ECOAGENT
ECOLOGY & BIODIVERSITY CONSULTANTS

A basic biodiversity assessment for the proposed Hendrina North 132kV powerline and a substation to the Hendrina power station in Steve Tshwete Local Municipality, Nkangala District Municipality Mpumalanga.

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by
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Assisted by
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Commissioned by

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National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	**Title page Chapter 10 p112**
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	**Page 8**
(c) an indication of the scope of, and the purpose for which, the report was prepared;	**Chapter 2 Page14-15**
(cA) an indication of the quality and age of base data used for the specialist report;	**Chapter 4 Page 18-23 And Chapter 5**
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**Chapter 3 P16-17 And Chapter 5 And Chapter 7**
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Chaper 4.1 2 and Chaper 4.2**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	**Chapter 4 P18-23**
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	**Paragraphs 5.2 and 5.3 P 29-51**
(g) an identification of any areas to be avoided, including buffers;	**Paragraph 5.2 P28-41**
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	**P30-31**
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	**Chapters 5, 6 and 7**

(k) any mitigation measures for inclusion in the EMPr;	**Chapter 7 Impact table P65-105**
(l) any conditions for inclusion in the environmental authorisation;	**Wetlands**
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**Monitor success of rehabilitation**
(n) a reasoned opinion— i. whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	**Paragraph 7.3 and Chapter 8**
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	**N/A** -No feedback has yet been received from the public participation process regarding the visual environment
(p) any other information requested by the competent authority	**N/A**. No information regarding the visual study has been requested from the competent authority to date.
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	**N/A**

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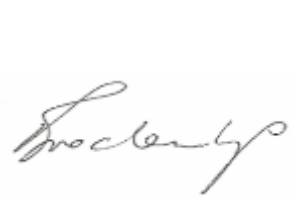
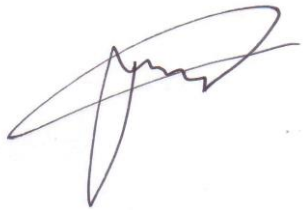
DECLARATION OF INDEPENDENCE

We, George Johannes Bredenkamp, Id 4602105019086, SACNASP Reg No 400086/83 and Jacobus Casparus Petrus Van Wyk, Id 680804 5041084, SACNASP Reg No 400062/09 declare that we:

- Hold higher degrees (MSc and DSc) in the biological sciences, which allowed registration by South African Council for National Scientific Professions as Professional Ecologist that sanction me to function independently as specialist scientific consultant;
- Act as an independent specialist consultant in the field of ecology, vegetation science, botany zoology and wetlands;
- Are employed by Eco-Agent CC, CK 95/37116/23, of which GJ Bredenkamp is the owner;
- Abide by the Code of Ethics of the SACNASP;
- Are committed to biodiversity conservation but concomitantly recognize the need for economic development;
- Are assigned as specialist consultants by Pierre Joubert Landscape Architect and Environmental Planner for the project **"A basic biodiversity assessment for the proposed Hendrina North 132kV powerline and a substation to the Hendrina power station in Steve Tshwete Local Municipality, Nkangala District Municipality Mpumalanga**." described in this report;
- Declare that, as per prerequisites of the Natural Scientific Professions Act (Act No. 27 of 2003), as amended by the Science and Technology Laws Amendment Act (Act 7 of 2014), this investigation of vegetation exclusively reflects our own observations and unbiased scientific interpretations, and was executed to the best of our ability;
- Within our fields of expertise, we reserve the right to form and hold our own opinions within the constraints of our training and experience and therefore will not submit willingly to the interests of other parties or change our statements to appease or unduly benefit them;
- Do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work performed;
- Do not have, and will not have any vested or conflicting interests in the proposed development;
- Undertake to disclose to the client and the competent authority any material information that have or may have the potential to influence the decision of the competent authority with regard to the Environmental Impact Assessment requirements;
- Will provide the client and competent authority with access to all information at our disposal, regarding this project, whether favourable or not;
- Reserve the right to only transfer our intellectual property contained in this report to the client(s), (party or company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, I recognise that written consent from the client(s) will be required for us to release any part of this report to third parties;
- In addition, remuneration for services provided by us is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.





GJ Bredenkamp JPC van Wyk

DISCLAIMER:

Even though every care is taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time and budget. Discussions and proposed mitigations are to some extent made on reasonable and informed assumptions built on *bone fide* information sources, as well as deductive reasoning. Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage. The vegetation team can thus not accept responsibility for conclusions and mitigation measures made in good faith based on own databases or on the information provided at the time of the directive. Although the author exercised due care and diligence in rendering services and preparing documents, he accepts no liability. The client, by receiving this document, indemnifies the authors against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, directly or indirectly by the author and by the use of this document. This report should therefore be viewed and acted upon with these limitations in mind.

ABSTRACT

The proposed project includes the construction and operation of a 132kV overhead power line to connect the proposed Hendrina North Wind Energy Facility (substation) to the Hendrina Power Station. The proposed powerline to Hendrina Power Station will be ~20km long depending on the exact route. A 500m corridor is proposed (250m from the centre lines).
Eco-Agent CC was appointed by SiVEST to assess the and biodiversity (fauna and flora) and ecological sensitivity for the transect relevant for this development.

This study was done in accordance with the National Environmental Management Act (Act 107 of 1998) Amendment of the Environmental Impact Assessment Regulations 2014, 7 April 2017. (GNR. 324, 325, 326 & 327: Listing Notices 1, 2, 3).

Furthermore, the results of the National Environmental Screening Tool (NE MA Government Notices 648 (2019) and 655 (2020)) indicate Very High sensitivity for Terrestrial Biodiversity and Medium for Animal Species sensitivity, Low to Medium sensitivity for Plant Species sensitivity. The sensitivity for Aquatic Biodiversity is indicated as low.

The Terms of Reference for this assignment is interpreted as follows: Compile a study of the vegetation sensitivity, fauna (except avifauna) and flora on the site, in accordance with all the requirements of relevant authorities, the Mpumalanga Tourism and Parks Agency (MTPA).

Vegetation

The relevant literature and databases were used to obtain data regarding threatened, protected, alien invasive and medicinal plant species, also regional vegetation, threatened status of vegetation types, protected and conservation areas, critical biodiversity areas, wetlands and water courses.

Standard methods for vegetation surveys were applied. Plant communities were mapped and described including total floristic composition per pant community. All the above data were applied in analyses to determine conservation status and ecological sensitivity per plant community.

SANBI and DEAT (2009) and NEMBA, Government Notice 1002 (2011) indicate that the Eastern Highveld Grassland is a **Vulnerable** ecosystem, as so much is already transformed. On the specific site the vegetation is mostly **transformed** by agriculture, with very little original natural vegetation remaining.

No Irreplaceable CBA's occur along the transect area. A **small CBA Optimal site** occurs in the wetland in the north, close to the Hendrina power station. Most of the transect is **Heavily Modified** or small local areas **Moderately Modified**. Most wetlands are classified as **Other Natural Areas**.

The vegetation study of the proposed powerline transects resulted in the identification of five different plant communities (= ecosystems on the plant community level of organisation) that could be mapped. The terrestrial plant communities identified have low plant species richness,

no threatened, red data or protected plant species were recorded on the two transect corridor sites.

The result of the sensitivity assessment indicates that the Wetlands have **High ecological sensitivity**. A power line will easily cross the drainage lines (wetlands). The Agricultural Fields, and Dry Grasslands have **Low** ecological sensitivity and **Low** conservation value, due to their transformed status.

It is suggested that development of the proposed powerline can be supported.

Fauna

The area on which the intended powerline development will take place has been severely altered by agricultural influences. With the exception of Red Data bats and birds, which may fly over the site, no other Red Data mammal, bird, reptile or amphibian species should occur on the site.

From a vertebrate fauna perspective, there is no objection against the development on condition that the development adheres to the mitigation measures concerning the wetlands on the site.

1. BACKGROUND AND ASSIGNMENT

The following information was provided by SiVEST SA (Pty) Ltd (hereafter referred to as "SiVEST").

ENERTRAG South Africa (Pty) Ltd appointed SiVEST to undertake the required BA Process for the proposed construction and operation of a 132kV overhead power line to connect the proposed Hendrina North Wind Energy Facility ("WEF") (14/2/16/3/3/2/2130) [1] to the Hendrina Power Station. The proposed project aims to feed the electricity generated by the proposed Hendrina North WEF into the national grid. The WEF will form part of the Renewable Energy Independent Power Producer Programme (REIPPP) (in line with the Integrated Resource Plan (IRP) – renewable wind energy).

The proposed project is located approximately 15 km west of Hendrina, within the Steve Tshwete Local Municipality, in the Nkangala District Municipality, Mpumalanga Province. The Hendrina Power Station is located approximately 17km northwest of Hendrina, near Pullens Hope (refer to Figure 1.1, below). The proposed powerline (up to and including 132kV) to Hendrina Power Station will be ~20km long depending on the exact route. A 500m corridor is proposed (250m from the centre lines).

Eco-Agent CC was appointed by SiVEST to assess the and biodiversity (fauna and flora) and ecological sensitivity for the transect relevant for this development. This investigation is in accordance with the EIA Regulations No. R982-985, Department of Environmental Affairs and Tourism, 4 December 2014. emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), and the Amendment of the Environmental Impact Assessment Regulations, 7 April 2017. (GNR. 324, 325, 326 & 327: and the Mpumalanga Tourism and Parks Agency (MTPA). It is also in accordance with Government Notice 648 Government Gazette 45421, 10 May 2019 (Biodiversity) and Government Notice 655 Government Gazette 42946, 10 January 2020 (Plants and Animals)(NEMA).

In accordance with the Natural Scientific Professions Act (Act 27 of 2003; and Science and Technology Laws Amendment Act (Act 7 of 2014) only a person registered with the South African Council for Natural Scientific Professions may practice in a consulting capacity. Prof GJ Bredenkamp and Mr JPC van Wyk of EcoAgent CC undertook an independent and professional assessment of the biodiversity and ecological sensitivity.

The Terms of Reference for this assignment is interpreted as follows: Compile a study of the biodiversity and ecological sensitivity on the site, in accordance with all the above requirements.

In the light of the above. the following had to be done:

[1] *Note: The proposed Hendrina North WEF (DFFE Reference No. 14/12/16/3/3/2/2130) is subject to a separate EIA Process as contemplated in terms of the EIA Regulations 2014 (as amended), which is currently being undertaken separately from this BA process by another consultant.*

1.1. Initial preparations:

Obtain all relevant maps and information on the natural environment of the concerned area.

These include:

- Results of the **National Environmental Screening Tool** with relevance to biodiversity, plant species and animal species, and where relevant of aquatic systems.
- Regional **Vegetation Types**
- Information (maps) with regard to **Critical Biodiversity Areas and Ecological Support Areas, Conservation Areas, Protected Areas and hydrology (wetlands),** and any other environmentally / ecologically sensitive areas in relation to the study site.
- Information on **Red Data** listed plant species and other plant species of conservation concern that may occur in the area.
- Delimit the various **plant communities** as relatively homogeneous vegetation mapping units that can be recognised on aerial photographs / Google Earth images of the site.

1.2. Vegetation and habitat survey:

- List the plant species (trees, shrubs, grasses and herbaceous species) present, for plant community (ecosystem delimitation) and vegetation status assessment.
- Identify suitable habitat for any Red Data listed plant species that may possibly occur on the site.
- Identify from this list any red data plant species, protected plant species, alien plant species, and medicinal plants that occur or may potentially occur on the study areas.

1.3. Plant community delimitation and description

- Process data (vegetation and habitat classification) to identify the plant communities that are present on the site, on an ecological basis.
- Prepare a vegetation map of the area.
- Describe the vegetation and habitat of each mapping unit.
- Determine the sensitivity of each mapping unit in terms of biodiversity and presence of rare or protected plant species, alien and weedy species.
- Determine the ecological status of each plant community in terms of primary, secondary, disturbed, degraded, transformed vegetation.
- Prepare a Site Sensitivity Verification Statement as required by Government Notice 648 (2019) and Government Notice 655 (2020) (Screening Tool).

1.4. Fauna survey

- List fauna species present on the site.
- List fauna species that may occur on the site.
- List Red data fauna species that occur or may possibly occur on the site.

This report resulted from a site visit by the EcoAgent team on 14 September 2022 to assess the vegetation, flora and fauna and ecological sensitivity.

2. RATIONALE AND SCOPE

2.1 Rationale

It is widely recognised that to conserve natural resources it is of the utmost importance to maintain ecological processes and life support systems for plants, animals and humans. To ensure that sustainable development takes place, it is therefore important that possible impacts on the environment are considered before relevant authorities approve any development. This led to legislation protecting the natural environment. In 1992, the Convention of Biological Diversity, a landmark convention, was signed by more than 90 % of all members of the United Nations. In South Africa, the Environmental Conservation Act (Act 73 of 1989), the National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998) and the National Environmental Management Biodiversity Act, 2004 (Act 10 0f 2004) ensure the protection of ecological processes, natural systems and natural beauty, as well as the preservation of biotic diversity within the natural environment. They also ensure the protection of the environment against disturbance, deterioration, defacement or destruction as a result of man-made structures, installations, processes, products or activities. In support of these Acts, a draft list of Threatened Ecosystems was published (Government Gazette 2009), as part of the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004), and these Threatened Ecosystems are described by SANBI & DEAT (2009) and a list of Threatened or Protected Species (TOPS) regulations is also available (NEMBA Notice 388 of 2013). International and national Red Data lists have also been produced for various plant and animal taxa.

All components of the ecosystems (physical environment, vegetation, animals) at a site are interrelated and interdependent. **A holistic approach is therefore imperative** to effectively include the development, utilisation and, where necessary, conservation of the given natural resources into an integrated development plan, which will address all the needs of the modern human population (Bredenkamp & Brown 2001).

It is therefore necessary to make a thorough inventory of the plant communities, flora and fauna on the site, to evaluate the plant diversity and possible presence of plant and fauna species of conservation concern, red listed plant and fauna species and protected plant and fauna species, alien species, invader species and weedy species. From the results of this evaluation the **sensitivity** of the vegetation and the conservation value can be determined.

2.2 Legal Framework

Authoritative legislation that lists impacts and activities on biodiversity and wetlands and riparian areas that requires authorisation includes *inter alia*:

- Conservation of Agriculture Resources Act, 1983 (Act 43 of 1983);
- Government Gazette 34809 Threatened Terrestrial Ecosystems of South Africa 9 December 2011 NEMBA)

- Government Notice Regulation 1182 and 1183 of 5 September 1997, as amended (ECA);
- Government Notice Regulation 385, 386 and 387 of 21 April 2006 (NEMA);
- Government Notice Regulation 392, 393, 394 and 396 of 4 May 2007 (NEMA);
- Government Notice Regulation 398 of 24 March 2004 (NEMA);
- Government Notice Regulation 544, 545 and 546 of 18 June 2010 (NEMA)
- Government Notice Regulation 982, 983, 984 and 985 of 4 December 2014 (NEMA).
- National Environmental Management Act (Act 107 of 1998) Amendment of the Environmental Impact Assessment Regulations 2014, 7 April 2017. (Government Notice Regulations. 324, 325, 326 & 327: Listing Notices 1, 2, 3).
- National Environmental Management Act, 1998 (Act No. 107 of 1998)(including all later amendments and additions);
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)(including all later amendments and additions);
- National Environmental Management: Protected Areas Act 2003 (Act 57 Of 2003) (as Amendment Act 31 of 2004 and Amendment Act 15 of 2009)
- National Forests Act, 1998 (Act 84 of 1998);
- National Water Act, 1998 (Act 36 of 1998);
- The older Environment Conservation Act, 1989 (Act 73 of 1989);
- Government Notice 655 Government Gazette 42946, 10 January 2020 (Plants and Animals)(NEMA).
- Government Notice 648 Government Gazette 45421, 10 May 2019 (Biodiversity)(NEMA).

2.3 The Scope and objectives

The Scope of this study is therefore:

- To identify describe and map the vegetation (ecosystems) that occur on the site;
- To assess the ecological sensitivity of these ecosystems and comment on ecologically sensitive areas, in terms of their plant diversity and where needed ecosystem function;
- To provide a list of plant species that do occur on site and that may be affected by the development;
- To identify fauna and flora species of conservation concern that may occur on the site;
- Compile a list of fauna that occur on the site or may from time to time occur on the site;
- Confirm or dispute the environmental sensitivity as identified by the National web-based environmental screening tool;
- If relevant, provide management recommendations that might mitigate negative and enhance positive impacts, should the proposed development be approved.

2.4 Limitations

A limitation was that at the time of the survey, the vegetation was still dormant after the winter season and the summer rains have not commenced yet.

3. STUDY SITE

3.1 Location and the receiving environment

The proposed project is located approximately 15 km west of Hendrina, within the Steve Tshwete Local Municipality, in the Nkangala District Municipality, Mpumalanga Province. The Hendrina Power Station is located approximately 17 km northwest of Hendrina, near Pullens Hope (Figure 3.1, below). The proposed powerline to Hendrina Power Station will be ~20km long depending on the exact route. A 500 m corridor is proposed (250 m from the centre lines) (Figure 3.1 and 3.2).

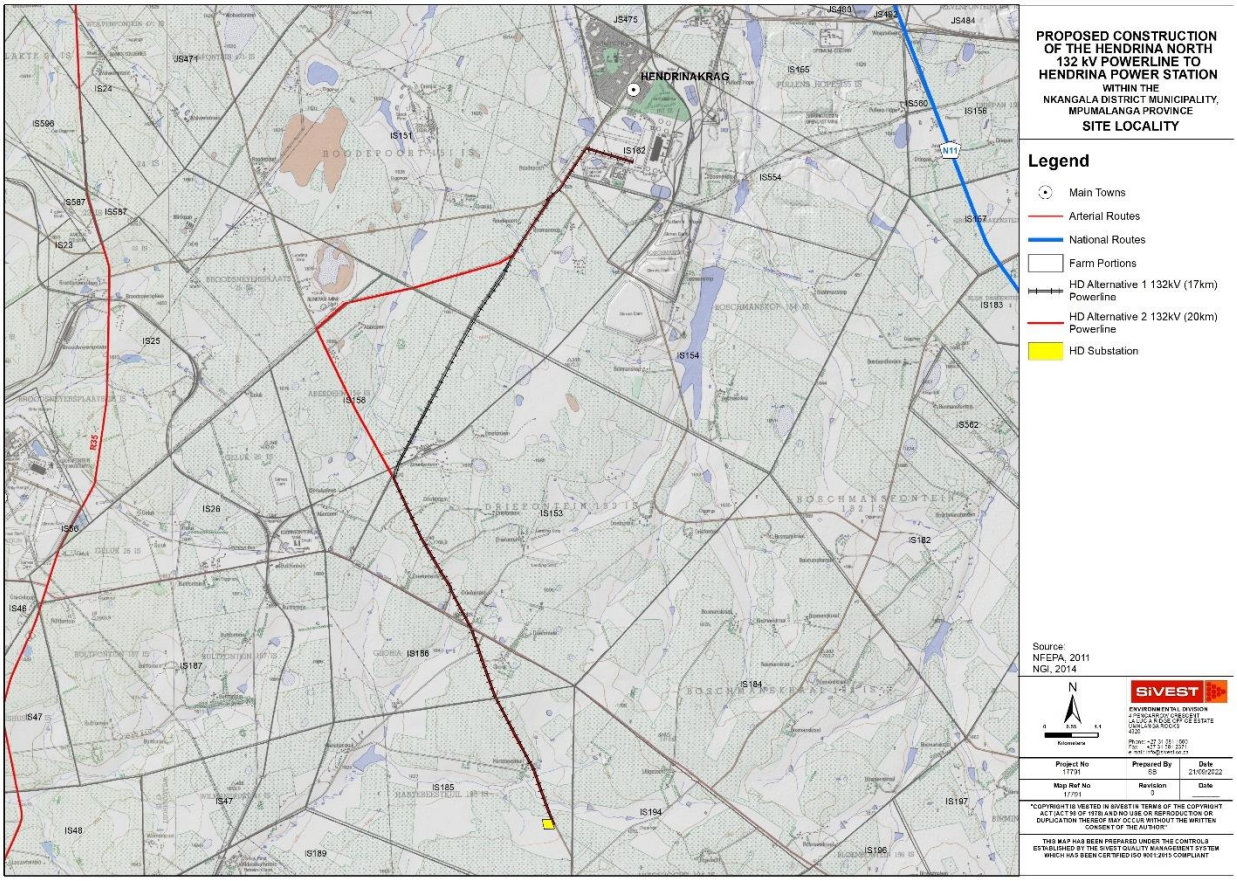


Figure 3.1: The locality of the proposed Hendrina North power line (map provided by SiVEST).

