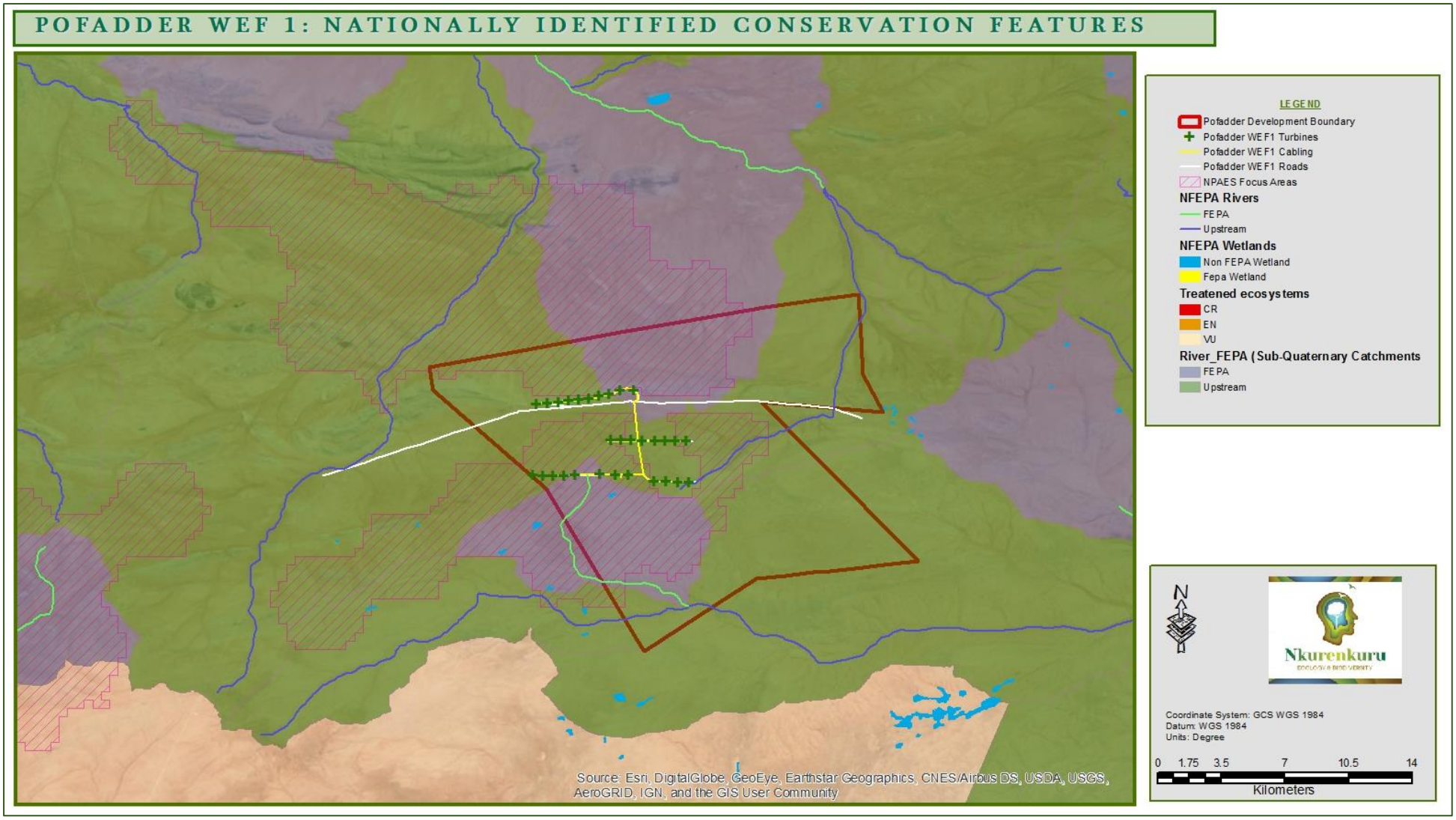


Figure 6: Nationally identified conservation priority areas found within the greater surroundings of the Pofadder 1 WEF.

6.2.5. Critical Biodiversity Areas and Broad Scale Ecological Processes

Critical Biodiversity Areas (CBA) have been identified for all municipal areas of the Northern Cape Province and are published by SANBI (http://bgis.sanbi.org/). This biodiversity assessment identifies CBAs representing biodiversity priority areas that should be maintained in a natural to near-natural state. CBA maps show the most efficient selection and classification of land portions to be safeguarded so that ecosystem functioning is maintained and national biodiversity objectives are met (see Table 11 for CBA land management objectives).

Table 11: Relationship between Critical Biodiversity Areas categories (CBAs) and land management objectives.

CBA category	Land Management Objective
Protected Areas (PA) & CBA 1	***Natural landscapes:*** » Ecosystems and species are fully intact and undisturbed. » Areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met. » Landscapes that are at or past their limits of acceptable change.
CBA 2	***Near-natural landscapes:*** » Ecosystems and species largely intact and undisturbed. » Areas with intermediate irreplaceability or some flexibility in terms of the area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve targets. » Landscapes that are approaching but have not passed their limits of acceptable change.
ESA	***Functional landscapes:*** » Ecosystem moderately to significantly disturbed but still able to maintain basic functionality. » Individual species or other biodiversity indicators may be severely disturbed or reduced. » Areas with low irreplaceability with respect to biodiversity pattern targets only.
ONA (Other Natural Areas) and Transformed	***Production landscapes***: » Manage land to optimise sustainable utilisation of natural resources.

The majority of the project site has been classified as Other Natural Areas (ONAs) (76.4%), whilst 12% of the project site is listed as ESA and 7.9% listed as CBA2. Only a very small portion of the project site has been classified as a CBA 1 (3.5% of project site) (Figure 7). A description of the biodiversity categories located within the project site as well as the features underlying these categories and remarks based on a screening site visit, are provided below in Table 12 below.

Table 12: Reasons underlying the CBA1 and CBA2 status of the affected property.

Feature	CBA 1	CBA 2	ESA	Other	Remarks
Larger River Features (1:500 000) and 500m Buffers			**X**		» The Non-FEPA river flowing in a north-eastern direction (across the eastern portion of the project site), as well as its 500m buffer areas. » All primary and larger ephemeral washes and alluvial floodplains along with their buffer areas have been classified either as Very High or High Sensitive areas that should be regarded as "No-Go" areas. » 100m Buffers around the primary and larger ephemeral washes was determined to be acceptable, and will allow for the persistence of the current present ecological status as well as functions and services provided by these aquatic features. » According to the current layout, very limited infrastructure is planned within this ESA, as well as any other freshwater resource features: • Only one pylon planned within the non-FEPA (ESA) watercourse; and • Only one pylon planned within the associated 500m buffer area. » Furthermore, a small portion of ESA will be impacted through the use/construction of access routes and the lying of underground cabling. » The following recommendations are provided regarding development within or near these larger watercourse features: • The use/upgrade of existing roads and watercourse crossings is acceptable and should be the preferred options (rather than the construction of new road infrastructure); • Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort. • All underground cabling should be laid either within access roads or next to access roads (as close as possible). • Any other activities and infrastructure, other than the above-mentioned infrastructure (roads and cabling), may not occur/be located within these watercourse features as well as their associated buffer areas. ▪ Subsequently, these watercourse features and their associated buffers should be regarded as "No-Go" areas for these activities and infrastructure. ▪ The pylon located within the Non-FEPA watercourse (ESA) is relocated to an acceptable area outside of the watercourse as well as its associated 100m buffer area.

					» With the implementation of the above-mentioned recommendation measures, it is highly unlikely that the proposed development will threaten the ESA as well as the other delineated watercourse features' integrity, as well as functions and services.
FEPA-River and 500m Buffers	**X**			»	» The large ephemeral wash to the south-west, listed as a FEPA-River as well as a 500m buffer area. » According to the current layout, very limited infrastructure is planned within this CBA1; • No pylons or crane pads planned within this watercourse as well as the 500m buffer area; • The only infrastructure planned within this CBA1 include a small section of access road (crossing) and underground cabling. » Primary and larger ephemeral washes and alluvial floodplains (including this FEPA-River) along with their buffer areas have been classified as Very High and/or High Sensitive Areas that should be regarded as "No-Go" areas. • According to the site visit this FEPA-river was confirmed, however the location and extent of this river was not consistent with the NFEPA spatial data. • According to the in-field delineation of freshwater resource features, no infrastructure (including river crossings and underground cabling) will be located within this watercourse as well as its associated buffer area. » 100m Buffers around the primary and larger ephemeral washes (including this FEPA-River) was determined to be acceptable, and will allow for the persistence of the current present ecological status as well as functions and services provided by these aquatic features. » Subsequently, based on the above mentioned findings, the proposed development will not have an impact on this FEPA-River (CBA2).
Sub-Quaternary Catchment of FEPA-Rivers		**X**		**X**	» The bulk of the FEPA1 prioritized and Upstream catchments have been classified as Other Natural Areas whilst approximately 50% of the FEPA1 prioritized catchment associated with the FEPA-river to the south-west of the project site have been classified as CBA2. • Most of the development will occur outside of these FEPA1 prioritized catchments, whilst no activities and infrastructure are planned within the portion of the FEPA1 prioritized catchment classified as CBA2. ▪ Subsequently, according to the current layout the proposed development will not have an impact on this CBA2.
Wetlands (Non-FEPA)			**X**		» All Non-FEPA Wetlands have been classified as ESAs. » A few Wetland ESAs have been mapped within the south-western portion of the project site. • During the site visit these wetland features (depression/pan wetlands) have been confirmed along with a few other depression wetland features that have not been captured within the CBA map. » All wetland features located within the project site have been delineated and classified in-field. » These wetland features included alluvial floodplains associated with the larger watercourse features as well as endorheic depression/pan features.

					» 100m Buffers around the larger watercourse features and associated alluvial floodplains, and 50m buffers around the depression wetlands have been recommended, and was deemed sufficient, allowing for the persistence of the current present ecological status as well as functions and services provided by these aquatic features. » All wetlands, along with their buffer areas, have been classified as High Sensitive that should be regarded as "No-Go" areas. » According to the current layout, no infrastructure is planned within any of these depression- and floodplain wetlands, as well as their recommended buffer areas. • Subsequently, according to the current layout the proposed development will not have an impact on these ESAs.
NPAES Focus Areas			**X**	**X**	» Portions of the project site are included within two NPAES Focus Areas. » The majority of these Focus Areas have been classified as Other Natural Areas whilst, only very small portions (within the project site) have been classified as ESAs. » Almost the entire project site will occur outside of these ESAs. » Due to the nature of this development, the integrity and conservation targets set out for these Focus Areas will not be threatened.
Important structural and landscape elements and areas of moderate to high climate resilience (SKEP & NDBSP:CBA1&2)		**X**			» The inselberg located within the top right corner of the project site has been listed as an important structural landscape element, important for biodiversity within both the Succulent Karoo Ecosystem Plan (SKEP, 2003) as well as the Namakwa District Biodiversity Sector Plan (2008). Within the Namakwa DBSP this inselberg has been listed as CBA2. » Subsequently this feature has been incorporated into the Northern Cape Critical Biodiversity Map (2016), where it is similarly listed as a CBA2. » The uniqueness and structural complexity of this inselberg was confirmed during the site visit. Furthermore, this inselberg may provide a habitat, for range restricted, and habitat specialist fauna and flora. » As such this terrestrial feature has been classified as high sensitive and should be regarded as a "No-Go" area. » According to the current layout, no activities or infrastructure is planned within this habitat. Also, the proposed development will not impact natural faunal movement between this inselberg and the surrounding plains and other important ridges in the area. • Subsequently, according to the current layout the proposed development will not threaten the integrity of this CBA2.

Development within CBA1 and CBA2 is undesirable and can potentially lead to loss of biodiversity and negatively affect ecological processes.

The CBA1, associated with a FEPA River and 500m buffer area will be, according to the current spatial data, only impacted to a limited extent through access route and underground cabling. However, based on an in-field delineation of freshwater resource features, it was found that this freshwater resource features will not be impacted by the proposed development as the actual extent of this watercourse was not consistent with that mapped within the NC-CBA map. Subsequently, direct impacts on the CBA1 will be avoided.

The CBA2 located within the north-western corner of the project site will not be impacted by the development of the Pofadder 1 WEF as no activities and infrastructure are planned within this area.

According to the current layout of the Pofadder 1 WEF, a very limited area of ESA will be impacted. Furthermore, it is recommended that the wind turbine located within the watercourse (freshwater resource system classified as ESA) is moved to an acceptable area outside of this watercourse as well as its recommended buffer area. Subsequently, it is unlikely that this development will have a significant impact on these ESAs located within the project site, and it is furthermore highly unlikely that this development will impact the province's conservation targets.

The majority of activities will be restricted within the ONAs, and based on the findings of the screening survey, development within these ONAs are regarded as acceptable

With the necessary mitigation measures in place the impacts associated with the proposed development will be reduced even furthermore. Refer to Sections 7, 8 & 9 for a description of the site sensitivity and suitability.

To conclude, based on the screening site-visit, no CBA1 or CBA2 will be impacted. Furthermore, a very small/limited impact is planned to occur within ESAs and will lead to a very limited loss of ESA (with the necessary mitigation measures in place). However, this loss of ESA is regarded as acceptable and will not threaten the province's conservation targets.

Based on the findings of the site visit, some, minor loss of the CBA1 and CBA2 are regarded as acceptable, Recommendations and additional requirements:

- The following buffer areas have been recommended, and are regarded as suitable for maintaining the freshwater resource features REC (Recommended Ecological Category) allowing the persistence of the current present ecological status as well as their functions and services.

- Primary and large ephemeral washes (including associated alluvial floodplains: 100m buffers from the outer edge of the freshwater resource features.
- Minor ephemeral washes: 50m buffers from the outer edge of the freshwater resource features.
- Endorheic depression wetlands (pans): 50m buffers from the outer edge of the freshwater resource features.
- Small drainage lines: 35m buffers.

» All ephemeral washes and alluvial floodplains with their buffer areas have been classified as either Very High- or High sensitive and should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):
- only activities relating to the route access and cabling:
  - the use/upgrade of existing roads and watercourse crossings are the preferred options;
  - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
  - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

» All depression wetlands with their buffer areas have been classified as High sensitive and should be regarded as "No-Go" areas for all activities associate with the proposed development.

» All drainage lines with their buffer areas have been classified as Medium sensitive and should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):
- only activities relating to the route access and cabling:
  - the use/upgrade of existing roads and watercourse crossings are the preferred options;
  - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
  - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

» In terms of activities and infrastructure planned within the FEPA1 prioritized- and Upstream Catchments: Even though no activities and infrastructure are planned within these areas that have been classified as CBA2, mitigation measures should still be considered for the development of the WEF within the remaining catchment portions, as careless and uncontrolled activities may lead to indirect negative impacts on the lower lying watercourses. Thus, the following mitigation measures should be considered;

- During the planning and design phase the following aspects should be considered and addressed:
  - Natural runoff patterns within the catchments: Provide mitigation measures that will manage/simulate these natural runoff patterns and prevent erosion.
  - Natural/normal water inputs, flow patterns and flood peaks associated with the lower lying watercourses: Provide mitigation measures in order to maintain these hydrological characteristics (drivers).
  - Landscape/Ecological Connectivity: Provide mitigation measures that will prevent the fracturing of landscape (maintain connectivity between upland terrestrial habitats and downstream freshwater resource features)
  - Recommended Ecological Categories (RECs) of downstream freshwater resource features: Maintain these RECs.

» The inselberg regarded as an important structural element within and classified as a CBA2 within the NC-CBA Map (also within SKEP and Namaqua District Biodiversity Spatial Plan (NDBSP)) should be regarded as a "No-Go" area apart from the following activities;
- the use of existing roads.

» In terms of activities and infrastructure planned within the NPAES Focus Areas: Even though no activities and infrastructure are planned within these Focus Areas that have been classified as ESA, mitigation measures should still be considered for the development of the WEF within the remaining portion of the focus areas, as these areas may still be considered as valuable and contribute to the national conservation targets (even with the development of the WEF): Thus, the following management plans and mitigation measures should be considered;
- Storm Water and Erosion Management Plan;
- A Plant Rehabilitation and Invasive Alien Plant Management Plan;
- Mitigation measures that allow/maintain landscape connectivity.

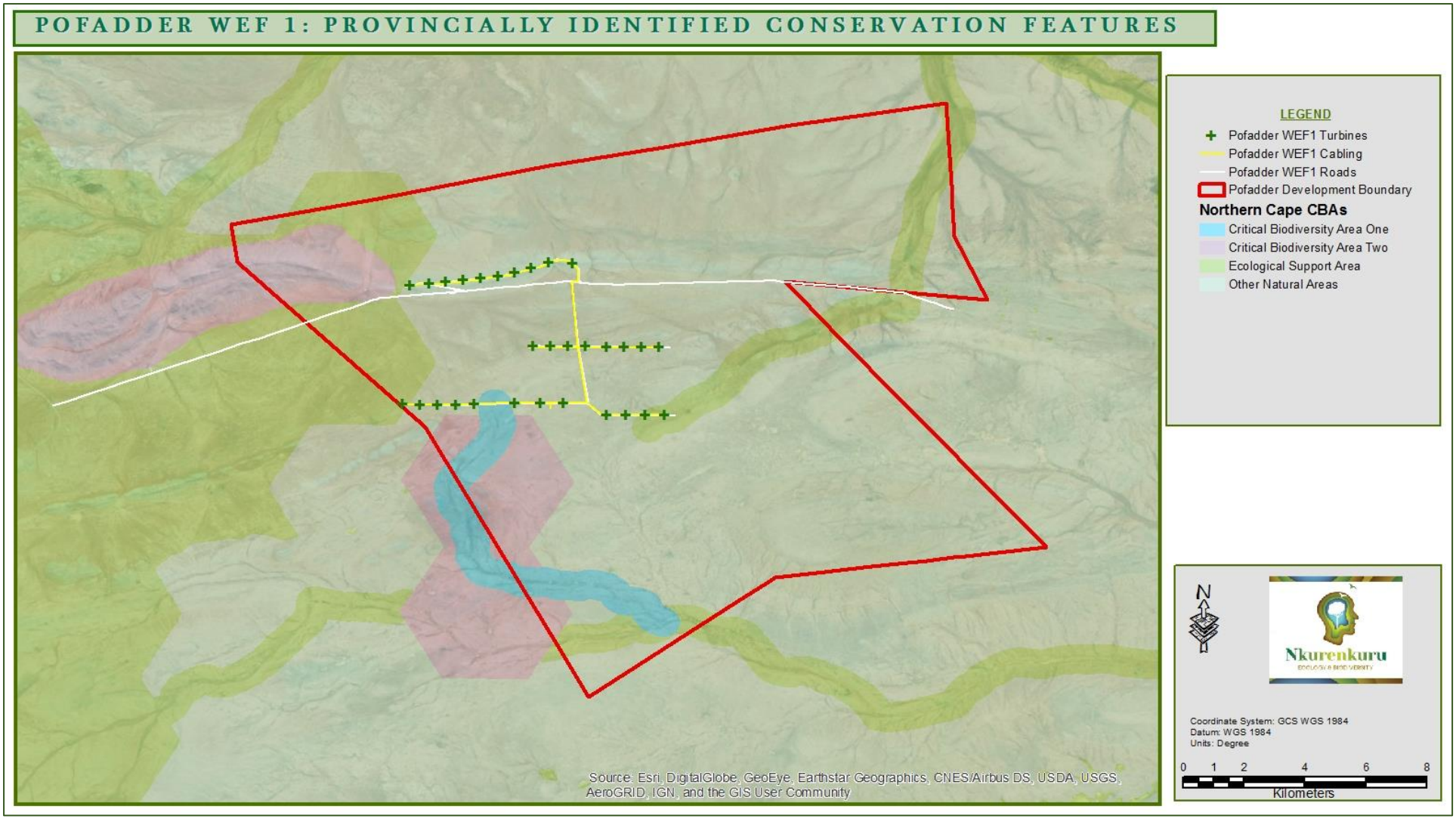


Figure 7: Critical biodiversity areas (CBA) found within the project site for the Pofadder WEF1 development.

7. TERRESTRIAL ECOLOGICAL BASELINE ASSESSMENT (SCREENING)

7.1. Botanical Screening Assessment

7.1.1. Broadscale Vegetation Patterns: National Vegetation Map of Southern Africa

This section deals with vegetation types as described in the National Vegetation Map of Southern Africa, which will be used interchangeably with the term "VegMap" ((Dayaram, et al., 2019), (SANBI, 2018), (Mucina & Rutherford, 2006); these references are the rest of this section)

The largest portion of the project site has been classified as Bushmanland Arid Grassland (81.2%). Bushmanland Basin Shrubland is mostly confined to the deeper sandier pediments surrounding the narrow ridge system, and only cover approximately 12.5% of the site. The narrow, west to east running ridge located within the northern portion of the site has been classified as Bushmanland Inselberg Shrubland and covers an area of around 6.4%. Namakwa Klipkoppe Shrubland is the smallest vegetation unit within the project site and cover less than 1% of the project site (Table 13 and Figure 8).

Table 13: Total area sizes (approximately) for vegetation types as mapped by the National Vegetation Map 2018.

Vegetation Type	Total extent (km^2)	Total area within project site (km^2)	Total area of vegetation unit being impacted (%)
Bushmanland Basin Shrubland	41251	29.894	0.07%
Bushmanland Arid Grassland	45479	194.274	0.4%
Bushmanland Inselberg Shrubland	638	15.389	2.4%
Namaqualand Klipkoppe Shrubland	10936	0.103	0.0009%

Due to the vast extent of intact, natural vegetation still present within all four mentioned vegetation types and the fact that only a very small extent of these vegetation types are located within the project site along with the fact that the development footprint itself will be much smaller, it is highly unlikely that this development will have an impact on the status and conservation targets set out for these vegetation types.

During the screening site-visit it was found that the VegMap provide a relatively rough reflections of the vegetation patterns found within the project site, with is slightly more heterogenous than the VegMap suggests. The primary drivers of vegetation differentiation at the site are edaphic and soil moisture. Rocky outcrops, ridges, koppies, drainage lines alluvial washes and floodplains all contribute to the heterogeneity of the site, especially within the northern half of the project site. These areas tend to accommodate different plant species compositions, then that of the adjacent plains. A general habitat map has been compiled, based on the finding of the screening site visit, and is illustrated in Figure

9. A more detailed description of the vegetation units/communities characterizing the various habitat types will be provided within the EIA phase report (based on a more detailed survey).

7.1.1.1. Bushmanland Arid Grassland

This unit falls within the Nama-Karoo Biome and Bushmanland and West Griqualand Bioregion and occurs in the Northern Cape Province between Aggeneys in the west to Prieska in the east. The Southern border of the unit is formed by edges of the Bushmanland Basin while in the north-west this vegetation unit borders on desert vegetation. The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often intermingling units of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld. The unit has an altitudinal range of 600 m – 1200 m, and is characterised by extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* species). In places low shrubs of Salsola change the vegetation structure.

A third of the area is covered by recent (Quaternary) alluvium and calcrete. Superficial deposits of Kalahari Group are also present in the east. The extensive Palaeozoic diamictites of the Dwyka Group also outcrop in the area as do gneisses and metasediments of Mokolian age. The soils of most of the area are red-yellow apedal soils, freely drained, with high base status and moderately to shallow in depth (<300 mm). Only about one fifth of the area may contained soils deeper than 300 mm. Soils are typical of the Ag and Ae land types.

