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Ecological Assessment Report

Slovo Park Residential Development, Brandfort, Free State Province

July 2020 and revised September 2020

Compiled for:

CONSULTANTS NSVT ENVIRONMENTAL & SOCIAL SCIENTISTS

Compiled by:

Rikus Lamprecht

Ecological Specialist (Pr.Sci.Nat)

EcoFocus Consulting

072 230 9598

ajhlamprecht@gmail.com

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EcoFocus Consulting (Pty) Ltd
Registration : 2017/223847/07
7 Edenglen, Waterberg Street, Langenhovenpark, Bloemfontein, 9330
T 072 230 9598
E ajhlamprecht@gmail.com

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Executive Summary

The project applicant, Masilonyana Local Municipality has historically installed underground communal water reticulation services for a portion of informal residential expansion which was conducted by residents of the local community, within the township of Majwemasweu. The township is located directly adjacent north of the town of Brandfort, Free State Province. The applicant now intends to formally develop the area along with an adjacently located open area, for mixed residential/commercial purposes. In accordance with the information received from the EAP, the development will tie into the existing municipal water, sewage and electrical infrastructure. The Masilonyana Local Municipality has confirmed that sufficient capacity is available.

NSVT Consultants was appointed by the applicant as the independent Environmental Assessment Practitioner (EAP) to conduct the Ecological Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed development footprint which may be affected by the proposed development. Proposed mitigation and management measures in accordance with the NEMA (Act 107 of 1998) mitigation hierarchy must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the development. This report constitutes the Ecological Assessment. A site assessment for the proposed development footprint area was conducted on 19 June 2020. This date forms part of the winter season. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

Methodology

The proposed development area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present. Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969). Georeferenced

photographs were taken of ecologically sensitive areas as well as the relevant nationally or provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

Potential ecological impacts of the proposed development on the surrounding natural environment were identified, evaluated and rated. The Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the proposed development area were also assessed and rated.

Assessment Area

The assessment area consists of a single footprint area of approximately 153 ha in size. The assessment area is situated on the Remaining Extent of the Farm Brandfort Townlands no 720 (SG 21 Digit Code: F00600000000072000000) within the township of Majwemasweu, which is located directly adjacent north of the town of Brandfort. The town forms part of the Masilonyana Local Municipality which in turn, forms part of the Lejweleputswa District Municipality, Free State Province. Access is obtained by way of the R 30 provincial road from the south.

Vegetation Types

According to SANBI (2006-2019), the entire assessment area falls within the Vaal-Vet Sandy Grassland vegetation type (Gh 10), which is characterised by a plains-dominated landscape, with some scattered, slightly irregular undulating plains and hills. The vegetation usually consists of low tussock grasslands with an abundant karroid element. Dominance of the grass species *Themeda triandra* is an important feature of the natural condition of this vegetation type while localised lower cover of this species and an associated increase in cover of grass species such as *Elionurus muticus, Cymbopogon pospischilii* and *Aristida congesta* is usually an indication of heavy grazing and/or erratic rainfall.

This vegetation type is classified as Endangered (SANBI, 2006-2019).

The Vaal-Vet Sandy Grassland vegetation type (Gh 10) is also officially classified as a nationally listed Endangered ecosystem type in accordance with the Department of Environmental Affairs' (DEA) List of Nationally Threatened Ecosystems (Government Gazette No 34809, 9 December 2011). This in turn, also renders the entire vegetation type a priority ecosystem type for conservation on a national scale.

Conservation Status

The entire assessment area falls within an Ecological Support Area two (ESA 2) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province. ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

Results and Conclusion

The assessment area consists of a single footprint area of approximately 153 ha in size. The proposed mixed residential/commercial development will in all probability completely transform the majority of the remaining natural surface vegetation within the assessment area.

According to SANBI (2006-2019), the entire assessment area falls within the Vaal-Vet Sandy Grassland vegetation type (Gh 10). This vegetation type is classified as Endangered (SANBI, 2006-2019).

The Vaal-Vet Sandy Grassland vegetation type (Gh 10) is also officially classified as a nationally listed Endangered ecosystem type in accordance with the Department of Environmental Affairs' (DEA) List of Nationally Threatened Ecosystems (Government Gazette No 34809, 9 December 2011).

The entire assessment area falls within an Ecological Support Area two (ESA 2) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province.