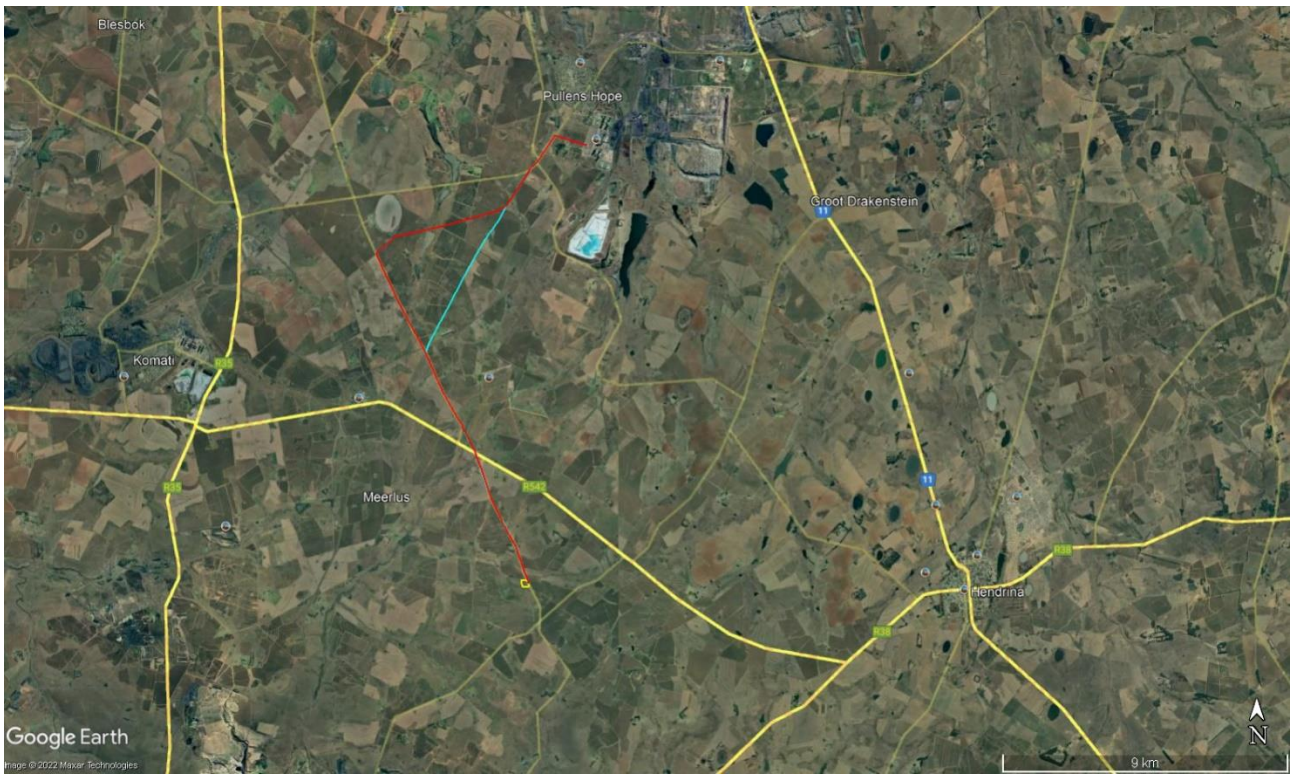


Figure 3.2: The locality of the proposed Hendrina North power line as seen on a Google Earth image (provided by SiVEST). (Note: Alternative 1 is the shorter (blue) line)

3.2 Geology, topography, drainage and soil

The area is a flat to slightly undulating plain with red to yellow sandy soils derived from shales and sandstone of the Madzaringwe Formation of the Karoo Supergroup. Lower-lying areas have darker more clayey soils. The northern are area slopes gradually to the north, but in the south the slopes are basically southwards, implying a watershed in the central parts. (Figure 3.3 below).

3.3 Regional Climate

Seasonal summer rainfall with very dry winters predominates the climate. The mean annual precipitation is about 650-750 mm, and the cold winters have severe and frequent frost. Mean temperature is 14.7^{o}C.

3.4 Land-use

The area along the transect is used for agriculture, coal mining and electricity generation power stations and small towns or villages. This was similar over many years (decades).

The current vegetation along the transect is mapped and described this report.

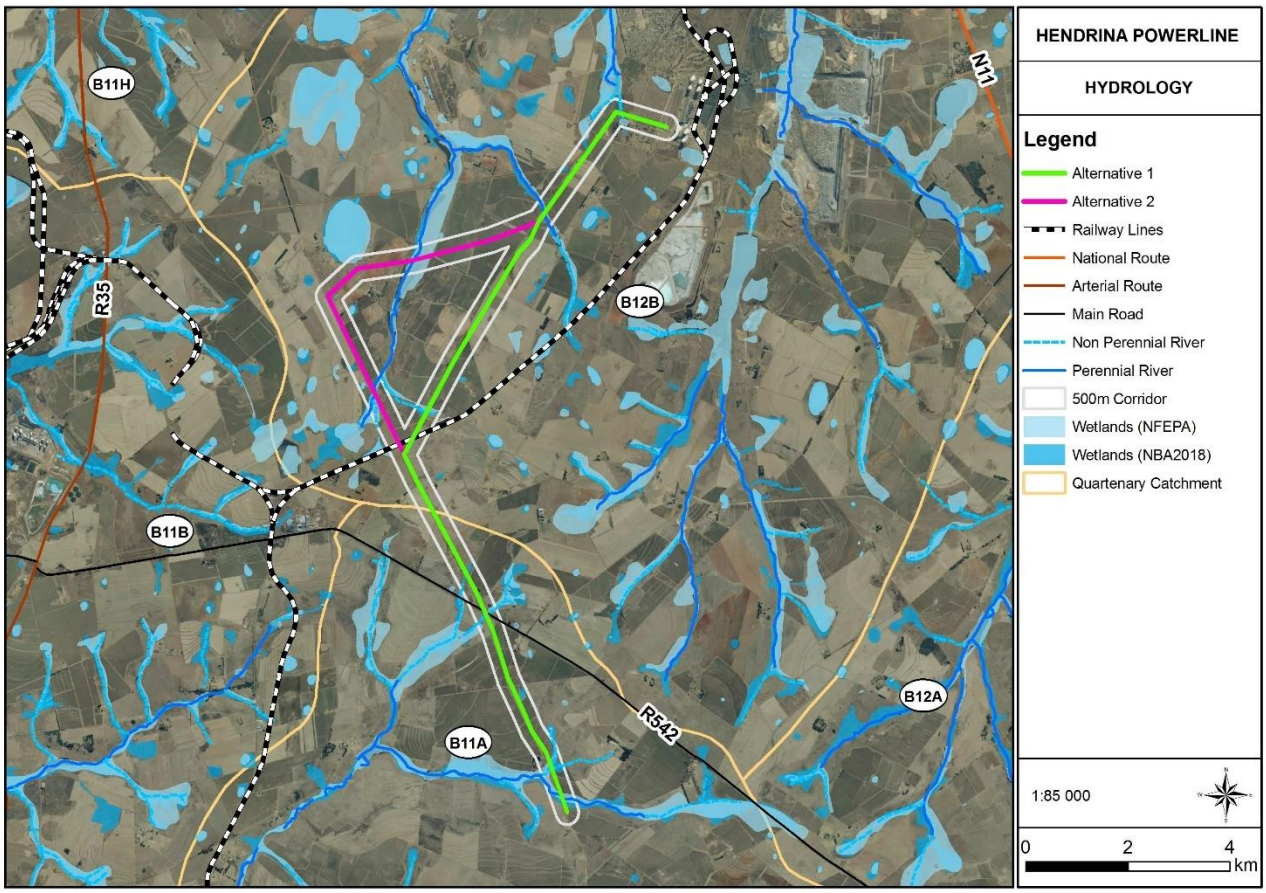


Figure 3.3: Hydrology in the area of the site.

4. METHODS

4.1 VEGETATION AND FLORA

4.1.1 Literature studies and databases:

For background information, the relevant maps, aerial photographs, and other information on the natural environment of the concerned area were obtained though literature studies and data bases. These *inter alia* include:

- Results of the National Environmental **Screening Tool** with relevance to biodiversity, plant species and animal species, and where relevant of aquatic systems. (Government Notice 655 Government Gazette 42946, 10 January 2020 [Plants and Animals)(NEMA) and Government Notice 648 Government Gazette 45421, 10 May 2019 (Biodiversity)(NEMA)].
- The relevant **vegetation types** in which the site is located using Mucina & Rutherford (2006, 2012).

- **Threatened ecosystems** are identified using Mucina & Rutherford (2006, 2012) SANBI & DEAT (2009) and NEMA Government Gazette 34809 (2011).

- Information (maps) about **Critical Biodiversity Areas and Ecological Support Areas,** and any other environmentally / ecologically sensitive areas in relation to the study site from the MTPA Conservation Plan.

- **Species of Conservation Concern**, including:

    - Information on **Red and Orange Data** listed plant species data from. SANBI and MTPA data bases.

    - Critically Endangered, Endangered, Vulnerable and Protected Species (**NEMBA species, TOPS species**) are evaluated against the list published in Department of Environmental Affairs and Tourism Notice No. 2007 (National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)).

    - **Nationally Protected Trees** as published in Government Notice No. 29062 3 (2006) (National Forests Act, 1998 (Act No. 84 0f 1998), as Amended (Department of Water Affairs Notice No 897, 2006).and that may occur in the area.

    - Other plant species of conservation concern, particularly **provincially protected species.**

4.1.2. Field studies: Vegetation and Flora surveys.

4.1.2.1 Vegetation and flora survey.

Prof GJ Bredenkamp of EcoAgent undertook the field survey on 14 September 2022, to assess the fauna, vegetation and flora, and the possible impacts of the proposed development on the vegetation and plant and animal species, and to suggest possible mitigation options where needed.

A Google Earth image was used to stratify and map different units representing differences in cover and vegetation. At several sampling plots and transects within each mapping unit a description of the dominant and characteristic plant species found was made. These descriptions were based on **total floristic** composition, following established vegetation survey techniques (Mueller-Dombois & Ellenberg 1974; Westhoff & Van der Maarel 1978). Data recorded resulted in a list of the plant species present, including trees, shrubs, grasses and forbs. A comprehensive species list was therefore derived for the site, but it is realised that some species could have been missed. These vegetation survey methods have been used as the basis of a national vegetation survey of South Africa (Mucina *et al*. 2000, Brown *et al.* 2013) and are considered an efficient method of describing vegetation and capturing species information. Within each mapping unit noted were made of relevant habitat features, with emphasis on topography and some soil properties Additional notes were made of any other features that might have had an ecological influence, e.g. previous utilization and disturbance.

From the floristic data an analysis of the presence of Alien and Invasive species on the site was made. Furthermore, the **ecological sensitivity** of each plant community was calculated by using plant species composition, plant species of conservation concern, habitat features and relevant legislation, including Critical Biodiversity Areas and the National Screening Tool. From this information an ecological sensitivity map was prepared.

Lastly an Impact Assessment was done by applying standard SiVEST assessment methods. (See Chapter 7 below)
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4.1.2.2 Plant Species Status

Plant species recorded in each plant community with an indication of the status of the species by using the following symbols:
A Followed by Invasive category (1a, 1b, 2, 3) = Alien woody species
D = Dominant
d = subdominant
EG = Exotic Garden ornamental or Garden Escape
G = Indigenous Garden ornamental or Garden Escape
M= Medicinal plant species
N = Exotic, naturalized
P = Protected trees species
NP = nationally protected species (NEMBA)
p = provincially protected species
RD = Species of Conservation Concern, Red data listed plant
W = weed.

4.1.2.3 Species Richness

Species Richness is interpreted as follows: Number of indigenous species recorded in the sample plots representing the plant community. Alien woody species and weeds are not included (Table 4.1).

Table 4.1: Categories of plant species richness.

No of species	Category
1-24	Low
25-39	Medium
40-59	High
60+	Very High

4.1.2 4 Indigenous vegetation and Vegetation Status

Indigenous vegetation: According to NEMA (Act 107 of 1998, - Amendment of the Environmental Impact Assessment Regulations 2014, 7 April 2017 (GNR. 324, 325, 326 & 327: Listing Notices 1, 2, 3):Definitions) Indigenous vegetation refers to vegetation consisting of **indigenous plant species occurring naturally in an area**, regardless of the level of alien infestation **and where the topsoil has not been lawfully disturbed during the preceding ten years**.

The following criteria indicate vegetation status:

Primary vegetation is the ***original indigenous vegetation*** that occurred in the area, in this case the Eastern Highveld Grassland (Gm 12) vegetation type (Mucina & Rutherford 2012). The vegetation is *relatively undisturbed, or slightly disturbed*, though the vegetation **still consists of the original dominant, sub-dominant and associated plant species**.

Disturbed primary vegetation is where the ***original indigenous vegetation*** that occurred in the area is **disturbed but can still be identified by the original dominant, sub-dominant and most associated plant species**. Some of the species that were present may have disappeared, however, some other species (species of lower successional status or weedy species) increased in abundance or invaded into the original vegetation. Disturbed primary vegetation may recover when well-managed.

Degraded vegetation is where the ***original indigenous vegetation*** is so **severely disturbed by impacts (mostly man-induced) that the original dominant, sub-dominant and most associated plant species and vegetation structure are changed**. Some of the originally occurring species are **still sparsely present**, but they are mostly replaced by other species of lower successional status, alien invasive species or weedy species. Degraded vegetation **may not recover** without active application of rehabilitation measures. **Severely Degraded vegetation can be regarded as Transformed.**

Transformed vegetation is where the **original indigenous vegetation was destroyed with no or very little of the original plant species remaining**, e.g. cleared for development (construction, tilled for agriculture (e.g. maize), silviculture (e.g. pines, wattles, eucalypts), total cover by alien invasive plant species (e.g. black wattle), planted pasture (e.g. *Eragrostis*), sports fields (e.g. kikuyu grass). Transformed vegetation areas include areas where the topsoil has been disturbed during the **preceding ten years**. Recovery to the **original indigenous vegetation is almost impossible** though by active application of rehabilitation measures a vegetation cover (not representing or similar to the original indigenous vegetation!) can be established.

Secondary (indigenous) vegetation is where the original indigenous vegetation was destroyed but the transformed area was left unused and fallow for several years. Vegetation, different from the original indigenous vegetation, can become (naturally) established and develop through successional processes to a specific plant community with a specific indigenous plant species composition and with good cover, hence secondary vegetation may fall within the definition of indigenous vegetation as provided for in NEMA, but it mostly represents **Transformed vegetation**, as the original vegetation has been destroyed. A good example is where species rich *Themeda*

triandra-dominated indigenous grassland was transformed for agriculture, (e.g. maize production) and then left fallow. Through successional phases secondary *Hyparrhenia hirta* – dominated grassland can become established. By applying specific rehabilitation and management procedures, the development of secondary vegetation can be enhanced.

4.2 FAUNA

The field survey was conducted on 14 September 2022. The day was sunny, pleasant with almost no wind. During this visit, the observed and derived presence of mammals, reptiles and amphibians associated with the recognised habitat types of the study site was recorded. This was done with due regard to the well-recorded global distributions of Southern African vertebrates, coupled with the qualitative nature of recognised habitats.

The 500 meters of adjoining areas were scanned for possible additional fauna habitats.

4.2.1 Field Surveys

During the site visit, mammals, reptiles and frogs were identified by visual sightings through random transect walks. No trapping or mist netting was conducted as the terms of reference did not require such intensive work. In addition, mammals were also identified by means of spoor, droppings, burrows or roosting sites, and frogs by their calls.

4.2.2 Desktop Surveys

As many mammals and herpetofauna are either secretive, nocturnal, hibernators and/or seasonal, and some are seasonal migrators, distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of such species based on authoritative tomes, scientific literature, field guides, atlases and data bases. This can be done with a high level of confidence irrespective of season.

The probability of the occurrence of mammal, reptile and amphibian species was based on their respective geographical distributional ranges and the suitability of on-site habitats:
High probability would be applicable to a species with a distributional range overlying the study site as well as the presence of prime habitat occurring on the study site. Another consideration for inclusion in this category is the inclination of a species to be common to the area, i.e. normally occurring at high population densities.

Medium probability pertains to a mammal and herpetofaunal species with its distributional range peripherally overlapping the study site, or its required habitat on the site being sub-optimal. The size of the site as it relates to its likelihood to sustain a viable breeding population, as well as its geographical isolation are taken into consideration. Species categorised as *medium* normally do not occur at high population numbers - but cannot be deemed as rare.

Low probability of occurrence would imply that the species' distributional range is peripheral to the study site and habitat is sub-optimal. Furthermore, some mammals, reptiles and amphibians categorised as low are generally deemed to be rare.

Mammals
Based on the impressions gathered during the site visit, as well as publications such as The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005), Smithers' Mammals of Southern Africa; A Field Guide (Apps, 2012) and Stuarts' Field Guide to Mammals of Southern Africa (Stuart & Stuart, 2015), a list of species which may occur on the site was compiled. The latest taxonomic nomenclature was used. The vegetation type was defined according to the standard handbook by Mucina and Rutherford (eds) (2006).

Herpetofauna
A list of herpetofauna (reptile and amphibian) species that may occur on the site was compiled, based on the impressions gathered during the site visit, as well as publications such as FitzSimons' Snakes of Southern Africa (Broadley, 1990), Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998), A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007), Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers, 2014), Amphibians of Central and Southern Africa (Channing 2001), Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (Minter, Burger, Harrison, Braack, Bishop & Kloepfer, 2004, 2004) and A Complete Guide to the Frogs of Southern Africa (Du Preez & Carruthers, 2009). The latest taxonomic nomenclature was used. The vegetation type was defined according to the standard handbook by Mucina and Rutherford (eds) (2006).