The unit is arid with a Mean Annual Precipitation (MAP) of around 70 mm in the west to 200 mm in the east, peaking in late summer/early autumn. The Mean Annual Temperature (MAT) is 17.4°C with a frost incidence of around 10 days in the northwest to about 35 days in the east. Whirl winds are common on hot summer days.

Table 14: *Key species associated with Bushmanland Arid Grassland.*

DOMINANT SPECIES	
Growth Form (d = Dominant)	**Key Species**
Succulent Shrubs	*Kleinia longiflora, Lycium bosciifolium, Salsola tuberculata, Salsola glabrescens,*
Low shrubs	*Aptosimum spinescens, Hermannia spinosa, Pentzia spinescens, Aizoon asbestinum, Aizoon schellenbergii, Aptosimum elongatum, Aptosimum lineare, Aptosimum marlothii, Barleria rigida, Berkheya annectens, Blepharis mitrata, Eriocephalus ambiguus, Eriocephalus spinescens, Limeum aethiopicum, Lophiocarpus polystachyus, Monechma incanum, Monechma spartioides, Pentzia pinnatisecta, Phaeoptilum spinosum, Polygala seminuda, Pteronia leucoclada, Pteronia mucronata, Pteronia sordida, Rosenia humilis, Senecio niveus, Sericocoma avolans, Solanum capense, Talinum arnotii, Tetragonia arbuscula, Zygophyllum microphyllum*
Small Tree	*Acacia mellifera subsp. detinens, Boscia foetida subsp. foetida*

Tall Shrubs	*Lycium cinereum* (d), *Rhigozum trichotomum* (d), *Cadaba aphylla, Parkinsonia africana*
Herbs	*Acanthopsis hoffmannseggiana, Aizoon canariense, Amaranthus praetermissus, Barleria lichtensteiniana, Chamaesyce inaequilatera, Dicoma capensis, Indigastrum argyraeum, Lotononis platycarpa, Sesamum capense, Tribulus pterophorus, Tribulus terrestris, Vahlia capensis*
Geophytic Herbs	*Moraea venenata*
Succulent Herbs	*Gisekia pharnaceoides, Psilocaulon coriarium, Trianthema parvifolia*
Graminoids	*Aristida adscensionis* (d), *Aristida congesta* (d), *Enneapogon desvauxii* (d), *Eragrostis nindensis* (d), *Schmidtia kalahariensis* (d), *Stipagrostis ciliata* (d), *Stipagrostis obtusa* (d), *Cenchrus ciliaris, Enneapogon scaber, Eragrostis annulata, Eragrostis porosa, Eragrostis procumbens, Panicum lanipes, Setaria verticillata, Sporobolus nervosus, Stipagrostis brevifolia, Stipagrostis uniplumis, Tragus berteronianus, Tragus racemosus*
BIOGEOGRAPHICALLY IMPORTANT SPECIES	
Growth Form	**Key Species**
Succulent Herbs	*Tridentea dwequensis*
ENDEMIC SPECIES	
Growth Form	**Key Species**
Succulent Shrubs	*Dinteranthus pole-evansii, Larryleachia dinteri, Larryleachia marlothii, Ruschia kenhardtensis*
Herbs	*Lotononis oligocephala, Nemesia maxii*

7.1.1.2. Bushmanland Basin Shrubland

This unit falls within the Nama-Karoo Biome and Bushmanland and West Griqualand Bioregion and is distributed in the Northern Cape Province with the large Bushmanland Basin centred on the Brandvlei and Van Wyksvlei area, spanning from Granaatboskolk in the west to Copperton in the east, and Kenhardt in the north to Williston in the south. Its altitudinal range is 800 m – 1 200 m, and it is characterised by slightly irregular plains with dwarf shrubland dominated by a mixture of low sturdy and spiny shrubs (*Rhigozum*, *Salsola*, *Pentzia*, *Eriocephalus*), "white" grasses (*Stipagrostis*), as well as abundant annuals, when rains are good, such as *Gazania* and *Leysera*.

Mudstones and shales of the Ecca Group (Prince Albert and Volksrust Formations) and Dwyka tillites predominate in this unit. Soils are shallow Glenrosa and Mispah forms, with lime often present (Fc land type), as well as some occasional red-yellow apedal, freely drained soils with a high base status and usually <15% clay (Ah and Ai land types). These soils have a very high salt content.

Rainfall occurs in late summer and early autumn, in contrast to the winter rainfall units, and MAP is about 100 – 200 mm, with high maximum monthly temperatures of about 39.6°C.

The unit is currently classified as Least Threatened with a conservation target of 21%, with none conserved in statutory conservation areas, but the total extent of the unit is extensive. Luckily, there are no signs of serious transformation, but *Prosopis* spp. can be problematic, with some dense localised infestations along the eastern border of the unit with Northern Upper Karoo (east of Van Wyksvlei). Erosion is moderate (56%) and low (34%).

A number of endorheic pans (vloere) and extensive systems of intermittent river channels (including that of the Sak River) occur in this unit. In comparison to the bordering Bushmanland Arid Grassland in the north, the Bushmanland Basin shows an increased presence of shrubs (especially succulents) and plants indicative of the high salt content of the soil.

Table 15: Key species associated with Bushmanland Basin Shrubland.

DOMINANT SPECIES	
Growth Form (d = Dominant)	**Key Species**
Tall Shrubs	*Lycium cinereum (d), Rhigozum trichotomum (d). Low Shrubs: Aptosimum spinescens (d), Hermannia spinosa (d), Pentzia spinescens (d), Zygophyllum microphyllum (d), Aptosimum elongatum, A. marlothii, Berkheya annectens, Eriocephalus microphyllus var. pubescens, E. pauperrimus, E. spinescens, Felicia clavipilosa subsp. clavipilosa, Limeum aethiopicum, Osteospermum armatum, O. spinescens, Pegolettia retrofracta, Phaeoptilum spinosum, Plinthus karooicus, Polygala seminuda, Pteronia glauca, P. inflexa, P. leucoclada, P. mucronata, P. sordida, Rosenia humilis, Selago albida, Senecio niveus, Tetragonia arbuscula, Zygophyllum lichtensteinianum.*
Succulent Shrubs	*Salsola tuberculata (d), Aridaria noctiflora subsp. straminea, Brownanthus ciliatus subsp. ciliatus, Galenia sarcophylla, Lycium bosciifolium, Ruschia intricata, Salsola namibica, Sarcocaulon patersonii, S. salmoniflorum, Tripteris sinuata var. linearis, Zygophyllum flexuosum.*
Semiparasitic Shrub	*Thesium hystrix.*
Herbs	*Gazania lichtensteinii (d), Leysera tenella (d), Amaranthus praetermissus, Chamaesyce inaequilatera, Dicoma capensis, Indigastrum argyraeum, Lepidium desertorum, Monsonia umbellata, Radyera urens, Sesamum capense, Tribulus terrestris, T. zeyheri.*
Succulent Herbs	*Mesembryanthemum crystallinum, M. stenandrum, Trianthema parvifolia, Zygophyllum simplex.*
Graminoids	*Aristida adscensionis (d), Enneapogon desvauxii (d), Stipagrostis ciliata (d), S. obtusa (d), Aristida congesta, Enneapogon scaber, Stipagrostis anomala, Tragus berteronianus, T. racemosus.*
BIOGEOGRAPHICALLY IMPORTANT SPECIES (BUSHMANLAND ENDEMIC)	
Growth Form	**Key Species**
Succulent Herb	*Tridentea dwequensis.*
ENDEMIC SPECIES	
Growth Form	**Key Species**
Herb	*Cromidon minutum.*
Geophytic Herbs	*Ornithogalum bicornutum, O. ovatum subsp. oliverorum.*

7.1.1.3. Bushmanland Inselberg Shrubland

This unit is located within the Succulent Karoo Biome and the Richtersveld Bioregion and is distributed in the Northern Cape Province where it is restricted to a group of prominent solitary mountains (inselbergs) and smaller koppies towering over surrounding flat plains, predominantly within the northern Bushmanland in the Aggeneys and Pofadder regions. It has an altitudinal range of 600 m – 1 180 m, with most of this vegetation type located between 700 m and 1 120 m.

The vegetation of this unit is of extrazonal nature and is part of the Succulent Karoo embedded within a region with transitional winter/summer -rainfall regime of the surrounding Bushmanland Arid Grassland. The unit is characterised by a shrubland containing both succulent (Aizoaceae, Asphodelaceae, Crassulaceae, Didiereaceae, Euphorbiaceae, Zygophyllaceae) as well as no succulent (mainly Asteraceae) elements and with sparse grassy undergrowth (*Aristida, Eragrostis, Stipagrostis*) on steep slopes of the iselbergs.

Inselbergs of high-grade metamorphic rocks on a broad alluvial plain consist of clastic sediments, volcanics and intrusive rocks of Mokolian age that were metamorphosed during the Namaqualand Metamorphic Event. Ib and IC land types are dominant in the area.

The unit has erratic and very low patterns (MAP below 100 mm, range 70-120 mm), occurring mainly in the form of thunderstorms in late summer from February to April. Around 20 days of frost per year (range 10-30 days). MAT is 16.9 °C with a high incidence of frost.

Table 16: Key species associated with Bushmanland Inselberg Shrubland.

DOMINANT SPECIES	
Growth Form (d = Dominant)	**Key Species**
Succulent Shrubs	*Adromischus diabolicus, Euphorbia gregaria, Ihlenfeldtia vanzylii, Ruschia divaricata, Schwantesia pillansii, Tylecodon sulphureus, Tylecodon sulphureus, Euphorbia gariepina, Kleinia longiflora, Othonna euphorbioides, Psilocaulon subnodosum, Tetragonia reduplicata, Tylecodon rubrovenosus,*
Tall Shrub	*Boscia foetida*
Low Shrubs	*Eriocephalus pauperrimus, Pteronia unguiculata*
Woody Climber	*Sarcostemma viminale*
Herbs	*Acanthopsis hoffmannseggiana*
Succulent Herbs	*Anacampseros baeseckei, Anacampseros karasmontana, Avonia ruschii, Conophytum fulleri, Avonia quinaria subsp. alstonii, Conophytum marginatum var. haramoepense*
Graminoids	*Aristida adscensionis, Eragrostis annulata, Stipagrostis obtusa*
BIOGEOGRAPHICALLY IMPORTANT SPECIES	

Growth Form	Key Species
Succulent Shrub	*Ceraria fruticulosa, Cheiridopsis pillansii, Hoodia alstonii*
Geophytic Herb	*Whiteheadia bifolia*
ENDEMIC SPECIES	
Growth Form	**Key Species**
Geophytic Herbs	*Huernia barbata subsp. ingeae*

7.1.1.4. Namaqualand Klipkoppe Shrubland:

This unit is falls within the Succulent Karoo Biome and the Namaqualand Hardeveld Bioregion and is distributed in the Northern and Western Cape Provinces where it is largely confined to the north-central regions of Namaqualand spanning Steinkopf in the north and Nuwerus in the south. The unit's altitudinal range is 120 – 1 260 m.

Dramatic landscape of huge granite and gneiss domes, smooth glacis and disintegrating boulder koppies supporting open shrubland up to 1 m tall, dominated by shrubs of dwarf to medium stature and with ericoid or succulent leaves. A few scattered pachycaul kokerboom trees (*Aloidendron dichotoma var. dichotoma*) are found mostly on north-facing slopes. Flat or gently sloping rock sheets (the dominant feature of this unit) support dwarf or prostrate succulents in shallow pockets with soil or in cracks. Fringe vegetation consists of 1-3 m tall shrubs with no succulent leaves and canopy cover reaching 40-100%.

A number of Mokolian granites and gneisses from gentle to moderate rocky slopes, rock sizes varying from medium to large with flat to gentle rock sheets as well as rock domes, yellow to-brown to brown loamy sand, 0.15-0.6 m deep. Ag and Ib land types (35% each) followed by Fb and Fc (10% each).

Seasonal winter rainfall (May to September) with a MAP of about 160 mm and with epizodic draught periods (well below 100 mm per year) for one or two years in succession. Dew is present throughout the winter. The MAT is 16.6°C with hot summers with mean maximum daily temperature of 30°C. Frost occurs about 8 days per year.

Table 17: Key species associated with Namaqualand Klipkoppe Shrubland.

DOMINANT SPECIES	
Growth Form (d = Dominant)	**Key Species**
Succulent Tree	*Aloidendron dichotoma var. dichotoma*
Small Tree	*Ficus ilicina, Pappea capensis*
Succulent Shrubs	*Didelta spinosa, Euphorbia decussata, Euphorbia mauritanica, Leipoldtia schultzei, Adromischus marianiae var. immaculatus, Antimima mesklipensis, Cotyledon cuneata, Cotyledon orbiculata var. orbiculata, Crassula atropurpurea var. watermeyeri, Crassula tetragona subsp. robusta, Manochlamys albicans, Othonna cylindrica, Othonna floribunda, Othonna furcata, Pelargonium crithmifolium, Phyllobolus roseus, Ruschia goodiae, Ruschia viridifolia, Sarcocaulon crassicaule, Sarcocaulon l'heritieri, Senecio junceus, Stoeberia utilis, Tetragonia fruticosa, Tylecodon paniculatus, Tylecodon striatus, Tylecodon wallichii subsp. wallichii, Zygophyllum foetidum, Zygophyllum morgsana*
Tall Shrubs	*Dodonaea viscosa var. angustifolia, Euclea tomentosa, Montinia caryophyllacea, Putterlickia pyracantha, Searsia undulata*
Low Shrub	*Berkheya fruticosa, Eriocephalus microphyllus var. pubescens, Galenia africana, Hermannia disermifolia, Lebeckia sericea, Acanthopsis spathularis, Antizoma miersiana, Asparagus capensis var. capensis, Athanasia flexuosa, Athanasia flexuosa, Ballota africana, Berkheya ferox, Eriocephalus brevifolius, Galenia fruticosa, Gnidia meyeri, Helichrysum scabrum, Helichrysum tricostatum, Indigofera nigromontana, Maytenus oleoides, Passerina galpinii, Pelargonium grandicalcaratum, Pelargonium praemorsum, Pharnaceum albens, Phylica montana, Phylica oleifolia, Pteronia divaricata, Pteronia incana, Selago divaricata, Selago glutinosa, Senecio cinerascens, Solanum burchellii, Solanum giftbergense, Tripteris oppositifolia, Tripteris sinuata*
Semiparasitic Shrub	*Thesium patulum, Thesium polycephalum, Thesium spinosum*
Woody Climber	*Asparagus retrofractus, Astephanus triflorus, Microloma sagittatum*
Woody Succulent Climber	*Sarcostemma viminale*
Herbaceous Climber	*Cysticapnos grandiflora*
Semiparasitic Epiphytic Shrub	*Viscum capense*
Herbs	*Tripteris amplectens, Tripteris hyoseroides, Adenogramma glomerata, Aizoon canariense, Arctotis revoluta, Diascia diffusa, Felicia bergeriana, Galium tomentosum, Heliophila amplexicaulis, Heliophila thunbergii, Heliophila variabilis, Hemimeris racemosa, Hermannia althaeifolia, Oncosiphon suffruticosum, Plantago cafra, Senecio glabrifolius, Trichogyne paronychioides, Tripteris microcarpa, Ursinia cakilefolia, Wahlenbergia oxyphylla*
Geophytic Herbs	*Ornithogalum multifolium, Ornithogalum rupestre, Oxalis ambigua, Oxalis obtusa, Oxalis pes-caprae, Trachyandra falcata,*
Succulent Herbs	*Conophytum breve, Conophytum depressum, Crassula muscosa, Crassula tomentosa, Tetragonia microptera*
Graminoids	*Ehrharta calycina, Chaetobromus involucratus subsp. dregeanus, Ehrharta barbinodis, Ehrharta delicatula, Fingerhuthia africana, Tribolium echinatum*
BIOGEOGRAPHICALLY IMPORTANT SPECIES	

Growth Form	Key Species
Succulent Shrub	*Cleretum papulosum subsp. schlechteri, Conophytum bilobum, Crassula dichotoma, Crassula hirsuta, Othonna macrophylla, Quaqua cincta*
Geophytic Herb	*Babiana curviscapa, Babiana dregei, Babiana stenomera, Gladiolus equitans, Lapeirousia pyramidalis, Lapeirousia silenoides, Oxalis comosa, Oxalis furcillata var. furcillata, Oxalis namaquana, Pelargonium bubonifolium, Romulea citrina, Romulea namaquensis, Tenicroa multifolia, Trachyandra involucrata, Whiteheadia bifolia*
Herb	*Adenogramma mollugo, Annesorhiza nuda, Gorteria diffusa subsp. calendulacea, Hermannia stipitata, Jamesbrittenia pedunculosa, Manulea altissima subsp. glabricaulis, Mollugo namaquensis, Phyllopodium anomalum, Polycarena capensis, Sonderina tenuis, Wahlenbergia cernua*
Herbaceous Succulent Climber	*Crassula roggeveldii*
Graminoids	*Aristida dasydesmis, Ehrharta erecta, Pentaschistis patula*
Woody Succulent Climber	*Crassula rudolfii*
Woody Climber	*Asparagus multituberosus, Indigofera amoena, Microloma calycinum*
Low Shrubs	*Acanthopsis horrida, Asparagus alopecurus, Athanasia linifolia, Chrysocoma oblongifolia, Dischisma clandestinum, Euryops brevipapposus, Felicia brevifolia, Oedera sedifolia, Pelargonium abrotanifolium, Pelargonium sericifolium, Pteronia leptospermoides, Pteronia ovalifolia, Salvia dentata, Salvia lanceolata, Selago speciosa, Senecio parvifolius*
Tall Shrubs	*Otholobium striatum*
Small Trees	*Ozoroa concolor, Ozoroa dispar*
ENDEMIC SPECIES	
Growth Form	**Key Species**
Geophytic Herbs	*Ornithogalum leeupoortense, Oxalis clavifolia, Oxalis louisae, Xysmalobium pearsonii*
Succulent Shrub	*Ottosonderia monticola, Tylecodon nigricaulis*
Low Shrub	*Lotononis benthamiana, Lotononis longiflora, Lotononis quinata, Wiborgia incurvata*
Herbs	*Tripteris spathulata, Zaluzianskya collina*
Succulent Herbs	*Quaqua bayeriana, Quaqua pallens, Stapeliopsis khamiesbergensis*

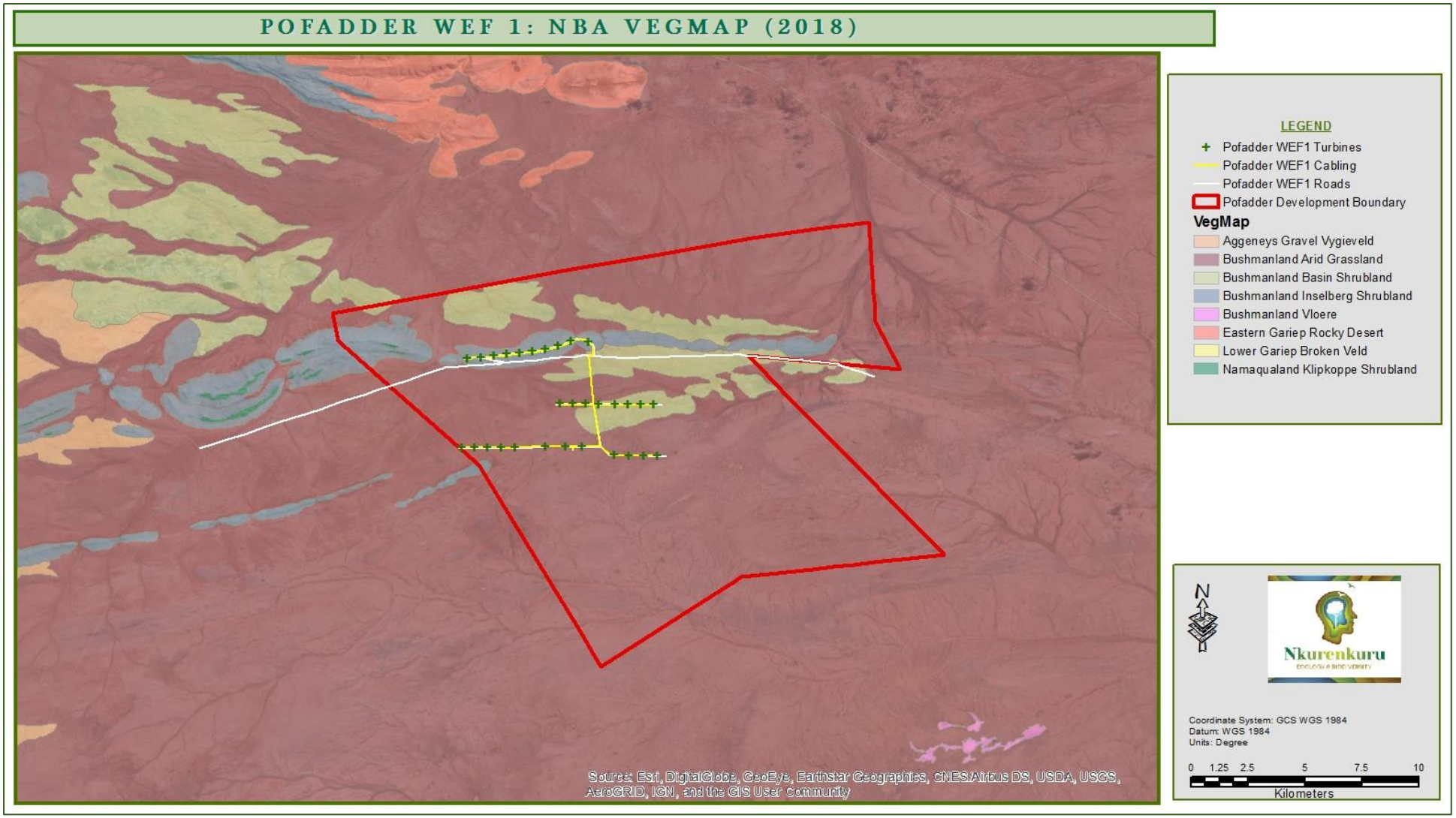


Figure 8: Map illustrating the different vegetation types, according to VegMap 2018, found on Kluitjieskraal farm and in the general region.