Central and Eastern Portions of the Assessment Area

The entire central and eastern portions of the assessment area are occupied by an existing dense informal residential settlement, which has virtually completely transformed all previously existing natural surface vegetation. The remaining sparse vegetation present on most of the informal residential properties within the central and eastern portions of the assessment area, mainly consists of exotic and/or weeds and legally declared alien invasive species which serve ornamental-, consumption- and/or shading purposes. Small and medium sized tree individuals of the legally declared invasive species *Prosopis glandulosa* (Category 3) and the species *Vachellia karroo* are mostly scattered throughout the existing informal residential settlement portion. The assessment

area is also completely isolated to the east by the existing Majwemasweu township. The central and eastern portions of the assessment area therefore scored a very low Present Ecological State (PES) value.

The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the central and eastern portions of the assessment area, is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the central and eastern portions of the assessment area, will therefore not be practicably feasible.
No Red Data Listed-, provincially- or nationally protected species or any other species of conservational significance were found to be present within the central and eastern portions of the assessment area. The relevant Vaal-Vet Sandy Grassland vegetation type (Gh 10) associated with the assessment area, however usually houses numerous provincially protected species and it is therefore reasonably expected that the central and eastern portions of the assessment area would likely historically have housed individuals of such species.

The central and eastern portions of the assessment area do not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731). No conservationally significant or important bird species or locally distinct habitats were observed during the site assessment or are necessarily expected to utilise the central and eastern portions of the assessment area for breeding, foraging and/or persistence purposes.

The assessment area gently slopes in a westerly and south-westerly direction. A number of small first-order ephemeral water drainage lines therefore historically traversed the central and eastern portions of the assessment area. The flow regimes of these drainage lines have however been significantly impeded and impacted upon by the informal residential expansion and only small intermittent portions of these drainage lines still remain. Surface water flow however still takes place to a limited extent, through the informal residential settlement and it is therefore recommended that an adequate Erosion and Stormwater Management Plan be implemented during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to ensure continued surface water runoff flow within the broader water catchment and drainage area. It is also recommended that the development design layout for the

new residential development should include adequate storm water management measures to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines.

The central and eastern portions of the assessment area would probably have scored a moderate historic Ecological Importance and Sensitivity (EIS) value. The central and eastern portions of the assessment area would therefore historically probably merely have been viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2), provincially protected species as well as the broader surface water catchment and drainage area.

Western Portion of the Assessment Area

The western portion of the assessment area along with the localised surrounding areas to the north, west and south, are currently undeveloped and constitute an open medium-height grassland landscape. The entire western portion of the assessment area and broader surrounding areas are however situated on old historically cultivated agricultural lands. Slight to moderate historic and continued long-term overgrazing of the subsequently established grassland, by livestock from the local community and subsequent sparse bush encroachment, is also evident. Confined portions of the area had been burnt at the time of the site assessment and it is reasonably assumed that the area is likely anthropogenically burnt on a regular basis.

The grassland landscape within the western portion of the assessment area is therefore not reminiscent of the natural climactic state of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10). The western portion of the assessment area therefore scored a moderate Present Ecological State (PES) value.

The grass species *Aristida spp., Eragrostis chloromelas, E gummiflua* and *Cynodon dactylon* are all well-represented and dominant within different areas of the western portion of the assessment area, which reiterates the historically disturbed and overgrazed state of the areas.

It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local community in order to prevent continued significant overgrazing of surrounding undeveloped areas and to attempt to improve/restore the ecological condition, over time.

Small tree and shrub individuals of the woody species *Vachellia karroo, Searsia lancea, Asparagus sp.* as well as the legally declared invasive species *Prosopis glandulosa* (Category 3) are merely sparsely scattered throughout the grassland. It is recommended that all individuals of the identified alien invasive species must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014.

Due to the historic cultivation impact within the broader area, the western portion of the assessment area does not necessarily house a diverse forb or karroid shrub layer. Individuals of the provincially protected species *Helichrysum nudifolium* were also found to be very sparsely present (≤ 15 individuals). A Provincial Flora Permit has to be obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), prior to the removal of any individuals of this species or any other provincially protected species individuals within the assessment area

No Red Data Listed-, other provincially- or nationally protected species or any other species of conservational significance were found to be present within the western portion of the assessment area. The relevant Vaal-Vet Sandy Grassland vegetation type (Gh 10) associated with the assessment area, however usually houses numerous provincially protected species and it is therefore reasonably expected that the western portion of the assessment area would likely historically have housed individuals of such species. It is therefore recommended that an additional ecological walkthrough be conducted, prior to the commencement of the proposed development, during the flowering period of underground bulb plant species. This will ensure that no provincially protected or other conservationally significant species have potentially been omitted.