4.2.3 Specific Requirements

Mammals:
During the visit, the site was surveyed and assessed for the potential occurrence of the following Red Data mammal species (threatened or rare) as provided by the Mpumalanga Province (MTPA) for the farms of the study transect:

Swamp musk shrew (*Crocidura mariquensis*);
Southern African hedgehog *(Atelerix frontalis)*;
African clawless otter (*Aonyx capensis*);
Serval (*Leptailurus serval*)
Oribi (*Ourebia ourebi*);

From the Screening Tool results the following mammal species were noted as having medium sensitivity:

Oribi (*Ourebia ourebi*);
Maquassie musk shrew (*Crocidura maquassiensis*);
Spotted-necked otter (*Hydrictis maculicollis*).

Herpetofauna: During the visit, the site was checked and assessed for the potential habitat and occurrence of South African Red Data species (Alexander and Marais, 2007; Minter, *et al*, 2004, Du Preez & Carruthers, 2017 and Hofmeyr, M.D. & Boycott, R.C. 2018), such as: Lobatse Hinged Tortoise (*Kinixys lobatsiana*); Giant Bullfrog (*Pyxicephalus adspersus*); Coppery Grass Lizard (*Chamaeasaura aenea*); Striped Harlequin Snake (*Homoroselaps dorsalis*).

5. RESULTS VEGETATION AND FLORA

5.1 RESULTS OF THE LITERATURE STUDY AND DATABASE SURVEY

5.1.1 Vegetation Type

The site is situated within the Eastern Highveld Grassland (Gm 12) vegetation type (Mucina & Rutherford 2012) (Figure 5.1 below).

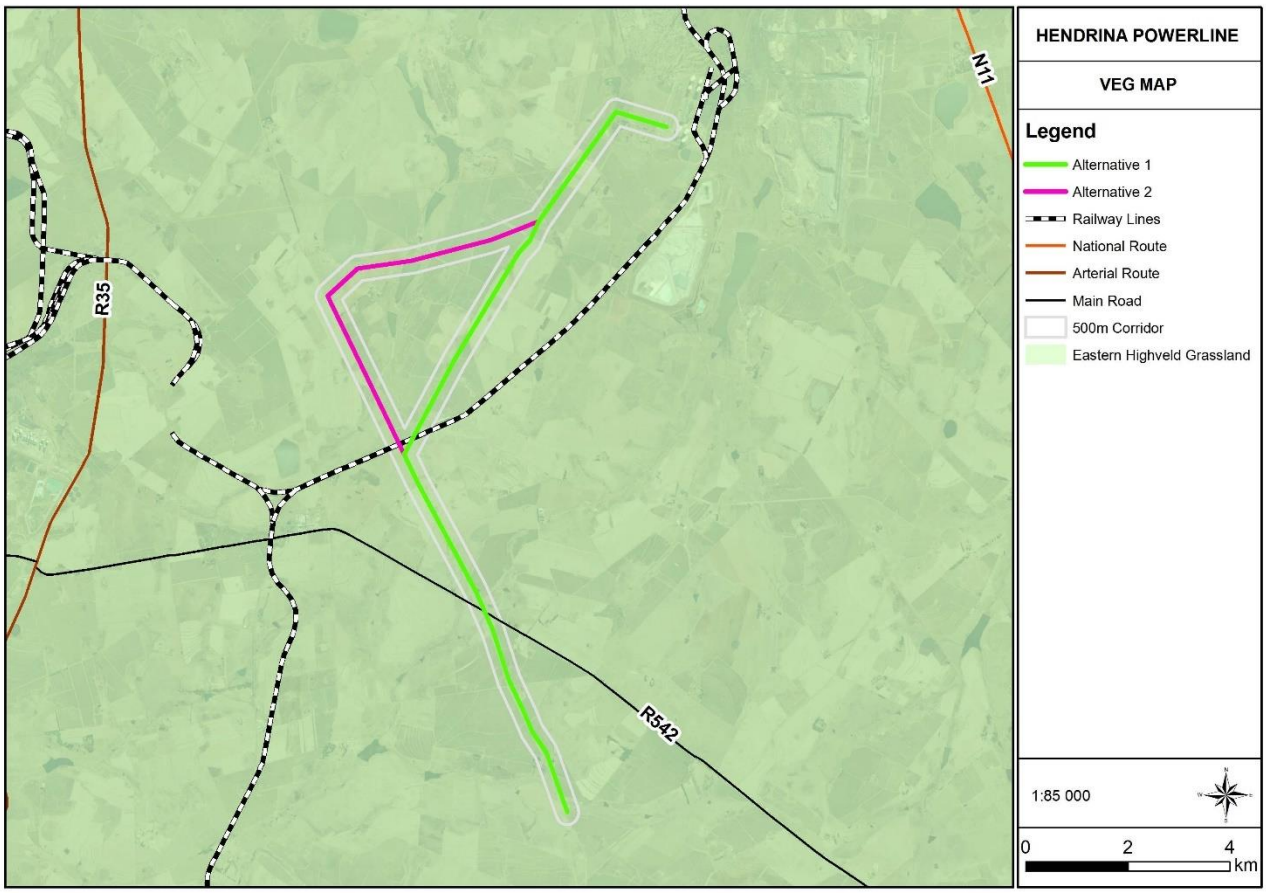

Figure 5.1: The site is located within the Eastern Highveld Grassland (Mucina & Rutherford 2006).

5.1.2 Threatened Ecosystems

According to Mucina & Rutherford (2006, 2012) Eastern Highveld is classified as **Endangered**. In Eastern Highveld Grassland about 44% has been ploughed for agriculture (Mucina & Rutherford

2006) or utilised for coal mining and very little (<1%) is statutorily conserved. According to SANBI & DEAT (2009) and NEMBA, Government Notice 1002 (2011) the Ecosystem status for this vegetation type is **Vulnerable**. This is because so much is already transformed, particularly by mining, agriculture and town and industrial development. The remaining natural habitats generally show evidence of grazing.

On the specific site the vegetation is mostly **transformed** by agriculture, with little original indigenous grassland vegetation remaining. The wetlands and drainage lines are mostly still natural, though often ploughed up to the edges and often grazed by livestock.

5.1.3 Critical Biodiversity Areas and Ecological Support Areas

In terms of the MBSP Terrestrial Assessment (Figure 5.2 below), **no Irreplaceable CBA's** occur along the transect area. A **small CBA Optimal site** occurs in the wetland in the north, close to the Hendrina (Pullen's Hope) power station. Most of the transect is Heavily Modified or small local areas Moderately modified. Most wetlands are classified as **Other Natural Areas**. (Figure 5.2 below).

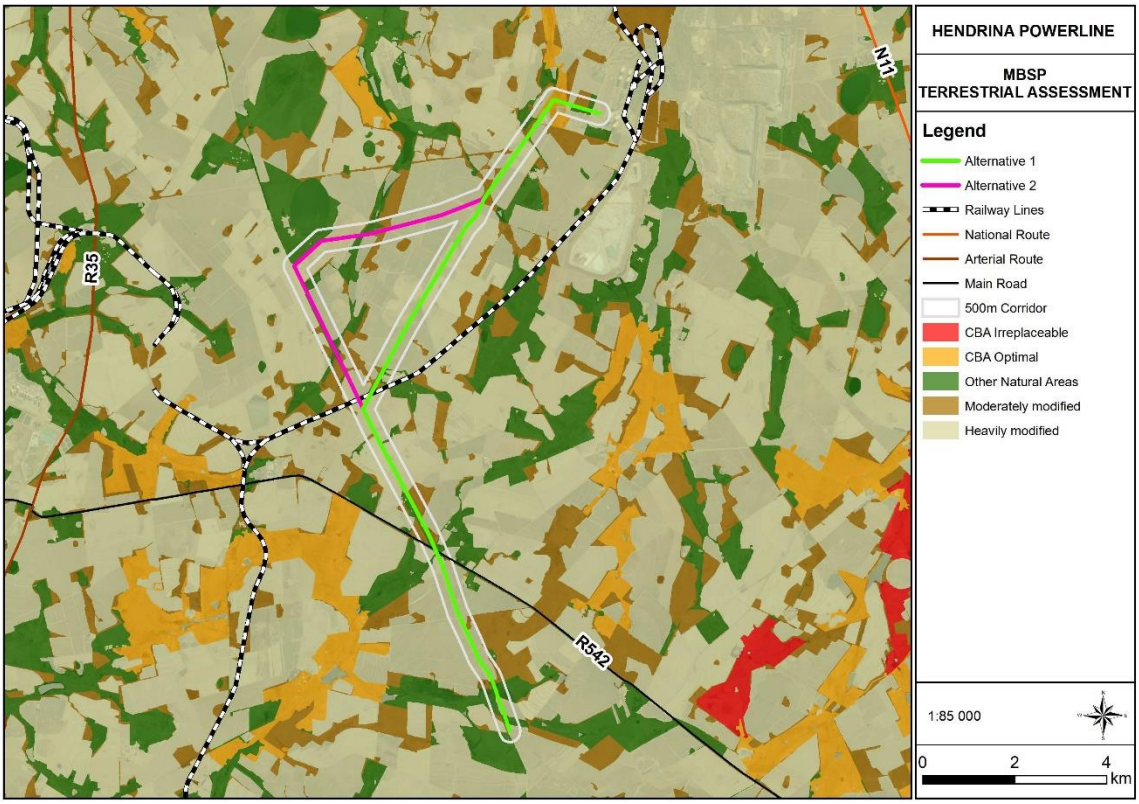

Figure 5.2: No Irreplaceable CBA,s occurs along the transect area. A limited CBA Optimal site occurs in the wetland in the north close to the Hendrina power station. Most of the transect is heavily or moderately modified. Most wetlands represent Other Natural Areas.

5.1.4 Protected and Conservation Areas

No formal protected or conservation area occur in the vicinity of the powerline transect.

5.1.5 Species of Conservation Concern (CCS), Red Listed plant species

Red Data listed plant species and Orange listed plant species (= plant species of conservation concern) are those plants that are important for South Africa's conservation decision making processes. These plants are nationally protected by the National Environmental Management: Biodiversity Act (Raimondo *et al*, 2009).

Threatened species (Red Data listed species) are those that are facing high risk of extinction, indicated by the categories Critically Endangered (CE), Endangered (EN) and Vulnerable (VU). Species of Conservation Concern include the Threatened Species.

Additionally, the Orange listed categories are Near Threatened (NT), Data Deficient (DD), (DDT = lack of taxonomic data), Critically Rare (CR), Rare (R) and Declining (D). This is in accordance with the new Red List for South African Plants (Raimondo *et al*. 2009 upgraded on SANBI website).

Lists of Red Data plant species (Raimondo *et al* 2009) for the area in general were obtained from DEA Screening Tool, (2022) MTPA (2022) and SANBI (Table 5.1 below).

Table 5.1 List of Red Data plant species for the area

Screening Tool

Family	Species	Status	Suitable habitat
Apiaceae	*Alepidea longiciliata*	Medium sensitivity, LC	Yes, moist grassland, not found
Iridaceae	*Gladiolus palidosus*	Medium sensitivity, LC	Yes, moist grassland, not found
Amaryllidaceae	*Nerine gracilis*	Medium sensitivity, VU	Yes, moist grassland, not found
Apocinaceae	*Pachycarpus suaveolens*	Medium sensitivity, VU	Very rare in grassland, not found

Mpumalanga (MTPA)

Family	Species	Status	Suitable habitat
Hyacinthaceae	*Eucomus autumnalis*	Declining	Yes, not recorded
Amaryllidaceae	*Boophone disticha*	LC	Yes, not recorded
Asphodelaceae	*Aloe bergiana*	Data Deficient	Yes, not recorded

SANBI (wider area)

Family	Species	Status	Suitable habitat on site
Apiaceae	*Alepidea peduncularis* A.Rich.	DDT	Marginally, but too transformed
Apocinaceae	*Aspidoglossum validum* Kupicha	DDT	No
Amaryllidaceae	*Boophone disticha* (L.f.) Herb.	LC Declining	Yes, but not found, large area too transformed
Asteraceae	*Callilepis leptophylla* Harv.	LC Declining	Marginally, but too transformed
Amaryllidaceae	*Crinum bulbispermum* (Burm.f.) Milne-Redh. & Schweick.	LC Declining	Marginally, but too transformed
Amaryllidaceae	*Crinum macowanii* Baker	LC Declining	Yes, not found, large area too transformed
Mesembryanthemaceae	*Frithia humilis* Burgoyne	EN	No
Hypoxidaceae	*Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall.	LC Declining	Yes, but not recorded, normally widespread large area too transformed
Aquifoliaceae	*Ilex mitis* (L.) Radlk. var. mitis	LC Declining	No
Mesembryanthemaceae	*Khadia carolinens*is (L.Bolus) L.Bolus	VU	No
Myrothamnaceae	*Myrothamnus flabellifolius* Welw.	DDT	No
Apocynaceae	*Pachycarpus suaveolens* (Schltr.) Nicholas & Goyder	VU	Marginally, but too transformed
Rubiaceae	*Pavetta zeyheri* Sond. subsp. *middelburgensis* (Bremek.) P.P.J.Herman	Rare	No

There is suitable habitat for the widespread *Boophane disticha* and *Hypoxis hemerocallidea* on the transect, however none of these were noted, probably due to the widely transformed nature (agriculture) of this area. These two species occur widespread and are not really rare, can be locally present. However, due to suitable habitat, particularly the moist grassland along the drainage lines, the rare *Alepidea longiciliata, Gladiolus palidosus, Nerine gracilis, Eucomus autumnalis, Crinum macowenii and Aloe modesta* may be locally present. There is however no chance that these species will be in danger or be threatened by the construction and operation of the proposed powerline.

5.1.6 NEMBA / TOPS plant species

These species are evaluated against the list published in Department of Environmental Affairs and Tourism Notice No. 2007, Government Gazette 574 of 2013 and Notice 256 of 2015 and National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act 10 of 2004).

No NEMBA/TOPS plant species occur on the site

5.1.7 Nationally Protected Trees

The National Forest Act, 1998 (Act No. 84 of 1998) enforces the protection of several indigenous trees. The removal, thinning or relocation of protected trees will require a permit from the Department of Agriculture, Forestry and Fisheries (DAFF) (Notice of the List of Protected Tree Species under the National Forests Act, 1998, Notice 835, Government Gazette 39741, No 19, 29 August 2014).

No protected trees occur on the site

5.1.8 Provincially Protected Plants

No Provincially protected plant species that were found on the site.

5.2 RESULTS OF THE VEGETATION AND FLORA SURVEY

Five plant communities were identified and mapped, (Table 5.2 below)with two additional mapping units namely Degraded area and Power station (Figure 5.3):

Table 5.2: List of mapping units with ecological sensitivity:

	Vegetation mapping unit	**Sensitivity result**
1	Agricultural Fields	Low
2	Dry Grassland	Low
3	Moist Grassland	High
4	Drainage Lines	High
5	Pan	High

A vegetation map showing the distribution of the mapping units is presented in Figure 5.3 (below) while the ecological sensitivity is given in Figure 5.4 (below).

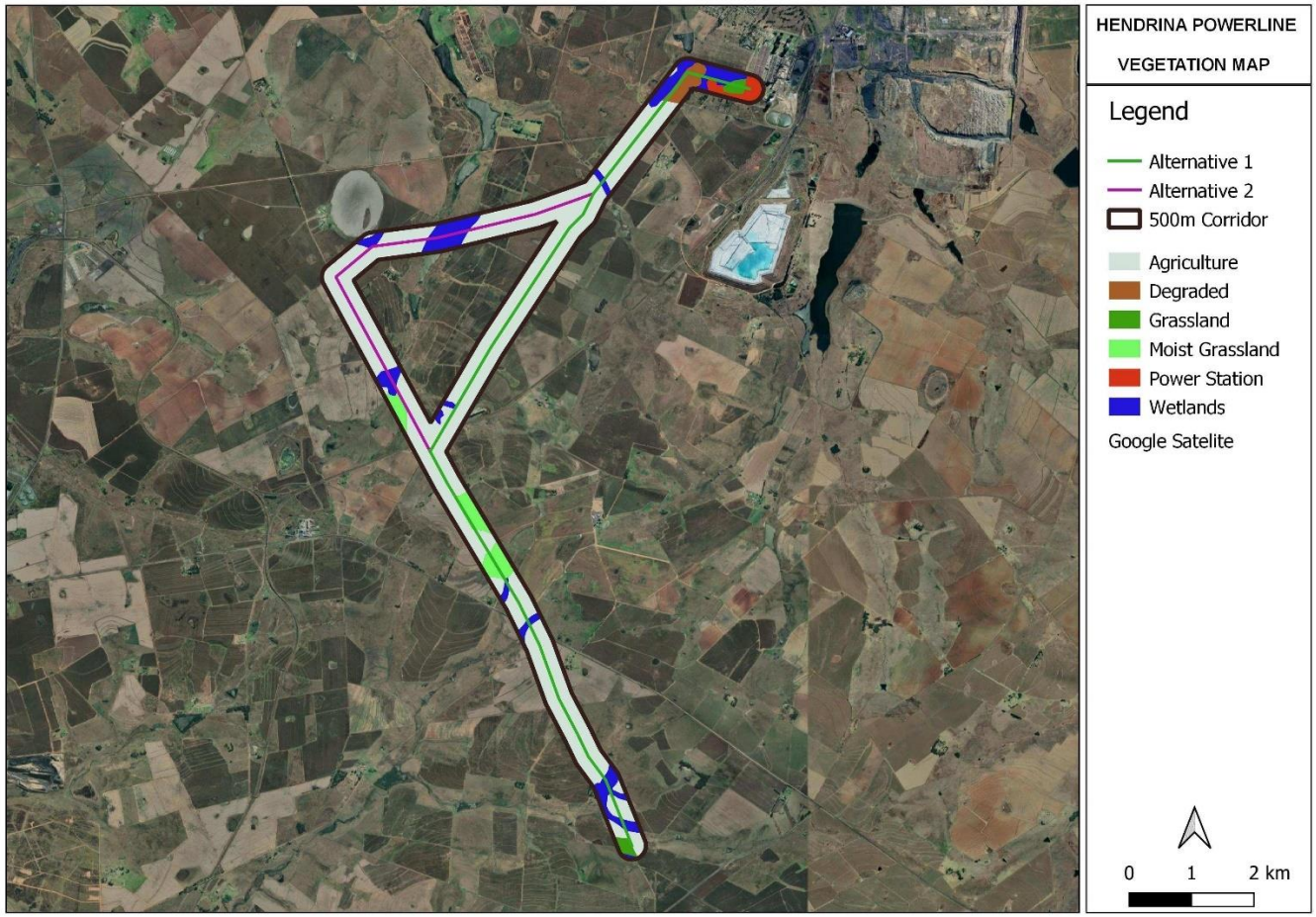

Figure 5.3: A vegetation map of Portion 50 of the Farm Elandsfontein 309 JS and Portion 142 of the Farm Nooitgedacht 300 JS, eMalahleni.