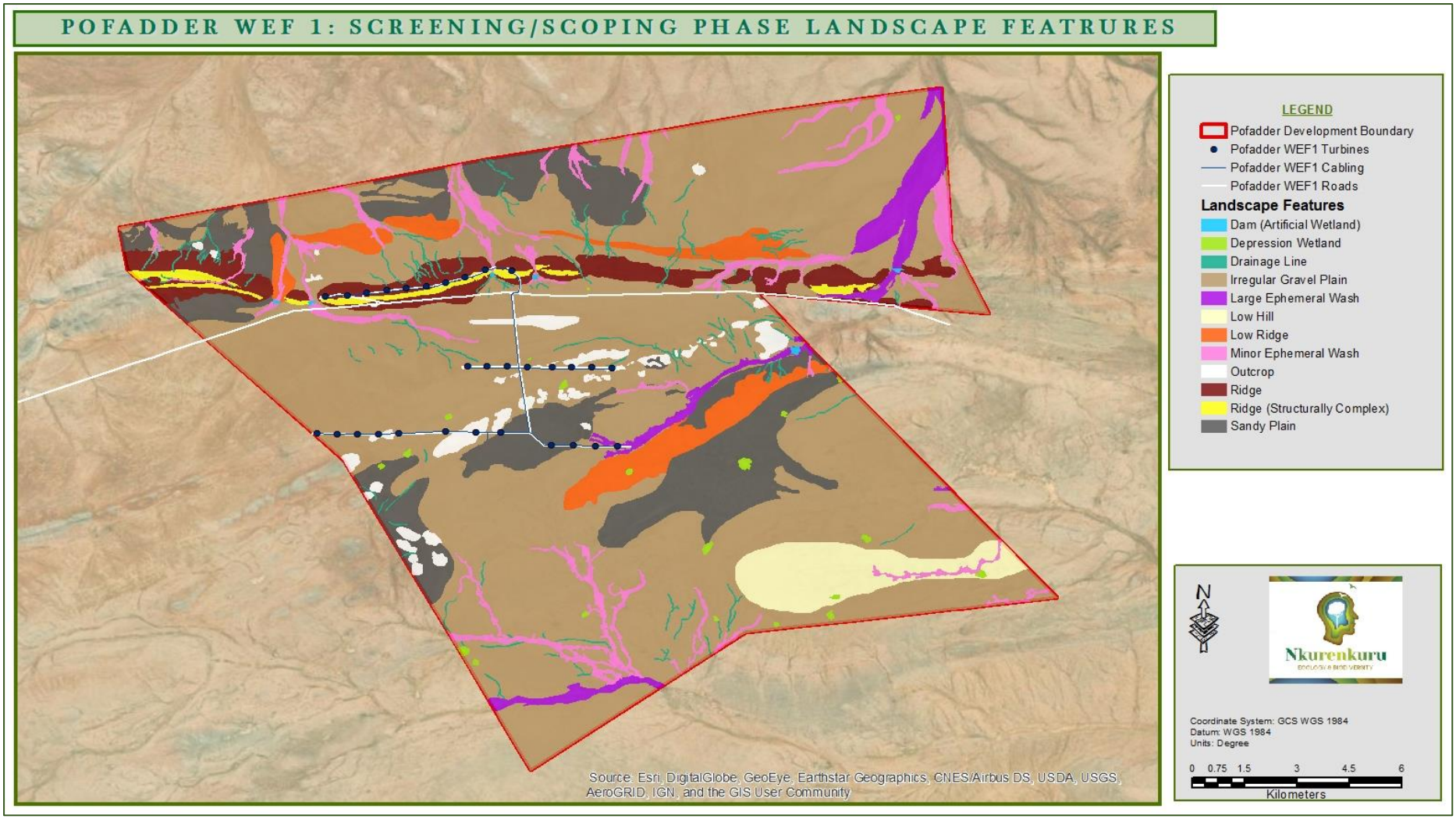


Figure 9: Screening/Scoping Phase delineated landscape (habitat) features.

7.1.2. POSA Plant Species Observations

A list was obtained from the SANBI database (POSA — Plants of southern Africa; http://posa.sanbi.org/) containing all plant species that have been recorded to date from the surroundings of the study area. POSA generated species lists also contain updated Red Data information according to the Red List of South African Plants (Raimondo et al., 2009; updated online version: http://redlist.sanbi.org/). Species listed as protected were also identified in the list. Therefore, only SoCC that may potentially occur in the study area have been listed within the baseline study section of this report.

A total of 116 species have been recorded within the broader area based on the online plant search. Of this, Asteraceae was the most prominent (25 species), followed by Aizoaceae with 14 species and then Poaceae with 12 species. This list comprised of 111 indigenous species, of which fourteen are South African Endemics namely

- *Conophytum fulleri,*
- *Conophytum praesectum,*
- *Drosanthemum latipetalum,*
- *Ihlenfeldtia excavata,*
- *Tetragonia nigrescens,*
- *Gazania jurineifolia,*
- *Othonna auriculifolia,*
- *Wahlenbergia divergens,*
- *Tylecodon sulphureus,*
- *Calobota lotononoides,*
- *Limeum aethiopicum,*
- *Nemesia maxii,*
- *Zaluzianskya sanorum,*
- *Tetraena chrysopteros*

Furthermore, one alien plant species was recorded within the extracted area, and furthermore this species is also listed as an invasive species within NEM:BA Act No. 10 of 2004 (Alien and Invasive Species List, 2016) namely:

- *Salsolla kali* (Category 1b)

7.1.3. Species of Conservation Concern

Only one Red List species were present in the list obtained online from the SANBI POSA database, namely *Calobota lotonoides*. However, 22 protected species were listed (Table 18), all of them under Schedule 2 of the Northern Cape Nature Conservation Act No. 9 of 2009. Also, the online screening report revealed the occurrence of three other Species of Conservation Concern (Sensitive Species), namely Species 1157, 854 and 144; these species will not be made public in order to protect them from illegal activities.

Table 18: Species of Conservation Concern that have been recorded within the broader region surrounding the study site, as per the SANBI POSA online database.

Family	Species	Protection Schedule
Aizoaceae	Conophytum fulleri	2
Aizoaceae	Conophytum praesectum	2
Aizoaceae	Conophytum sp.	2

Aizoaceae	Drosanthemum latipetalum	2
Aizoaceae	Galenia sarcophylla	2
Aizoaceae	Ihlenfeldtia excavata	2
Aizoaceae	Mesembryanthemum crystallinum	2
Aizoaceae	Psilocaulon sp.	2
Aizoaceae	Ruschia sp.	2
Aizoaceae	Tetragonia arbuscula	2
Aizoaceae	Tetragonia nigrescens	2
Aizoaceae	Trianthema parvifolia	2
Aizoaceae	Trichodiadema pomeridianum	2
Amaryllidaceae	Hessea speciosa	2
Anacampserotaceae	Anacampseros albissima	2
Apocynaceae	Fockea comaru	2
Apocynaceae	Gomphocarpus filiformis	2

7.2. Faunal Screening Assessment

7.2.1. Mammal Diversity and Habitats

The IUCN Red List Spatial Data lists 65 mammal species that could be expected to occur within the vicinity of the project site. This is regarded as a moderately-low species diversity.

Of these species, eight are medium to large conservation dependant species, or species that had a historical range that included the project area, but with natural populations since becoming locally "extinct" in these areas. These species are now generally restricted to protected areas such as game reserves and protected areas, with most of these species being re-introduced in these areas.

Examples of such species are:

- African Wild Dog – *Lycaon pictus* (Endangered);
- Spotted Hyaena – *Crocuta crocuta* (Near Threatened);
- Lion – *Panthera leo* (Vulnerable);
- Cheetah – *Acinonyx jubatus* (Vulnerable);
- Hook-lipped Rhinoceros – *Diceros bicornis bicornis* (Endangered);
- Red Hartebeest – *Alcelaphus caama* (Not Evaluated);
- African Savanna Buffalo – *Syncerus caffer* (Least Concern); and
- Hartmann's Mountain Zebra – *Equus zebra hartmannae* (Vulnerable)

These species are not expected to occur in the project site and are removed from the expected Species of Conservation Concern (SCC) list.

Of these 57 remaining mammals, only five species been previously recorded within the larger survey area (Quarter Degree Grids: 2919BA, 2919BB, 2919BD and 2920AA) according to the Animal Demographic Unit (ADU) database, indicating a significant undersupplying within the area (https://vmus.adu.org.za/vm_sp_list.php). These recorded species are;

- Steenbok - *Raphicerus campestris* (No. of Records: 1)
- Bat-eared Fox – *Otocyon megalotis* (No. of Records: 1);
- Aardwolf – *Proteles cristata* (No. of Records: 1);
- Acacia Thallomys - *Thallomys paedulcus* (No. of Records: 1);
- Striped Polecat – *Ictonyx striatus* (No. of Records: 1)

SCREENING SITE VISIT OBSERVATIONS:

Of the remaining 57 small- to medium sized mammal species, eight (8) indigenous mammal species have been observed (refer to Table 19) through direct observations, camera trap photographs, Sherman traps, and/or the presence of visual tracks & signs. within the project site. These data represent strong evidence as to a potential low diverse and functional mammal assemblage populating the study area.

Based on the various sampling techniques, the following mammals were the most frequently observed within the project site:

- Bat-eared Fox (*Otocyon megalotis*): No of Records 8 (and digging/feeding signs);
- Cape Porcupine (*Hystrix africaeaustralis*): No of Records 4 (and numerous feeding/gnawing signs);
- Pygmy Hairy-footed Gerbil (*Desmodillus auricularis*): No physical records but numerous burrows);

Table 19: List of Mammalian species that has been observed within the project site.

Common Name	Scientific Name	Regional Status (2016)	Global Status (2015)	TOPS (NEMBA)	CITES	DENC	Endemic
Steenbok	*Raphicerus campestris*	LC	LC			II	
Gemsbok	*Oryx gazella*						
Bat-eared Fox	*Otocyon megalotis*	LC	LC	Protected		I	
Cape Grey Mongoose	*Herpestes pulverulentus*	LC	LC			II	Near Endemic
Aardwolf	*Proteles cristatus*	LC	LC			I	
Cape Hare	*Lepus capensis*	LC	LC			II	
Cape Ground Squirrel	*Xerus inauris*	LC	LC				
Cape Porcupine	*Hystrix africaeaustralis*	LC	LC			II	

Structural and compositional habitat/vegetation unit diversity can be described as moderately diverse within the project site. However, the bulk of the project site is dominated by low dwarf shrubland plains. The most significant habitat within the project site is the larger alluvial ephemeral washes. This habitat type is fairly diverse in terms of its structural geomorphological diversity allowing for most of the mammal diversity, observed within the project site, to inhabit this area. Second to the alluvial washes are the steep slopes and outcrops dominated by boulders and large rock which is also relatively structural complex.

7.2.2. Mammal Species of Conservation Concern (SCC)

SCCs include those species listed within the Regional Red Data List (2016), Global Red Data List (2015), that indicate severe recent population decline and those species or populations of species that are highly range restricted.

Of the remaining 57 small- to medium sized mammal species, that have a natural distribution range that include the project site and have a likelihood of occurring within the project site, five (5) are listed as being of conservation concern on a regional or global basis (Table 20).

The list of potential species includes:

» Two (2) that are listed as Vulnerable (VU) on a regional basis; and
» Three (3) that are listed as Near Threatened (NT) on a regional scale.

Table 20: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016)

Species	Common Name	Conservation Status			Likelihood of Occurrence
		Red Data	IUCN	TOPS	
Parotomys littledalei	Littledale's Whistling Rat	NT	LC		Moderate
Parahyaena brunnea	Brown Hyaena	NT	NT	Protected	High
Felis nigripes	Small Spotted Cat	VU	VU	Protected	Moderate
Panthera pardus	Leopard	VU	VU	VU	Low
Graphiurus ocularis	Spectacled Dormouse	NT	LC		Moderate

» *Paratomys littledalei* (Littledale's Whistling Rat) has a narrow, highly patchy distribution in the driest parts of southern Africa, and occurs in the South-West Africa Biotic Zone (Namib Desert and Karoo regions).

P. littledalei is a diurnal, herbivorous (only fresh plant material excluding seeds) species occurs in stable/climax shrubland and is more dependent on a stable ground cover. They avoid open habitats. It has a patchy habitat distribution, reflecting forage availability and the need for deep soils.

Listed, under a precautionary risk tolerance, as Near Threatened as it is suspected to be threatened by droughts and became locally extinct as a result of ongoing droughts. Thus, this species might be especially vulnerable to an increase in intensity and duration of droughts as a consequence of climate change. Additionally, habitat degradation from overgrazing of rangelands may threaten this species as it is reliant on a stable plant cover. However, it also has a wide distribution within its distribution region and occurs in several protected areas.

Only limited suitable habitat exist, restricted to sandy, alluvial planes fringing the ephemeral watercourses, and sandy pockets scattered throughout the rocky plains and plateaus. However, due to the relative scarcity of fresh plant material (due to the extensive drought period) within the rocky plains and plateaus, it is highly unlikely that this species will inhabit these areas and subsequently the larger drainage systems with suitable burrowing substrate and sufficient forage are the only suitable habitat within the project site. Furthermore, taking into account habitat requirements, the fact that they are fairly patchily distributed/rare within their range, and their vulnerability to ongoing severe drought conditions, it can be concluded that these species have a **moderate likelihood of occurrence** within the project site.

» *Felis nigripes* (Black-footed cat) is endemic to the arid regions of southern Africa, occurring widely across the western reaches of the assessment region, and have a relatively restricted and patchy distribution. This species is naturally rare, occur in low densities, has cryptic colouring, is small in size and is nocturnal. These factors have contributed to a lack of information on this species.

Black-footed Cats are strictly crepuscular and nocturnal and are active throughout the night. During the day, the cats make use of dens. The species prefers hollowed out abandoned termite mounds when available (especially for the kittens), but will use dens dug by other animals such as Springhares, Cape Ground Squirrels - *Xerus inauris*, and Aardvark - *Orycteropus afer*. It is a specialist of open, short grass areas with an abundance of small rodents and ground-roosting birds.

There is a general suspected continuing decline in population sizes due to the loss of prey base due to bushmeat poaching (especially Springhare - *Pedetes capensis*), persecution (direct or incidental), road collisions and predation by domestic pets. Livestock farming (especially small livestock), and inappropriate predator management has resulted in an increase in local Back-backed Jackal – *Canis mesomelas*, and Caracal – *Caracal caracal*, populations. The overabundance of such mesopredators is regarded as an important emerging threat to Black-footed Cat populations as a result of increasing interspecific competition, including intraguild predation. Perhaps the most serious long-term threat for Black-footed Cats is the loss of key resources, such as den sites and prey, from anthropogenic disturbance or habitat degradation (for example, from overgrazing). They are unable to create or maintain their own dens or burrows and rely on those made by other species. Thus, the localised removal of a sympatric species, Springhare with

whom they have a crucial inquilistic relationship, can be detrimental to their continued existence in a region.

Taking availability/abundance of prey, burrows and sympatric species it is highly likely that this species may occur within the project site. Sandy areas along the alluvial planes and watercourses are regarded as the most suitable habitat for this species as this is the areas with the highest density of rodent, lagomorph and ground nesting bird (larks etc.) activity (food source), along with an abundance of burrows (dug mainly by Aardvark – *Orycteropodidae*, and Bat-eared Fox – *Otocyon megalotis*). Interspecific competition and intraguild predation within this habitat may however have an impact on the presence of Black-footed Cat within this habitat type. Burrows found within the deeper sandy patches within the calcrete plains may also be utilized, however, the abundance of prey may be a limiting factor within these plains. Subsequently based on the above-mentioned factors there is a **moderate likelihood of occurrence** for this species within the project area.

» *Panthera pardus* (Leopard) has a wide distributional range across Africa and Asia, however throughout their range there are extremely patchily distributed, having been lost from at least 37% of their historical range in sub-Saharan Africa 51% of their historical range in Southern Africa. The Leopard has a wide habitat tolerance, including woodland, grassland savannah and mountain habitats but also occur widely in coastal scrub, shrubland and semi-desert. Densely wooded and rocky areas are preferred as choice habitat types. Within the montane and rocky areas of the Western Cape and Northern Cape provinces, small prey such as Rock Hyraxes - *Procavia capensis,* and Klipspringer antelope - *Oreotragus oreotragus*, are extensively utilised. Leopard densities vary with habitat, prey availability, and threat severity, from fewer than one individual/100 km² to over 30 individuals/100 km². Typically, population densities within the Western Cape/Northern Cape (south western and western portions of the Northern Cape) range from 0.25 to 2.3 individuals/100 km2.

Even though, being highly adaptable and having a natural wide distributional range, populations have become reduced and isolated, and they are now extirpated from large portions of their historic range. Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting.

Although, known to occur and persist outside of formally protected areas, and previously recorded within the region densities in these areas are considered to be low. However suitable habitat and prey is available within the project site and surroundings and subsequently **likelihood of occurrence in the project area is low.**

» *Parahyaena brunnea* (Brown Hyaena) is endemic to southern Africa and has a widespread distribution throughout the region. Habitat types with which Brown Hyaena is typically associated with include; Desert areas with annual rainfall less than 100 mm, semi-desert, open scrub and open woodland savannah with a maximum rainfall up to about 700 mm. Furthermore, Brown Hyaena also shows an ability to survive close to urban areas. It requires some type of cover in which to lie up during the day. For this it favours rocky, mountainous areas with bush cover in the bushveld areas of South Africa. This species is primarily a scavenger consuming a wide range of vertebrate remains, which is supplemented by wild fruits, insects, birds, their eggs and the occasional small animal which is killed; and its impact on domestic livestock is usually small. Brown Hyaenas occupy a range of ranch land, but typically avoid agricultural and heavily urbanised habitats.

It faces multiple threats across unprotected areas, especially in regions dominated by livestock and game ranching. Despite the evidence of locally stable and increasing populations, the species does face persistent threats of direct and indirect persecution within the assessment region. Small isolated subpopulations in reserves surrounded by predator-proof fencing may be at risk of inbreeding depression impacting the populations.

This species is known to persist outside of protected areas and even within agricultural lands and as such the **likelihood of occurrence is regarded as high**.

SCREENING SITE VISIT OBSERVATIONS:

During the site visit no Mammal SCC were recorded. Based on the ecology and behaviour of the potential Mammal SCC that may occur within the region, as well as the general design and layout of the WEF (avoiding sandy alluvial washes and floodplains as well steep slopes and tall ridges) it is highly unlikely that this development will threaten local individual and populations of Mammal SCC.

7.2.3. Protected Mammal Species

These area species that are either protected nationally within TOPS (Threatened and Protected Species Issued in terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004) or provincially within Schedule 1 and 2 of the Northern Cape Nature Conservation Act No 9 of 2009.

TOPS Regulations:

» The Threatened or Protected Species (TOPS) regulations, 2007, provide a national approach to sustainable use of species that are threatened with extinction, or in need of national protection, while ensuring the survival of the species in the wild, thus ensuring the conservation of the species.

» The TOPS regulations address multiple issues including: unethical hunting practices such as hunting in confined spaces, or hunting of tranquilised animals or by means of bait; activities related to the management of damage-causing animals; hybridisation and spreading diseases as a result of translocation; activities threatening cycad populations; and registration of captive breeding and keeping facilities.
» NEMBA enabled the Minister to prohibit activities that may impact on the survival of species in the wild, and to regulate activities to ensure sustainable use of indigenous biological resources.
» According to the definitions provided within the TOPS regulations (Section 56 (1)):
    • a Protected Species (56(1)(d)) is any indigenous species which are of high conservation value or national importance, or required regulation in order to ensure that the species are managed in an ecologically sustainable manner. Furthermore, all indigenous species listed within CITES (Conservation on International Trade in Endangered Species of Wild Fauna and Flora) are also automatically listed as a Protected Species within TOPS.

Schedule 1 and 2 of the Northern Cape Nature Conservation Act No 9 of 2009 (NCNCA):

» The aim/purpose of the Act is to provide for;
    • the sustainable utilisation of wild animals, aquatic biota and plants;
    • to provide for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora;
    • to provide for offences and penalties for contravention of the Act;
    • to provide for the appointment of nature conservators to implement the provisions of the Act;
    • to provide for the issuing of permits and other authorisations; and
    • to provide for matters connected therewith.

Table 21: List of Protected mammal species (according to national provincial regulations) that have a distribution that include the project site.

Species	Common Name	TOPS (NEM:BA)	CITES	NCNCA Schedule 1	NCNCA Schedule 2	Likelihood of Occurrence
Felis nigripes	Small Spotted Cat	Protected	I	I	Virtually all indigenous fauna which do not fall under Schedule 1 are classified under Schedule 2, except those species classified as pests. In terms of mammals most rodents, shrews, elephant shrews, bats, hares and rabbits, carnivores, antelope are included. The full list	Moderate
Felis sylvestris cafra	African Wild Cat	Protected	II	I		High
Otocyon megalotis	Bat-eared Fox	Protected		I		Confirmed
Vulpes chama	Cape Fox	Protected		I		High
Mellovora capensis	Honey Badger	Protected		I		Moderate
Parahyaena brunnea	Brown Hyaena	Protected		I		High
Panthera pardus	Leopard	VU	I	I		Low

Species	Common Name	TOPS (NEM:BA)	CITES	NCNCA Schedule 1	NCNCA Schedule 2	Likelihood of Occurrence
Proteles cristatus	Aardwolf			I		Confirmed
Orycteropus afer	Aardvark			I		High
Ictonyx striatus	Striped Polecat			I		Moderate
Caracal caracal	Caracal		II			High
Papio ursinus	Chacma Baboon		II			Low

SCREENING SITE VISIT OBSERVATIONS:

During the site visit four protected mammal species (within TOPS as well as Provincial Act) were recorded namely:

- Bat-eared Fox (*Otocyon megalotis*): 8 recordings;
- Aardwolf (*Proteles cristatus*): 1 recording.

The most significant habitat for these protected species, are the alluvial washes along with its floodplains and woody/thicket patches. Most of the protected mammals recorded within the project site or which has a high likelihood of occurring within the project site, utilize burrows, and the deeper sandy substrates of these washes provide valuable burrowing sites. The higher rodent, small mammal and invertebrate activities within this habitat also makes this habitat a valuable forage/hunting area for potential protected species such as Bat-eared Fox, Aardvark, Cape Fox and African Wild Cat and potentially for Honey Badger, Striped Polecat, and Aardwolf.

7.2.4. Reptile Diversity

The IUCN Red List Spatial Data lists 41 reptile species that could be expected to occur within the vicinity of the project site and include one tortoise, 13 geckos, 16 lizards, 3 agamas, one chameleon and 15 snakes. This is comparatively moderate-low suggesting that reptile diversity at the site is likely to be fairly low.

Of these 41 reptile species, 15 have been previously recorded within the larger survey area (Quarter Degree Grids: 2919BA, 2919BB, 2919BD, and, 2920AA) according to the Animal Demographic Unit (ADU) database, indicating significant under sampling within the region. Species that has been frequently observed within the these QDGs are:

- Purchell's Gecko – *Pachydactylus prucelli* (No. of Records: 17); and
- Western Three-striped Skink – *Trachylepis occidentalis* (No. of Records: 4).

SCREENING SITE VISIT OBSERVATIONS:

Of the 41 reptile species that have a distribution that include the project area, four (4) indigenous reptile species have been observed (refer to Table 22) through direct observations, within the project site.

However, it must be reiterated that the low diversity observed within the project site can most likely be attributed unfavourable climatic conditions. However, the area is still none the less, regarded as containing a potentially moderate-low diverse and functional reptile assemblage populating

The following reptiles were the most frequently observed within the project site:

» Western Ground Agama (*Agama aculeata aculeata*): No of Records 14;
» Southern Karusa Lizard (*Karusasaurus polyzonus*): No of Records 12;

Table 22: List of Reptilian species that has been observed within the project site.

Common Name	Scientific Name	Regional Status (2016)	Global Status (2015)	TOPS (NEMBA)	CITES	DENC	Endemic
Agama aculeata aculeata	Western Ground Agama	LC	LC				
Karusasaurus polyzonus	Southern Karusa Lizard	LC	LC			I	Near Endemic
Ptenopus garrulus maculatus	Spotted Barking Gecko	LC	LC				
Psammobates tentorius verroxi	Tent Tortoise	NT	NT	Protected	II	I	

7.2.5. Reptile Species of Conservation Concern (SCC)

SCCs include those species listed within the Regional Red Data List (2017), Global Red Data List (2015), that indicate severe recent population decline and those species or populations of species that are highly range restricted.

Of the 41 reptile species that have a natural distribution range that include the project site, and have a likelihood of occurring within the project site, two (2) are listed as being of conservation concern on a regional or global basis (Table 23).