The western portion of the assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731).
No conservationally significant or important bird species or locally distinct habitats were observed during the site assessment or are necessarily expected to utilise the western portion of the assessment area for breeding, foraging and/or persistence purposes. Only common local resident bird species were found to be present.

No conservationally significant or important faunal species or locally distinct habitats were observed during the site assessment. Due to the presence of the existing informal residential settlement along with the continued long-term overgrazing by livestock from the local community, the western portion of the assessment area as well as the surrounding undeveloped areas, are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any conservationally significant or important faunal species would necessarily utilise the western portion of the assessment area or the surrounding undeveloped areas for breeding, foraging and/or persistence purposes, or would necessarily have historically utilised the central and eastern portions of the assessment area. Sporadic dens of burrowing mammals were however observed during the site assessment. The mobility of any such faunal species along with the vast, continuous surrounding undeveloped landscape to the north, west and south, also allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas.

The remnants of the small ephemeral water drainage lines, which historically traversed the central and eastern portions of the assessment area, continue to flow into the western grassland portion of the assessment area, to a limited extent. Two of these drainage lines eventually dissipate into the western grassland while the rest join two larger more significant first-order ephemeral water drainage lines, which flow along the northern/western- and the southern boundaries of the assessment area respectively. These two larger more significant drainage lines are viewed as playing an important role in the local water catchment and drainage towards the west and south-west.

Due to the lack of continuous water flow through the assessment area, these two larger more significant drainage lines possess no distinct riparian zone or significant variation in vegetation species composition relative to the surrounding grassland landscape. A significant increase in small to medium sized woody tree and shrub density of the species *Vachellia karroo* and *Searsia lancea* and to a lesser extent, the legally declared invasive species *Prosopis glandulosa* (Category 3), is however evident within and directly surrounding these two larger more significant drainage lines. The presence of the grass species *Themeda triandra* is significantly increased while the grass species *Setaria sphacelata* is also diagnostically present within and directly surrounding the two larger more significant drainage lines as well as the smaller drainage lines, which join them.

Although the western portion of the assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731), the larger more significant drainage lines provide locally unique and distinct woody habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are likely utilised by a wide variety of common and habitat-specific bird species for breeding, foraging and persistence purposes.

It is therefore recommended that the two larger more significant water drainage lines should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the two drainage lines and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines.

The western portion of the assessment area scored a moderate Ecological Importance and Sensitivity (EIS) value as the area forms part of an Ecological Support Area two (ESA 2) and the two larger more significant water drainage lines play an important role in the local water catchment and drainage.

The western portion of the assessment area is therefore merely viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2) as well as the broader surface water catchment and drainage area.

Conclusion

Transformation of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10) and Ecological Support Area two (ESA 2) as well as the impeding and contamination of the flow regimes of the two larger more significant first-order ephemeral water drainage lines and the associated local water catchment and drainage area, were identified and addressed during the construction phase as significant potential long-term ecological impacts, associated with the proposed development. These impacts could cumulatively add to existing negative impacts caused by the Majwemasweu township within the broader local landscape to the east.

It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that these potential ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels by implementation of the recommended mitigation measures

The proposed development of the assessment area should therefore be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this ecological report must however be adequately implemented and managed for both the construction and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

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Abbreviations

BA	Basic Assessment
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture Forestry and Fisheries
DESTEA	Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
MAP	Mean Annual Precipitation
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMA	National Environmental Management Act (Act 107 of 1998)
NFA	National Forests Act (Act 84 of 1998)
NWA	National Water Act (Act 36 of 1998)
ONA	Other Natural Area
PES	Present Ecological State
WULA	Water Use License Application

Declaration of Independence

I, Adriaan Johannes Hendrikus Lamprecht, ID 870727 5043 083, declare that I:

- am the Director and Ecological Specialist of EcoFocus Consulting (Pty) Ltd
- act as an independent specialist consultant in the field of botany and ecology
- am assigned as the Ecological Specialist consultant by the Environmental Assessment Practitioner (EAP), NSVT Consultants, for the proposed development
- do not have or will not have any financial interest in the undertaking of the proposed development activity other than remuneration for work as stipulated in the Purchase Order terms of reference
- confirm that remuneration for my services relating to the proposed development is not linked to approval or rejection of the development by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed development
- have no and will not engage in any conflicting interests in the undertaking of the activity
- undertake to disclose to the applicant and the competent authority any information that has or may have the potential to influence the decision of the competent authority
- will provide the applicant and competent authority with access to all relevant project information in my possession whether favourable or not

AJH Lamprecht

Signature

1. Introduction

The project applicant, Masilonyana Local Municipality has historically installed underground communal water reticulation services for a portion of informal residential expansion which was conducted by residents of the local community, within the township of Majwemasweu. The township is located directly adjacent north of the town of Brandfort, Free State Province. The applicant now intends to formally develop the area along with an adjacently located open area, for mixed residential/commercial purposes. In accordance with the information received from the EAP, the development will tie into the existing municipal water, sewage and electrical infrastructure. The Masilonyana Local Municipality has confirmed that sufficient capacity is available.

NSVT Consultants was appointed by the applicant as the independent Environmental Assessment Practitioner (EAP) to conduct the Ecological Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed development footprint which may be affected by the proposed development. Proposed mitigation and management measures in accordance with the NEMA (Act 107 of 1998) mitigation hierarchy must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the development. This report constitutes the Ecological Assessment.

Preliminary preparations conducted prior to the ecological site assessment where as follows:

- Georeferenced spatial information was obtained of the development area in order to determine the direct impact footprint area.
- A desktop study was conducted of the information available on the relevant vegetation types and national/provincial conservation significance status associated with the development footprint area.

EcoFocus Consulting (Pty) Ltd
Registration : 2017/223847/07
7 Edenglen, Waterberg Street, Langenhovenpark, Bloemfontein, 9330
T 072 230 9598
E ajhlamprecht@gmail.com

2. Date and Season of Ecological Site Assessment

A site assessment for the proposed development footprint area was conducted on 19 June 2020. This date forms part of the winter season. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is therefore recommended that an additional ecological walkthrough be conducted, prior to the commencement of the proposed development, during the flowering period of underground bulb plant species. This will ensure that no provincially protected or other conservationally significant species have potentially been omitted.

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3. Assessment Rational

South Africa is a country rich in natural resources and splendour and is rated as having some of the highest biodiversity in the world. Other than the pure aesthetic value which our biodiversity and natural resources provides, it also plays a significant positive role in our national economy. While continuous economic development and progress is a key national focus area, which forms a cornerstone in the socio-economic improvement of society and the livelihoods of communities and individuals, the preservation and management of the integrity and sustainability of our natural resources is also essential in achieving this objective.

Socio-economic development and progress can therefore not be completely inhibited for the sake of ensuring environmental conservation, therefore solutions and compromises rather need to be explored in order to achieve the need for socio-economic development without unreasonably jeopardising the needs of environmental conservation. A sustainable and responsible balance needs to be maintained in order to accommodate the requirements of both.

Adequate, sustainable and responsible utilisation and management of our natural resources is crucial. Finding the required balance between socio-economic development and environmental conservation, should therefore always be a priority focus point during any proposed development process.

Various environmental legislation in South Africa makes provision for the protection of our natural resources and the functionality of ecological systems in order to ensure sustainability. Such acts include the National Environmental Management: Biodiversity Act (Act 10 of 2004), National Forests Act (Act 84 of 1998), Conservation of Agricultural Resources Act (Act 43 of 1983), National Water Act (Act 36 of 1998) and framework legislation such as the National Environmental Management Act (Act 10 of 2004).

An Ecological Assessment of the proposed development area was therefore conducted in order to determine and quantify the impacts of the development on the natural environment in the area.

4. Objectives of the Assessment

Ecological and habitat survey:

- Describe the vegetation on the assessment area and identify and list conservationally significant faunal and floral species encountered within the assessment area.
    - List any nationally and/or provincially protected and/or Red Data Listed species.
- Determine and discuss the Present Ecological State (PES) and extent of degradation and/or transformation of the vegetation on the assessment area and surrounding areas. Also indicate the Ecological Importance and Sensitivity (EIS) of the assessment area in order to provide an indication of the conservational significance of the assessment area.
- Identify and delineate all watercourses/wetland areas potentially present within the assessment area.
- Identify, evaluate and rate the potential ecological impacts of the proposed development on the natural environment.
- Provide recommendations on mitigation and management measures in order to attempt to reduce/alleviate these identified potential ecological impacts.
- Provide recommendations on the suitability of the proposed development area.
- A digital report (this document) as well as the digital KML files of any identified ecologically sensitive/conservationally significant areas will be provided to the applicant.