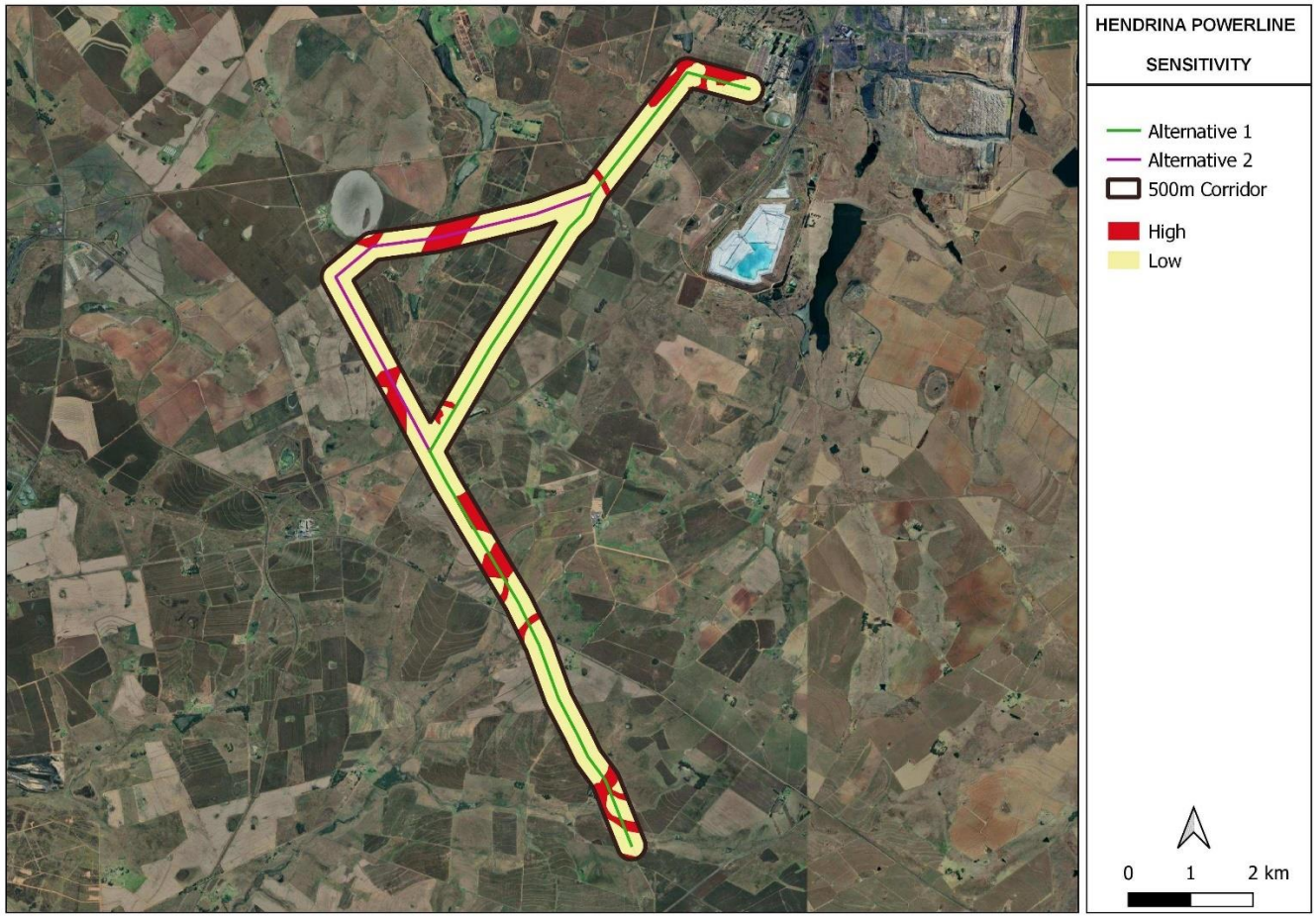

Figure 5.4: Ecological sensitivity of Portion 50 of the Farm Elandsfontein 309 JS and Portion 142 of the Farm Nooitgedacht 300 JS, eMalahleni.

5.2.1. Agricultural Fields

Agriculture is very important in this area, as shown in the results of the DEA Screening Tool (Figure 5.5, below). Agricultural fields of various ages, mainly for cultivation of maize, occur on most of the area (Figure 5.3 above and Figure 5.6. below). Currently the ecological and biodiversity sensitivity, based on vegetation and flora, is **Low**, and the resulting nature conservation value is also **Low.**

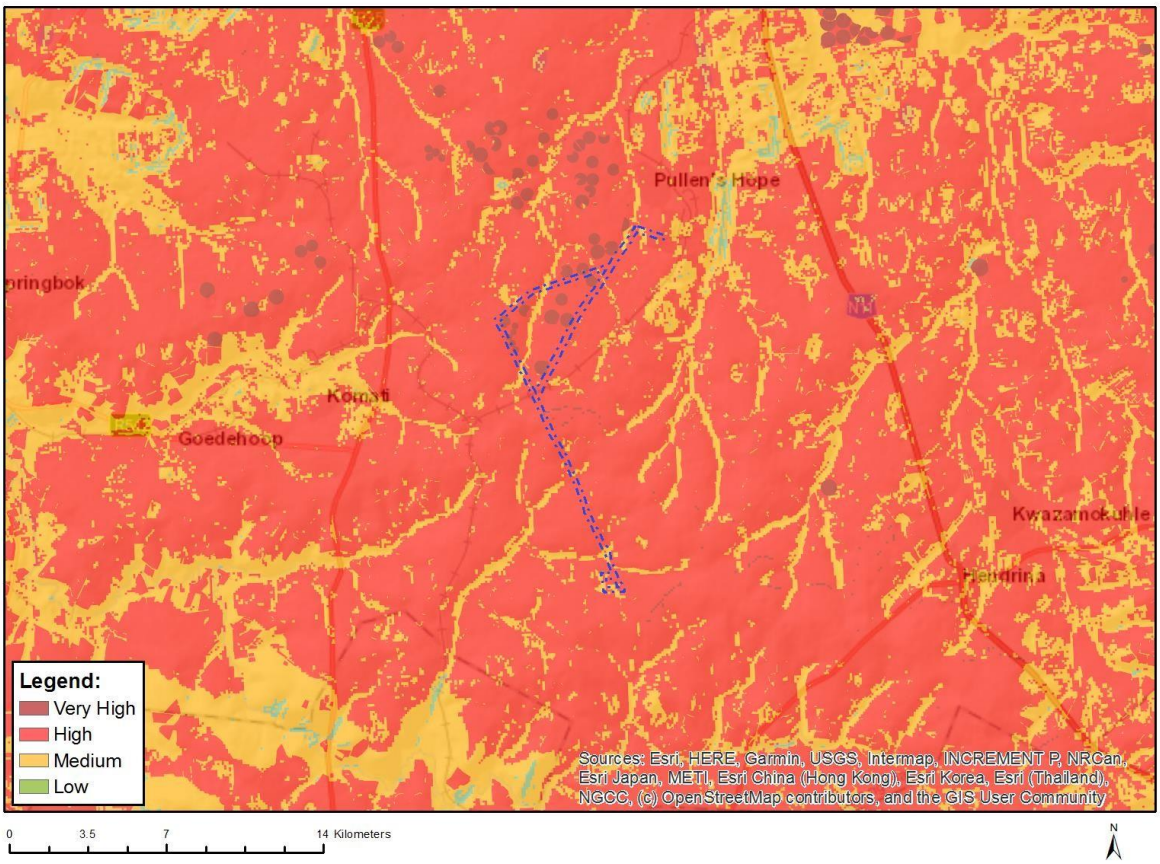

Figure 5.5: Results of the Screening Tool indicate that the entire area (except drainage lines) has Very High (irrigated areas) to High agricultural sensitivity.

A narrow strip of disturbed, degraded grassland may be present between or surrounding agricultural lands. Here the pioneer grasses *Cynodon dactylon, Melinis repens, Eragrostis curvula* and the tall-growing grass, *Hyparrhenia hirta* are mostly prominent. Several forb species are present, though they are often weedy or indicating a late successional stage.

Trees and Shrubs

Seriphium plumosum	W

Grasses and sedges

Aristida congesta		*Eragrostis curvula*	D
Cynodon dactylon	d	*Eragrostis plana*	M
Eragrostis chloromelas		*Hyparrhenia hirta*	D

Melinis repens *Trichoneura grandiglumis*
Pogonarthria squarrosa

Forbs

Chamaecrista mimosoides		*Richardia braziliensis*	W
Conyza bonariensis	W	*Schkuhria pinnata*	MW
Conyza podocephala		*Selago densiflora*	
Gomphrena celosioides	W	*Senecio erubescens*	
Hypochaeris radicata	W	*Verbena bonariensis*	W
Osteospermum muricatum	W	*Verbena braziliensis*	W
Pseudognaphalium luteoalbum	W		

Table 5.3: Number of species recorded in disturbed grassland between the Agricultural lands

	Indigenous	**Aliens / Weeds**	**Total**	**Red Data**	**Protected**	**Medicinal**
Trees and shrubs	1	0	1	0	0	0
Grasses	9	0	9	0	0	1
Forbs	4	9	13		0	1
Total	14	9	23		0	2

The species richness is Low, with no species of conservation concern present, but several weed species present. It has low conservation value and low ecological sensitivity. This does not exclude occasional possible occurrence of species of conservation concern in the grassland strips between agricultural fields, this is however not likely and the powerline will not be a threat for such a species.

Table 5.4: Summary of some characteristics of the Agricultural lands within the proposed powerline

Agricultural lands: summary			
Status	Transformed, original vegetation cleared and removed		
Soil	deep red to yellow sandy loam soil	**Rockiness % cover**	2
Conservation priority:	Low	**Sensitivity:**	Low
Species Richness	Low	**Need for rehabilitation**	Low
Dominant spp.	*Cynodon dactylon, Hyparrhenia hirta, Eragrostis curvula,*		

Discussion

From a vegetation and flora point of view, there is no objection against the transect of the proposed powerline through the agricultural fields. At several places within the study area, cultivated lands were observed under existing powerlines (Figure 5.6 below).

Figure 5.6: Agricultural field with Hendrina power station in the background. A drainage line (dammed) visible on the left.

5.2.2. Dry Grassland

Two small patches of Dry Grassland were recognised:

The **first Dry Grassland** is located in the **north**, east of the **Hendrina (Pullen's Hope) power station**, where the proposed powerline enters the power station. This grassland at the northern site is highly disturbed, with several existing powerlines crossing the area (Figure 5.7 below).

The **second Dry Grassland** is located in the south at the proposed **Wind Energy Facility (substation) site (substation)**(Figure 5.3 above). The southern Dry Grassland at the proposed Wind Energy Facility (substation) site is less disturbed but appears to be secondary, totally dominated by *Eragrostis curvula* with patches of old planted Kikuyu grass and several scattered weedy species. Two planted exotic trees are present at some old ruins.

Figure 5.7: The disturbed Dry Grassland at the Hendrina (Pullen's Hope) power station.

The following species were noted in the **northern** Dry Grassland:

Trees and Shrubs

No indigenous trees and shrubs

Grasses

Themeda triandra		*Heteropogon contortus*	
Cymbopogon caesius		*Hyparrhenia hirta*	
Cynodon dactylon		*Melinis repens*	
Eragrostis curvula	d		

Forbs

Becium obovatum		*Helichrysum nudifolium*	
Euphorbia striata		*Helichrysum rugulosum*	
Felicia muricata	W	*Hypochaeris radicata*	W
Gazania krebsiana		*Hypoxis multiceps*	
Haplocarpha scaposa		*Plantago lanceolata*	W
Helichrysum aureonitens	M	*Scabiosa columbaria*	M

Table 5.5: Number of plant species recorded in the northern Dry Grassland

	Indigenous	**Aliens / Weeds**	**Total**	**Red Data**	**Protected**	**Medicinal**
Trees and shrubs	0	0	0	0	0	0
Grasses	7	0	7	0	0	0
Forbs	9	3	12	0	0	2
Total	16	3	19	0	0	2

The species richness is Low. No species of conservation concern

The following species were noted in the **southern** Dry Grassland:

Trees and Shrubs

No indigenous trees and shrubs

Grasses

Cynodon dactylon		*Melinis repens*	
Eragrostis curvula	D	*Microchloa caffa*	
Hyparrhenia hirta		*Pennisetum clandestinum*	A

Forbs

Becium obovatum		*Felicia muricata*	W
Cirsium vulgare	W	*Gazania krebsiana*	

Hypochaeris radicata	W	*Senecio erubescens*	
Moraea spathulata		*Senecio inaequidens*	W
Plantago lanceolata	W	*Taraxacum officinalis*	W
Scabiosa columbaria		*Verbena braziliensis*	W

Table 5.5: Number of plant species recorded in the southern Dry Grassland

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	0	1	1	0	0	0
Grasses	5	1	6	0	0	0
Forbs	5	7	12	0	0	0
Total	10	9	19	0	0	0

The species richness is Low. No species of conservation concern

Table 5.6: Dry Grassland - Summary			
Status	Highly disturbed or secondary.		
Soil	Deep sandy soil	**Rockiness**	0%
Conservation value:	Low	**Ecological sensitivity**	Low
Species richness:	Low	**Need for rehabilitation**	N/A
Dominant spp.	*Eragrostis curvula*		

Discussion

The species richness in this plant community is low, no species of conservation concern occur, the ecological sensitivity and conservation value is low and both areas are quite small.

The area included in the 500 m corridor at the southern Dry Grassland, includes the site of the proposed **Wind Energy Facility (substation) site (substation).**

5.2.3. Moist Grassland

The Moist Grasslands along the proposed powerline transect occur scattered throughout the study area (Figure 5.3 above) but are restricted to relatively lower-lying areas, always associated with drainage lines, therefore with higher ecological sensitivity. It can mostly be regarded as floodplain area. These areas have darker clayey soils that are often wet, and are mostly not ploughed for cultivation, but are grazed by livestock. Mostly the Moist Grasslands occur only in a narrow strip of grassland between a drainage line and the ploughed area. In these cases the Moist Grasslands are mapped as a single unit with the drainage lines. In some cases the strip of Moist Grassland may be a bit wider. In limited areas the Moist Grasslands

occupy larger areas that could be mapped separately, (e.g. on the Farms Aberdeen and Driefontein) (Figure 5.3 above).

The vegetation is generally regarded as primary grassland (Figure 5.8 below). The grass *Eragrostis plana* is mostly the dominant, though grass species such as *Eragrostis curvula, Setaria sphacelata* and *Themeda triandra* are often prominent. Several forbs species are present, though they are scattered and are never dominant.

The following species were noted in this plant community:

Trees, Shrubs and Dwarf shrubs

Seriphium plumosum

Grasses and Sedges

Andropogon eucomis		*Eragrostis curvula*	d
Aristida bipartita		*Hyparrhenia hirta*	d
Aristida junciformis		*Imperata cylindrica*	
Bulbostylis hispidula		*Juncus* sp	
Cymbopogon caesius		*Leersia hexandra*	
Cynodon dactylon		*Paspalum dilatatum*	
Eragrostis gummiflua		*Setaria sphacelata*	d
Eragrostis plana	D		

Forbs

Albuca setosa		*Hypochaeris radicata*	
Anthospermum hispidulum		*Limosella maior*	
Berkheya echinacea		*Lobelia erinus*	
Berkheya radula		*Monopsis decipiens*	
Conyza podocephala		*Oenothera rosea*	
Falckia oblonga		*Richardia braziliensis*	W
Gladiolus crassifolius		*Rumex woodii*	
Haplocarpa lyrata		*Scabiosa columbaria*	M
Helichrysum aureonitens	M	*Verbena bonariensis*	W
Hilliardiella oligocephala		*Wahlenbergia undulata*	

Table 5.7: Number of plant species recorded in the Moist Grassland

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	0	1	1	0	0	0
Grasses	14	0	14	0	0	0
Forbs	18	2	20	0	0	2
Total	32	3	35	0	0	2

The plant species richness is Medium. No species of conservation concern or protected species were observed.

Table 5.8: **Moist Grassland - Summary**			
Status	Associated with wetlands		
Soil	Black clay soil	**Rockiness**	0%
Conservation value:	High	**Ecological sensitivity**	-High
Species richness:	Medium	**Need for rehabilitation**	N/A
Dominant spp.	*Eragrostis plana, Hyparrhenia hirta, Paspalum dilatatum*		

Discussion

The Moist Grasslands are regarded as wetlands. All wetland systems in South Africa have legal protection (National Water Act (2004). These Grassland therefore have -**High** ecological sensitivity and therefore **High** conservation value. In some cases the Moist Grassland has been ploughed. It is suggested that, if feasible, no pylons should be located within pristine (not previously ploughed) Most Grassland. This may be a problem on Rietfontein and Aberdeen.

Figure 5.8: Moist Grassland

5.2.4. Drainage Lines

(Note: This report does not include a wetland analysis but the wetland vegetation is mapped and described as part of the vegetation and flora study).

There are several drainage lines in the area (Figure 5.3 above). Along the proposed powerline transect, most of the drainage lines still had flowing water, but most can be regarded as seasonal spruits (Figure 5.9 below). The drainage lines do not have riparian zones, but all are directly adjacent to Moist Grassland (paragraph 5.2.3 above), The Moist Grassland can often be regarded as flood plain area. The plant species in or close to the drainage lines often include hydrophilous species growing, at least seasonally, in the water.

Trees, Shrubs and Dwarf shrubs
None recorded

Grasses and Sedges

Andropogon eucomis		*Hyparrhenia hirta*	d
Aristida bipartita		*Imperata cylindrica*	
Aristida junciformis		*Juncus* sp	
Brachiaria eruciformis		*Kyllinga alata*	
Cyperus esculentus		*Leersia hexandra*	
Eleocharis sp		*Mariscus congestus*	
Eragrostis bicolor		*Paspalum dilatatum*	
Eragrostis gummiflua		*Schoenoplectus corymbosus*	
Eragrostis plana	D	*Setaria nigrirostris*	
Eragrostis curvula	d	*Setaria sphacelata*	d
Fuirena pubescens		*Sporobolus africanus*	
Hemarthria altissima		*Typha capensis*	d

Forbs

Albuca setosa		*Limosella maior*	
Anthospermum hispidulum		*Lobelia erinus*	
Berkheya echinacea		*Monopsis decipiens*	
Berkheya radula		*Oenothera rosea*	
Cirsium vulgare	W	*Ranunculus multifidus*	
Conyza podocephala		*Richardia braziliensis*	W
Falckia oblonga		*Rumex acetosella*	
Gladiolus crassifolius		*Senecio erubescens*	
Haplocarpa lyrata		*Scabiosa columbaria*	M
Hypochaeris radicata		*Verbena bonariensis*	W
Hypoxis filiformis		*Wahlenbergia caledonica*	

Table 5.9: Number of plant species recorded in the Moist Grassland

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	0	0	0	0	0	0
Grasses	24	0	24	0	0	0
Forbs	20	3	23	0	0	1
Total	44	3	47	0	0	1

The plant species richness is High. No species of conservation concern or protected species were observed.