Table 23: List of reptile species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Red Data	IUCN	
Psammobates tentorius verroxi	Tent Tortoise	NT	NT	Confirmed
Pachydactylus goodi	Good's Gecko	VU	VU	Low

» *Psammobates tentorius* (Karoo Dwarf Tortoise/Karoo Padloper) is restricted to South Africa and Namibia. The distribution ranges of the three recognized subspecies overlap, and there remains some uncertainty about their exact limits.

- *P. t. verroxii* has a wide distribution throughout the Nama Karoo in the Northern Cape and penetrates the Western Cape and possibly the Eastern Cape peripherally.
- *P. t. verroxii* occurs mainly on the inland plateau above 900 m, although its range may extend below the escarpment in the west, and rainfall in its range is predominantly in summer and generally unpredictable.

Although *P. tentorius* is widespread, population density is generally low throughout its range (Branch 2008), and populations appear to be declining slowly. Known threats for *P. tentorius* include road mortality, veld fires, electrocution by livestock/game fences, and overgrazing from domestic livestock as well as predation by small carnivores, eagles, honey badgers, goshawks, crows, monitor lizards, and ostriches. Available information indicates that Pied Crow (*Corvus albus*) predation on this taxon is increasingly severe, with anthropogenic facilitation of Pied Crows having led to increased abundance in western South Africa, making increased predation highly likely. Threats for *P. t. verroxii* are however generally low because its distribution is wide and mainly in areas with low human density.

SCREENING SITE VISIT OBSERVATIONS:

During the site visit the only Reptile SCC recorded was *Psammobates tentorius verroxii* (four individuals have been recorded within the project site). Three of the four specimens that were observed, were found within larger ephemeral washes whilst the fourth specimen was observed within a gravel plain. The combination of sandy substrates and denser shrubby vegetation, associated with the alluvial washes, make these habitats suitable for burrowing, egg lying and these species are known to spend their dormant periods (torpor) within these habitats. Especially during the drier periods, these species tend to move towards the surrounding drainage lines where their food source (plant material) tend the persist for longer periods of time (high moisture content).

In terms of the likely impacts of the development on these tortoise species, habitat loss is not likely to be highly significant as the direct footprint of the development is not likely to exceed a few hundred hectares and this would not be significant in context of the relatively

homogenous and intact surrounding landscape. In some situations, the loss of vegetation cover associated with roads and grid line construction and other cleared areas can generate potential impact on these species as they may be vulnerable to predation while crossing such cleared areas, but as the site is arid, plant cover is already low.

7.2.6. Protected Reptile Species

These are species that are either protected nationally within TOPS (Threatened and Protected Species Issued in terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004) or provincially within Schedule 1 and 2 of the Northern Cape Nature Conservation Act No 9 of 2009.

Table 24: List of Protected reptile species (according to national provincial regulations) that have a distribution that include the project site.

Species	Common Name	TOPS (NEM:BA)	NCNCA Schedule 1	NCNCA Schedule 2	CITES	Likelihood of Occurrence
Psammobates tentorius verroxi	Tent Tortoise	Protected		II	II	Moderate to High
Karusasaurus polyzonus	Southern Karusa Lizard		I			Confirmed
Dasypeltis scabra	Rhombic Egg-eater			II		Moderate
Meroles knoxii	Knox's Desert Lizard			II		Moderate
Merolessuborbitalis	Spotted Desert Lizard			II		High
Nucras tessellata	Western Sandveld Lizard			II		Moderate
Pedioplanis laticeps	Karoo Sand Lizard			II		Moderate
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard			II		Low
Pedioplanis lineoocellata pulchella	Common Sand Lizard			II		Low
Pedioplanis namaquensis	Namaqua Sand Lizard			II		High
Boaedon capensis	Common House Snake			II		High
Lamprophis guttatus	Spotted Rock Snake			II		High

SCREENING SITE VISIT OBSERVATIONS:

During the site visit the only protected species confirmed, was *Psammobates tentorius verroxii*. *P. t. verroxii* is expected to potentially inhabit any of the identified habitats. As mentioned, habitat loss and other likely impacts are not likely to be highly significant as the direct footprint of the development is not likely to exceed a few hundred hectares and this would not be significant in context of the relatively homogenous and intact surrounding landscape.

7.2.7. Amphibian Diversity

The IUCN Red List Spatial Data lists only eight amphibian species that occur within the region. Given the aridity of the site and lack of surface water in the area, this low diversity of amphibians is not surprising.

Of these eight amphibian species, only one species has been previously recorded within the larger survey area (Quarter Degree Grids: 2919BA, 2919BB, 2919BD, 2920AA) according to the Animal Demographic Unit (ADU) database.

» Common Caco – *Cacosternum boettgeri* (No. of Records: 1)

SCREENING SITE VISIT OBSERVATIONS:

No amphibian species have been recorded within the project area, however there are available habitat for these species and the likelihood of some of these species to occur

The most likely amphibian species to inhabit the project site include:

» Tandy's Sand Frog – *Tomopterna tandyi*; and
» Common Caco – *Cacosternum boettgeri*

Impacts on amphibians are likely to be low given the limited extent of the development as well as low likely density of amphibians in the area. Although there are some available amphibian habitats these habitats are unlikely to be impacted by the proposed development.

7.2.8. Amphibian Species of Conservation Concern (SCC)

SCCs include those species listed within the Regional Red Data List (2017), Global Red Data List (2015), that indicate severe recent population decline and those species or populations of species that are highly range restricted.

Of the eight amphibian species that have a natural distribution range that include the project site, none are listed as being of conservation concern on a regional or global basis.

7.2.9. Protected Amphibian Species

These area species that are either protected nationally within TOPS (Threatened and Protected Species Issued in terms of Section 56(1) of the National Environmental Management: Biodiversity Act, 2004) or provincially within Schedule 1 and 2 of the Northern Cape Nature Conservation Act No 9 of 2009.

All indigenous amphibians which do not fall under Schedule 1 are classified under Schedule 2. Subsequently all amphibian species that have a distribution range that include the project site are included within Schedule 2. The full list is contained within the Schedule and it not repeated here.

7.3. Terrestrial Ecological Scoping/Screening Phase Sensitivity Assessment

The majority of the site can be considered as "Medium" sensitive (Figure 10). This classification coincides largely with the vegetation types, Bushmanland Arid Grassland and Bushmanland Basin Shrubland covering the slightly broken/irregular sandy and gravel plains. Although these unit are largely undisturbed in its nature, it has a large extent of occurrence as mapped by the National Vegetation Map 2018. This unit was largely mapped as an ONA within the NC-CBA Map (section 6.2.5 and Figure 7), and ground truthing verified it to conform to these standards. These areas are largely homogenous with little structural and landscape variation (low number of micro-habitats and niche-space). The sandier substrates are however, more preferable for burrowing, but due to the low forage available within these habitats, only a few burrows (rodents and other small to medium sized mammals) were observed (less than expected). Low rocky outcrops do provide some landscape variation; however, such outcrops are small, and relative scarcely scattered throughout this habitat type. Due to the aforementioned reasons, faunal diversity within these habitats are likely to be fairly low and will likely comprises largely of "habitat generalists". As such, development within these habitats are regarded as acceptable. However, care should be taken when developing in thus unit, since some of these areas are characterised by deeper sandier soils that may be prone to erosion. Therefore, erosion should be carefully monitored and mitigated wherever possible. Furthermore, although overall conservation value and sensitivity is medium, a Pre-Construction Botanical and Faunal Walk-Through will have to be conducted in order to identify the presence of any potential sensitive species (protected and SCC) that may occupy/inhabit the development footprints of the WEF and to assist in the biodiversity permitting processes.

The areas classified as "Very High" sensitivity coincide with the primary and larger washes, which are by nature ephemeral river systems. In order to avoid any detrimental impacts on these features' functions, services and ecological drivers a 100m buffer is recommended around these freshwater resource features. These buffer areas are also subsequently regarded as "Very High" sensitive. These larger ephemeral streams/washes are considered to be ecologically important and sensitive, as these features are regarded as valuable resources, contributing to habitat and species diversity as well as providing numerous other ecological functions and services. These ephemeral freshwater resource features are probably the most significant faunal habitats within the project site (for mammals, reptiles and also potentially for amphibians). These freshwater resource systems along with their vegetation are extremely heterogenous and provides highly structural complexity and breeding/foraging habitats for various mammal species. These features furthermore contribute to habitat heterogeneity within the area and as such increase habitat and niche diversity within the larger area. Furthermore, these freshwater resource systems can be regarded as potentially important corridors for faunal movement

and migration. Lateral and longitudinal connectivity is also regarded as fairly high. The overall diversity, connectivity and sensitivity of these areas were regarded as "Very High" and as such these areas should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):

» only activities relating to the route access and cabling:
  - the use/upgrade of existing roads and watercourse crossings are the preferred options;
  - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
  - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

All moderately sized ephemeral washes are regarded as High sensitive and are regarded is important tributaries of the larger watercourses. These watercourses provide mostly, similar ecological functions and services as provided by the larger watercourses, but to a slightly smaller extent. However, these tributaries support the "hard-working" mainstem watercourses, and are an essential part of these larger watercourse features. As such these smaller ephemeral washes should be maintained in good condition in order to conserve the larger freshwater ecosystems. In order to achieve this, a 50m buffer area around all of these smaller watercourses have been recommended and should also be similarly classified as High sensitive areas. Furthermore, these areas should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):

» only activities relating to the route access and cabling:
  - the use/upgrade of existing roads and watercourse crossings are the preferred options;
  - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
  - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

All small drainage channels are considered to be of moderate ecologically importance and sensitivity. These systems convey floodwater into and out of the ecologically important and sensitive larger washes and subsequently play an important role in the maintenance of these, more important, systems. Furthermore, the vegetation of these drainage lines help reduces flood damage to downstream habitats and subsequently contribute to the maintenance of biological productivity of downstream environments. In order to avoid any detrimental impacts on these drainage features' functions and services a 35m buffer is recommended around these features. These buffer areas are also subsequently regarded as Moderate sensitive. Even though these areas are only regarded as Medium

sensitive, these areas should still be regarded as "No-Go" areas for most activities, apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint):

- » only activities relating to the route access and cabling:
  - the use/upgrade of existing roads and watercourse crossings are the preferred options;
  - Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.
  - All underground cabling should be laid either within access roads or next to access roads (as close as possible).

The medium sensitive areas coincide with portions of Bushmanland Inselberg Shrubland, (occupying outcrops, ridges and undulating areas covered by shallow soils, exposed bedrock and surface stones and boulders) that contain more gradual slopes, are more homogenous, structurally less complex and generally low in species diversity. Bushmanland Inselberg Shrubland tend to patchily distributed throughout the project site, especially within the northern half of the project site. Even though these areas are regarded as medium sensitive, they still none the less contribute to habitat diversity within the region. These habitats show moderately-high potential for unique succulent and dwarf shrub plant species as well as mammal and reptile species. Species diversity within these habitats were however, found to be fairly low during the screening site-visit. Connectivity with similar habitats as well as other habitats are regarded as good. Development within these medium sensitive portions of the Bushmanland Inselberg Shrubland are regarded as acceptable. Erosion would likely not be a problem in this unit, given the shallow and rocky nature of the soils; however, the sandier pediments surrounding some of the larger ridges and outcrops may be vulnerable to erosion, and as such stormwater runoff from the disturbed areas should be mitigated in order to avoid unnatural runoff patterns within the disturbed areas, affecting the lower lying sandier areas. As such, a detailed Storm Water and Erosion Management Plan as well as a Plant Rehabilitation and Invasive Alien Plant Management Plan should accompany the EIA Report. Furthermore, a Pre-Construction Fauna and Flora Walk-Through will be required in order to determine whether there are any sensitive, restricted species confined to these areas and at risk of being impacted by the proposed development.

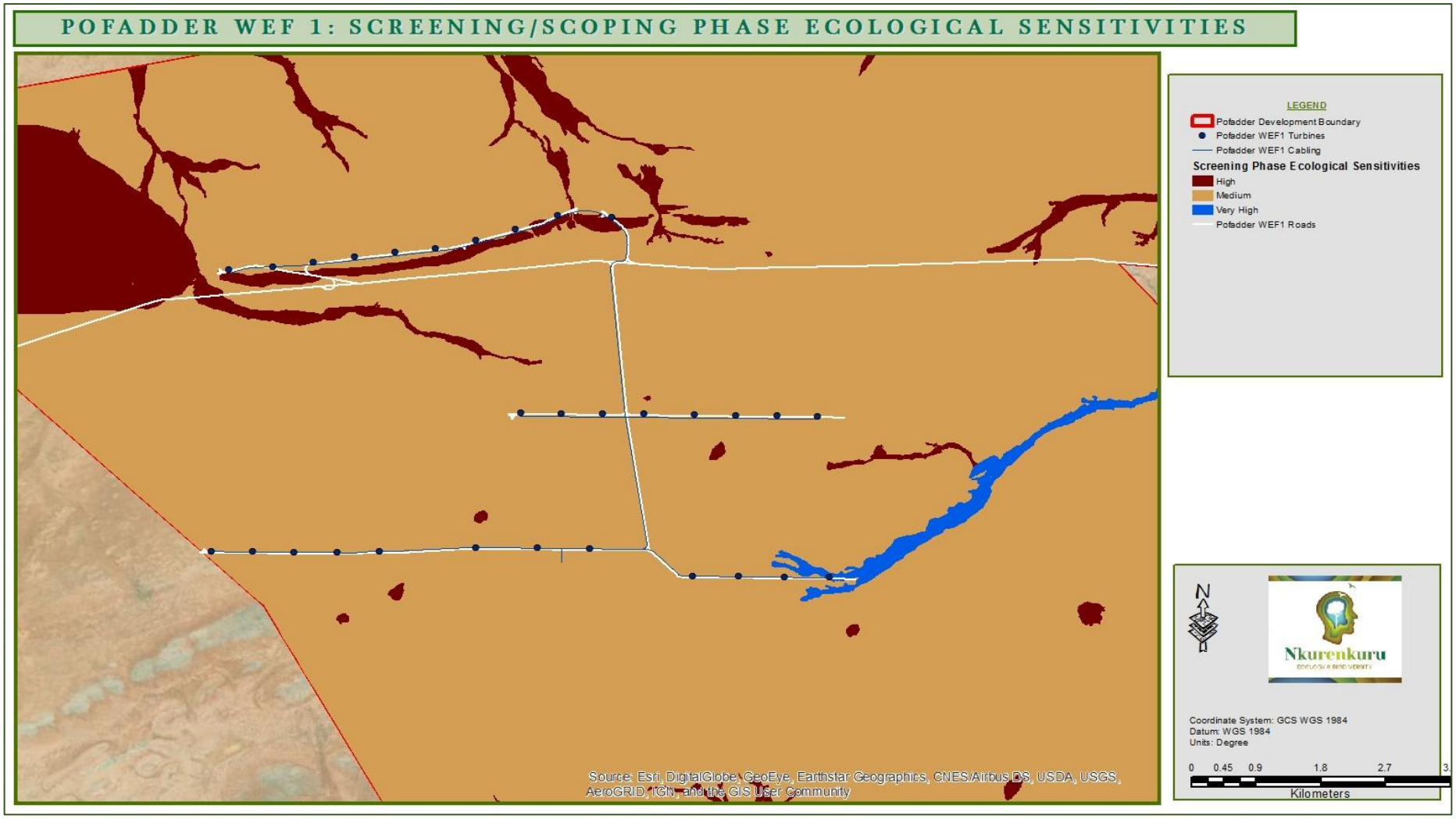


Figure 10: Sensitivity mapping of the Pofadder WEF 1's project site.

8. AQUATIC/FRESHWATER RESOURCE BASELINE ASSESSMENT (SCREENING)

8.1. Desktop Freshwater Resource Description

The study site occurs within three Quaternary Catchments namely D81G, D81F and D53G (All of which are located within the Lower Orange Water Management Area). The main drainage features within the region are the Kaboep River (area to the north-east – D81F), T-Goob se Laage River (area to the north-west – D81G) and Soutput se Laagte River (area to the south – D53G). Both the Kaboep River and the T-Goob se Laagter River drains directly into the Orange River whilst Soutput se Laagter River drains into the Sout River. Furthermore, the Kaboep River drains a portion of the project site whilst smaller drainage networks and tributaries of the other two main river features drain the eastern and southern portion of the project site. All of the rivers within the region are regarded as Ephemeral and are typically lower foothill rivers comprising of floodplains that are either slightly confined (V4) on both side or only to one side (V2) (Rowntree & Wadeson, 1999).

The Hydrological Characteristics of the project site are summarised as follows:

- Mean Annual Precipitation = 88-106 mm;
- Mean Annual Runoff = 0.3 – 0.5 mm;
- Mean Annual Evaporation = > 2600 mm; and
- Hydrological Zone = L.

Almost all of the watercourses within the region are still in a largely natural state with minor modifications (PES: B) (DWS, 2014)

The Pofadder WEF1 project is located within the Nama Karoo Level 1 ecoregion (26.02 level 2 ecoregion) (Kleynhans, et al., 2005). The Nama Karoo ecoregion incorporates a number of northward flowing rivers, with the main system into which these rivers flow being the Orange River. The characteristics of the ecoregion are:

- Topography is diverse, but plains with a moderate to high relief and lowlands, hills and mountains with moderate to high relief are dominant. Vegetation consists almost exclusively of Nama Karoo vegetation types;
- Most of the rivers in the region are seasonal to ephemeral,
- Perennial rivers that traverse this region are the Riet and Orange;
- Rainfall is moderate to low in the east, decreasing to arid in the west. Coefficient of variation of annual precipitation is moderate to high in the east to very high in the west;
- Drainage density is generally low, but medium to high in some parts;
- Median annual simulated runoff is moderate to low in the east, decreasing to arid in the west, and
- Mean annual temperature is moderate to low in the east, increasing to moderate to high in the west.

The proposed development area is situated within the Northern Cape Pan Veld Geomorphic Province (Partridge, et al., 2010). The main feature of this province, which straddles the uplifted Griqualand–Transvaal axis, is the frequency of pans (some of vast size e.g., Verneukpan and Grootvloer) that are remnants of earlier (Cretaceous) drainage systems (De Wit, 1993). Each pan has its own endoreic drainage network. These pans can be regarded as discontinuous groundwater windows, in which the substantial excess of evaporation over precipitation under the prevailing hot, dry climate, leads to rapid concentration of dissolved solids within each discrete basin. Some of the pans are linked by now defunct palaeo-valleys which, under the more humid conditions of the Miocene, contained substantial rivers. These drainage systems were disrupted both by progressive aridification and by uplift along the Griqualand–Transvaal axis, causing the dismembering of several (Partridge & Maud, 2000).

Four main drainage systems traverse this geographic province; from east to west these are the Boesak, Vis/Hartbees and Brak rivers. The rivers to the east (Boesak and Vis/Hartbees) display remarkable uniformity, with flat slopes, wide valley cross-sectional profiles, concave longitudinal profiles and exponential BFCs (Macro-reach Best Fit Curves: aggregading alluvial river systems where there is no significant lateral input of water or sediment). The sediment storage surrogate descriptors are consequently WF (a sediment storage surrogate descriptor indicative of high sediment storage capability).

8.2. Screening Phase: Classification and Description of Aquatic/Freshwater Resource Features

The study site occurs within three Quaternary Catchments namely D81G, D81F and D53G (All of which are located within the Lower Orange Water Management Area). The main drainage features within the region are the Kaboep River (area to the north-east – D81F), T-Goob se Laage River (area to the north-west – D81G) and Soutput se Laagte River (area to the south – D53G). Both the Kaboep River and the T-Goob se Laagter River drains directly into the Orange River whilst Soutput se Laagter River drains into the Sout River. Furthermore, the Kaboep River drains a portion of the project site whilst smaller drainage networks and tributaries of the other two main river features drain the eastern and southern portion of the project site. All of the rivers within the region are regarded as Ephemeral and are typically lower foothill rivers comprising of floodplains that are either slightly confined (V4) on both side or only to one side (V2) (Rowntree & Wadeson, 1999).

8.2.1. Aquatic/Freshwater Resource Delineation

The water body delineation and classification were conducted using the standards and guidelines produced by the DWS (DWAF, 2005 & 2007) and the South African National Biodiversity Institute (2009) (refer to **Error! Reference source not found.**).

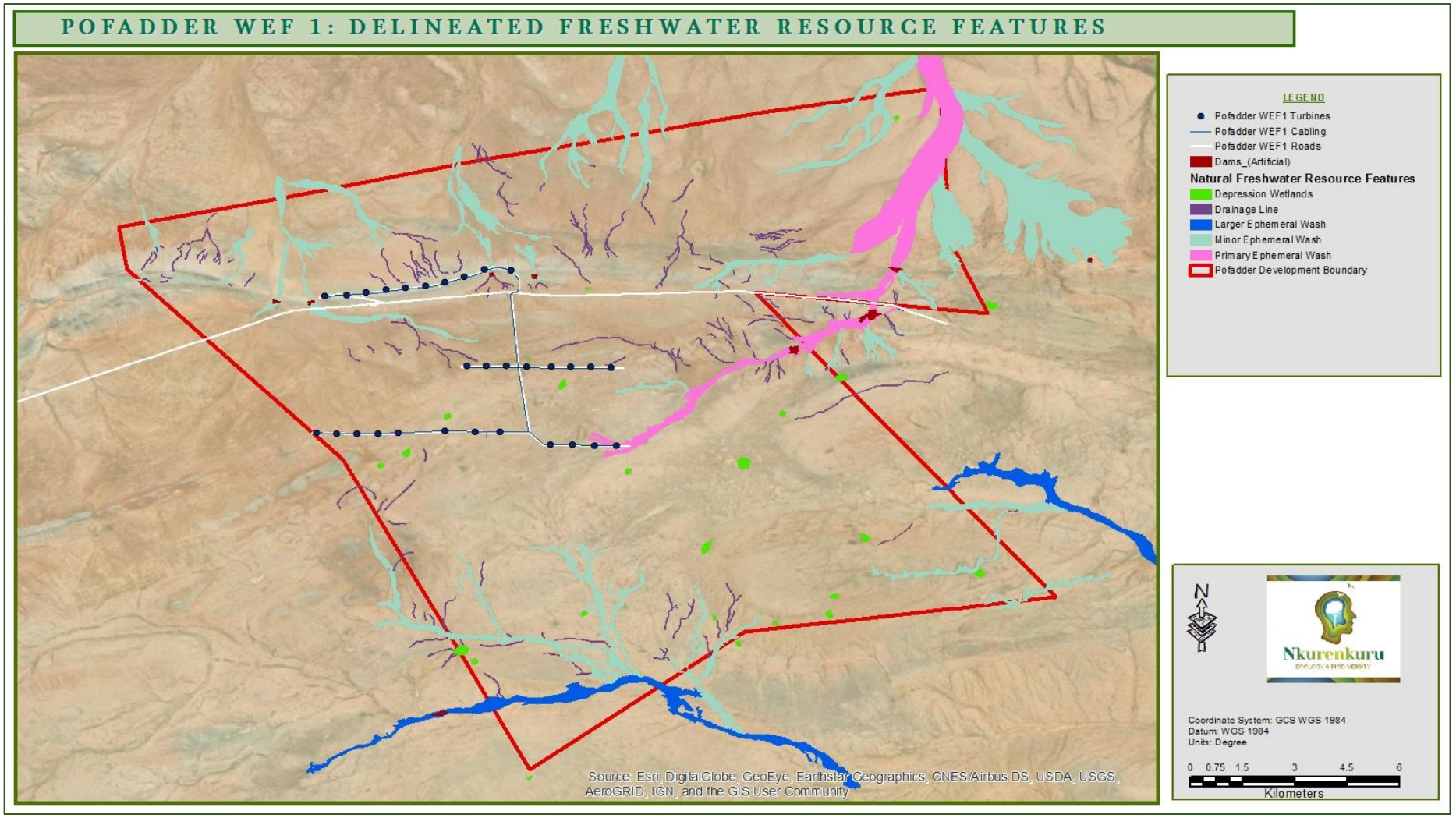


Figure 11: Aquatic/Freshwater Resource Features delineated and classified within the project site for the Pofadder WEF1 development.