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Registration : 2017/223847/07
7 Edenglen, Waterberg Street, Langenhovenpark, Bloemfontein, 9330
T 072 230 9598
E ajhlamprecht@gmail.com

5. Methodology

- The proposed development area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present.
- Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969).
- Georeferenced photographs were taken of ecologically sensitive areas as well as the relevant nationally or provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The **Present Ecological State (PES)** of the proposed development area was assessed and rated as per the table below.

- The Present Ecological State (PES) refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem.

EcoFocus Consulting (Pty) Ltd
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Table 1: Criteria for PES calculations

Ecological Category	Score	Description
A	> 90-100%	**Unmodified**, natural and pristine.
B	> 80-90%	**Largely natural**. A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged.
C	> 60-80%	**Moderately modified**. Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged.
D	> 40-60%	**Largely modified**. A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	> 20-40%	**Seriously modified**. The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	0-20%	**Critically/Extremely modified**. Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

The **Ecological Importance and Sensitivity (EIS)** of the proposed development area and surrounding undeveloped areas were assessed and rated as per the table below.

- The Ecological Importance and Sensitivity (EIS) of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales, and both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred.

Table 2: Criteria for EIS calculations

EIS Categories	Score	Description
Low/Marginal	**D**	Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
Moderate	**C**	Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
High	**B**	Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
Very High	**A**	Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

Potential ecological impacts of the proposed development on the surrounding natural environment were identified, evaluated and rated as per the methodology described below. The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential ecological impacts. Each potential ecological impact is scored for each of the Evaluation Components as per the table below.

Table 3: Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/Criteria
Magnitude of Negative or Positive Impact	**10 - Very high**: Bio-physical features and/or ecological functionality/processes may be severely impacted upon. **8 - High**: Bio-physical features and/or ecological functionality/processes may be significantly impacted upon. **6 - Medium**: Bio-physical features and/or ecological functionality/processes may be moderately impacted upon. **4 - Low**: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon. **2 - Very Low**: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon. **0 - Zero**: Bio-physical features and/or ecological functionality/processes will not be impacted upon.
Duration of Negative or Positive Impact	**5 – Permanent**: Impact will continue on a permanent basis. **4 - Long term**: Impact should cease a period (> 40 years) after the operational phase/project life of the activity. **3 - Medium term**: Impact may occur for the period of the operational phase/project life of the activity. **2 - Short term**: Impact may only occur during the construction phase of the activity after which it will cease. **1 - Immediate**: Impact may only occur as a once off during the construction phase of the activity.

Extent of Positive or Negative Impact	**5 - International**: Impact will extend beyond National boundaries. **4 - National**: Impact will extend beyond Provincial boundaries but remain within National boundaries. **3 - Regional**: Impact will extend beyond 5 km of the development footprint but remain within Provincial boundaries. **2 - Local**: Impact will not extend beyond 5 km of the development footprint. **1 - Site-specific**: Impact will only occur on or within 200 m of the development footprint. **0 –** No impact.
Irreplaceability of Natural Resources being impacted upon	**5 – Definite** loss of irreplaceable natural resources. **4 – High** potential for loss of irreplaceable natural resources. **3 – Moderate** potential for loss of irreplaceable natural resources. **2 – Low** potential for loss of irreplaceable natural resources. **1 – Very low** potential for loss of irreplaceable natural resources. **0 –** No impact.
Reversibility of Impact	**5 –** Impact **cannot** be reversed. **4 – Low** potential that impact may be reversed. **3 – Moderate** potential that impact may be reversed. **2 – High** potential that impact may be reversed. **1 –** Impact **will be** reversible. **0 –** No impact.
Probability of Impact Occurrence	**5 - Definite**: Probability of impact occurring is > 95 %. **4 - High**: Probability of impact occurring is > 75 %. **3 - Medium**: Probability of impact occurring is between 25 % - 75 %. **2 - Low**: Probability of impact occurring is between 5 % - 25 %. **1 - Improbable**: Probability of impact occurring is < 5 %.
Cumulative Impact	**High**: Numerous similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. **Medium**: Few similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. **Low**: Virtually no similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. The development is anticipated to be an isolated occurrence and should therefore have a negligible cumulative impact. **None**: No cumulative impact.