Table 5.10: Drainage Lines - Summary			
Status	Wetlands		
Soil	Black clay soil or alluvial soil	**Rockiness**	0%
Conservation value:	High	**Ecological sensitivity**	High
Species richness:	High	**Need for rehabilitation**	N/A
Dominant spp.	*Eragrostis plana, Typha capensis, Hyparrhenia hirta, Setaria sphacelata*		

Discussion

The Drainage Lines are all regarded as wetlands. All wetland systems in South Africa have legal protection (National Water Act (2004). The wetlands within the transect corridor have - **High** ecological sensitivity and therefore **High** conservation value. It is suggested that, if feasible, no pylons should be located within a drainage line, but the power lines should easily cross over most of the drainage lines on the route.

Figure 5.9: Drainage lines.

5.2.5. Pan

A single Pan is located just north of the Alternate Route. (Figure 5.3). This pan is added to the report as a cautionary measure, as all pans in the area are regarded to be highly sensitive, with specialised habitat for fauna and flora. The pan edge vegetation is very similar to the Drainage Lines and are not described further.

Figure 5.10: The Pan

5.3 ANALYSIS

5.3.1 Alien and Invasive plants species

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that these plants be controlled and eradicated by means of an eradication and monitoring program. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

Previously declared weeds and invasive plants were controlled by regulations of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA). Later Alien and Invasive Species Regulations, as well as a new draft list of categories of invasive species in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) was published in the Government Gazette No. 32090, in April 2009. Several amendments followed. Considering Sections 66(1), 67(1) 70(1)(a), 71(3) and 71A of the National Environmental

Management: Biodiversity Act (Act 10 of 2004) the latest Alien and Invasive plant **species list** was published in 2016 (Government Gazette 40166, Notice 864, 29 July 2016) This notice replaces and repeals any Alien and Invasive **species lists** published under the Act, including Notice 599 of 1 August 2014, (Government Gazette 37886) and Notice R507, 508 and 509 of 19 July 2013 (Government Gazette 36683).

Below is a brief explanation of the categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) and described in Regulation Gazette 10244, Vol 590, and No 37885 (1 August 2014):

Category 1a: Invasive species requiring **compulsory** control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. A person in control of a Category 1a Listed Invasive Species must **immediately** take steps to combat or **eradicate** listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of these listed invasive species. No permits will be issued.

Category 1b: Invasive species require **compulsory** control as part of an invasive species **control program** that will result in **removal and destruction** of all such listed species. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management program. No permits will be issued.

Category 2:
Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a **permit** to carry out a restricted activity within an area specified in the Notice or an area specified in the permit (e.g. a plantation, woodlot, orchard etc.), as the case may be.

Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.

A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.

If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3.

Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, according to Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

In summary: Category 2 Invasive species are regulated within a specific **area**. A **permit** for this specific area is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. A landowner on whose land a Category 2 Listed Invasive Species occurs, or a person in possession of a permit, **must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.**

Category 2 Listed Invasive Species that occur outside the specified area contemplated, must, for purposes of these regulations, be considered as Category 1b listed invasive species and must be managed accordingly.

No permits will be issued for Category 2 species to exist in riparian zones. These are considered as Category 1b listed invasive plants species and must be managed accordingly.

Category 3: Invasive species regulated by activity. Category 3 Listed Invasive Species are species that are subject to **exemptions** in terms of section 71(3) and **prohibitions** in terms of section 71A of Act. This means that a permit to have these species on the particular property is **not required**, though the landowner is still responsible to control this species and is prohibited of growing, breeding or in any other way propagating these listed invasive species, or allow it to multiply and spread. Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen of these listed invasive species are also prohibited.

Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered as a Category 1b Listed Invasive Species and must be managed accordingly.

In terms of the amendments to the regulations under the Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983) and Regulation 598, Government Gazette 37885, August 2014) (Alien and Invasive Species Regulations), landowners are legally responsible for the control of alien species on their properties.

It should further be noted that the National Environmental Management: Biodiversity Act (2004), Chapter 5, Part 2, Section 73(2), states that a person who is the owner of land on which a listed invasive species occurs must notify any relevant competent authority in writing of the listed invasive species that occur on that land.

Furthermore, that according to the National Environmental Management: Biodiversity Act (2004), Alien and Invasive species Regulations (2017), Chapter 7, Section 29 (1), (2) and (3), the seller of any immovable property must, prior to the conclusion of the relevant sale

agreement, notify the purchaser of that property in writing of the presence of listed invasive species on that property. Several listed alien and invasive plant species were observed on the study site.

No Alien and Invasive woody species were recorded on the transect area of the proposed power line, though the following species were observed in the vicinity
:

Species name	**Common name**	**Category**
Acacia mearnsii	Black wattle	2
Eucalyptus camaldulensis	River gum	2, 1b in Grassland biome

5.3.2 Medicinal Plants

Only medicinal plants listed by Van Wyk, Van Oudtshoorn & Gericke (2005), and rare medicinal plants as indicated by Williams, Victor & Crouch (2013) were indicated with the letter "M" in the list of species for each plant community.

4.3.3 Ecological Sensitivity

It has been clearly demonstrated that vegetation not only forms the basis of the trophic pyramid in an ecosystem, but also plays a crucial role in providing the physical habitat within which organisms complete their life cycles (Kent & Coker 1992). Therefore, the vegetation of an area will largely determine the ecological sensitivity thereof.

The vegetation sensitivity assessment aims to identify whether the vegetation within the study area is of conservation concern and thus sensitive to development:

In order to determine the sensitivity of the vegetation (ecosystem) on the site, weighting scores are calculated per plant community. The following six criteria are used, and each allocated a value of 0-3.

- Conservation status of a regional vegetation unit;
- Listed ecosystem (e.g. wetlands, hills and ridges etc)
- Legislative protection (e.g. threatened ecosystems, SANBI & DEAT 2009, Government Gazette NEMA 2011)
- Plant species of conservation concern (e.g. red listed, nationally or provincially protected plant species, habitat or potential habitat to plants species of conservation concern, protected plants or protected trees);
- Situated within ecologically functionally important features (e.g. wetlands or riparian areas; important habitat for rare fauna species);
- Conservation importance (e.g. untransformed and un-fragmented natural vegetation, high plant species richness, important habitat for rare fauna species, Critical Biodiversity Areas).

Sensitivity is calculated as the sum the values of the criteria. The vegetation with the lowest score represents the vegetation that has the least / limited sensitivity). A maximum score of

18 can be obtained, a score of 15-18 indicated high sensitivity. The sensitivity scores are as follows (Table 5.11):

Table 5.11: Sensitivity Weighting scores for vegetation.

Scoring	15-18	12-14	9-11	6-8	0-5
Sensitivity	High	Medium-High	Medium	Medium-Low	Low

Development on vegetation that has High sensitivity will normally not be supported, except that specific circumstances may still lead to support of the proposed development. Portions of vegetation with Medium-High or Medium sensitivity should be conserved**.** Development may be supported on vegetation considered to have Medium-Low or Low sensitivity.

The result of the sensitivity assessment (Table 5.12 below) indicates that the Moist Grassland, Drainage Lines and the Pan (all regarded as wetlands) have **High ecological sensitivity**. The Dry Grassland and agricultural Fields have **Low** ecological sensitivity and **Low** conservation value, due to their transformed status.

Table 5.12: Scoring of vegetation that occurs within the study area (see Table 5.12).

Vegetation	**Conservation Status of regional Vegetation unit**	**Listed Ecosystem**	**Legislated Protection**	**Species of conservation concern**	**Ecological Function**	**Conservation Importance**	**Total Score out of max of 18**
5.2.1. Agricultural Fields	**3**	**0**	**0**	**0**	**1**	**0**	**4 Low**
5.2.2. Dry Grassland	**3**	**1**	**0**	**0**	**1**	**0**	**5 Low**
5.2.3. Moist Grassland	**3**	**3**	**3**	**1**	**3**	**3**	**16 High**
5.2.4. Drainage Lines	**3**	**3**	**3**	**1**	**3**	**3**	**16 High**
5.2.5 Pan	**3**	**3**	**3**	**1**	**3**	**3**	**16 High**

5.3.4 Conservation Value

The following **conservation value** categories were used for assessing the study site:

High: Ecologically sensitive and valuable land with high species richness and/or sensitive ecosystems or red data species that should be conserved and no developed allowed.

Medium-high: Land where sections are disturbed but which is in general ecologically sensitive to development/disturbances.

Medium: Land on which low impact development with limited impact on the vegetation / ecosystem could be considered for development. It is recommended that certain portions of the natural vegetation be maintained as open space.

Medium-low: Land of which small sections could be considered to conserve but where the area in general has little conservation value.

Low: Land that has little conservation value and that could be considered for developed with little to no impact on the vegetation.

The conservation value of the Moist Grassland, Drainage Lines and the Pan (all regarded as wetlands) is **High**. The Dry Grassland and agricultural Fields have **Low** conservation value, due to their transformed status.

5.3.5 Assessment of Screening Tool Results

The results of the DEA Screening Tool are indicated in Figures 5.11-5.13 (below).

5.3.5.1 Plant Species Sensitivity

The Result of the DEA Screening Tool analysis for Plant Species Sensitivity for the Highveld Park development site is given in Figure 5.12 (below). The plant species sensitivity is shown as **Low** for the agriculture areas and **Medium** for more natural areas. The wetlands have **Medium** Plant Species Sensitivity.

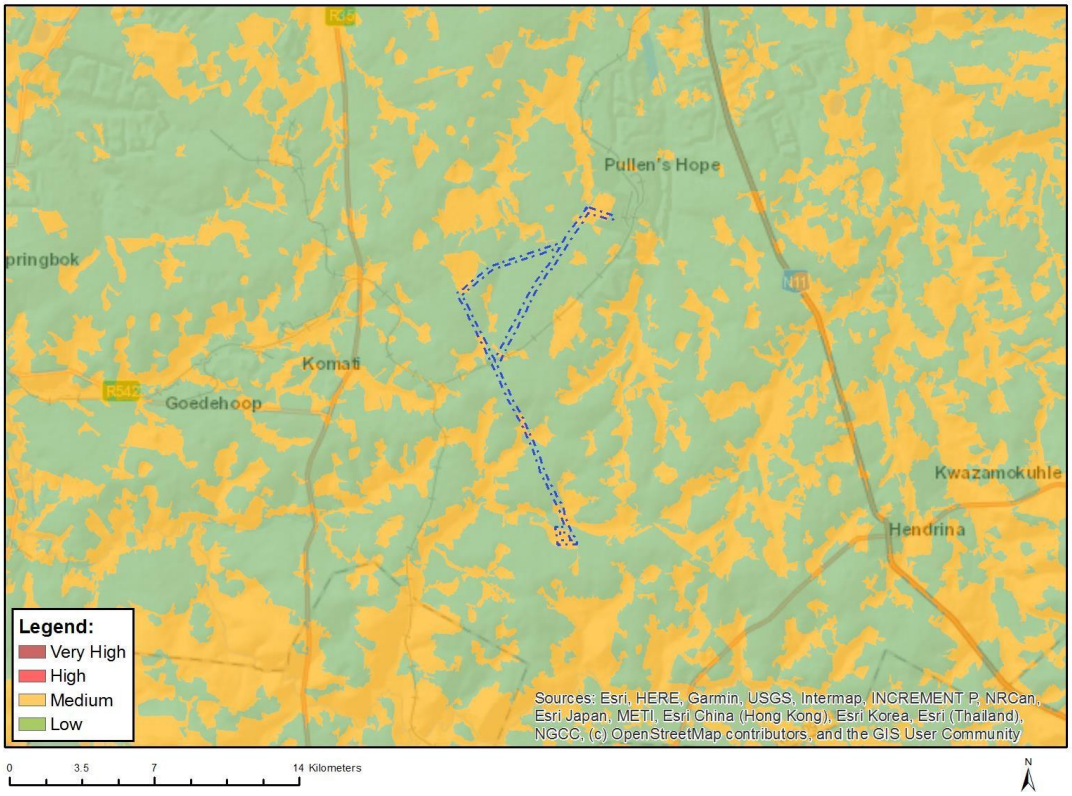

Figure 5.11: The Result of the DEA Screening Tool analysis for Plant Species Sensitivity for the study area.

The vegetation survey results indicate Low plant species richness in the various plant communities on the site. No protected and no red data plant species were found on the site, In general, the DEA Screening Tool result of **Low** Plant Species Sensitivity for the terrestrial habitat is **confirmed**, The very limited wetland plant communities have **Medium** plant species sensitivity. This is also **confirmed**.

5.3.5.2 Animal Species Sensitivity

The Result of the DEA Screening Tool analysis for Animal Species Sensitivity for the powerline transect area is given in Figure 5.12 (below). This Sensitivity is regarded as **Medium**. This is however **disputed** because the habitats are mostly transformed.

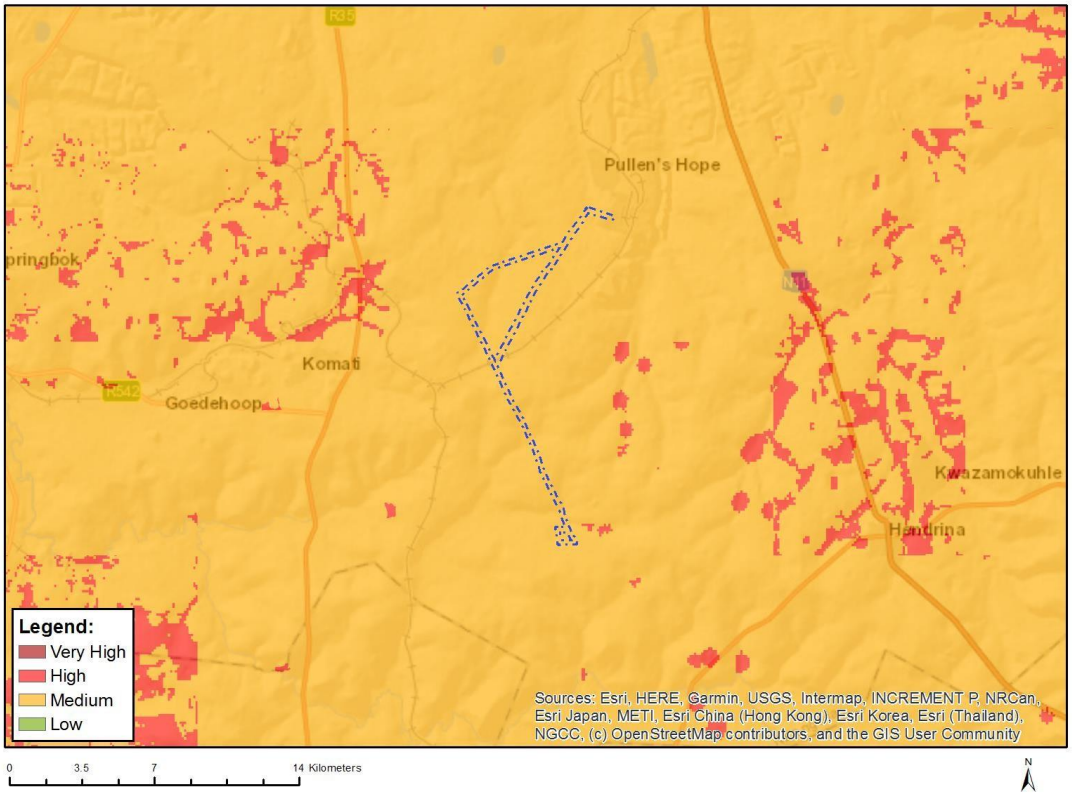

Figure 5:12 The Result of the DEA Screening Tool analysis for Animal Species Sensitivity for the study area

5.3.5.3 Terrestrial Biodiversity Sensitivity

The Result of the DEA Screening Tool analysis for Terrestrial Biodiversity Sensitivity for the study is given in Figure 5.13 (below). This Sensitivity is regarded as **Very High**.

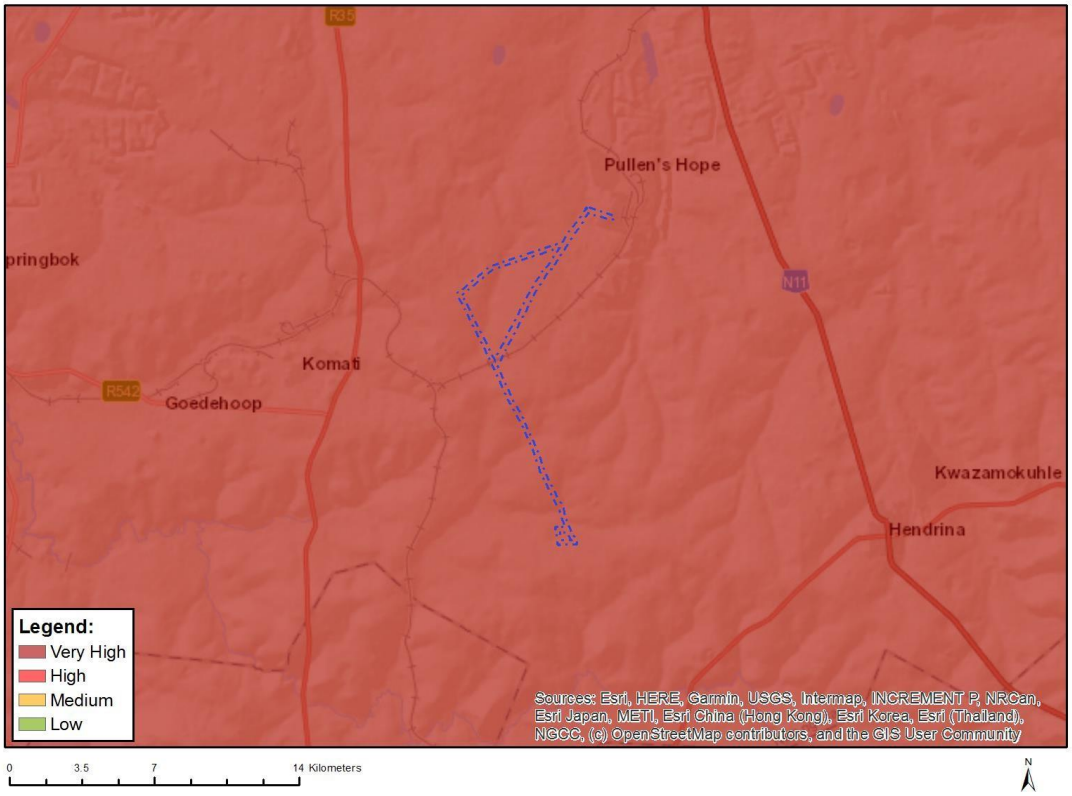

Figure 5.13: The Result of the DEA Screening Tool analysis for Terrestrial Biodiversity Sensitivity for the study area.

The Terrestrial Biodiversity Sensitivity is regarded to be **Very High.** This is because, according to SANBI & DEAT (2009) and NEMBA, Government Notice 1002 (2011) the Ecosystem status for this vegetation type (Eastern Highveld Grassland) is **Vulnerable**, as so much of this vegetation type is already transformed.

In terms of the MBSP Terrestrial Assessment (Figure 5.2 above) almost the entire area is Heavily Modified and some areas Moderately Modified. Very limited areas area classified as Other Natural Areas. Critical Biodiversity Area is almost non-existing. However, the field survey indicated that most of the site is **totally transformed** by cultivation. Only the small wetland area in the north, at the Hendrina (Pullen's Hope) power station is mapped as an **Optimal** Critical Biodiversity Area, but the field survey showed that this wetland area is also highly disturbed and degraded.