Wetland Features:

Soil and vegetation sampling in conjunction with the recording of topographical features enabled the delineation of a twenty-three (23) wetland units within the project site (**Error! Reference source not found.**). Wetland ecosystems are in general the dominant drainage features in this landscape and comprised of ephemeral depressions (endorheic) hydrogeomorphic (HGM) units. Depression wetlands, also known as pans, form within shallowed-out basins within the flatter landscape areas and are generally closed systems that are inward draining (endorheic). These depression wetlands are located outside of the proposed Pofadder WEF 1 footprint, but a very small portion of some of these wetlands' catchments will be impacted by the proposed development.

Such depression wetlands make up the majority of the lentic (non-flowing) systems of the greater landscape. This depression wetland is endorheic, i.e. isolated from other surface water ecosystems, usually with inflowing surface water but no outflow. There is generally little or no direct connection with groundwater, and this pan tends to be fed by unchanneled overland flow and interflow following rainfall events. Interflow is the lateral movement of water, usually derived from precipitation that occurs in the upper part of the unsaturated zone between the ground surface and the water table. This water generally enters directly into a wetland or other aquatic ecosystem, without having occurred first as surface runoff, or it returns to the surface at some point down-slope from its point of infiltration. This depression wetland does however contain a small drainage line, which started as a small erosion feature.

Endorheic pans are the most common wetland type in arid and semi-arid environments (Allan et al., 1995), and are generally thought to form as a result of the synergy of a number of factors and processes, including low rainfall, sparse vegetation, flat to gently sloping topography, disrupted drainage, geology (e.g. dolerite sills and dykes) grazing and deflation. The Bushmanland endorheic pans, or "vloere" as they are called locally, are one of the most extensive salt pan systems in South Africa (Mucina et al., 2006). These pans are highly variable in size and form.

Inundation periods for this wetland is very short-lived (days to a few weeks) following sufficient precipitation. Similarly, the frequency is highly variable, from less than once a year to once every few decades. The flat, central portion of this pan is mostly devoid of vegetation, with a zonation of plants occurring around the margin.

Ephemeral Streams and Washes:

Three major/primary washes, and 35 minor streams/washes were identified and delineated (**Error! Reference source not found.**).

Arid streams and rivers can typically include discontinuous, ephemeral, compound, alluvial fan, anastomosing, and single-threaded channels, which vary due to a range of gradients (slopes), sediment sizes, and volumes and rates of discharge. Discontinuous ephemeral stream systems and alluvial fans are most prevalent in, but not restricted to, piedmont (foot hill) settings, while compound channels, anastomosing rivers, and single-thread channels with adjacent floodplains generally occupy the valley bottoms (Beven &Kirby 1993). Ephemeral and intermittent streams are the dominant stream types within the arid parts of southern Africa

The "master variable" responsible for shaping such an ephemeral watercourse is associated with the flow regime of the system, which includes variations and patterns in surface flow magnitude, frequency, duration, and timing (Poff et al., 1997). It follows that the size and shape of a watercourse is controlled in large part by the dominant discharge in a particular region (Lichvar & Wakeley, 2004). Fluvial morphology is frequently associated with extreme discharge events; streams and floodplains trap sediments and nutrients in addition to attenuating flood waters (Graf 1988; Leopold 1994).

These delineated features represent larger and wider watercourses that include broad watercourses that may lack distinct channel development and are referred to as Washes or Wadis in Arabia, Arroyos in Spanish, and Laagtes in Afrikaans. These washes are all classified as Lower Foothill River in terms of the national classification system. Washes are typically discontinuous, diffuse channels on a flat topography in dry environments. Washes that lack distinct channel features do often display braided channel configuration referred to as bar and swale topography. Discontinuous streams can also display a stream pattern characterized by alternating erosional and depositional reaches. A summary of the classification and description of the various ephemeral washes/streams identified within the DWS regulated area are provided below in Table 7.

Smaller Ephemeral Channels and Drainage Lines:

Represent linear and narrow watercourses in the form of headwater drainage lines (second order drainage lines and channels). A total one hundred and seventy-three (173) drainage lines where identified within the project site (**Error! Reference source not found.**). These features were captured as lines during the delineation process and are expected to be consistent with the NWA watercourse definition of 'natural channels that flow regularly or intermittently'. They can be marginal in nature with discontinuous or poorly developed channels that represent swales due to poor channel development in arid areas with low rainfall, high evapotranspiration and high infiltration in areas with sandy soils. No hydromorphic (wetland soil) or hydrophyte (wetland plant) indicators were recorded in these watercourses. Aerial imagery interpretations identified linear features with textural changes that were regarded to be associated with areas of preferential flows during cyclic surface flow events that can occur at frequencies that are several years apart. These features were considered as drainage lines and ephemeral channels.

These drainage systems differ from downstream reaches due to a closer linkage with hillslope processes, higher temporal and spatial variation, and their need for different protection measures from land use activities (Gomi et al. 2002). These drainage lines are never or very seldom in connection with the zone of saturation and they consequently never have base flow and are unlikely to support wetland conditions.

These drainage lines can contain discontinuous channels due to lower annual rainfall, longer rainfall intervals, and low runoff versus infiltration ratio due to greater transmission losses (Lichvar et al., 2004). Discontinuous channels are more common on low gradient topographies (e.g. basins and plains) in arid and semi-arid environments, with deeper substrates that result in lower energy fluctuations and greater water recharge into the surrounding soils during flow events.

These systems form part of a continuum between hillslopes and stream channels, which can be generally classified into four topographic units (Gomi et al. 2002):

» Hillslopes have divergent or straight contour lines with no channelised flow.
» Zero-order basins have convergent contour lines and form unchannelised hollows.
» Transitional channels (temporary or ephemeral channels) can have defined channel banks, as well as discontinuous channel segments along their length, and emerge out of zero-order basin. They form the headmost definable portion of the drainage line network (first-order channels) and can have either ephemeral or intermittent flow.
» Well defined first and second-order streams that are continuous with either intermittent or perennial flow.

8.3. Aquatic/Freshwater Resource Screening Phase Sensitivity Assessment

A summary of the EI&S importance assessment scores and ratings for wetlands is provided in Table 10 below (also refer to Figures 8) and indicates the following:

Depression Wetlands

» These depression wetlands are considered to be ecologically important and sensitive (High sensitive).
» Ecosystem functions include:
    - Depression wetlands capture runoff due to their inward draining nature, reducing the volume of surface water that would either simply disappear into the soil or exit the area via drainage and stream channels.
    - This collection and retention of water, following rainfall events plays an important role in the maintenance of biodiversity and the creation of special niche habitats.
    - Furthermore, temporary to ephemeral wet pans provide the opportunity for the precipitation of minerals including phosphate minerals because of the

concentrating effects of evaporation. Additionally, Nitrogen recycling is also an important function of these wetlands.

» Such depression wetlands are known to contain important/unique invertebrate populations like branchiopods, crustaceans, and dipterans. These invertebrates can lay dormant (cysts/eggs) for many years and will hatch during periods of flooding providing, along reactivated algae, a valuable source of food for various faunal species, especially migrating and water birds, including Lesser Flamingos (*Phoeniconaias minor*) which is regarded as Near Threatened.
» As mentioned above such depression wetlands may provide important feeding sites for local and migrating faunal species.
» The contribution of these pans to grazing will only be on and around the outer edges of these pans, where seasonal higher soil moisture in less saline soils can support more palatable vegetation during periods of rainfall.
» The ephemeral nature of the wetlands mean that the wetlands will be fairly sensitive to further reductions and changes in the natural hydrological regime. This may have a significant impact on the floral composition of these areas and may result in a reduction in water supply and a collapse in invertebrate populations.

Major Ephemeral Streams/Washes

» All major ephemeral streams/washes are considered to be of very high importance and sensitivity.
» The smaller ephemeral streams/washes are considered to be of high importance and sensitivity
» The braided channel network and "vloere" of most of the washes contribute slightly to diversity in vegetation and geomorphological structure but more significantly to patchiness.
» Furthermore, deeper pools within these systems may contain important/unique invertebrate populations like branchiopods, crustaceans, and dipterans. These invertebrates can lay dormant (cysts/eggs) for many years and will hatch during periods of flooding providing, along reactivated algae, a valuable source of food for various faunal species, especially migrating and water birds.
» The morphological heterogeneity of these features and their associated vegetation contribute to habitat diversity within the region and valuable resources, not only for faunal species associated with these habitats, but for faunal species in general.
    - The softer sand of the floodplains is preferred by burrowing species such as Bat-eared Fox, Cape Porcupine, Aardvark, Aardwolf and small rodents etc.
    - The patches of taller shrubs attract and provide nesting and feeding site for numerous avifaunal species and provide shelter and browsing for antelope species such as Kudu, Steenbok and Common Duiker
» Dry watercourses are known to serve as important migration routes and corridors, especially the more extensive habitats.
» These systems provide inter alia the following ecosystem services
    - Convey floodwaters.
    - Help ameliorate flood damage.
    - Maintain water quality and quantity.

- Provide habitat for plants, aquatic organisms, and wildlife; and determine the physical characteristics and biological productivity of downstream environments.

Smaller Drainage Features

» All smaller ephemeral washes and drainage channels are considered to be of moderate ecologically importance and sensitivity.
» These smaller, valley floor and drainage systems in general were found to be more prone to degradation – often visible by the formation of smaller washes and/or occasional dense encroachment by spiny high shrubs, most notably of Rhigozum trichotomum. It was then also quite significant that these smaller valley floor systems had a much lower apparent utilisation by livestock and game, although the presence of smaller fauna (birds, rodents) still seemed higher than on surrounding rocky plains.
» These systems convey floodwater into and out of the ecologically important and sensitive larger washes and subsequently play an important role in the maintenance of these, more important, system.
» Furthermore, the vegetation of these drainage lines help reduces flood damage to downstream habitats and subsequently contribute to the maintenance of biological productivity of downstream environments.

According to the current layout no depression wetlands will be impacted by the development, whilst very limited development/activities will occur within the watercourses, which is mostly restricted to watercourse crossings and underground cabling between the wind turbines. According to the current layout only one wind turbine is located within a watercourse features and it is recommended that this turbine as relocated to a more acceptable area outside of the watercourse and its associated buffer area.

For other additional development recommendations (applicable to the watercourses and their associated buffer areas) refer to Sections 3.1 (Aquatic Biodiversity Theme), 6.2.5 and 7.3, :

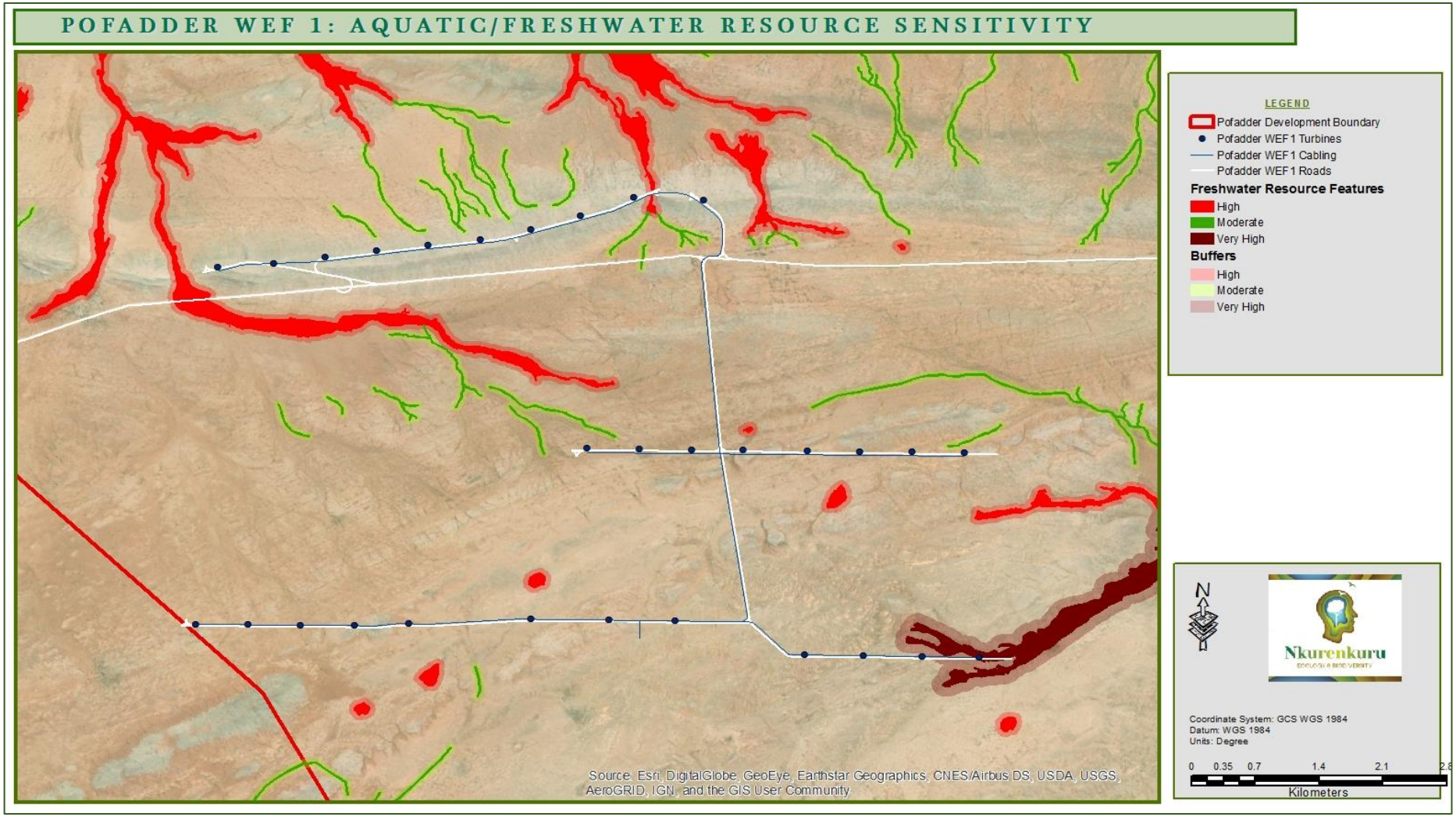


Figure 12: Aquatic/Freshwater Resource Sensitivity mapping of the Pofadder WEF 1's project site.

9. SCOPING PHASE IMPACT ASSESSMENT

Expected impacts of the proposed development will mostly be focused on the vegetation (and supporting substrate) and freshwater resource features. Possible impacts could also be expected on bird species or small mammals and invertebrates. Potential expected impacts on the biodiversity are listed below, but it must be stressed that this evaluation is preliminary and based on desktop information and will only be finalised after a field study of the area in the EIA phase.

9.1. Terrestrial Ecological Impact Assessment

Overview of the most significant impacts of the proposed development

» *Impacts on vegetation and protected plant species*

At Vegetation Level:

As mentioned above the most likely and significant impact will be on the vegetation. The proposed development may lead to direct loss of vegetation. Consequences of the impact occurring may include:

- general loss of habitat for sensitive species;
- loss in variation within sensitive habitat due to a loss of portions thereof;
- general reduction in biodiversity;
- increased fragmentation (depending on the location of the impact);
- disturbance to processes maintaining biodiversity and ecosystem goods and services; and
- loss of ecosystem goods and services.

At species level:

Even though only one species of conservation concern (SCC) has been previously recorded within the region, there is a potential for SCC to occur within the development footprint due to suitable habitat. Such species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities and are also affected by overall loss of habitat. SCC (red data species) include those listed as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened plant species, loss of a population or individuals could lead to a direct change in the conservation status of the species and possible extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations. Consequences may include:

- fragmentation of populations of affected species;
- reduction in the area of occupancy of affected species; and
- loss of genetic variation within affected species.

These may all lead to a negative change in the conservation status of the affected species, which implies a reduction in the chances of the species' overall survival.

The impacts can be largely mitigated through avoidance of potential sensitive areas and listed species by allowing a minimum clearance of vegetation (restricted to the absolute necessary areas) etc.

» *Direct Faunal impacts*

Faunal species will primarily be affected by the overall loss of habitat. Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species and species confined and dependant on specified habitats would not be able to avoid the construction activities and might be killed. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. This impact is highly likely to occur during the construction phase and would also potentially occur with resident fauna within the facility after construction.

SCC (red data species) include those listed as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened animal species, loss of a population or individuals could lead to a direct change in the conservation status of the species, possible extinction. This may arise if the proposed infrastructure is located where it will impact on such individual or populations. Consequences may include:

- fragmentation of populations of affected species;
- reduction in area of occupancy of affected species; and
- loss of genetic variation within affected species

These may all lead to a negative change in the conservation status of the affected species, which implies a reduction in the chances of the species' overall survival.

Disturbance of faunal species can be maintained to a minimum and low significance by implanting effective mitigation measures.

» *Soil erosion and associated degradation of ecosystems*

Soil erosion is a frequent risk associated with the development of WEF on account of the vegetation clearing and disturbance associated with the construction phase of the development and may continue occurring throughout the operational phase. Service roads and panels will generate an increase in runoff during intense rainfall events and may exaggerate the effects of erosion. These eroded materials may enter the nearby streams and rivers and may potentially impact these systems through siltation and change in chemistry and turbidity of the water.

With effective mitigation measures in place including regular monitoring the occurrence, spread and potential cumulative effects of erosion may be limited to an absolute minimum.

» *Alien Plant Invasions*

Major factors contributing to invasion by alien invader plants includes habitat disturbance and associated destruction of indigenous vegetation. Consequences of this may include:

- further loss and displacement of indigenous vegetation;
- change in vegetation structure leading to a change in various habitat characteristics;
- change in plant species composition;
- change in soil chemistry properties;
- loss of sensitive habitats;
- loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
- fragmentation of sensitive habitats;
- change in flammability of vegetation, depending on alien species;
- hydrological impacts due to increased transpiration and runoff; and
- impairment of wetland function.

Although the potential severity of this impact may be high, it can be easily mitigated through regular alien control.

» *Impacts on Critical Biodiversity Areas and Broad-Scale Ecological Processes*

The majority of the project site has been classified as Other Natural Areas (ONAs) (76.4%), whilst 12% of the project site is listed as ESA and 7.9% listed as CBA2. Only a very small portion of the project site has been classified as a CBA 1 (3.5% of project site)

Issue	**Nature of Impact during the <u>Construction and Decommision Phases</u>**	**Extent of Impact**	**No-Go Areas**
Disturbance to and loss of indigenous natural vegetation.	Construction of infrastructure will lead to direct loss of vegetation, causing a localised or more extensive reduction in the overall extent of vegetation. Consequences of the clearing and loss of indigenous semi – to near-natural vegetation occurring may include: » Increased vulnerability of remaining vegetation to future disturbance, including extreme climatic events; » General loss of habitat for sensitive fauna and flora species; » Loss in variation within sensitive habitats due to loss of portions of it; » General reduction in biodiversity; » Increased fragmentation (depending on the location of the impact) and associated reduced viability of species populations; » Alteration of the habitat suitable for plant populations by altering surface structure. This will change species composition and associated species interactions;	Local	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Inselberg classified as a CBA2 » Structurally complex portions of ridges and outcrops The only activities allowed within these areas are the use/upgrade of existing routes. Appart from avoiding the above mentioned "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 7.3 and 11

	» Disturbance to processes maintaining biodiversity and ecosystem goods and services; and » Loss of ecosystem goods and services.		
Disturbance or loss of threatened/protected plants.	SCC could potentially occur in the study area. Flora is affected by an overall loss or alteration of habitat and due to its limited ability to extend or change its distribution range. In the case of SCC, a loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations. Consequences of this may include: » Fragmentation and decline of populations of affected species; » Reduction in the area of occupancy of affected species; » Loss of genetic variation within affected species; » Alteration of the habitat suitable for plant associations by altering of the surface structure. This will change species composition and associated species interactions and species ability to persist; and » Future extinction debt of particular species of flora and fauna.	Local	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Inselberg classified as a CBA2 » Structurally complex portions of ridges and outcrops The only activities allowed within these areas are the use/upgrade of existing routes. SCC species have a distribution that include the study area and may potentially occur within the study area; the issue requires further investigation in the EIA phase. During the EIA Phase areas containing SCC may be identified and these areas will subsequently be upgraded to a higher sensitivity and will be accompanied with additional mitigation measures to avoid any potential detrimental impacts. Appart from avoiding the above mentioned "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 7.3 and 11.

	These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chance of survival of the species.		
Loss of habitat for fauna species of conservation concern.	Fauna species of conservation concern are indirectly affected primarily by a loss of or alteration of habitat and associated resources. Animals are mobile and, in most cases, can move away from a potential threat, unless they are bound to a specific habitat that is also spatially limited and will be negatively impacted by a development. Nevertheless, the proposed development will reduce the extent of habitat available to fauna. For any species, a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened animal species, loss of a suitable habitat, population, or individuals could lead to a direct change in the conservation status of the species. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include: » Loss of populations of affected species; » Reduction in area of occupancy of affected species; » Loss of genetic variation within affected species; and » Future extinction debt of a particular species.	Local	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Inselberg classified as a CBA2 » Structurally complex portions of ridges and outcrops The only activities allowed within these areas are the use/upgrade of existing routes. SCC species have a distribution that include the study area and may potentially occur within the study area; the issue requires further investigation in the EIA phase. During the EIA Phase areas containing SCC may be identified and these areas will subsequently be upgraded to a higher sensitivity and will be accompanied with additional mitigation measures to avoid any potential detrimental impacts. Appart from avoiding the above mentioned "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 7.3 and 11

	There are a number of red data species that have been recorded for the wider area within which the study area is located. Their presence and the necessity to keep their habitats intact in the study area needs to be confirmed during a field survey in the EIA phase.		
Disturbance to migration routes and associated impacts to species populations.	Site preparation and construction activities may interfere with the current migration routes of fauna species. This may lead to: » Reduced ability of species to move between breeding and foraging grounds, reducing breeding success rates; » Reduced genetic variation due to reduced interaction amongst individuals or populations as a result of fragmentation effects caused by the proposed developments	Site and surroundings	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Larger ephemeral watercourses and associated smaller tributaries The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from avoiding the above mentioned "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 7.3 and 11
Impact on Critical Biodiversity Areas.	Development within the CBAs and ESAs may negatively impact biodiversity and the ecological functioning of these features.	Local and Regional	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » CBA 1 (FEPA River and 500m buffer); » CBA 2 (structurally important inselberg) » ESA (Kaboep River and 500m buffer)

			The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from avoiding the above mentioned "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 3.1, 6.2.5, 7.3 and 11
Establishment and spread of declared weeds and alien invader plants.	Major factors contributing to invasion by alien invader plants include excessive disturbance to vegetation, creating a window of opportunity for the establishment of alien invasive species. In addition, regenerative material of alien invasive species may be introduced to the site by machinery traversing through areas with such plants or materials that may contain regenerative materials of such species. Consequences of the establishment and spread of invasive plants include: » Loss of indigenous vegetation; » Change in vegetation structure leading to change in or loss of various habitat characteristics; » Change in plant species composition; » Altered and reduced food resources for fauna; » Change in soil chemical properties; » Loss or disturbance to individuals of rare, endangered, endemic and/or protected species; » Fragmentation of sensitive habitats;	Local and Regional	No "no-go" areas have been identified to date but the potential for alien invasive species present in or around the study area is regarded as moderate. The extent to which the site contains alien plants will be determined in the EIA phase through detailed investigation and field-survey.