Once the Environmental Risk Ratings have been evaluated for each potential ecological impact, the Significance Score of each potential ecological impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential ecological impact as per Table 4 below. The Environmental Significance rating process is completed for all identified potential ecological impacts both before and after implementation of the recommended mitigation measures.

Table 4: Scale used for the evaluation of the Environmental Significance Ratings

Environmental Significance Score	Environmental Significance Rating	Description/Criteria
125 – 150	Very high	An impact of very high significance after mitigation will mean that the development may not take place. The impact cannot be suitably reduced and mitigated to within acceptable levels.
100 – 124	High	An impact of high significance after mitigation should influence a decision about whether or not to proceed with the development. Additional, impact-specific mitigation measures must be implemented if the continuation of the development is to be considered.
75 – 99	Medium-high	Additional, impact-specific mitigation measures must be implemented for an impact of medium-high significance if the continuation of the development is to be considered.
50 – 74	Medium	An impact of medium significance after mitigation must be adequately managed in accordance with the mitigation measures provided by the specialist.
< 50	Low	If any mitigation measures are provided by the specialist for an impact of low significance after mitigation, the impact must be adequately managed in accordance with these measures.
+	Positive impact	A positive impact is likely to result in a beneficial consequence/effect and should therefore be viewed as a motivation for the development to proceed.

Wetlands/watercourses were identified and delineated within the proposed development area if present, as per the methodology described below:

For the purposes of this investigation a wetland was defined according to the definition in the National Water Act (Act 36 of 1998) as: “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

In 2005 DWAF published a wetland delineation procedure in a guideline document titled “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”. Guidelines for the undertaking of biodiversity assessments exist. These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments.

The wetland delineation procedure identifies the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas. This constitutes the part of the wetland that might remain flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.

The guidelines also state that the locating of the outer edge of the temporary zone must make use of four specific indicators namely:

- terrain unit indicator,
- soil form indicator,
- soil wetness indicator and
- vegetation indicator.

In addition, the wetland/watercourse and a protective buffer zone beginning from the outer edge of the wetland temporary zone, was designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of the wetland temporary zone, was implemented and designated as sensitive within which no development must be allowed to occur.

6. Assessment Area

The assessment area consists of a single footprint area of approximately 153 ha in size. The assessment area is situated on the Remaining Extent of the Farm Brandfort Townlands no 720 (SG 21 Digit Code: F00600000000072000000) within the township of Majwemasweu, which is located directly adjacent north of the town of Brandfort. The town forms part of the Masilonyana Local Municipality which in turn, forms part of the Lejweleputswa District Municipality, Free State Province. Access is obtained by way of the R 30 provincial road from the south.

See locality map below (see A3 sized map in the Appendices).

Figure 1: Locality map illustrating the assessment area

6.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 561 mm (www.climate-data.org). The maximum average monthly temperature is approximately 22.3°C in the summer months while the minimum average monthly temperature is approximately 6°C during the winter (www.climate-data.org). Maximum daily temperatures can reach up to 29.9°C in the summer months and dip to as low as -3.3°C during the winter (www.climate-data.org).

6.2. Geology and Soils

According to Mucina & Rutherford (2006) the geology of the landscape and associated vegetation type can be described as the following:

Aeolian and colluvial sand overlaying sandstone, mudstone and shale of the Karoo Supergroup as well as the older Ventersdorp Supergroup. Soils are mainly Avalon, Westleigh and Clovelly.

6.3. Vegetation and Conservation Status

Vegetation Types

According to SANBI (2006-2019), the entire assessment area falls within the Vaal-Vet Sandy Grassland vegetation type (Gh 10), which is characterised by a plains-dominated landscape, with some scattered, slightly irregular undulating plains and hills. The vegetation usually consists of low tussock grasslands with an abundant karroid element. Dominance of the grass species *Themeda triandra* is an important feature of the natural condition of this vegetation type while localised lower cover of this species and an associated increase in cover of grass species such as *Elionurus muticus, Cymbopogon pospischilii* and *Aristida congesta* is usually an indication of heavy grazing and/or erratic rainfall.

This vegetation type is classified as Endangered (SANBI, 2006-2019).