The result of the screening tool on terrestrial biodiversity sensitivity for the proposed powerline transect is therefore disputed.

5.3.5.4 Aquatic Biodiversity Sensitivity

The Result of the DEA Screening Tool analysis for Aquatic Biodiversity Sensitivity for the study is given in Figure 5.14 (below). This Sensitivity is regarded as **Low** for most of the proposed powerline transect. Only the few drainage line crossings have Very High Sensitivity. Therefore

this **Low** Aquatic Sensitivity for the majority of the site is confirmed, and the very **High Sensitivity** for the drainage Lines is also confirmed.

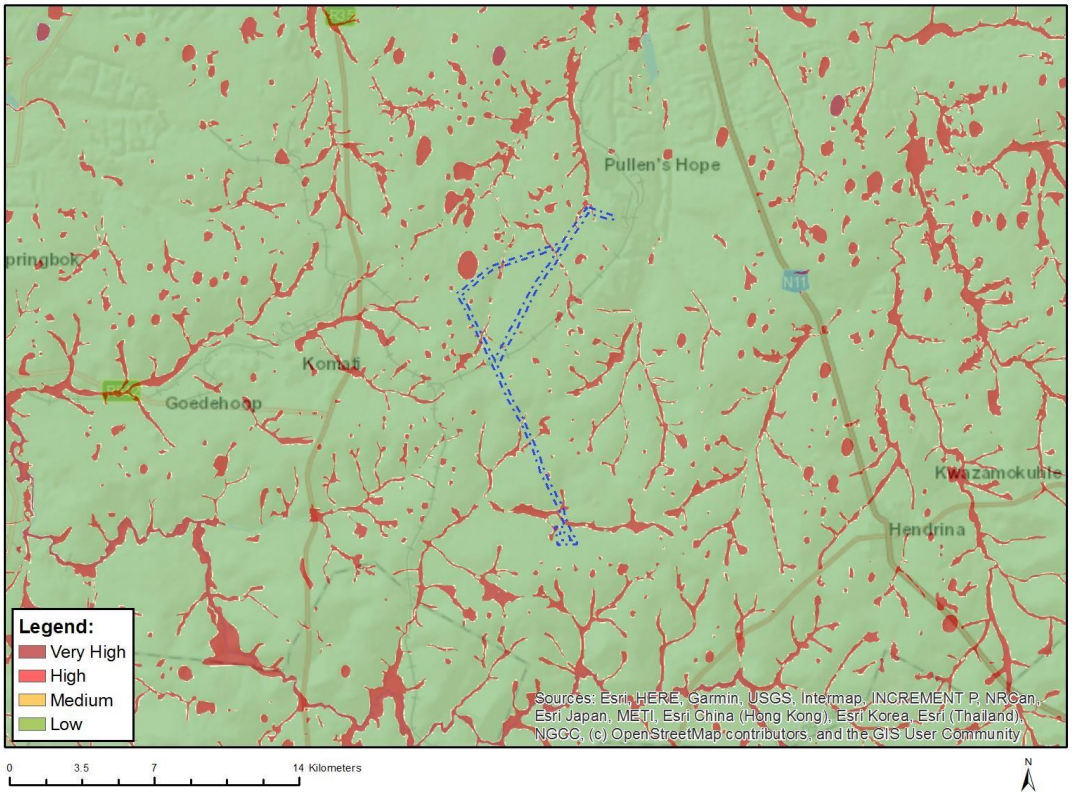

Figure 5.14: The Result of the DEA Screening Tool analysis for Aquatic Biodiversity Sensitivity for the study area.

5.4 Discussion and Conclusion

The results of the vegetation and flora study indicate that most of the terrestrial habitat areas along the powerline transect corridor have been transformed for cultivation with very little original natural vegetation remaining. From a vegetation and flora perspective these areas have low species richness, no threatened or protected plant species and low conservation value. Very limited areas still contain natural primary vegetation. Two small areas, one on the north at the Hendrina power station, and one in the south at the Only the drainage line areas and their floodplains (Moist Grassland) have high ecological sensitivity and high conservation value.

No Irreplaceable CBA's occur along the transect area. A **small CBA Optimal site** occurs in the wetland in the north, close to the Hendrina power station. Most of the transect is **Heavily Modified** or small local areas **Moderately Modified**. Most wetlands are classified as **Other Natural Areas**.

The vegetation study of the proposed powerline transects resulted in the identification of five different plant communities (= ecosystems on the plant community level of organisation) that could be mapped. The terrestrial plant communities identified have low plant species

richness, no threatened, red data or protected plant species were recorded on the two transect corridor sites.

The result of the sensitivity assessment indicates that the Wetlands have **High ecological sensitivity**. The Agricultural Fields, and Dry Grasslands have **Low** ecological sensitivity and **Low** conservation value, due to their transformed status.

The construction of the proposed powerline can be supported. Care should be taken with positioning of pylons in the larger Moist Grassland areas and the crossing of Drainage Lines.

6. RESULTS: FAUNA

6.1 MAMMALS

6.1.1 Mammal Habitat Assessment

Acocks (1988), Mucina and Rutherford (2006), Low and Rebelo (1996), Knobel and Bredenkamp (2006), SANBI & DEAT (2009) discuss the vegetation types of the study area in broad terms. Rautenbach (1978 & 1982) found that mammal assemblages can at best be correlated with botanically defined biomes, such as those by Low and Rebelo (1996), and latterly by Mucina and Rutherford (2006, 2012) as well Knobel and Bredenkamp (2006). The definitions of biomes are basically similar, and both remain valid for mammals and are therefore recognised as a reasonable determinant of mammal distribution.

The local occurrences of mammals are, on the other hand, closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of mammal species by evaluating the habitat types within the context of biome distribution ranges.

Two of the four major habitat types are represented on the study site, namely terrestrial (widely distributed grassland) and limited areas of wetland (spruits, dams and pans) habitat.

Large tracks of natural grasslands were first transformed for agricultural purposes and later affected by other anthropogenic activities such as towns, roads, mining, fences, invasive plants, grass cutting, rubble dumping, etc. Most of the study transect site has been transformed for cultivation and other agricultural purposes. The terrestrial (grassland) habitats are now limited to patches and strips between and surrounding agricultural fields.

At the time of the site visit, the vegetation cover was varied from locally good to poor in some places but would provide adequate nourishment and cover for small terrestrial mammals.

There are several seasonal and some more permanent drainage lines crossing the proposed powerline corridor, with several small dams constructed in some of the drainage lines.

There are no caves suitable for cave-dwelling bats on the study site, although some of the nearby buildings may act as substitute daytime roosts. It is likely that common bats commute from roosting sites elsewhere to hawk for insects over the wetlands near the study site .corridor.

6.1.2 Observed and Expected Mammal Species Richness

Mammals are not so obvious in the open Highveld grassland. Large and medium-sized mammals (such as buffalo, blue wildebeest, red hartebeest, eland, plains zebra, white rhino, lion, cheetah and spotted hyena) have long ago been eradicated from the Highveld areas and are now only seen in certain nature conservation areas and game farms. However, a number of species are expected in most highveld grassland localities. (Borent CC, 2012). These

include several species of rodents, mongooses, porcupine and aardvark. A list of all mammals that may occur on site was compiled from the existing mammal literature (Skinner & Chimimba 2006, Friedman 2005), based on the known habitat preference and distribution of these species.

It is estimated that 46 mammal species may from time to time occur on or near the study site area (Table 6.1), and 17 were confirmed on or close to the site. Six of the species listed in Table 6.1 are listed as Red Data species.

Most of the species of the resident diversity (Table 6.1) are common and widespread (viz. scrub hares, multimammate mice, pygmy mice, genets, mongooses and others). Many of the species listed in Table 6.1 are robust (some with strong pioneering capabilities allowing them to invade and occupy new habitats). The reason for their survival success is predominantly seated in their remarkable reproduction potential (viz. multimammate mice species capable of producing ca. 12 pups per litter at intervals of three weeks), and to a lesser extent their reticent and cryptic nature (scrub hares, genets and mongooses).

The Rough-haired golden mole has Critically Endangered status under NEM:BA and should this species occur in the area or vicinity of the site, it may be expected in the moist grasslands along drainage lines at low densities.

In pristine conditions the African Marsh Rat and Swamp Musk Shrew could occur in the Moist Grassland close to water on the site. However, these species are not easily seen.

Eleven of the listed species are bats. Due to their ability to fly and to cover large distances, the distribution information on some bat species is insufficient. This has resulted in Red Data species such as the Blasius's (Peak-saddle) horseshoe bat being included as a precautionary measure. The Egyptian and flat-headed free-tailed bats as well as the vespertilionid bats show remarkable adaptability by expanding their distributional ranges and population numbers significantly by capitalising on the roosting opportunities offered by manmade structures in the vicinity. Vesper bats are more tolerant towards roost opportunities, and it is more than likely that small colonies have found roosting opportunities in the roofs of buildings in the vicinity of the study site. Free-tailed bats are likewise partial to narrow-entranced roosts provided by buildings and in some instances roost occupation could reach epidemic proportions. The study site offers no caves or suitable structures answering to the exacting roosting requirements of cave-dwelling bats (Hipposideridae, Rhinolophidae, Nycteridae), but it is likely that they have roosts elsewhere and during summer sunsets commute to the area of the site to hawk for invertebrates rising over the waterbodies and wetlands. It can be expected that the pools of water are sources of insects that rise in swarms at summer sunsets and act as feeding patches for hawking vesper bats.

Although Serval was not observed on the site during this survey, this species was photographed at a close by site. This mammal has been encountered during a few other surveys on the eastern Highveld (Borent CC 2012).

The genet species, the mongooses and Black-backed Jackal all have wide habitat tolerances, and, coupled with their catholic diets and reticent habits, render them persistent carnivores, even in or close to human settlements.

African Clawless Otter was found on a farm in the study area (MTPA). Although the Spotted-Necked Otter is mentioned as medium sensitive within the study area, this species needs and larger, pristine water bodies and streams and because of their narrow dependence on large permanent wetland habitat, it is probably not present in the area of the site transect.

The Southern African hedgehog occurs in a wide variety of habitat types but must have vegetation cover. The study site has suitable habitat therefore this species may be present in the corridor transect, but the large area used for agriculture limits the distribution and occurrence of this species.

The study site falls outside the natural distribution range or has no suitable habitat due to anthropogenic influences or natural habitat for the following species: The Highveld golden mole, Juliana's golden mole, Sclater's golden mole, robust golden mole, white-tailed mouse, Maquassie musk shrew, Short-eared trident bat, Cohen's horseshoe bat, Peak-saddle horseshoe bat, red duiker, suni, Tsessebe, roan, sable, African wild dog, African striped weasel, brown hyena, mountain reedbuck, grey rhebok, and spotted hyena. These species should not occur on the study site.

Mammal species listed by Mpumalanga Province (MTPA) for the farms of the study transect:

Swamp musk shrew (*Crocidura mariquensis*) – probably present in the area of the site;
Southern African hedgehog *(Atelerix frontalis)* – probably present in the area of the site;
African clawless otter (*Aonyx capensis*) - probably present in the area of the site;
Serval (*Leptailurus serval*) - probably present in the area of the site;
Oribi (*Ourebia ourebi*)- probably present in the area of the site;

From the **Screening Tool** results the following mammal species were noted as having medium sensitivity:

Oribi (*Ourebia ourebi*) - probably present in the area of the site;
Maquassie musk shrew (*Crocidura maquassiensis*); doubtful;
Spotted-necked otter (*Hydrictis maculicollis*) doubtful.

Table 6.1 (below) provides information on mammal species that may from time-to-time occur in the area.

Table 6.1: **Mammal diversity of the study site.**

The species observed or deduced to occupy the site. (Systematics and taxonomy as proposed by Skinner & Chimimba [2005], Apps [2012], Stuart & Stuart [2015] & Child *et.a*l.[2016]).

Red Data species rankings as defined in Friedmann and Daly's S.A. Red Data Book / IUCN (World Conservation Union) (2004): CR= Critically Endangered, En = Endangered, Vu = Vulnerable, LR/cd = Lower risk conservation dependent, LR/nt = Lower Risk near threatened, DD = Data Deficient. All other species are deemed of Least Concern.

Probability:

High Definitely there or have a *high* probability to occur;

Medium probability to occur based on ecological and distributional parameters;

Low probability to occur based on ecological and distributional parameters.

SCIENTIFIC NAME	ENGLISH NAME	RD Status	Probability	Remarks
Order: AFROSORICIDA				
Family: Chrysochloridae	**Golden Moles**			
Chrysopalax villosus	Rough-Haired Golden Mole	**CE**	Low	Only possible habitat Moist Grassland close to water
Order: TUBULIDENTATA				
Family: Orycteropodidae				
Orycteropus afer	Aardvark		Low	Most habitat destroyed for cultivation
Order: LAGOMORPHA				
Family: Leporidae	**Hares, Rabbits and Rock Rabbits**			
Lepus saxatilis	Scrub Hare		**High**	Seen on the site
Order: RODENTIA				
Family: Bathyergidae	**Mole-Rats**			
Cryptomys hottentotus	African Mole-Rat		**High**	Mound seen on the site
Family: Hystricidae	**Porcupines**			
Hystrix africaeaustralis	Cape Porcupine		Low	

Family: Muridae	Rats and Mice			
Rhabdomys pumilio	Four-Striped Grass Mouse	**DD**	**High**	Trapped at close by area
Dasymys robertsii (=D incomptus)	African March Rat	**DD**	Low	
Mus indutus	Desert Pygmy Mouse		Low	
Mastomys natalensis	Natal Multimammate Mouse		Medium	
Mastomys coucha	Southern Multimammate Mouse		**High**	Trapped at close by area
Aethomys namaquensis	Namaqua Rock Mouse		Low	
Otomys angoniensis	Angoni vlei rat		**High**	In Moist Grassland adjacent to drainage line
Otomys irroratus	Vlei rat		Medium	
Gerbilliscus (Tatera) leucogaster	Bushveld Gerbil		Low	
Gerbilliscus (Tatera) brantsii	Highveld Gerbil		**High**	Diggings seen
Order: EULIPOTYPHA				
Family: Soricidae	**Shrews**			
Myosorex varius	Forest Shrew		Low	
Crocidura mariquensis	Swamp Musk Shrew		Medium	Reported from a farm in the study area (MTPA)
Crocidura cyanea	Reddish-grey Musk Shrew		Medium	
Crocidura silacea	Lesser Grey-Brown Musk Shrew		Low	
Crocidura hirta	Lesser Red musk Shrew		Low	
Family Erinaceidae				
Atelerix frontalis	South African Hedgehog	NT	Medium	Probably present
Order: CHIROPTERA				See note on bats in text
Family: Pteropodidae	**Fruit Bats**			
Eidolon helvum	Straw-Coloured Fruit Bat		Low	
Family: Embalonuridae	**Sheath-Tailed Bats**			
Taphozous mauritianus	Mauritian Tomb Bat		Low	

Family: Molossidae	**Free-Tailed Bats**			
Tadarida aegyptiaca	Egyptian Free-Tailed Bat		**High**	
Family: Vespertilionidae	**Vesper Bats**			
Miniopterus natalensis	Natal Long-Fingered Bat		**High**	
Neoromicia capensis	Cape Serotine Bat		**High**	
Myotis tricolor	Temminck's Hairy Bat		**High**	
Family: Nycteridae	**Slit-Faced Bats**			
Nycteris thebaica	Egyptian Slit-Faced Bat		**High**	
Family: Rhinolophidae	**Horseshoe Bats**		Low	
Rhinolophus clivosus	Geoffroy's Horseshoe Bat		**High**	
Rhinolophus darlingi	Darling's horseshoe Bat		Low	
Rhinolophus blasii	Blasius's Horseshoe Bat	**NT**	Low	
Rhinolophus simulator	Bushveld Horseshoe Bat		Low	
Order: CARNIVORA				
Felidae	**Cats**			
Felis silvestris	African Wild Cat		Medium	
Leptailurus serval	Serval		**High**	Photographed at close by area (Ferguson, Borent CC 2012)
Family: Viverridae	**Civets and Genets**			
Genetta genetta	Small-Spotted Genet		**High**	Dropping seen
Genetta tigrina	South African Large-Spotted Genet		Low	
Family: Herpestidae	**Suricates and Mongooses**			
Cynictis penicillata	Yellow Mongoose		**High**	Seen on site
Galerella sanguinea	Slender Mongoose		Medium	Photographed in close by area (Ferguson, Borent CC 2012)
Atilax paludinosus	Marsh Mongoose		Medium	Seen close to water
Family Canidae	**Jackals**			

Canis mesomelas	Black-backed Jackal		**High**	Noted at close by area (Ferguson, Borent CC 2012)
Family: Mustelidae	**Otters**			
Aonix capensis	African Clawless Otter		Medium	Reported from farm in the study area (MTPA)
Lutra maculicollis	Spotted-necked Otter	**VU**	Low	Mentioned by SEA Screening Tool
ORDER RUMINANTIA				
Family Bovidae	**Buffalo, Wildebeest and Antelopes**			
Sylvicapra grimmea	Common Duiker		**High**	Observed in the area
Ourebia oribi	Oribi		Low	Reported from farm in the study area (MTPA)
Raphicerus campestris	Steenbok		**High**	Noted at close by area (Ferguson, Borent CC 2012)

6.1.3.Conclusion

Although many mammal species may from time to time occur in the area of the site transect, only few may probably be encountered at any one time. This is due to low densities of small species, not easily seen. Many smaller mammals are either secretive, nocturnal, hibernators and/or seasonal, and some are seasonal migrators. However, by applying the standard methods of deducing probable presence by using the recognised literature on distribution and habitat preferences, and knowledge of habitats present on the site, a list of mammals could successfully be compiled with a acceptable level of confidence.

None of the mammal species predicted to visit the area of the site, will be threatened by the construction of the pylons and powerline, or the during the operational phase. These mammal species are all quite motile and if present in the way of the powerline during construction, will easily move away from the danger. Although linear and stretching over about 20 km, the area affected is way too small to affect any of the mammal species.

From a mammal perspective, the powerline can be supported.

6.2 HERPETOFAUNA

6.2.1 Herpetofauna Habitat Assessment

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the context of global distribution ranges. From a herpetological habitat perspective, it was established that two of the four major habitat types are represented on the study site, namely terrestrial and small areas of wetland habitat.

The natural grasslands were first transformed for agricultural purposes and later by other anthropogenic influences such as agriculture mining, diggings, wire fences, invasive plants, grass cutting, rubble dumping. The study transect is mostly ecologically disturbed by cultivation. in many parts. No moribund termitaria were recorded within the study transect. These structures are generally good indicators of the occurrence of small herpetofauna. Accordingly, it is estimated that the herpetofauna population density for the study site is low. At the time of the site visit, the vegetation cover was good where not ploughed and would provide adequate cover for small terrestrial herpetofauna.

There are several drainage lines in the area and the powerline will have to cross these drainage lines. Several small dams occur locally in the drainage lines. Moist grassland occur in the floodplain areas of the drainage lines.