	» Change in flammability of vegetation, depending on alien species; » Hydrological impacts due to increased transpiration and runoff; » Increased production and associated dispersal potential of alien invasive plants, especially to lower-lying wetland areas, and » Impairment of wetland function.		

Gaps in knowledge & recommendations for further study

» The initial desk-top investigation of the study area indicates that a few protected and red-data species as well as sensitive habitats potentially occur on the site. However, once the final layout has been designed in accordance to findings of a field investigation, the likelihood that the development will compromise the survival of any species of conservation concern is expected to be limited.

» **Plant species of conservation concern will only be identifiable during the growing season; thus any field survey of vegetation should only commence from November and be completed by April.**

» Although previous collection records from the area exist, the study area itself may not have been previously surveyed and there may be additional species that have not yet been captured in the existing species databases for the area. A detailed ecological survey and sensitivity assessment will be undertaken during the EIA phase.

Issue	**Nature of Impact during the <u>Operational Phase</u>**	**Extent of Impact**	**No-Go Areas**
Disturbance or loss of indigenous natural vegetation.	Hard and engineered surface create areas of altered surface characteristics, rainfall interception patterns. Consequently, it can be expected that within the Facility development footprint, the species composition and topsoil characteristics will change significantly. A sparser or less stable vegetation, together with the altered surface and runoff characteristics may lead to:	Local	No "no-go' areas so far identified. For mitigation measures refer to Sections 7.3 and 11

	» Increased vulnerability of the remaining vegetation to future disturbance, including erosion; » General loss or significant alteration of habitats for sensitive species; » Loss in variation within sensitive habitats due to a loss of portions of it; » General reduction in biodiversity; » Increased fragmentation (depending on location of impact); » Future extinction debt of a particular species; » Disturbance to processes maintaining biodiversity and ecosystem goods and services; and » Loss of ecosystem goods and services.		
Altered runoff patterns due compacted areas.	Hard, engineered surfaces create surfaces of rainfall interception, where rainfall is collected and concentrated at the edges from where it then moves onto the ground in larger, concentrated quantities as opposed to small drops being directly intercepted and raindrop impact dispersed by vegetation, then absorbed by the ground. This may lead to a localised increase in runoff during rainfall events, which may result in localised accelerated erosion. Likewise, access roads and areas where soils have been compacted during construction will have a low rainfall infiltration rate, hence creating more localised runoff from those surfaces. Runoff will	Site and surroundings	No "no-go" areas regarding high risk erodible soils have been identified to date. This must be verified during a detailed investigation and field-survey as part of the EIA phase For mitigation measures refer to Sections 7.3 and 11

	thus have to be monitored and channelled where necessary to prevent erosion over larger areas.		
Establishment and spread of declared weeds and alien invader plants.	The envisaged altered vegetation cover after construction and during the operation phase of the proposed development will create a window of opportunity for the establishment of alien invasive species. In addition, regenerative material of alien invasive species may be introduced to the site by machinery or persons traversing through areas with such plants or materials that may contain regenerative materials of such species. Consequences of the establishment and spread of invasive plants include: » Loss of indigenous vegetation or change in vegetation structure leading to an even more significant change in or loss of various habitat characteristics; » Loss of plant resources available to fauna; » Change in soil chemical properties; » Loss or fragmentation of sensitive or restricted habitats; » Loss or disturbance to individuals of rare, endangered, endemic and/or protected species; » Change in flammability of vegetation, depending on alien species; » Hydrological impacts due to increased transpiration and runoff;	Local to regional	No "no-go" areas have been identified to date but the potential for alien invasive species present in or around the study area is regarded as moderate. The extent to which the site contains alien plants will be determined in the EIA phase through detailed investigation and field-survey.

	» Increased production and associated dispersal potential of alien invasive plants		

Gaps in knowledge & recommendations for further study

» The largest opportunity for mitigating any negative impacts exists during the design phase, if layouts adhere to the findings and recommendations of detailed field studies and investigations carried out during the EIA phase.
» Limited knowledge does, however exist on the potential and ease with which vegetation can be re-established after construction given the variable rainfall regime of the region; which species would be able to persist in the altered environment on and around the proposed development; and what effect this altered species composition and –density will have on ecosystem intactness and –functionality.
» Regular monitoring of a minimum set of environmental parameters throughout the operational phase, coupled with an adaptive environmental management program, will thus be essential to prevent any environmental degradation and any cumulative effects of the development beyond its periphery.

The significance of the proposed development in terms of Duration, Magnitude, Probability as well as cumulative impacts

» Most of the above-mentioned impacts are probable, although the extent, duration, and magnitude of these impacts can be minimalised to levels where these impacts can be regarded as low significance by having the necessary mitigation measures implemented. By exclusion of certain sensitive areas from the development footprint area, the probability of some of these above-mentioned impacts occurring within these habitats can be avoided.
» The duration of the project is expected to be long term (~20-25 years) and subsequently most of the impacts are also expected to be long term. However, some impacts are expected to be of short term and confined to the construction phase. For example, the disturbance of some animal species will be confined to the construction phase and as human movement decreases during the operation phase some species may return to the site. Furthermore, impacts such as erosion and invasion of alien invasive species, with effective mitigation measures including regular monitoring in place, can be retained to a medium to short duration although monitoring and implementation of mitigation measures will have to be implemented throughout the lifespan of the proposed development.
» Although most impacts associated with the proposed development are expected to be local, affecting mainly the immediate environment, the potential does exist for some impacts to be exacerbated and even spread outside the development footprint area if left unattended, eventually posing a potential threat to important environmental processes and functionality. Impacts that may potentially pose a threat to the magnitude and duration, if left unattended or not mitigated accordingly, include invasion by invasive alien species, soil erosion, significant disturbance and alteration of important wetland habitats and watercourses.

» The most significant cumulative impact that the proposed development will have is the potential impact on Broad-Scale Ecological possesses and the impact on Ecological Support Areas.
» Cumulative impacts of developments on population viability of species can be reduced significantly if new developments are kept as close as possible to existing developed and/or transformed areas or, where such is not possible, different sections of a development be kept as close together as possible. Thus, new power lines should follow routes of existing servitudes if such exist. Renewable energy facilities, like solar WEFs and PVs should be constructed as close as possible to existing infrastructure or substations, and if several developments are planned within close proximity, these developments should be situated as close together as possible, not scattered throughout the landscape.
- Excessive clearing of vegetation can and will influence runoff and stormwater flow patterns and dynamics, which could cause excessive accelerated erosion of plains, and this could also have detrimental effects on the downslope freshwater resource systems.
  - Rehabilitation and revegetation of all surfaces disturbed or altered during construction is desirable.
  - Runoff from sealed surfaces or surfaces that need to be kept clear of vegetation to facilitate operation of a development needs to be monitored regularly to ensure that erosion control and stormwater management measures are adequate to prevent the degradation of the surrounding environment.
- Large-scale disturbance of indigenous vegetation creates a major opportunity for the establishment of invasive species and the uncontrolled spread of alien invasives into adjacent agricultural land and rangelands.
  - A regular monitoring and eradication protocol must be part of all developments long term management plans.

9.2. Aquatic/Freshwater Resource Impact Assessment

The majority of impacts associated with the development would occur during the construction phase as a result of the disturbance associated with the operation of heavy machinery at the site and the presence of construction personnel. The major risk factors and contributing activities associated with the development are identified below before the impacts are assessed. These are not necessarily a reflection of the impacts that would occur, but rather a discussion on overall potential impacts and/or extent of these potential impacts that would occur if mitigation measures are not considered and/ or sensitive areas not avoided.

Overview of the most significant impacts of the proposed development

Construction and operation may lead to potential indirect loss of / or damage to potential freshwater resource habitats. This may potentially lead to localised loss of sensitive habitat and may lead to downstream impacts that affect a greater extent of freshwater resources or impact on these systems functions and biodiversity. Where these habitats are already stressed due to degradation and transformation, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat. Physical alteration to wetlands can have an impact on the functioning of those wetlands. Consequences may include:

- *increased loss of soil;*
- *loss of/or disturbance to indigenous wetland vegetation;*
- *loss of sensitive wetland habitats;*
- *loss or disturbance to individuals of rare, endangered, endemic and/or protected species that occur in wetlands;*
- *fragmentation of sensitive habitats;*
- *impairment of wetland function;*
- *change in channel morphology in downstream wetlands, potentially leading to further loss of wetland vegetation; and*
- *reduction in water quality in wetlands downstream*

Various freshwater resource features have preliminary been identified. The extent, condition as well as functions and services of these freshwater resources will be determined during the EIA phase Assessment and final appropriate buffers will be recommended.

Issue	**Nature of Impact during the <u>Construction and Decommision Phases</u>**	**Extent of Impact**	**No-Go Areas**
Disturbance to and loss of wetland vegetation	Construction of infrastructure may lead to direct loss of vegetation, causing a localised or more extensive reduction in the overall extent of vegetation. Potential consequences include: » General loss of habitat for sensitive fauna and flora species;	Local	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Primary Ephemeral Wash and 100m Buffer; » Larger Ephemeral Washes and 100m Buffers; » Minor Ephemeral Washes and 50m Buffers; » Depression Wetlands and 50m Buffers; and » Drainage lines and 35m Buffers

	» General reduction in biodiversity; » Reduction in the ability of the wetlands to fulfil their ecological services and functions such as flood attenuation and the enhancement of water quality through the precipitation and storage of nitrates and toxicants; » Disturbance to processes maintaining biodiversity and ecosystem goods and services; and » Exposure of soil to erosion.		The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from allowed activities within the "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 8.3 and 11.
Impact on freshwater resource systems through the possible increase in surface water runoff	An increase in the surface water budget of the wetlands and watercourses, due to an increase in volume and velocity of surface water flow from the cleared construction areas into the wetlands, may result in the loss of natural wetland/aquatic vegetation and potentially expose the wetland/aquatic soils to erosion.	Local and immediate surroundings	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Primary Ephemeral Wash and 100m Buffer; » Larger Ephemeral Washes and 100m Buffers; » Minor Ephemeral Washes and 50m Buffers; » Depression Wetlands and 50m Buffers; and » Drainage lines and 35m Buffers The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from allowed activities within the "No-Go" areas additional mitigation measures for the development

			outside of the "No-Go" areas are provided within Sections 8.3 and 11.
Increase sedimentation and erosion	Activities associated with the construction phase may potentially lead to some direct or indirect loss of or damage to the identified wetlands and watercourses. Impacts on these systems will most likely be: » Vegetation clearing within the development area may result in an increase in surface water flow and expose areas prone to erosion and these areas may expand / spread into the wetlands. » The eroded material may enter the wetlands and may potentially impact these systems through siltation.	Local and immediate surroundings	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Primary Ephemeral Wash and 100m Buffer; » Larger Ephemeral Washes and 100m Buffers; » Minor Ephemeral Washes and 50m Buffers; » Depression Wetlands and 50m Buffers; and » Drainage lines and 35m Buffers The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from allowed activities within the "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 8.3 and 11.
Impact on localized surface water quality	Chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement etc.) could potentially be washed downslope into the wetlands and potentially affect water quality.	Local and immediate surroundings	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Primary Ephemeral Wash and 100m Buffer; » Larger Ephemeral Washes and 100m Buffers; » Minor Ephemeral Washes and 50m Buffers; » Depression Wetlands and 50m Buffers; and » Drainage lines and 35m Buffers

			The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from allowed activities within the "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 8.3 and 11.
Loss of habitat for fauna dependent on such habitats.	Fauna species of conservation concern are indirectly affected primarily by a loss of or alteration of habitat and associated resources. Animals are mobile and, in most cases, can move away from a potential threat, unless they are bound to a specific habitat that is also spatially limited, such as isolated, endorheic pans, and will be negatively impacted by a development. For any species, a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened animal species, loss of a suitable habitat, population, or individuals could lead to a direct change in the conservation status of the species. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include: » Loss of populations of affected species;	Local	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Primary Ephemeral Wash and 100m Buffer; » Larger Ephemeral Washes and 100m Buffers; » Minor Ephemeral Washes and 50m Buffers; » Depression Wetlands and 50m Buffers; and » Drainage lines and 35m Buffers The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from allowed activities within the "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 8.3 and 11.

	» Reduction in area of occupancy of affected species; » Loss of genetic variation within affected species; and » Future extinction debt of a particular species. There is SCC that may potentially utilized these habitat types.		

Gaps in knowledge & recommendations for further study

» A detailed Surface Hydrological survey and assessment will be undertaken during the EIA phase according to methods outlined in this report.
» Following, the determination of habitat integrity and sensitivity (during EIA phase), especially towards the impacts associated with such a WEF development; appropriate buffers will be recommended as well as activities which may be acceptable within the buffer areas without threatening the integrity of the wetland areas.

Issue	**Nature of Impact during the <u>Operational Phase</u>**	**Extent of Impact**	**No-Go Areas**
Impact on freshwater resource systems through the possible increase in surface water runoff	An increase in the surface water budget of the wetlands and watercourses, due to an increase in volume and velocity of surface water flow from the cleared areas and from any compacted and hard surfaces. This may result in: » a change in vegetation composition and structure, » the exposure of wetland soils leaving these areas prone to soil erosion; » increase in sedimentation and subsequently a reduction in water quality; and	Local to immediate surroundings	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Primary Ephemeral Wash and 100m Buffer; » Larger Ephemeral Washes and 100m Buffers; » Minor Ephemeral Washes and 50m Buffers; » Depression Wetlands and 50m Buffers; and » Drainage lines and 35m Buffers The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads).

	» reduction in the ability of the wetlands to fulfil vital ecological functions and services such as flood attenuation and precipitation of minerals such as nitrates and toxicants.		Appart from allowed activities within the "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 8.3 and 11.
Impact on localized surface water quality	Chemical pollutants (hydrocarbons from service equipment and vehicles etc.) could potentially be washed downslope into these wetlands and potentially affect water quality.	Local to immediate surroundings	The following areas have been classified as "No-Go" areas for most of the activities associated with the proposed development: » Primary Ephemeral Wash and 100m Buffer; » Larger Ephemeral Washes and 100m Buffers; » Minor Ephemeral Washes and 50m Buffers; » Depression Wetlands and 50m Buffers; and » Drainage lines and 35m Buffers The only activities allowed within these areas are the use/upgrade of existing routes and watercourse crossings (new routes only last resort) as well as underground cabling (within roads). Appart from allowed activities within the "No-Go" areas additional mitigation measures for the development outside of the "No-Go" areas are provided within Sections 8.3 and 11.
Gaps in knowledge & recommendations for further study » A detailed Surface Hydrological survey and assessment will be undertaken during the EIA phase according to methods outlined in this report. » Following the determination of habitat integrity and sensitivity (during EIA phase), especially towards the impacts associated with such a WEF development; appropriate buffers will be recommended as well as activities which may be acceptable within the buffer areas without threatening the integrity of the wetland areas.			
The significance of the proposed development in terms of Duration, Magnitude, Probability as well as cumulative impacts			

The duration of the project is expected to be long term (~20-25 years) and subsequently most of the impacts are also expected to be long term. However, some impacts are expected to be of short term and confined to the construction phase. For example, the disturbance of some animal species will be confined to the construction phase and as human movement decreases during the operation phase some species may return to the site. Furthermore, impacts such as erosion and invasion of alien invasive species, with effective mitigation measures including regular monitoring in place, can be retained to a medium to short duration although monitoring and implementation of mitigation measures will have to be implemented throughout the lifespan of the proposed development.

Due to the fact that these identified wetlands have been subjected to very long term (>12 years) cultivation practices, as well as other forms of disturbances these wetlands have lost some of their functions and services with the remainder occurring in a limited and highly altered manner. Subsequently, their value (ecological importance and sensitivity) has been significantly reduced. It is also probable that this value will only slightly increase if rehabilitated to a satisfactory level (will never be able to rehabilitate to original form). Taking the current state, value and rehabilitation potential into account, the potential significance, magnitude, extent of the above described impacts is regarded as very low. Furthermore, with the necessary mitigation measures, the significance of these impacts can be even further reduced.

Furthermore, potential cumulative impacts are:

» The compromise of ecological processes as well as ecological functioning of these important freshwater resource habitats

- Transformation of intact habitat could potentially compromise ecological processes as well as ecological functioning of important habitats and would contribute to habitat fragmentation and potentially disruption of habitat connectivity and furthermore impair their ability to respond to environmental fluctuations. This is especially of relevance for larger watercourses and wetlands serving as important groundwater recharge and floodwater attenuation zones, important microhabitats for various organisms and important corridor zones for faunal movement.
    - The following mitigation measures will be taken into account during the EIA phase Impact Assessment (in order to reduce the contrubtion of this WEF to cummulative impacts):
        - The recommended buffer areas between the delineated freshwater resource features and proposed project activities should be maintained.
        - Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
        - The potential stormwater impacts of the proposed developments areas should be mitigated on-site to address any erosion or water quality impacts.
        - Good housekeeping measures as stipulated in the EMPr for the project should be in place where construction activities take place to prevent contamination of any freshwater features.

	- Where possible, infrastructure should coincide with existing infrastructure or areas of disturbance (such as existing roads). - Disturbed areas should be rehabilitated through reshaping of the surface to resemble that prior to the disturbance and vegetated with suitable local indigenous vegetation.

10. PLAN OF STUDY FOR EIA

The plan of study for the detailed EIA-phase of the project was informed by this scoping report and the preliminary ecological constraints and development implications highlighted within this ecological scoping report.

The Terrestrial Biodiversity (Fauna and Flora and Terrestrial Habitat) Assessment as well as Aquatic Biodiversity Assessment will be conducted in accordance with the protocols and procedures (3(a-d)) as set out in Section 24(5)(a) and (h) of the National Environmental Act, 1998, which has been gazetted on 10 January 2020.

Furthermore, the Terrestrial Biodiversity (Fauna and Flora) Impact Assessment will be undertaken in accordance with the Species Environmental Assessment Best Practice Guidelines.

10.1. Plan of Study for Detailed Terrestrial Ecological Assessment

» Detailed baseline field survey to assess baseline terrestrial vegetation status, species composition, condition and importance, with a focus on mapping and assessing untransformed grassland vegetation and habitat. A key distinction will be made between primary and secondary vegetation communities, and the representatives of any remaining intact grassland vegetation communities by comparison with known reference state/composition.

- » Baseline vegetation surveys to include an assessment of faunal SCC which will need to be documented and GPS coordinates taken for species encountered in the field.
- » The focus of faunal surveys should be on assessing habitat condition and requirements for key mammal and herpetofaunal species and documenting the presence and location of any SCC in the field.
- » Identification and assessment of the estimated significance of key ecological impacts to vegetation, plant species and fauna.
- » Confirm any fatal flaws from a terrestrial ecological perspective to inform planning and layout of development proposed.
- » Assess the need and desirability for terrestrial biodiversity offsets (where necessary) and provide preliminary recommendations.

Recommendations in terms of impact mitigation and management aimed at reducing impacts significant in line with the principles of the 'mitigation hierarchy', including possible biodiversity buffer zones, development realignments, onsite controls (Best Management Practices: BMPs) and initial post-development rehabilitation requirements (i.e. conceptual terrestrial habitat rehabilitation strategy).

10.2. Plan of Study for Detailed Freshwater Resource Assessment

- A detailed baseline field survey to delineate and classify all freshwater resource features within the project site has already been done. However, the field survey for the EIA will focus on the assessment on freshwater resource condition, functioning and importance/sensitivity.
- Identification and assessment of the estimated significance of key ecological impacts to wetlands/watercourses.
- Assess the need and desirability for wetland/watercourse offsets (if necessary) and provide preliminary recommendations.

Recommendations in terms of impact mitigation and management aimed at reducing impacts significant in line with the principles of the 'mitigation hierarchy', including relevant wetland buffer zones, development realignments, onsite controls (Best Management Practices: BMPs) and initial post-development rehabilitation requirements (i.e. conceptual wetland rehabilitation strategy).

11. CONCLUSION AND RECOMMENDATIONS

This study aimed to conduct a screening assessment of the projects site to:

- Identify any ecological sensitive areas (freshwater and terrestrial);
- Confirm or dispute the current use of the land and environment sensitivity as identified by the national web-based environmental screening tool;
- Provide motivation and evidence of either the verified or different use of the land and environmental sensitivity;
- Identify sensitive areas to be avoided (including corresponding spatial data);
- Provide recommendations regarding the areas available for the development of wind energy facilities; and
- Provide recommendations regarding any further assessments required.

As part of this Assessment a screening survey of the freshwater and terrestrial features was conducted in October 2021.

The outcome of this report is a terrestrial and aquatic/freshwater ecological sensitivity map visually illustrating the findings and results which will then aid in the initial planning and design phase with the purpose of avoiding any sensitive areas.

Habitat sensitivity classification was based on available GIS coverages including various terrestrial ecosystems and biodiversity data, a recent screening survey, and the expert's mapping from Google Earth satellite imagery (altitude 1 to 2 km).

The water body delineation and classification were conducted using the standards and guidelines produced by the DWS (DWAF, 2005 & 2007) and the South African National Biodiversity Institute (2009) (refer to **Error! Reference source not found.**).

The affected properties are currently used for livestock (cattle and sheep) farming. Infrastructure within the property is minimal and consists of kraals, homesteads, boreholes, small reservoirs, feeding and drinking points, stores, and power line infrastructure.

A summary of the sensitivities of the identified/delineated terrestrial and aquatic/freshwater resource features as well as general development recommendations for each feature are provided below in Table 25

Overall, no significant ecological as well as surface hydrological flaws that could pose a risk to the proposed WEF development were identified during the scoping phase assessment; this will however, be confirmed during a detailed field study of the vegetation of the area.

Table 25: Summary of the scoping phase sensitivity assessment.

Feature	Scoping Phase Sensitivity	Remarks
Bushmanland Arid Grassland and Bushmanland Basin Shrubland on slightly broken/irregular sandy and gravel plains	**Medium**	» Development within these habitats are regarded as acceptable. » Care should be taken when developing in thus unit, since some of these areas are characterised by deeper sandier soils, that may be prone to erosion. » Therefore, erosion should be carefully monitored and mitigated wherever possible. » A pre-Construction Botanical and Faunal Walk-Through will have to be conducted in order to identify the presence of any potential sensitive species (protected and SCC) that may occupy/inhabit the development footprints of the WEF and to assist in the biodiversity permitting processes.
Structurally, less complex portions of Bushmanland Inselberg Shrublands	**Medium**	» Development within these medium sensitive portions of the Bushmanland Inselberg Shrubland are regarded as acceptable. » Erosion would likely not be a problem in this unit, given the shallow and rocky nature of the soils; however, the sandier pediments surrounding some of the larger ridges and outcrops may be vulnerable to erosion, and as such stormwater runoff from the disturbed areas should be mitigated in order to avoid unnatural runoff patterns within the disturbed areas, affecting the lower lying sandier areas. » As such, a detailed Storm Water and Erosion Management Plan as well as a Plant Rehabilitation and Invasive Alien Plant Management Plan should accompany the EIA Report. » Furthermore, a Pre-Construction Fauna and Flora Walk-Through will be required in order to determine whether there are any sensitive, restricted species confined to these areas and at risk of being impacted by the proposed development.
Structurally complex portion of the Bushmanland Inselberg Shrublands	**High**	» These areas should be regarded as a "No-Go" area apart from the following activities; • the use of existing roads.
Drainage Lines and 35m Buffers	**Medium**	» All drainage lines with their buffer areas should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint): • only activities relating to the route access and cabling: • the use/upgrade of existing roads and watercourse crossings are the preferred options; • Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort.