The Vaal-Vet Sandy Grassland vegetation type (Gh 10) is also officially classified as a nationally listed Endangered ecosystem type in accordance with the Department of Environmental Affairs' (DEA) List of Nationally Threatened Ecosystems (Government Gazette No 34809, 9 December 2011). This in turn, also renders the entire vegetation type a priority ecosystem type for conservation on a national scale.

Conservation Status

The entire assessment area falls within an Ecological Support Area two (ESA 2) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province. ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

See vegetation and conservation status maps below (see A3 sized maps in the Appendices).

EcoFocus Consulting (Pty) Ltd
Registration : 2017/223847/07
7 Edenglen, Waterberg Street, Langenhovenpark, Bloemfontein, 9330
T 072 230 9598
E ajhlamprecht@gmail.com

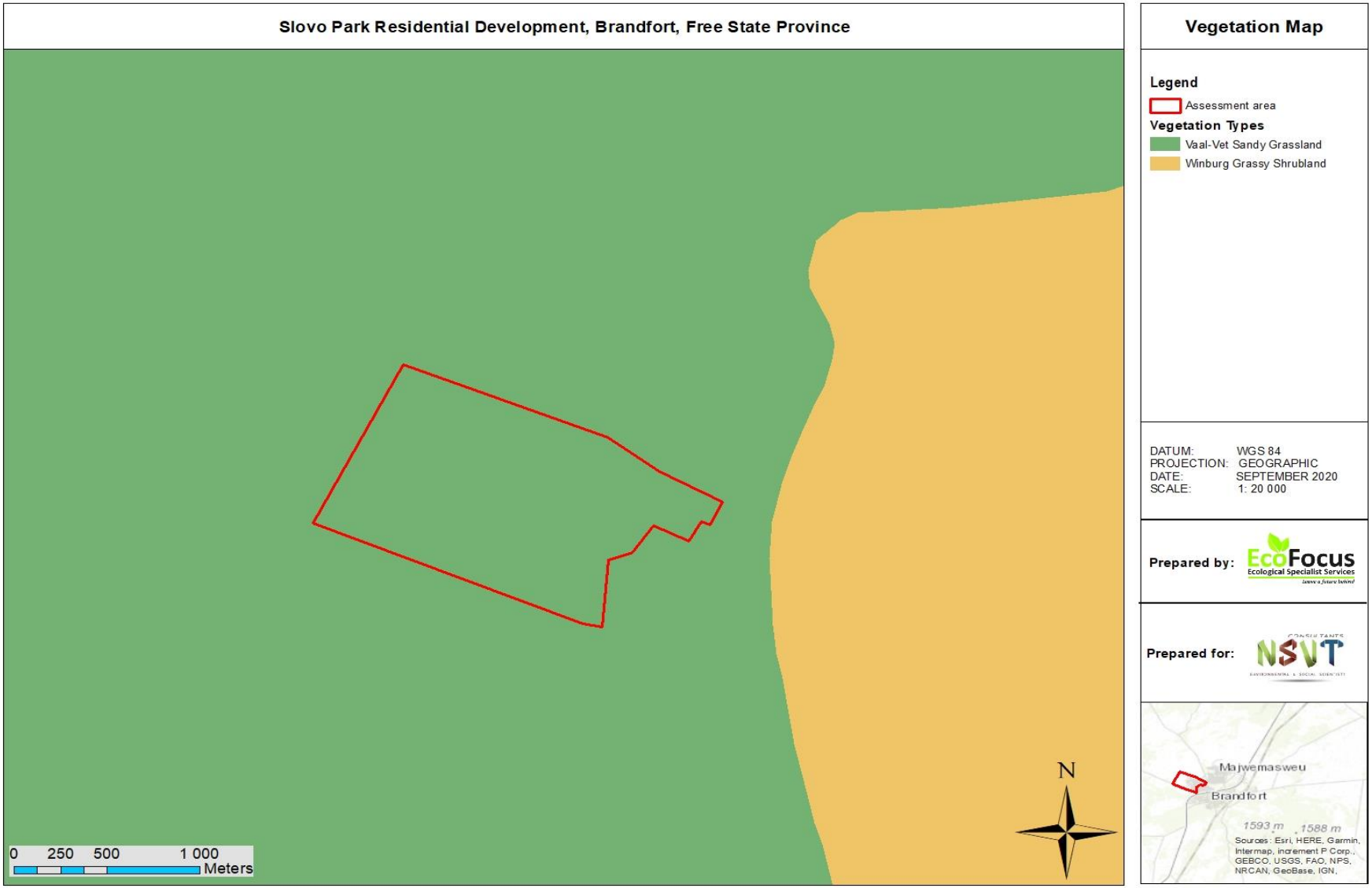

Figure 2: Vegetation map illustrating the vegetation type associated with the assessment area