6.2.2 Expected and Observed Herpetofauna Species Richness

Of the 39 reptile species that may occur on the study site (Table 6.2), three were confirmed during the site visit, and of the 13 amphibian species that may possibly occur on the study site (Table 6.3), two were confirmed during the site visits.

Table 6.2 lists the reptiles which were observed on or deduced to occupy the site.

The species assemblage is typical of what can be expected of the habitats on the site or the vicinity of the site. Most of the species of the resident diversity (Tables 6.2 and 6.3) are fairly common and widespread e.g. the common house snake, Cape skink, speckled rock skink, variable skink, yellow-throated plated lizard, common river frog, striped stream frog, guttural toad and red toad.

The species richness is poor to fair due to the fact that only two habitat types occur on or near the study site.

Table 6.2: The Reptile species observed on or deduced to occupy the site. Systematic arrangement and nomenclature according to Branch (1998), Bates, *et.al* 2014 and Alexander & Marais (2007).

Probability:
High Definitely there or have a *high* probability to occur;
Medium probability to occur based on ecological and distributional parameters;
Low probability to occur based on ecological and distributional parameters.

Probability to occur	SCIENTIFIC NAME	ENGLISH NAME
	CLASS: REPTILIA	**REPTILES**
	Order: TESTUDINES	**TORTOISES & TERRAPINS**
	Family: Pelomedusidae	**Side-necked Terrapins**
?	*Pelomedusa subrufa*	Marsh Terrapin
	Family: Testudinidae	**Tortoises**
Low	*Stigmochelys pardalis*	Leopard Tortoise
	Order: SQUAMATA	**SCALE-BEARING REPTILES**
	Suborder:LACERTILIA	**LIZARDS**
	Family: Gekkonidae	**Geckos**
High	*Pachydactylus affinis*	Transvaal Gecko
Medium	*Pachydactylus capensis*	Cape Gecko
	Family: Lacertidae	**Old World Lizards or Lacertids**
Seen	***Ichnotropis capensis***	**Ornate Rough-Scaled Lizard**
High	*Nucras ornata*	Ornate Sandveld Lizard
	Family: Gerrhosauridae	**Plated Lizards**
High	*Gerhosaurus flavigularis*	Yellow-throated Plated Lizard
	Family: Scincidae	**Skinks**

Probability to occur	SCIENTIFIC NAME	ENGLISH NAME
Low	*Acontias gracilicauda*	Thin-tailed Legless Skink
Low	*Acontias occidentalis*	Savanna Legless Skink
High	*Afroablepharus wahlbergii*	Wahlberg's Snake-Eyed Skink
Low	*Mochlus sundevallii sundevallii*	Sundevall's Writhing Skink
Seen	***Trachylepis capensis***	**Cape Skink**
High	*Trachylepis punctatissima*	Speckled Rock Skink
Medium	*Trachylepis varia*	Variable Skink
	Family: Agamidae	**Agamas**
High	*Agama aculeate distanti*	Ground Agama
	Suborder: SERPENTES	**SNAKES**
	Family: Typhlopidae	**Blind Snakes**
Medium	*Afrotyphlops bibronii*	Bibron's Blind Snake
Low	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake
	Family: Leptotyphlopidae	**Thread Snakes**
Low	*Leptotyphlops distanti*	Distant's Thread Snake
High	*Leptotyphlops scutifrons*	Peter's Thread Snake
	Family: Viperidae	**Adders**
Medium	*Causus rhombeatus*	Rhombic Night Adder
	Family: Lamprophiidae	
Medium	*Aparallactus capensis*	Black-headed Centipede Eater
Low	*Atractapis bibronii*	Bibron's Stiletto Snake
High	*Boaedon capensis*	Common House Snake
Low	*Lamprophis aurora*	Aurora House Snake
*	*Lycodonomorphus rufulus*	Brown Water Snake
High	*Lycophidion capense*	Cape Wolf Snake
High	*Psammophis brevirostris*	Short-snouted Grass Snake
Low	*Psammophis subtaeniatus*	Western Yellow-bellied Sand Snake
Low	*Psammophis trinasalis*	Kalahari Sand Snake
Medium	*Psammophylax rhombeatus*	Spotted Grass Snake
High	*Psammophylax tritaeniatus*	Striped Grass Snake
Medium	*Duberria lutrix*	Common Slug Eater
Low	*Prosymna bivittata*	Two-Striped Shovel-Snout
High	*Pseudaspis cana*	Mole Snake
	Family: Elapidae	**Cobras, Mambas and Others**
Low	*Elapsoidea sunderwallii*	Sundevall's Garter Snake
Seen	***Hemachatus haemachatus***	**Rinkhals**
	Family: Colubridae	
High	*Crotaphopeltis hotamboeia*	Red-Lipped Snake
High	*Dasypeltis scabra*	Rhombic Egg Eater
High	*Dispholidus typus*	Boomslang

The American red-eared terrapin (*Trachemys scripta elegans*) and the Brahminy blind snake (*Ramphotyphlops braminus*) are the only two feral reptile species known to occur in South Africa (De Moor and Bruton, 1988; Picker and Griffiths, 2011), but with only a few populations, they are not expected to occur on this particular site.

Table 6.3: The Amphibia species observed on or deduced to occupy the site. Systematic arrangement and nomenclature according to Minter, *et.al* (2004) and Du Preez & Carruthers (2017).
Probability:
High Definitely there or have a *high* probability to occur;
Medium probability to occur based on ecological and distributional parameters;
Low probability to occur based on ecological and distributional parameters.

PROBALILITY	CLASS: AMPHIBIA	AMPHIBIANS
	Order: ANURA	**FROGS**
	Family: Pipidae	**Clawed Frogs**
High	*Xenopus laevis*	Common Platanna
	Family: Bufonidae	**Toads**
High	*Sclerophrys gutturalis*	Guttural Toad
Medium	*Sclerophrys capensis*	Raucous Toad
High	*Schismaderma carens*	Red Toad
	Family: Hyperoliidae	**Reed Frogs**
High	*Kassina senegalesis*	Bubbling Kassina
Low	*Semnodactylus wealii*	Rattling Frog
	Family: Phrynobatrachidae	**Puddle Frog**
Low	*Phrynobatrachus natalensis*	Snoring Puddle Frog
	Family: Pyxicephalidae	
Heard	***Amietia delalandii***	**Common River Frog**
High	*Cocosternum boettgeri*	Boettger's Caco
Medium	*Pyxicephalus adspersus*	Giant Bullfrog
Heard	***Strongylopus fasciatus***	**Striped Stream frog**
Medium	*Tomopterna cryptotis*	Tremolo Sand Frog
High	*Tomopterna natalensis*	Natal Sand Frog

6.2.4 Threatened and Red listed Reptile and Amphibian Species

Red Data species rankings as defined in Minter, *et.al*, Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (2004), Bates, *et.al*, Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (2014) & Du Preez & Carruthers *Frogs of Southern Africa A Complete Guide* (2017) are indicated in the first column: CR= Critically Endangered, En = Endangered, Vu = Vulnerable, NT = Near Threatened, DD = Data Deficient. All other species are deemed of Least Concern.

The study site falls outside the natural range of Nile crocodile, Southern African python, Breyer‘s long-tailed seps, spotted shovel-nosed frog, large-scaled grass lizard, giant dragon lizard and Fitzsimons’ flat lizard. These species should not occur on the site.

The striped harlequin snake has not been recorded on this quarter degree square (TVL Museum Records or Ditsong Museum of Natural History), and no moribund termitaria, where this species is most likely to be found, are present on the study site. It is very difficult to confirm whether this cryptic snake is present on any study site, but this species should not occur on the study site.

The coppery grass lizard has been recorded on this quarter degree square (TVL Museum Records or Ditsong Museum of Natural History) but grassland is too limited in the study site and this species should not occur on the site.

Giant bullfrogs need temporary dams in order to avoid predation from fish. There may be temporary water bodies with gradual sides on or near the study site, where bullfrogs may breed. This species may occur on or near the study site. The Red Data status of the Giant Bullfrog was recently changed to Least Concern, but there is still some disagreement on this.

6.2.5 Discussion

No threatened herpetofauna species were recorded from the area of the site. Should wetland areas be protected, most herpetofauna species will not be threatened. by the construction of the pylons and powerline, or the phase of operation

7. IMPACT ASSESSMENT

7.1 Methods

The following methodology was provided by SiVEST.

1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).

1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one

(1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used.

Table 1: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.

3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE (S)

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

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

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

Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

7.2 Results

The following Impact Tables (Table 7.2.1, the preferred Alternative 1 and Table 7.2.2, the not-preferred Alternative 2) contain the results of the impact assessment. These Tables were compiled by using the Excel spreadsheet, prescribed and provided by SiVEST.

A summary of the results is provided in Table 7.2.3 (below).

Table 7.2.1: Results of the impact assessment on biodiversity along the preferred Alternative 1 Hendrina powerline corridor																				
ENVIRONMENTAL PARAMETER	**ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE**	**ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION**									**RECOMMENDED MITIGATION MEASURES**	**ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION**								
		E	**P**	**R**	**L**	**D**	**I / M**	**TOTAL**	**STATUS (+ OR -)**	**S**		**E**	**P**	**R**	**L**	**D**	**I / M**	**TOTAL**	**STATUS (+ OR -)**	**S**
Construction Phase																				
Vegetation and plant species in the Agricultural fields: Low species richness, **Low ecological sensitivity**	Agricultural Fields. Vegetation clearing for access roads, pylons, powerline and their service areas may impact on vegetation and plant species	2	1	1	1	1	1	6	-6	Low	Agriculture will continue - no natural indigenous vegetation· ·	2	1	1	1	1	1	6	-6	Low

Vegetation and plant species in the **Dry Grassland**: Low species richness, ecological sensitivity	Northern dry grassland at Hendrina power station - entrance of powerline into power station and Southern Dry Grassland at WEF. Vegetation clearing for access roads, pylons, powerline and their service areas may impact on vegetation and plant species	1	4	1	2	1	2	18	-18	Low	Rehabilitate cleared area at pylons. allow natural succession where possible, sow indigenous grass if needed	1	4	1	2	1	1	9	-9	Low

Vegetation and plant species in the Moist Grassland and drainage Lines: **High species richness, High ecological sensitivity**	Vegetation clearing for access roads, pylons, powerline and their service areas may impact on vegetation and plant species	2	4	2	2	1	2	22	-22	Low	If possible, avoid putting pylons in Moist Grassland, if not possible rehabilitate at pylons, avoid access road under powerline, use existing roads. The clearing of vegetation must be kept to a minimum and remain within the footprint development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left. · The clearing of vegetation must be kept to a minimum and remain within the	2	2	1	2	1	1	8	-8	Low

											footprint development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left · Remove alien invasive species wherever possible · Construction must be completed as quickly as possible · Disturbed open areas must be rehabilitated immediately after construction has been completed · During the construction phase workers must be limited to areas under									

											construction and access to adjacent private areas must be strictly controlled · Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas. · Plant only indigenous grass – no alien species									
Vegetation and plant species at the Pan: High species	Vegetation clearing for access roads, pylons,	1	1	2	3	1	3	24	-24	Medium	Do not use alternative close to Pan If possible, avoid putting	1	1	1	1	1	1	5	-5	Low

richness, **High ecological sensitivity**	powerline and their service areas may impact on vegetation and plant species										pylons in the Pan's Moist Grassland, if not possible rehabilitate at pylons, avoid access road under powerline, use existing roads									
Increase **of alien and invasiv**e plant species	Alien invasive plant species and weeds may encroach into any disturbed areas particularly areas cleared for the proposed development	2	2	2	2	1	2	18	-18	Low	An alien invasive management programme must be incorporated into the Environmental Management Programme;Ongoing alien plant control must be undertaken; Areas which have been disturbed will be quickly colonised by invasive alien species. An ongoing	2	1	1	2	1	1	7	-7	Low

											management plan must be implemented for the clearing/eradication of alien species. Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. Avoid planting of exotic plant species, use indigenous grass species.									

Mammals, unlikely to occur in the way of the powerline corridor, if present likely to move away.	Direct impacts on mammals and habitat destruction	2	2	2	2	1	2	18	-18	Low	Should any mammal species be encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. The contractor must ensure that no indigenous mammal species are disturbed, trapped, hunted or killed during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with	1	4	1	2	1	1	9	-9	Low

											penalty clauses for non-compliance. The appropriate agency should implement an ongoing monitoring and eradication program for all invasive plant species growing on the site. Any post-development re-vegetation or landscaping exercise should use grass species indigenous to the area are preferred									

Herpetofauna Should any reptile or amphibia species are encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. The contractor must ensure that no indigenous herpetofauna species are disturbed, trapped, hunted or killed during the construction phase. During the construction phase there may be increased surface runoff	Direct impact on herpetofauna and habitat destruction, unkikely to be present at powerline transect, is present may move away, slower movement. The current habitat is mostly disturbed terrestrial habitat The footprint for the proposed residential development will result in clearing most of the vegetation area. This will result in some loss of herpetofauna habitat. After clearing the vegetation,	2	2	2	2	1	2	18	-18	Low	Should any reptile or amphibia species are encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. The contractor must ensure that no indigenous herpetofauna species are disturbed, trapped, hunted or killed during the construction phase. During the construction phase there may be increased surface runoff and a decreased water quality.	1	4	1	2	1	1	9	-9	Low

and a decreased water quality. Completing construction during the winter months would mitigate the environmental impact. The appropriate agency should implement an ongoing monitoring and eradication program for all invasive plant species growing on the site. Any post-development re-vegetation or landscaping exercise should use species indigenous to South Africa. Plant species locally	construction will commence.										Completing construction during the winter months would mitigate the environmental impact. The appropriate agency should implement an ongoing monitoring and eradication program for all invasive plant species growing on the site. Any post-development re-vegetation or landscaping exercise should use species indigenous to South Africa. Plant species locally indigenous to the area are preferred.									

indigenous to the area are preferred.																				
Operational Phase																				
Vegetation and plant species in the Agricultural fields: **Low species richness, ecological sensitivity**	Maintenance of powerline	2	1	2	1	4	1	10	-10	Low	Agriculture will continue - no natural indigenous vegetation. Remain in designated corridor. No access to	2	2	4	1	4	1	13	-13	Low

											adjacent private agricultural land.· .									
Vegetation and plant species in the **Dry Grassland: Low species richness, ecological sensitivity**	Maintenance of powerline	2	3	1	2	4	2	24	-24	Medium	Remain in designated corridor. No access to adjacent private grassland veld.·	2	2	1	2	4	1	11	-11	Low
Vegetation and plant species in the Moist Grassland and drainage Lines: **High species richness, High ecological sensitivity**	Maintenance of powerline	2	3	3	2	4	2	28	-28	Medium	Remain in designated corridor. No access to adjacent wetland areas	2	1	2	1	4	1	10	-10	Low
Mammals, unlikely to occur in the way of the powerline corridor, if	Maintenance of powerline	2	1	1	1	4	1	9	-9	Low	Remain in designated corridor. No access to adjacent wetland areas	2	1	1	1	4	1	9	-9	

present likely to move away.																				
Herpetofauna direct impact or habitat loss	Maintenance of powerline	2	1	1	1		1	5	-5	Low	Remain in designated corridor. No access to adjacent wetland areas	2	1	1	1	4	1	9	-9	
Cumulative impacts																				
The powerline will only very slightly affect Broad-scale ecological processes	Transformation and presence of the facility will only slightly contribute to cumulative habitat loss and impacts on broad-scale ecological	2	2	2	2	4	2	24	-24	Medium	If possible, avoid putting pylons in Moist Grassland, if not possible rehabilitate at pylons, avoid access road under powerline, use existing roads. The clearing of vegetation must be kept to a minimum and remain within the footprint	2	1	2	1	4	1	22	-22	Low

											development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left. · The clearing of vegetation must be kept to a minimum and remain within the footprint development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left · Remove alien invasive species wherever possible · Construction must be completed as									

											quickly as possible · Disturbed open areas must be rehabilitated immediately after construction has been completed · During the construction phase workers must be limited to areas under construction and access to adjacent private areas must be strictly controlled · Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas. · Plant only indigenous grass									

											– no alien species									

Table 7.2.2: Results of the impact assessment on biodiversity along the not-preferred Alternative 2 Hendrina powerline corridor																				
ENVIRONMENTAL PARAMETER	**ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE**	**ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION**									**RECOMMENDED MITIGATION MEASURES**	**ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION**								
		E	**P**	**R**	**L**	**D**	**I / M**	**TOTAL**	**STATUS (+ OR -)**	**S**		**E**	**P**	**R**	**L**	**D**	**I / M**	**TOTAL**	**STATUS (+ OR -)**	**S**
Construction Phase																				
Vegetation and plant species in the Agricultural fields: Low species richness, **Low ecological sensitivity**	Agricultural Fields. Vegetation clearing for access roads, pylons, powerline and their service areas may impact on vegetation and plant species	2	1	1	1	1	1	6	-6	Low	Agriculture will continue - no natural indigenous vegetation· ·	2	1	1	1	1	1	6	-6	Low

Vegetation and plant species in the **Dry Grassland**: Low species richness, ecological sensitivity	Northern dry grassland at Hendrina power station - entrance of powerline into power station and Southern Dry Grassland at WEF. Vegetation clearing for access roads, pylons, powerline and their service areas may impact on vegetation and plant species	1	4	1	2	1	2	18	-18	Low	Rehabilitate cleared area at pylons. allow natural succession where possible, sow indigenous grass if needed	1	4	1	2	1	1	9	-9	Low

Vegetation and plant species in the Moist Grassland and drainage Lines: **High species richness, High ecological sensitivity**	Vegetation clearing for access roads, pylons, powerline and their service areas may impact on vegetation and plant species	2	4	2	2	1	2	22	-22	Low	If possible, avoid putting pylons in Moist Grassland, if not possible rehabilitate at pylons, avoid access road under powerline, use existing roads. The clearing of vegetation must be kept to a minimum and remain within the footprint development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left. · The clearing of vegetation must be kept to a minimum and remain within the	2	2	1	2	1	1	8	-8	Low

											footprint development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left · Remove alien invasive species wherever possible · Construction must be completed as quickly as possible · Disturbed open areas must be rehabilitated immediately after construction has been completed · During the construction phase workers must be limited to areas under									

											construction and access to adjacent private areas must be strictly controlled · Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas. · Plant only indigenous grass – no alien species									
Vegetation and plant species at the Pan: High species	Vegetation clearing for access roads, pylons,	1	1	2	3	1	3	24	-24	Medium	Do not use alternative close to Pan If possible, avoid putting	1	1	1	1	1	1	5	-5	Low

richness, **High ecological sensitivity**	powerline and their service areas may impact on vegetation and plant species										pylons in the Pan's Moist Grassland, if not possible rehabilitate at pylons, avoid access road under powerline, use existing roads									
Increase **of alien and invasiv**e plant species	Alien invasive plant species and weeds may encroach into any disturbed areas particularly areas cleared for the proposed development	2	2	2	2	1	2	18	-18	Low	An alien invasive management programme must be incorporated into the Environmental Management Programme;Ongoing alien plant control must be undertaken; Areas which have been disturbed will be quickly colonised by invasive alien species. An ongoing	2	1	1	2	1	1	7	-7	Low

											management plan must be implemented for the clearing/eradication of alien species. Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. Avoid planting of exotic plant species, use indigenous grass species.									