		• All underground cabling should be laid either within access roads or next to access roads (as close as possible).
Depression Wetlands and 50m buffers	**High**	» All depression wetlands with their buffer areas should be regarded as "No-Go" areas for all activities associate with the proposed development.
Minor Ephemeral Washes and 50m Buffer Areas	**High**	» All minor ephemeral washes with their buffer areas should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint): • only activities relating to the route access and cabling: • the use/upgrade of existing roads and watercourse crossings are the preferred options; • Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort. • All underground cabling should be laid either within access roads or next to access roads (as close as possible).
Primary and Larger Ephemeral Washes and 100m Buffer Areas	**Very High**	» All larger ephemeral washes and alluvial floodplains with their buffer areas should be regarded as "No-Go" areas apart from the following activities and infrastructure which may be allowed (although restricted to an absolute minimum footprint): • only activities relating to the route access and cabling: • the use/upgrade of existing roads and watercourse crossings are the preferred options; • Where no suitable existing roads and watercourse crossings exist, the construction of new access roads and watercourse crossings can be allowed, however this should be deemed as a last resort. • All underground cabling should be laid either within access roads or next to access roads (as close as possible).

12. REFERENCES

Brownlie, S., Walmsley, B., Tarr, P., 2006. Guidance Document on Biodiversity, Impact Assessment and Decision Making in Southern Africa. The Southern African Institute for Environmental Assessment.

Dayaram, A., Harris, L., Grobler, B.A., van der Merwe, S., Rebelo, A.G., Powrie, L.W., Vlok, J.H.J., Desmet, P., Qabaqaba, M., Hlahane, K.M., Skowno, A.L., 2018. Vegetation Map of South Africa, Lesotho and Swaziland 2018: A description of changes since 2006. Bothalia 49, a2452.

de Villiers, C., Driver, A., Clark, B., Euston-Brown, D., Day, L., Job, N., Helme, N., Holmes, P.M., Brownlie, S., Rebelo, A.G., 2005. Fynbos Forum Ecosystem Guidelines For Environmental Assessment in the Western Cape. Fynbos Forum and Botanical Society of South Africa, Kirstenbosch.

Driver, A., Maze, K., Rouget, M., Lombard, A.T., Nel, J., Turpie, J.K., Cowling, R.M., Desmet, P., Goodman, P., Harris, J., Jonas, Z., Reyers, B., Sink, K., Strauss, T., 2005. National Spatial Biodiversity Assessment 2004: Priorities for Biodiversity Conservation in South Africa. Strelitzia 17. South African National Biodiversity Institute, Pretoria.

Government of South Africa, 2008. National Protected Area Expansion Strategy for South Africa 2008: Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Government of South Africa, Pretoria.

Manning, J.C., Goldblatt, P., 2012. Plants of The Greater Cape Floristic Region 1: The Core Cape Flora, Strelitzia 2 (IUCN, 2021)9. South African National Biodiversity Institute, Pretoria.

Mucina, L., Rutherford, M.C. (Eds.), 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Nel, J., Maherry, A.M., Peterson, C.P., Roux, D.J., Driver, A., Hill, L., van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L., Nienaber, S., 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. 1801/2/11.

Raimondo, D., von Staden, L., Foden, W., Victor, J.E., Helme, N., Turner, R.C., Kamundi, D.A., Manyama, P.A., 2009. Red List of South African plants 2009. Strelitzia 25. South African National Biodiversity Institute, Pretoria.

South African National Biodiversity Institute, 2019. National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries. Pretoria.

South African National Biodiversity Institute, 2018. The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Version 2018 [WWW Document]. URL http://bgis.sanbi.org/Projects/Detail/186

van Wyk, A.E., Smith, G.F., 2001. Regions of Floristic Endemism: A Review with an Emphasis on Succulents. Umdaus Press, Hatfield.

13. APPENDICES

Appendix 1 Plant Species List (Site and POSA Generated List)

The species list presented here is a combination of online (POSA) and site survey data. Descriptions of colours and symbols are given below:

Species in **bold**: Observed on site.
Species marked with "*": Protected species.
Species marked with "†": Red List species.
Species highlighted in blue: Alien species.
Species marked with NEM:BA: Alien species listed in the NEM:BA Alien and Invasive Species Regulations.
Species marked with NCE: Northern Cape Endemic.

Family	*Species*	IUCN	Family	*Species*	IUCN
Acanthaceae	*Acanthopsis carduifolia*	LC	**Asteraceae**	***Ursinia nana* subsp. *nana***	**LC**
Acanthaceae	*Acanthopsis villosa*	LC	Boraginaceae	*Heliotropium curassavicum*	NE
Acanthaceae	***Blepharis furcata***	**LC**	**Boraginaceae**	***Trichodesma africanum***	**LC**
Acanthaceae	***Justicia spartioides***	**LC**	**Brassicaceae**	***Heliophila laciniata*** NCE	**LC**
Agavaceae	***Chlorophytum undulatum***	**LC**	**Brassicaceae**	***Lepidium desertorum***	**LC**
Aizoaceae	**Aloinopsis luckhoffii*	LC	**Cactaceae**	***Opuntia ficus-indica*** NEM:BA	**NE**
Aizoaceae	**Conophytum uviforme* subsp. *uviforme*	LC	Caryophyllaceae	*Dianthus namaensis* var. *dinteri*	LC
Aizoaceae	**Drosanthemum sp.*		Caryophyllaceae	*Spergularia bocconei*	LC
Aizoaceae	****Galenia africana***	**LC**	**Colchicaceae**	***Colchicum capense* subsp. *ciliolatum***	**LC**
Aizoaceae	**Galenia fruticosa*	LC	**Colchicaceae**	***Ornithoglossum vulgare***	**LC**
Aizoaceae	****Galenia sarcophylla***	**LC**	**Crassulaceae**	***Crassula muscosa***	**LC**
Aizoaceae	**Galenia squamulosa*	LC	**Crassulaceae**	***Crassula subaphylla* var. *subaphylla***	**LC**
Aizoaceae	****Lampranthus otzenianus***	**LC**	**Crassulaceae**	***Tylecodon wallichii* subsp. *wallichii***	**LC**
Aizoaceae	****Mesembryanthemum baylissii***	**LC**	**Euphorbiaceae**	****Euphorbia rhombifolia***	**LC**
Aizoaceae	****Mesembryanthemum brevicarpum***	**LC**	**Fabaceae**	****Lessertia spinescens*** NCE	**LC**
Aizoaceae	****Mesembryanthemum guerichianum***	**LC**	**Fabaceae**	***Lotononis leptoloba***	**LC**
Aizoaceae	****Mesembryanthemum junceum***	**LC**	**Fabaceae**	***Melolobium candicans***	**LC**
Aizoaceae	****Mesembryanthemum noctiflorum* subsp. *noctiflorum***	**LC**	**Fabaceae**	***Prosopis glandulosa* var. *torreyana*** NEM:BA	**NE**
Aizoaceae	****Mesembryanthemum tetragonum***	**LC**	**Frankeniaceae**	***Frankenia pulverulenta***	**LC**
Aizoaceae	****Mesembryanthemum vaginatum***	**LC**	**Geraniaceae**	***Monsonia crassicaulis***	**LC**
Aizoaceae	****Ruschia grisea***	**LC**	**Geraniaceae**	***Monsonia salmoniflora***	**LC**
Aizoaceae	****Ruschia spinosa***	**LC**	**Geraniaceae**	****Pelargonium pseudofumarioides***	**LC**
Aizoaceae	****Tetragonia reduplicata***	**LC**	**Hyacinthaceae**	***Albuca leucantha*** NCE	**LC**
Amaranthaceae	*Atriplex eardleyae*	NE	**Hyacinthaceae**	***Albuca longipes***	**LC**
Amaranthaceae	***Atriplex lindleyi* subsp. *inflata***	**NE**	**Hyacinthaceae**	***Albuca secunda***	**LC**
Amaranthaceae	*Atriplex nummularia* subsp. *nummularia* NEM:BA	NE	**Hyacinthaceae**	***Albuca spiralis***	**LC**
Amaranthaceae	***Atriplex semibaccata***	**NE**	**Hyacinthaceae**	***Albuca suaveolens***	**LC**
Amaranthaceae	***Chenopodium murale* var. *murale***	**NE**	**Hyacinthaceae**	***Dipcadi crispum***	**LC**
Amaranthaceae	***Salsola aphylla***	**LC**	**Hyacinthaceae**	****Lachenalia xerophila*** NCE	**LC**
Amaranthaceae	*Salsola henriciae*	LC	**Hyacinthaceae**	***Ledebouria apertiflora***	**LC**

Amaranthaceae	***Salsola kali*** [NEM:BA]	**NE**	**Iridaceae**	****Ferraria variabilis***	**LC**
Amaranthaceae	*Salsola procera*	LC	**Iridaceae**	****Gladiolus orchidiflorus***	**LC**
Amaranthaceae	***Sericocoma avolans***	**LC**	**Iridaceae**	****Gladiolus scullyi***	**LC**
Amaranthaceae	***Suaeda fruticosa***	**LC**	**Iridaceae**	****Tritonia karooica***	**LC**
Amaranthaceae	*Suaeda merxmuelleri*	LC	Lamiaceae	*Salvia disermas*	LC
Amaryllidaceae	**Brunsvigia comptonii*	LC	**Lamiaceae**	***Salvia verbenaca***	**LC**
Anacardiaceae	***Schinus molle***	**NE**	**Lamiaceae**	***Stachys cuneata***	**LC**
Apiaceae	****Deverra denudata* subsp. *aphylla***	**LC**	**Malvaceae**	***Malva parviflora* var. *parviflora***	**NE**
Apocynaceae	****Gomphocarpus filiformis***	**LC**	**Melianthaceae**	***Melianthus comosus***	**LC**
Asparagaceae	***Asparagus capensis* var. *capensis***	**LC**	**Neuradaceae**	***Grielum humifusum* var. *humifusum***	**LC**
Asphodelaceae	****Aloe falcata***	**LC**	**Neuradaceae**	***Grielum humifusum* var. *parviflorum***	**LC**
Asphodelaceae	****Gonialoe variegata***	**LC**	**Orobanchaceae**	***Hyobanche glabrata***	**LC**
Asphodelaceae	****Trachyandra flexifolia***	**LC**	**Oxalidaceae**	***†*Oxalis hirsuta*** [NCE]	**DD**
Asphodelaceae	****Trachyandra revoluta***	**LC**	**Oxalidaceae**	****Oxalis lichenoides***	**LC**
Asteraceae	***Amellus microglossus***	**LC**	**Oxalidaceae**	****Oxalis pes-caprae* var. *pes-caprae***	**LC**
Asteraceae	***Amphiglossa triflora***	**LC**	**Oxalidaceae**	****Oxalis pulchella***	**LC**
Asteraceae	***Arctotis fastuosa***	**LC**	**Oxalidaceae**	****Oxalis purpurea***	**LC**
Asteraceae	***Athanasia minuta* subsp. *minuta***	**LC**	**Oxalidaceae**	****Oxalis reclinata* var. *reclinata***	**LC**
Asteraceae	*Didelta carnosa* var. *carnosa*	LC	**Papaveraceae**	***Argemone ochroleuca* subsp. *ochroleuca***	**NE**
Asteraceae	***Didelta spinosa***	**LC**	**Plumbaginaceae**	***Dyerophytum africanum***	**LC**
Asteraceae	***Dimorphotheca pinnata* var. *pinnata***		**Poaceae**	***Ehrharta calycina***	**LC**
Asteraceae	***Dimorphotheca polyptera***	**LC**	**Poaceae**	***Enneapogon scaber***	**LC**
Asteraceae	***Eriocephalus namaquensis***	**LC**	**Poaceae**	***Lolium perenne***	**NE**
Asteraceae	*Eriocephalus spinescens*	LC	**Poaceae**	***Phragmites australis***	**LC**
Asteraceae	***Felicia bergeriana***	**LC**	**Poaceae**	***Schismus barbatus***	**LC**
Asteraceae	***Foveolina dichotoma***	**LC**	**Poaceae**	***Stipagrostis ciliata* var. *capensis***	**LC**
Asteraceae	***Gazania heterochaeta***	**LC**	**Poaceae**	***Stipagrostis namaquensis***	**LC**
Asteraceae	***Gazania jurineifolia* subsp. *jurineifolia***	**LC**	**Poaceae**	***Stipagrostis obtusa***	**LC**
Asteraceae	***Gazania lichtensteinii***	**LC**	**Poaceae**	***Tribolium tenellum***	**LC**
Asteraceae	***Helichrysum herniarioides***	**LC**	**Rubiaceae**	***Nenax namaquensis*** [NCE]	**LC**
Asteraceae	***Helichrysum tinctum***	**LC**	**Rutaceae**	****Agathosma virgata***	**LC**
Asteraceae	***Hirpicium alienatum***	**LC**	**Santalaceae**	***Thesium lineatum***	**LC**
Asteraceae	*Lasiopogon glomerulatus*	LC	**Santalaceae**	***Viscum capense***	**LC**
Asteraceae	***Lasiospermum brachyglossum***	**LC**	**Scrophulariaceae**	***Aptosimum indivisum***	**LC**
Asteraceae	***Leysera tenella***	**LC**	**Scrophulariaceae**	***Aptosimum procumbens***	**LC**
Asteraceae	***Oedera spinescens***	**LC**	**Scrophulariaceae**	***Aptosimum spinescens***	**LC**
Asteraceae	***Oncosiphon piluliferus***	**LC**	**Scrophulariaceae**	***Lyperia tristis***	**LC**
Asteraceae	***Oncosiphon suffruticosus***	**LC**	**Scrophulariaceae**	****Nemesia anisocarpa***	**LC**
Asteraceae	***Osteospermum sinuatum* var. *sinuatum***	**LC**	**Scrophulariaceae**	****Nemesia calcarata***	**LC**
Asteraceae	***Osteospermum spinescens***	**LC**	**Scrophulariaceae**	****Nemesia ligulata***	**LC**
Asteraceae	***Pegolettia retrofracta***	**LC**	**Scrophulariaceae**	***Zaluzianskya pilosissima*** [NCE]	**LC**
Asteraceae	***Pentzia incana***	**LC**	**Solanaceae**	***Lycium cinereum***	**LC**
Asteraceae	***Pteronia glauca***	**LC**	**Solanaceae**	***Lycium pumilum***	**LC**
Asteraceae	***Pteronia glomerata***	**LC**	**Solanaceae**	***Nicotiana glauca*** [NEM:BA]	**NE**
Asteraceae	***Pteronia incana***	**LC**	**Tamaricaceae**	***Tamarix usneoides***	**LC**
Asteraceae	*Pteronia leucoclada*	LC	**Tecophilaeaceae**	****Cyanella hyacinthoides***	**LC**
Asteraceae	***Pteronia mucronata***	**LC**	**Zygophyllaceae**	***Augea capensis***	**LC**
Asteraceae	***Pteronia onobromoides***	**LC**	**Zygophyllaceae**	***Roepera lichtensteiniana***	**LC**
Asteraceae	***Senecio arenarius***	**LC**	**Zygophyllaceae**	***Tetraena retrofracta***	**LC**
Asteraceae	***Senecio niveus***	**LC**	**Zygophyllaceae**	***Tetraena rigida***	**LC**
Asteraceae	*Sonchus oleraceus*	NE	Zygophyllaceae	*Tetraena simplex*	LC

Appendix 2 Specialist Curriculum Vitae

CURRICULUM VITAE:

Gerhard Botha

Name:	:	Gerhardus Alfred Botha
Date of Birth	:	11 April 1986
Identity Number	:	860411 5136 088
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Nationality:	:	South African
Years Experience:	:	8
Bilingualism	:	Very good – English and Afrikaans

Professional Profile:

Gerhard is a Managing Director of Nkurenkuru Ecology and Biodiversity (Pty) Ltd. He has a BSc Honours degree in Botany from the University of the Free State Province and is currently completing a MSc Degree in Botany. He began working as an environmental specialist in 2010 and has since gained extensive experience in conducting ecological and biodiversity assessments in various development field, especially in the fields of conventional as well as renewable energy generation, mining and infrastructure development. Gerhard is a registered Professional Natural Scientist (Pr. Sci. Nat.)

Key Responsibilities:

Specific responsibilities as an Ecological and Biodiversity Specialist include, inter alia, professional execution of specialist consulting services (including flora, wetland and fauna studies, where required), impact assessment reporting, walk through surveys/ground-truthing to inform final design, compilation of management plans, compliance monitoring and audit reporting, in-house ecological awareness training to on-site personnel, and the development of project proposals for procuring new work/projects.

Skills Base and Core Competencies

- Research Project Management
- Botanical researcher in projects involving the description of terrestrial and coastal ecosystems.

- Broad expertise in the ecology and conservation of grasslands, savannahs, karroid wetland, and aquatic ecosystems.
- Ecological and Biodiversity assessments for developmental purposes (BAR, EIA), with extensive knowledge and experience in the renewable energy field (Refer to Work Experiences and References)
- Over 3 years of avifaunal monitoring and assessment experience.
- Mapping and Infield delineation of wetlands, riparian zones and aquatic habitats (according to methods stipulated by DWA, 2008) within various South African provinces of KwaZulu-Natal, Mpumalanga, Free State, Gauteng and Northern Cape Province for inventory and management purposes.
- Wetland and aquatic buffer allocations according to industry best practice guidelines.
- Working knowledge of environmental planning policies, regulatory frameworks, and legislation
- Identification and assessment of potential environmental impacts and benefits.
- Assessment of various wetland ecosystems to highlight potential impacts, within current and proposed landscape settings, and recommend appropriate mitigation and offsets based on assessing wetland ecosystem service delivery (functions) and ecological health/integrity.
- Development of practical and achievable mitigation measures and management plans and evaluation of risk to execution
- Qualitative and Quantitative Research
- Experienced in field research and monitoring
- Working knowledge of GIS applications and analysis of satellite imagery data
- Completed projects in several Provinces of South Africa and include a number of projects located in sensitive and ecological unique regions.

Education and Professional Status

Degrees:

- *2015:* Currently completing a M.Sc. degree in Botany (Vegetation Ecology), University of the Free State, Bloemfontein, RSA.
- *2009:* B.Sc. Hons in Botany (Vegetation Ecology), University of the Free State, Bloemfontein, RSA.
- *2008:* B.Sc. in Zoology and Botany, University of the Free State, University of the Free State, Bloemfontein, RSA.

Courses:

- *2013*: Wetland Management (ecology, hydrology, biodiversity, and delineation) – University of the Free State accredited course.
- *2014*: Introduction to GIS and GPS (Code: GISA 1500S) – University of the Free State accredited course.

Professional Society Affiliations:

- The South African Council of Natural Scientific Professions: Pr. Sci. Nat. Reg. No. 400502/14 (Botany and Ecology).

Employment History

- December 2017 – Current: Nkurenkuru Ecology and Biodiversity (Pty) Ltd
- 2016 – November 2017: ECO-CARE Consultancy
- *2015 - 2016*: Ecologist, Savannah Environmental (Pty) Ltd
- *2013 – 2014*: Working as ecologist on a freelance basis, involved in part-time and contractual positions for the

following companies

- Enviroworks (Pty) Ltd
- GreenMined (Pty) Ltd
- Eco-Care Consultancy (Pty) Ltd
- Enviro-Niche Consulting (Pty) Ltd
- Savannah Environmental (Pty) Ltd
- Esicongweni Environmental Services (EES) cc

- *2010 - 2012*: Enviroworks (Pty) Ltd

Publications

Publications:

- Botha, G.A. & Du Preez, P.J. 2015. A description of the wetland and riparian vegetation of the Nxamasere palaeo-river's backflooded section, Okavango Delta, Botswana. S. *Afr. J. Bot*., **98**: 172-173.

Congress papers/posters/presentations:

- Botha, G.A. 2015. A description of the wetland and riparian vegetation of the Nxamasere palaeo-river's backflooded section, Okavango Delta, Botswana. 41st Annual Congress of South African Association of Botanists (SAAB). Tshipise, 11-15 Jan. 2015.
- Botha, G.A. 2014. A description of the vegetation of the Nxamasere floodplain, Okavango Delta, Botswana. 10st Annual University of Johannesburg (UJ) Postgraduate Botany Symposium. Johannesburg, 28 Oct. 2014.

Other

- Guest speaker at IAIAsa Free State Branch Event (29 March 2017)
- Guest speaker at the University of the Free State Province: Department of Plant Sciences (3 March 2017):

References:

- Christine Fouché
  Manager: GreenMined (Pty) LTD
  Cell: 084 663 2399
- Professor J du Preez
  Senior lecturer: Department of Plant Sciences
  University of the Free State
  Cell: 082 376 4404

CURRICULUM VITAE:

Jan-Hendrik Keet, PhD

Address: Unit 29 Avignon, Hillcrest Road
Land en Zeezicht, Somerset West
South Africa
7130
Email: jhkeet@hotmail.com
Phone: +27 71 451 4853

Expertise and experience

- Current profession: Post Doctoral Researcher – Centre for Invasion Biology (Department of Botany and Zoology), Stellenbosch University
- Specialisation: Botany, ecology, invasive plant species, and invasion biology
- Years of experience: 7 years
- Published in various national and international scientific journals

Skills and competencies

- Invasive species biology
- Plant biogeography and ecology
- Plant identification and taxonomy
- Vegetation surveys and mapping
- Soil microbiomes, function, and chemistry
- Geographic Information Systems
- Data analysis and Statistics in R Statistical Software

Tertiary education

- *2015 – 2019: Stellenbosch University, Stellenbosch, South Africa. Doctor of Philosophy (Botany)*
- *2013 – 2014: University of the Free State, Bloemfontein, South Africa. Magister Scientiae (Botany)*
- *2012: University of the Free State, Bloemfontein, South Africa. Bachelor of Science Honours (Botany) - cum laude*
- *2009 – 2011: University of the Free State, Bloemfontein, South Africa. Bachelor of Science (Chemistry with Physics and Biology) - cum laude*

Employment history

- *2011: Part-time demonstrator. Department of Plant Sciences, University of the Free State, Bloemfontein, South Africa*
- *2010: Part-time lab assistant. Department of Chemistry, University of the Free State, Bloemfontein, South Africa*
- *2007 – 2009: Shop Manager. Christian Tees, Brandwag Centre, Bloemfontein*

Certifications

- *SAGIC Invasive Species Consultant (Cape Town, South Africa), March 2016*
- *GIS Intermediate (NQF level 5): Hydrological modelling and terrain analysis using digital elevation models (University of the Free State, South Africa), 2014*
- *Good Laboratory Practice seminar presented by Merck Millipore South Africa, 2012*
- *Laboratory Safety seminar presented by Merck Millipore South Africa, 2012*

Appendix 3 Specialist Work Experience and References

WORK EXPERIENCES

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References

Gerhard Botha

ECOLOGICAL RELATED STUDIES AND SURVEYS

Date Completed	Project Description	Type of Assessment/Study	Client
2019	Sirius Three Solar PV Facility near Upington, Northern Cape	Ecological Assessment (Basic Assessment)	Aurora Power Solutions
2019	Sirius Four Solar PV Facility near Upington, Northern Cape	Ecological Assessment (Basic Assessment)	Aurora Power Solutions
2019	Lichtenburg 1 100MW Solar PV Facility, Lichtenburg, North-West Province	Ecological Assessment (Scoping and EIA Phase Assessments)	Atlantic Renewable Energy Partners
2019	Lichtenburg 2 100MW Solar PV Facility, Lichtenburg, North-West Province	Ecological Assessment (Scoping and EIA Phase Assessments)	Atlantic Renewable Energy Partners
2019	Lichtenburg 3 100MW Solar PV Facility, Lichtenburg, North-West Province	Ecological Assessment (Scoping and EIA Phase Assessments)	Atlantic Renewable Energy Partners
2019	Moeding Solar PV Facility near Vryburg, North-West Province	Ecological Assessment (Basic Assessment)	Moeding Solar
2019	Expansion of the Raumix Aliwal North Quarry, Eastern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	GreenMined
2018	Kruisvallei Hydroelectric 22kV Overhead Power Line, Clarens, Free State Province	Faunal and Flora Rescue and Protection Plan	Zevobuzz
2018	Kruisvallei Hydroelectric 22kV Overhead Power Line, Clarens, Free State Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Zevobuzz
2018	Proposed Kruisvallei Hydroelectric Power Generation Scheme in the Ash River, Free State Province	Ecological Assessment (Basic Assessment)	Zevobuzz
2018	Proposed Zonnebloem Switching Station (132/22kV) and 2X Loop-in Loop-out Power Lines (132kV), Mpumalanga Province	Ecological Assessment (Basic Assessment)	Eskom
2018	Clayville Thermal Plant within the Clayville Industrial Area, Gauteng Province	Ecological Comments Letter	Savannah Environmental
2018	Iziduli Emoyeni Wind Farm near Bedford, Eastern Cape Province	Ecological Assessment (Re-assessment)	Emoyeni Wid Farm Renewable Energy
2018	Msenge Wind Farm near Bedford, Eastern Cape Province	Ecological Assessment (Re-assessment)	Amakhala Emoyeni Renewable Energy

2017	H2 Energy Power Station near Kwamhlanga, Mpumalanga Province	Ecological Assessment (Scoping and EIA phase assessments)	Eskom
2017	Karusa Wind Farm (Phase 1 of the Hidden Valley Wind Energy Facility near Sutherland, Northern Cape Province)	Ecological Assessment (Re-assessment)	ACED Renewables Hidden Valley
2017	Soetwater Wind Farm (Phase 2 of the Hidden Valley Wind Energy Facility near Sutherland, Northern Cape Province)	Ecological Assessment (Re-assessment)	ACED Renewables Hidden Valley
2017	S24G for the unlawful commencement or continuation of activities within a watercourse, Honeydew, Gauteng Province	Ecological Assessment	Savannah Environmental
2016 - 2017	Noupoort CSP Facility near Noupoort, Northern Cape Province	Ecological Assessment (Scoping and EIA phase assessments)	Cresco
2016	Buffels Solar 2 PV Facility near Orkney, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Kabi Solar
2016	Buffels Solar 1 PV Facility near Orkney, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Kabi Solar
2016	132kV Power Line and On-Site Substation for the Authorised Golden Valley II Wind Energy Facility near Bedford, Eastern Cape Province	Ecological Assessment (Basic Assessment)	Terra Wind Energy
2016	Kalahari CSP Facility: 132kV Ferrum–Kalahari–UNTU & 132kV Kathu IPP–Kathu 1 Overhead Power Lines, Kathu, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Kathu Solar Park
2016	Kalahari CSP Facility: Access Roads, Kathu, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Kathu Solar Park
2016	Karoshoek Solar Valley Development – Additional CSP Facility including tower infrastructure associated with authorised CSP Site 2 near Upington, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Emvelo
2016	Karoshoek Solar Valley Development –Ilanga CSP 7 and 8 Facilities near Upington, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Emvelo
2016	Karoshoek Solar Valley Development –Ilanga CSP 9 Facility near Upington, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Emvelo
2016	Lehae Training Academy and Fire Station, Gauteng Province	Ecological Assessment	Savannah Environmental
2016	Metal Industrial Cluster and Associated Infrastructure near Kuruman, Northern Cape Province	Ecological Assessment (Scoping Assessment)	Northern Cape Department of Economic Development and Tourism
2016	Semonkong Wind Energy Facility near Semonkong, Maseru District, Lesotho	Ecological Pre-Feasibility Study	Savannah Environmental
2015 - 2016	Orkney Solar PV Facility near Orkney, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Genesis Eco-Energy
2015 - 2016	Woodhouse 1 and Woodhouse 2 PV Facilities near Vryburg, North West Province	Ecological Assessment (Scoping and EIA phase assessments)	Genesis Eco-Energy
2015	CAMCO Clean Energy 100kW PV Solar Facility, Thaba Eco Lodge near Johannesburg, Gauteng Province	Ecological Assessment (Basic Assessment)	CAMCO Clean Energy
2015	CAMCO Clean Energy 100kW PV Solar Facility, Thaba Eco Lodge near Johannesburg, Gauteng Province	Ecological Assessment (Basic Assessment)	CAMCO Clean Energy

2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Aurora Power Solutions
2015	Sirius 2 Solar PV Project near Upington, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	Aurora Power Solutions
2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Invasive Plant Management Plan	Aurora Power Solutions
2015	Sirius 2 Solar PV Project near Upington, Northern Cape Province	Invasive Plant Management Plan	Aurora Power Solutions
2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Plant Rehabilitation Management Plan	Aurora Power Solutions
2015	Sirius Phase 2 Solar PV Project near Upington, Northern Cape Province	Plant Rehabilitation Management Plan	Aurora Power Solutions
2015	Sirius 1 Solar PV Project near Upington, Northern Cape Province	Plant Rescue and Protection Plan	Aurora Power Solutions
2015	Sirius Phase 2 Solar PV Project near Upington, Northern Cape Province	Plant Rescue and Protection Plan	Aurora Power Solutions
2015	Expansion of the existing Komsberg Main Transmission Substation near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ESKOM
2015	Karusa Wind Farm near Sutherland, Northern Cape Province)	Invasive Plant Management Plan	ACED Renewables Hidden Valley
2015	Proposed Karusa Facility Substation and Ancillaries near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ACED Renewables Hidden Valley
2015	Eskom Karusa Switching Station and 132kV Double Circuit Overhead Power Line near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ESKOM
2015	Karusa Wind Farm near Sutherland, Northern Cape Province)	Plant Search and Rescue and Rehabilitation Management Plan	ACED Renewables Hidden Valley
2015	Karusa Wind Energy Facility near Sutherland, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	ACED Renewables Hidden Valley
2015	Soetwater Facility Substation, 132kV Overhead Power Line and Ancillaries, near Sutherland, Northern Cape Province	Ecological Assessment (Basic Assessment)	ACED Renewables Hidden Valley
2015	Soetwater Wind Farm near Sutherland, Northern Cape Province)	Invasive Plant Management Plan	ACED Renewables Hidden Valley
2015	Soetwater Wind Energy Facility near Sutherland, Northern Cape Province	Fauna and Flora Pre-Construction Walk-Through Assessment	ACED Renewables Hidden Valley
2015	Soetwater Wind Farm near Sutherland, Northern Cape Province	Plant Search and Rescue and Rehabilitation Management Plan	ACED Renewables Hidden Valley
2015	Expansion of the existing Scottburgh quarry near Amandawe, KwaZulu-Natal	Botanical Assessment (for EIA)	GreenMined Environmental
2015	Expansion of the existing AFRIMAT quarry near Hluhluwe, KwaZulu-Natal	Botanical Assessment (for EIA)	GreenMined Environmental
2014	Tshepong 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Ecological Assessment (Basic Assessment)	BBEnergy
2014	Nyala 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Ecological Assessment (Basic Assessment)	BBEnergy
2014	Eland 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Ecological Assessment (Basic Assessment)	BBEnergy
2014	Transalloys circulating fluidised bed power station near Emalahleni, Mpumalanga Province	Ecological Assessment (for EIA)	Trans-Alloys
2014	Umbani circulating fluidised bed power station near Kriel, Mpumalanga Province	Ecological Assessment (Scoping and EIA)	Eskom
2014	Gihon 75MW Solar Farm: Bela-Bela, Limpopo Province	Ecological Assessment (for EIA)	NETWORX Renewables

2014	Steelpoort Integration Project & Steelpoort to Wolwekraal 400kV Power Line	Fauna and Flora Pre-Construction Walk-Through Assessment	Eskom
2014	Audit of protected *Acacia erioloba* trees within the Assmang Wrenchville housing development footprint area	Botanical Audit	Eco-Care Consultancy
2014	Rehabilitation of the N1 National Road between Sydenham and Glen Lyon	Peer review of the ecological report	EKO Environmental
2014	Rehabilitation of the N6 National Road between Onze Rust and Bloemfontein	Peer review of the ecological report	EKO Environmental
2011	Illegally ploughed land on the Farm Wolwekop 2353, Bloemfontein	Vegetation Rehabilitation Plan	EnviroWorks
2011	Rocks Farm chicken broiler houses	Botanical Assessment (for EIA)	EnviroWorks
2011	Botshabelo 132 kV line	Ecological Assessment (for EIA)	CENTLEC
2011	De Aar Freight Transport Hub	Ecological Scoping and Feasibility Study	EnviroWorks
2011	The proposed establishment of the Tugela Ridge Eco Estate on the farm Kruisfontein, Bergville	Ecological Assessment (for EIA)	EnviroWorks
2010 - 2011	National long-haul optic fibre infrastructure network project, Bloemfontein to Beaufort West	Vegetation Rehabilitation Plan for illegally cleared areas	NEOTEL
2010 - 2011	National long-haul optic fibre infrastructure network project, Bloemfontein to Beaufort West	Invasive Plant Management Plan	NEOTEL
2010 - 2011	National long-haul optic fibre infrastructure network project, Bloemfontein to Beaufort West	Protected and Endangered Species Walk-Through Survey	NEOTEL
2011	Optic Fibre Infrastructure Network, Swartland Municipality	Botanical Assessment (for EIA) - Assisted Dr. Dave McDonald	Dark Fibre Africa
2011	Optic Fibre Infrastructure Network, City of Cape Town Municipality	Botanical Assessment (for EIA) - Assisted Dr. Dave McDonald	Dark Fibre Africa
2010	Construction of an icon at the southernmost tip of Africa, Agulhas National Park	Botanical Assessment (for EIA)	SANPARKS
2010	New boardwalk from Suiderstrand Gravel Road to Rasperpunt, Agulhas National Park	Botanical Assessment (for EIA)	SANPARKS
2010	Farm development for academic purposes (Maluti FET College) on the Farm Rosedale 107, Harrismith	Ecological Assessment (Screening and Feasibility Study)	Agri Development Solutions
2010	Basic Assessment: Barcelona 88/11kV substation and 88kV loop-in lines	Botanical Assessment (for EIA)	Eskom Distribution
2011	Illegally ploughed land on the Farm Wolwekop 2353, Bloemfontein	Vegetation Rehabilitation Plan	EnviroWorks

WETLAND DELINEATION AND HYDROLOGICAL ASSESSMENTS

Date Completed	Project Description	Type of Assessment/Study	Client
In progress	Steynsrus PV 1 & 2 Solar Energy Facilities near Steynsrus, Free State Province	Wetland Assessment	Cronimet Mining Power Solutions
2019	Lichtenburg 1 100MW Solar PV Facility, Lichtenburg, North-West Province	Surface Hydrological Assessment (Scoping and EIA Phase)	Atlantic Renewable Energy Partners
2019	Lichtenburg 2 100MW Solar PV Facility, Lichtenburg, North-West Province	Surface Hydrological Assessment (Scoping and EIA Phase)	Atlantic Renewable Energy Partners
2019	Lichtenburg 3 100MW Solar PV Facility, Lichtenburg, North-West Province	Surface Hydrological Assessment (Scoping and EIA Phase)	Atlantic Renewable Energy Partners
2019	Moeding Solar PV Facility near Vryburg, North-West Province	Wetland Assessment (Basic Assessment)	Moeding Solar
2018	Kruisvallei Hydroelectric 22kV Overhead Power Line, Clarens, Free State Province	Wetland Assessment (Basic Assessment	Zevobuzz
2017	Nyala 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Wetland Assessment	BBEnergy

2017	Eland 5MW PV facility within Harmony Gold's mining rights areas, Odendaalsrus	Wetland Assessment	BBEnergy
2017	Olifantshoek 10MVA 132/11kV Substation and 31km Power Line	Surface Hydrological Assessment (Basic Assessment)	Eskom
2017	Expansion of the Elandspruit Quarry near Ladysmith, KwaZulu-Natal Province	Wetland Assessment	Raumix
2017	S24G for the unlawful commencement or continuation of activities within a watercourse, Honeydew, Gauteng Province	Aquatic Assessment & Flood Plain Delineation	Savannah Environmental
2017	Noupoort CSP Facility near Noupoort, Northern Cape Province	Surface Hydrological Assessment (EIA phase)	Cresco
2016	Wolmaransstad Municipality 75MW PV Solar Energy Facility in the North West Province	Wetland Assessment (Basic Assessment)	BlueWave Capital
2016	BlueWave 75MW PV Plant near Welkom Free State Province	Wetland Delineation	BlueWave Capital
2016	Harmony Solar Energy Facilities: Amendment of Pipeline and Overhead Power Line Route	Wetland Assessment (Basic Assessment)	BBEnergy

AVIFAUNAL ASSESSMENTS

Date Completed	Project Description	Type of Assessment/Study	Client
2019	Sirius Three Solar PV Facility near Upington, Northern Cape	Avifauna Assessment (Basic Assessment)	Aurora Power Solutions
2019	Sirius Four Solar PV Facility near Upington, Northern Cape	Avifauna Assessment (Basic Assessment)	Aurora Power Solutions
2019	Moeding Solar PV Facility near Vryburg, North-West Province	Avifauna Assessment (Basic Assessment)	Moeding Solar
2018	Proposed Zonnebloem Switching Station (132/22kV) and 2X Loop-in Loop-out Power Lines (132kV), Mpumalanga Province	Avifauna Assessment (Basic Assessment)	Eskom
2017	Olifantshoek 10MVA 132/11kV Substation and 31km Power Line	Avifauna Assessment (Basic Assessment)	Eskom
2016	TEWA Solar 1 Facility, east of Upington, Northern Cape Province	Wetland Assessment (Basic Assessment	Tewa Isitha Solar 1
2016	TEWA Solar 2 Facility, east of Upington, Northern Cape Province	Wetland Assessment	Tewa Isitha Solar 2

ENVIRONMENTAL IMPACT ASSESSMENT

- Barcelona 88/11kV substation and 88kV loop-in lines – BA (for Eskom).
- Thabong Bulk 132kV sub-transmission inter-connector line – EIA (for Eskom).
- Groenwater 45 000 unit chicken broiler farm – BA (for Areemeng Mmogo Cooperative).
- Optic Fibre Infrastructure Network, City of Cape Town Municipality – BA (for Dark Fibre Africa (Pty) Ltd).
- Optic Fibre Infrastructure Network, Swartland Municipality – BA (for Dark Fibre Africa).
- Construction and refurbishment of the existing 66kV network between Ruigtevallei Substation and Reddersburg Substation – EMP (for Eskom).
- Lower Kruisvallei Hydroelectric Power Scheme (Ash river) – EIA (for Kruisvallei Hydro (Pty) Ltd).
- Construction of egg hatchery and associated infrastructure – BA (For Supreme Poultry).

- Construction of the Klipplaatdrif flow gauging (Vaal river) – EMP (DWAF).

ENVIRONMENTAL COMPLIANCE AUDITING AND ECO

- National long haul optic fibre infrastructure network project, Bloemfontein to Laingsburg – ECO (for Enviroworks (Pty) Ltd.).
- National long haul optic fibre infrastructure network project, Wolmaransstad to Klerksdorp – ECO (for Enviroworks (Pty) Ltd.).
- Construction and refurbishment of the existing 66kV network between Ruigtevallei Substation and Reddersburg Substation – ECO (for Enviroworks (Pty) Ltd.).
- Construction and refurbishment of the Vredefort/Nooitgedacht 11kV power line – ECO (for Enviroworks (Pty) Ltd.).
- Mining of Dolerite (Stone Aggregate) by Raumix (Pty) Ltd. on a portion of Portion 0 of the farm Hillside 2830, Bloemfontein – ECO (for GreenMined Environmental (Pty) Ltd.).
- Construction of an Egg Production Facility by Bainsvlei Poultry (Pty) Ltd on Portions 9 & 10 of the farm, Mooivlakte, Bloemfontein – ECO (for Enviro-Niche Consulting (Pty) Ltd.).
- Environmental compliance audit and botanical account of Afrisam's premises in Bloemfontein – Environmental Compliance Auditing (for Enviroworks (Pty) Ltd.).

OTHER PROJECTS:

- Keeping and breeding of lions (*Panthera leo*) on the farm Maxico 135, Ficksburg – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Keeping and breeding of lions (*Panthera leo*) on the farm Mooihoek 292, Theunissen – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Keeping and breeding of wild dogs (*Lycaon pictus*) on the farm Mooihoek 292, Theunissen – Management and Business Plan (for Enviroworks (Pty) Ltd.)
- Existing underground and aboveground fuel storage tanks, TWK AGRI: Pongola – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks on Erf 171, TWK AGRI: Amsterdam – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 14 000 L of fuel (diesel) aboveground on Erf 32, TWK AGRI: Carolina – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 23 000 L of fuel (diesel) above ground on Portion 10 of the Farm Oude Bosch, Humansdorp – Environmental Management Plan (for TWK Agricultural Ltd).
- Proposed storage of 16 000 L of fuel (diesel) aboveground at Panbult Depot – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks, TWK AGRI: Mechanisation and Engineering, Piet Retief – Environmental Management Plan (for TWK Agricultural Ltd).
- Existing underground fuel storage tanks on Portion 38 of the Farm Lothair, TWK AGRI: Lothair – Environmental Management Plan (for TWK Agricultural Ltd).

WORK EXPERIENCES

&

References

Jan-Hendrik Keet, PhD

Publications

- Hirsch H, Allsopp MH, Canavan S, Cheek M, Geerts S, Geldenhuys CJ, Harding G, Hurley BP, Jones W, **Keet J-H**, Klein H, Ruwanza S, van Wilgen BW, Wingfield MJ, Richardson DM (**2019**) *Eucalyptus camaldulensis* in South Africa – past, present, future, *Transactions of the Royal Society of South Africa*, https://doi.org/10.1080/0035919X.2019.1669732.
- Le Roux JJ, Hui C, Castillo ML, Iriondo, JM, **Keet J-H**, Khapugin, AA, Médail F, Rejmánek M, Theron G, Yannelli FA, Hirsch H (**2019**) Recent anthropogenic plant extinctions differ in biodiversity hotspots and coldspots. *Current Biology*, https://doi.org/10.1016/j.cub.2019.07.063.
- **Keet J-H**, Ellis A G, Hui C, Le Roux JJ (**2019**) Strong spatial and temporal turnover of soil bacterial communities in South Africa's hyperdiverse fynbos biome. *Soil Biology and Biochemistry* **136:** 107541, https://doi.org/10.1016/j.soilbio.2019.107541.
- Le Roux JJ, Ellis AG, Van Zyl L-M, Hosking ND, **Keet J-H**, Yannelli F (**2018**) Importance of soil legacy effects and successful mutualistic interactions during Australian acacia invasions in nutrient-poor environments. *Journal of Ecology* **105**(6): 2071-2081, https://doi.org/10.1111/1365-2745.1296.
- **Keet J-H**, Ellis A G, Hui C, Le Roux JJ (**2017**) Legume–rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness. *Annals of Botany* **119**(8): 1319-1331, https://doi.org/10.1093/aob/mcx028.
- Le Roux JJ, **Keet J-H**, Mutiti B, Ellis AG (**2017**) Cultivation may not dramatically alter rhizobial community diversity or structure associated with rooibos tea (*Aspalathus linearis* Burm.f.) in South Africa. *South African Journal of Botany* **110**: 87-96, https://doi.org/10.1016/j.sajb.2017.01.014.
- Le Roux JJ, Hui C, **Keet J-H**, Ellis AG (**2017**) Co-introduction vs ecological fitting as pathways to the establishment of effective mutualisms during biological invasions. *New Phytologist* **215**:1354–1360. https://doi.org/10.1111/nph.14593.
- Nsikani M, Novoa A, Van Wilgen B, **Keet J-H**, Gaertner M (**2017**) *Acacia saligna*'s soil legacy effects persist up to ten years after clearing: Implications for ecological restoration. *Austral Ecology* **42**(8): 880-889, https://doi.org/10.1111/aec.12515.
- **Keet J-H**, Cindi D, Du Preez PJ (**2016**) Assessing the invasiveness of *Berberis aristata* and *B. julianae* (Berberidaceae) in South Africa: management options and legal recommendations. *South African Journal of Botany* **105**: 299-28, https://doi.org/10.1016/j.sajb.2016.04.012.

Conferences

- 46th South African Association of Botanists conference (Qwa-Qwa, South Africa), January 2020, ***Alnus glutinosa* (L.) Gaertn. [Black Alder]: *an emerging invader in South Africa***
- International Association for Food Protection (IAFP; Louisville, Kentucky, USA), July 2019.
- Ecological Society of America Conference, (New Orleans, Louisiana, USA), August 2018 **Invasive legumes dramatically impact soil bacterial community structures but not function**
- Legumes for Life Workshop (Stellenbosch, South Africa), May 2018 **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness**
- Fynbos Forum Conference (Swellendam, South Africa), July 2017 **Assessing the impacts of invasive legumes on soil conditions and microbial community composition in a biodiversity hotspot**
- 43rd South African Association of Botanists Conference (Cape Town, South Africa), January 2017, **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness** *Best PhD presentation*
- 43rd Annual Research Symposium on the Management of Biological Invasions Conference (Worscester, South Africa), May 2016, **Legume-rhizobium symbiotic promiscuity does not determine plant invasiveness**
- Evolutionary dynamics of tree invasions: drivers, dimensions, and implications for management (Stellenbosch, South Africa), November 2015
- Neobiota: 8th International Conference on Biological Invasions (Antalya, Turkey), November 2014, **Assessing the threat and potential for management of Berberis spp. (Berberidaceae) in South Africa**
- 42nd Annual Symposium on the Management of Invasive Alien Plants (Karridene Beach Hotel, Durban, South Africa)
- XXth Association for the Taxonomic Study of the Flora of Tropical Africa International Conference (Stellenbosch, South Africa), January 2014
- 41st Annual Symposium on the Management of Invasive Alien Plants (Cape St. Francis, South Africa), May 2013

EIA and other surveys

- Specialist Invasive Alien Plant Species Report: Prepared for: Mpact Corrugated, Kuils River (Western Cape), July 2019
- Proposed Township development, Country view, Gauteng: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015
- Colenso Anthracite Coal Mining and Power Station Project: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015