Mammals, unlikely to occur in the way of the powerline corridor, if present likely to move away.	Direct impacts on mammals and habitat destruction	2	2	2	2	1	2	18	-18	Low	Should any mammal species be encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. The contractor must ensure that no indigenous mammal species are disturbed, trapped, hunted or killed during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with	1	4	1	2	1	1	9	-9	Low

											penalty clauses for non-compliance. The appropriate agency should implement an ongoing monitoring and eradication program for all invasive plant species growing on the site. Any post-development re-vegetation or landscaping exercise should use grass species indigenous to the area are preferred									

Herpetofauna Should any reptile or amphibia species are encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. The contractor must ensure that no indigenous herpetofauna species are disturbed, trapped, hunted or killed during the construction phase. During the construction phase there may be increased surface runoff	Direct impact on herpetofauna and habitat destruction, unkikely to be present at powerline transect, is present may move away, slower movement. The current habitat is mostly disturbed terrestrial habitat The footprint for the proposed residential development will result in clearing most of the vegetation area. This will result in some loss of herpetofauna habitat. After clearing the vegetation,	2	2	2	2	1	2	18	-18	Low	Should any reptile or amphibia species are encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. The contractor must ensure that no indigenous herpetofauna species are disturbed, trapped, hunted or killed during the construction phase. During the construction phase there may be increased surface runoff and a decreased water quality.	1	4	1	2	1	1	9	-9	Low

and a decreased water quality. Completing construction during the winter months would mitigate the environmental impact. The appropriate agency should implement an ongoing monitoring and eradication program for all invasive plant species growing on the site. Any post-development re-vegetation or landscaping exercise should use species indigenous to South Africa. Plant species locally	construction will commence.										Completing construction during the winter months would mitigate the environmental impact. The appropriate agency should implement an ongoing monitoring and eradication program for all invasive plant species growing on the site. Any post-development re-vegetation or landscaping exercise should use species indigenous to South Africa. Plant species locally indigenous to the area are preferred.									

indigenous to the area are preferred.																				
Operational Phase																				
Vegetation and plant species in the Agricultural fields: **Low species richness, ecological sensitivity**	Maintenance of powerline	2	1	2	1	4	1	10	-10	Low	Agriculture will continue - no natural indigenous vegetation. Remain in designated corridor. No access to	2	2	4	1	4	1	13	-13	Low

											adjacent private agricultural land.· .									
Vegetation and plant species in the **Dry Grassland: Low species richness, ecological sensitivity**	Maintenance of powerline	2	3	1	2	4	2	24	-24	Medium	Remain in designated corridor. No access to adjacent private grassland veld.·	2	2	1	2	4	1	11	-11	Low
Vegetation and plant species in the Moist Grassland and drainage Lines: **High species richness, High ecological sensitivity**	Maintenance of powerline	2	3	3	2	4	2	28	-28	Medium	Remain in designated corridor. No access to adjacent wetland areas	2	1	2	1	4	1	10	-10	Low
Vegetation and plant species in the **Pan**: High species richness, High	Maintenance of powerline	1	1	3	4	4	3	39	-39	Medium	Avoid Pan wetland, rather use nearest road for travel	1	1	2	3	4	2	22	-22	Low

ecological sensitivity																				
Mammals, unlikely to occur in the way of the powerline corridor, if present likely to move away.	Maintenance of powerline	2	1	1	1	4	1	9	-9	Low	Remain in designated corridor. No access to adjacent wetland areas	2	1	1	1	4	1	9	-9	
Herpetofauna direct impact or habitat loss	Maintenance of powerline	2	1	1	1		1	5	-5	Low	Remain in designated corridor. No access to adjacent wetland areas	2	1	1	1	4	1	9	-9	
Cumulative impacts																				
The powerline will only very slightly affect Broad-scale ecological processes	Transformation and presence of the facility will only slightly contribute to cumulative habitat loss and impacts on	2	2	2	2	4	2	24	-24	Medium	If possible, avoid putting pylons in Moist Grassland, if not possible rehabilitate at pylons, avoid access road under powerline, use existing	2	1	2	1	4	1	22	-22	Low

	broad-scale ecological										roads. The clearing of vegetation must be kept to a minimum and remain within the footprint development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left. · The clearing of vegetation must be kept to a minimum and remain within the footprint development – leave the rest of the area with natural vegetation intact, but there is very little, if any, natural vegetation left									

											· Remove alien invasive species wherever possible · Construction must be completed as quickly as possible · Disturbed open areas must be rehabilitated immediately after construction has been completed · During the construction phase workers must be limited to areas under construction and access to adjacent private areas must be strictly controlled · Rehabilitated areas must be monitored to ensure the									

											establishment of re-vegetated areas. · Plant only indigenous grass – no alien species									

Table 7.2.2: Summary of results for impacts on terrestrial biodiversity for the preferred option

		Construction Phase				**Operational Phase**			
Impact on:		**Without mitigation**		**With mitigation**		**Without mitigation**		**With mitigation**	
Vegetation and plant species	Consequence	-2.25		-1.75		-3		-2.5	
	Environmental Risk	-11.25	Medium	-8.75	Low	-15.0	High	-12.5	Medium
	Environmental Significance	-11.5	Medium	-8.75	Low	-17.55	Medium	-12.5	Medium
Alien Invasives	Consequence	-2		-1.5		-2.75		-2.25	
	Environmental Risk	-10.0	Medium	-7.5	Low	-13.75	Medium	-11.25	Medium
	Environmental Significance	-13.75	Medium	-11.25	Medium	-13.75	Medium	-11.25	Medium
Mammals	Consequence	-2’25		-2.0		-3.25		-2.25	
	Environmental Risk	-12.5	Medium	-10.0	Medium	13.75	Medium	11.25	Medium
	Environmental Significance	-12.5	Medium	-10.0	Medium	13.75	Medium	11.25	Medium
Herpetofauna	Consequence	-2.0		-1.75		-3.0		-2.75	
	Environmental Risk	-10.0	Medium	-8.75	Low	-15	High	-13.75	Medium
	Environmental Significance	-10.0	Medium	-8.75	Low	-15.0	Medium	-13.75	Medium

7.3 Comparative Assessment of the Alternatives

The vegetation and fauna surveys of the two alternative proposed corridors clearly showed that the plant communities, plant species, mammals and herpetofauna along these corridors are so similar that the envisaged impacts of the powerlines on the biodiversity are also similar. The only differences being the slightly longer length of Alternative 2 and that Alternative 2 will run close to the edge of a **pan**. The vegetation along the pan edge

The corridors of the two alternatives both contain similar Agricultural fields, Dry Grassland, Moist Grassland and Drainage Lines. The impact on all these systems during the construction phase is Medium, which can be lowered by mitigation. Alternative 2 **additionally** contains Pan vegetation, similar to Moist Grassland, also with Medium impact, which can be lowered by mitigation. All the Moist Grasslands are regarded as wetland vegetation with High ecological sensitivity.

However, Alternative 2 is longer and has more Moist Grassland and Drainage lines (wetlands with high ecological sensitivity) to cross, and additionally runs close to the pan Figures 5.3 and 5.4 above).

Key

PREFERRED Alternative 1	Shorter distance, with less wetlands to cross
FAVOURABLE	-
LEAST PREFERRED	Longer distance with more wetlands to cross
NO PREFERENCE	Impacts on both basically similar

Alternative	Preference	Reasons (incl. potential issues)
POWERLINE ALTERNATIVES		
Powerline Option 1		Alternative 1 is shorter and has less Moist Grassland and Drainage lines (wetlands with high ecological sensitivity) to cross, and does not run close to the pan (Figures 5.3 and 5.4 above).
Powerline Option 2		Alternative 2 is longer and has more Moist Grassland and Drainage lines (wetlands with high ecological sensitivity) to cross, and additionally runs close to the pan (Figures 5.3 and 5.4 above).

8. DISCUSSION AND CONCLUSION

8.1 Vegetation

SANBI and DEAT (2009) and NEMBA, Government Notice 1002 (2011) indicate that the Eastern Highveld Grassland is a **Vulnerable** ecosystem, as so much is already transformed. On the specific site the vegetation is mostly **transformed** by agriculture, with very little original natural vegetation remaining. Very limited areas still contain natural primary vegetation. Two small areas, one on the north at the Hendrina power station, and one in the south at the power facility.

No Irreplaceable CBA's occur along the transect area. A **small CBA Optimal site** occurs in the wetland in the north, close to the Hendrina power station. Most of the transect is **Heavily Modified** or small local areas **Moderately Modified**. Most wetlands are classified as **Other Natural Areas** (Figure 5.2 above).

The vegetation study of the proposed corridors resulted in the identification of five different plant communities (= ecosystems on the plant community level of organisation) that could be mapped. The Agricultural area, and Dry Grassland have low plant species richness, but the Moist plant communities identified have high to medium plant species richness, no threatened, red data or protected plant species occur on the site. Only the drainage line areas and their floodplains (Moist Grassland) have high ecological sensitivity and high conservation value.

The result of the sensitivity assessment indicates that the Wetlands have **High ecological sensitivity**. The Agricultural Fields, and Dry Grasslands have **Low** ecological sensitivity and **Low** conservation value, due to their transformed status.

8.2 Fauna

The area where the intended development will take place has been severely altered by several anthropogenic influences.

The drainage line and other wetlands are sensitive habitat for various vertebrates. It is suggested that these important habitats and their buffers must be protected. The accompanying wetland report will be important from an aquatic perspective to determine the wetlands and their buffers.

With the exception of Red Data bats (and birds), which may fly over the site, no other Red Data mammal, reptile or amphibian species should occur on the site.

From a vertebrate perspective, there is no objection against the development as long as the development adheres to the mitigation measures concerning the wetlands on the site.

8.3 Conclusion

The construction of the proposed powerline can be supported. Care should be taken with positioning of pylons in the larger Moist Grassland areas and the crossing of Drainage Lines.

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10. CURRICULA

10.1 Abridged Curriculum Vitae: Prof George Johannes Bredenkamp

Born: 10 February 1946 in Johannesburg, South Africa.
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Previous work address:
Extra-ordinary Professor
Department of Plant Sciences, University of Pretoria, Pretoria, 0002, South Africa

Qualifications:
1963 Matriculation Certificate, Kempton Park High School
1967 B.Sc. University of Pretoria, Botany and Zoology as majors,
1968 B.Sc. Hons. (cum laude) University of Pretoria, Botany.
1969 H.E.D. (cum laude) Pretoria Teachers Training College.
1975 M.Sc. University of Pretoria, Plant Ecology .
1982 D.Sc. (Ph.D.) University of Pretoria, Plant Ecology.

Theses: (M.Sc. and D.Sc.) on plant community ecology and wildlife management in nature reserves in South African grassland and savanna.

Professional titles:

MSAIE&ES	South African Institute of Ecologists and Environmental Scientists - 1989-1990 Council member
MGSSA	Grassland Society of Southern Africa - 1986 Elected as Sub-editor for the Journal - 1986-1989 Serve on the Editorial Board of the Journal 1990 Organising Committee: International Conference: Meeting Rangeland challenges in Southern Africa - 1993 Elected as professional member
Pr.Sci.Nat.	South African Council for Natural Scientific Professions **Reg No 400086/83** 1993-1997 **Chairman** of the Professional Advisory Committee:Botanical Sciences - 1993-1997: **Council** Member - 1992-1994: Publicity Committee

- 1994-1997: Professional Registration Committee
2017-2020: Council Member

Professional career:

• Teacher in Biology 1970-1973 in Secondary Transvaal Schools
• Lecturer and senior lecturer in Botany 1974-1983 at University of the North
• Associate professor in Plant Ecology 1984-1988 at Potchefstroom University for CHE
• Professor in Plant Ecology 1988-2008 at University of Pretoria.
• Founder and owner of the Professional Ecological Consultancy firms Ecotrust Environmental Services CC and Eco-Agent CC, 1988-present.

Academic career:

• Students:
- Completed post graduate students: M.Sc. 57; Ph.D. 16.

• Author of:
- about 200 scientific papers in refereed journals
- >150 papers at national and international congresses
- >1000 scientific (unpublished) reports on environment and natural resources
- 17 popular scientific papers.
- about 45 contributions in books

• Editorial Committees of
South African Journal of Botany,
Journal Grassland Society of Southern Africa,
Bulletin of the South African Institute of Ecologists.
Journal of Applied Vegetation Science.(Sweden)
Phytocoenologia (Germany)
• Highest FRD evaluation category: C1 (=leader in South Africa in the field of Vegetation Science/Plant Ecology)

Membership:

• International Association of Vegetation Science.
• International Society for Ecology (Intecol)
• Association for the Taxonomic study of the Flora of Tropical Africa (AETFAT).
• South African Association of Botanists (SAAB)
1988-1993 Elected to the **Council** of SAAB.
1989-1990 Elected as **Chairman** of the Northern Transvaal Branch
1990 Elected to the Executive Council as **Vice-President**
1990 Sub-editor Editorial Board of the Journal
1991-1992 Elected as **President** (2-year period)
1993 **Vice-President** and Outgoing President
• Wildlife Management Society of Southern Africa
• Suid-Afrikaanse Akademie vir Wetenskap en Kuns
(=South African Academy for Science and Art).
• Wildlife Society of Southern Africa

1975 - 1988: Member
1975 - 1983: Committee member, Pietersburg Centre
1981 - 1982: **Chairman**, Pietersburg Centre

• Dendrological Society of Southern Africa
1984 - present: Member
1984 - 1988: Committee member, Western Transvaal Branch
1986 - 1988: **Chairman**, Western Transvaal Branch
1987 - 1989: Member, Central Committee (National level)
1990 - 2000: Examination Committee

• Succulent Society of South Africa
1987 - present: Member

• Botanical Society of South Africa
2000 – present: Member
2001- 2008: Chairman, Pretoria Branch
2009-present Committee member Pretoria Branch
2002 – 2015: Chairman, Northern Region Conservation Committee
2002- 2007: Member of Council
2017-2017 President of Council

Special committees:
• Member or past member of 10 special committees re ecology, botany, rangeland science in South Africa.
• Member of the International Code for Syntaxonomical Nomenclature 1993-1996.

Merit awards and research grants:
1968 Post graduate merit bursary, CSIR, Pretoria.
1977-1979 Research Grant, Committee re Research Development, Dept. of Co-operation and Development, Pretoria.
1984-1989 Research Grant, Foundation for Research Development, CSIR, Pretoria.
1986-1987 Research Grant, Dept. of Agriculture and Water Supply, Potchefstroom.
1990-1997 Research Grant, Dept. of Environmental Affairs & Tourism, Pretoria.
1991-present Research Grant, National Research Foundation , Pretoria.
Research Grant, Water Research Commission.
1999-2003 Research Grant, Water Research Commission.
2006 South African Association of Botanists Silwer Medal for outstanding contributions to South African Botany

Abroad:
1986 Travel Grant, Potchefstroom University for Christian Higher Education, Potchefstroom
Visits to Israel, Italy, Germany, United Kingdom, Portugal.
1987 Travel Grant, Potchefstroom University for Christian Higher Education, Potchefstroom.
Visits to Germany, Switzerland, Austria, The Netherlands, United Kingdom.
1990 Travel Grant, FRD.
Visit to Japan, Taiwan, Hong-Kong.
1991 Travel Grant, FRD.

Visits to Italy, Germany. Switzerland, Austria, France, The Netherlands, United Kingdom.

1993 Travel Grant, University of Pretoria.
Visits to the USA, Costa Rica, Czech Republic, Austria.

1994 Travel Grant FRD.
Visits to Switzerland, The Netherlands, Germany, Czech Republic.

1995 Travel Grant FRD, University of Pretoria
Visits to the USA

Travel Grant, University of Pretoria, Visit to the UK.
Travel Grant University of Pretoria, Visit Czech Republic, Bulgaria
Travel Grant, University of Pretoria, Visit Czech Republic, Italy, Sweden
Travel Grant, University of Pretoria, Visit Hungary, Spain, USA
Travel Grant, University of Pretoria, Visit Poland, Italy, Greece.
Travel Grant, NRF, Visit Brazil
2006 German Grant Invited lecturer in Rinteln, Germany

Consultant

Founder and owner of Ecotrust Environmental Services CC and Eco-Agent CC
Since 1988 **>1000** reports as consultant on environmental matters, including:
Game Farm and Nature Reserve planning,
Environmental Impact Assessments,
Environmental Management Programme Reports,
Vegetation Surveys,
Wildlife Management,
Veld Condition and Grazing Capacity Assessments,
Red data analysis (plants and animals).

10.2. Abridged Curriculum Vitae: Jacobus Casparus Petrus (Jaco) Van Wyk

Identity number	680804 5041 08 4
Gender	Male
Date of birth	4 August 1968
Nationality	South African
Home languages	Afrikaans, fluent in English

Postal address P.O. Box 25085, Monument Park, Pretoria, 0105.

Tel no +27 12 347 6502, Cell +27 82 410 8871

E-mail **jcpvanwyk@absamail.co.za**

Present position Co-Department Head, Environmental Education & Life Sciences, Hoërskool Waterkloof

Consultant Specialist Environmental Assessments, EIAs, writing, photo-recording

Qualifications **B.Sc**. (U.F.S.) **B.Sc. (Hon.)** (U.F.S.), **H.E.D** (U.F.S.), **M.Sc.** (U.F.S.)

Honours Foundation of Research Development bursary holder

Professional Natural Scientist (Zoology) – S.A Council for Natural Scientific Professions, Registration # 400062/09

Notable Research Contribution In-depth field study of the giant bullfrog

Formal Courses Attended Outcomes Based Education, University of the South Africa (2002)

Introductory Evolution, University of the Witwatersrand (2008)

OBE, GET & FET training, 2002-2008, Education Department

Employment history

2009 – Present Vertebrate surveys for different Environmental Companies.

2000 – 2018 Co-Department Head for Environmental Education & Life Sciences, Hoërskool Waterkloof, Pretoria.

1995 - 1999 Teaching Biology (Grades 8 – 12) and Physics / Chemistry (Grades 8 – 9) at the Wilgerivier High School, Free State. Duties included teaching, mid-level management and administration.

July 1994 – Dec 1994 Teaching Botany practical tutorials to 1st year students at the Botany & Zoology Department of the Qwa-Qwa campus of the University of Free State, plant collecting, amphibian research

1993 - 1994 Mammal Research Institute (University of Pretoria) research associate on the Prince Edward Islands: topics field biology and population dynamics of invasive alien rodents, three indigenous seals, invertebrate assemblages, censussing king penguin chicks and lesser sheathbills, and marine pollution

1991 - 1993 Laboratory demonstrator for Zoological and Entomological practical tutorials, and caring for live research material, University of the Free State

1986 - 1990 Wildlife management and eco-guiding, Mt. Everest Game Farm, Harrismith

Professional Achievement

Research: Author and co-author of 52 scientific publications in peer-reviewed and popular subject journals, and >350 contractual EIA research reports. Extensive field work and laboratory experience in Africa

Public Recognition: Public speaking *inter alia* radio talks, TV appearances

Hobbies: Popular writing, travel, marathon running, climbing (viz Kilimanjaro), photography, biological observations, public speaking.