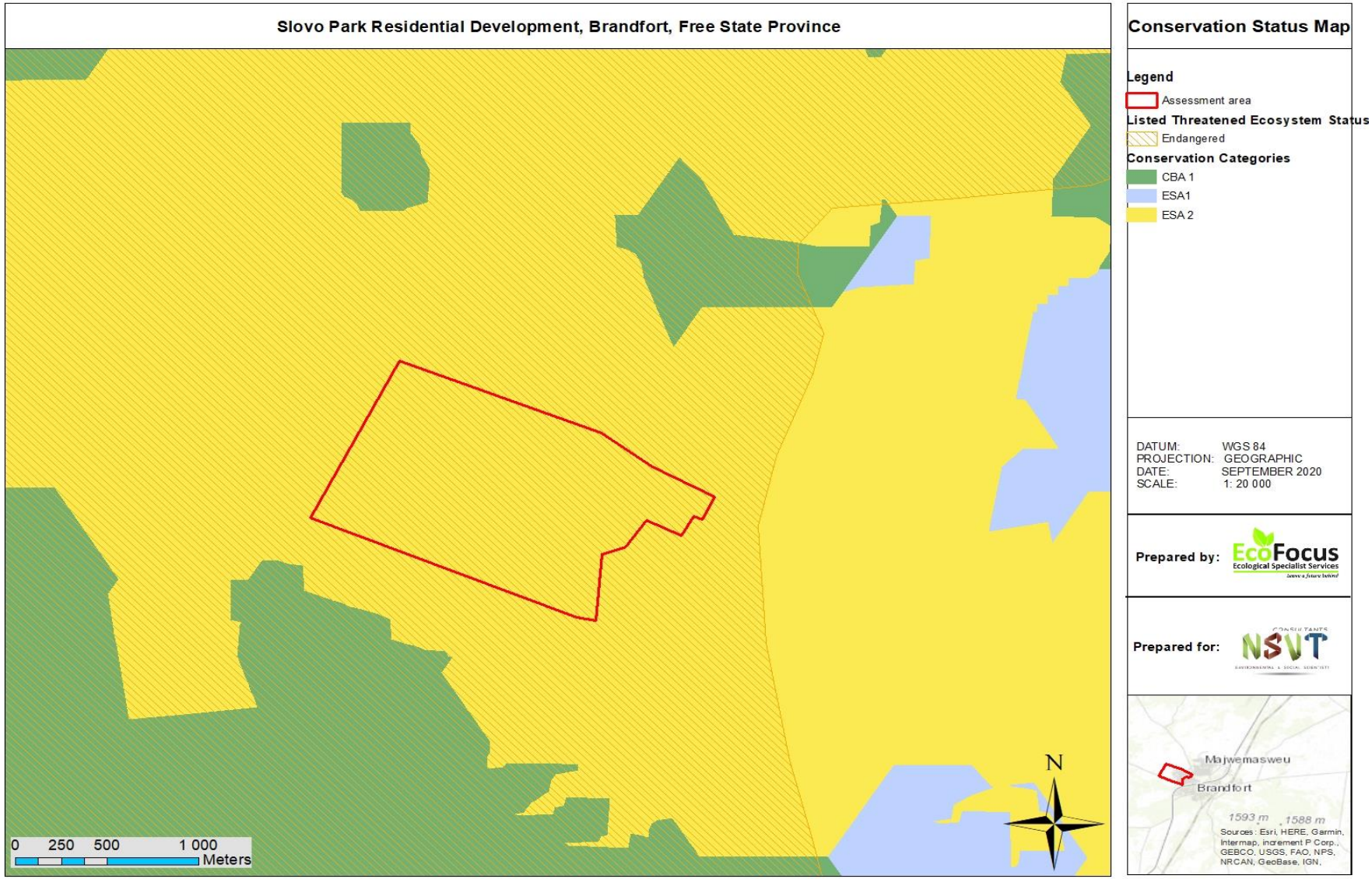

Figure 3: Conservation status map illustrating the conservation statuses associated with the assessment area

7. Assumptions, Uncertainties and Gaps in Knowledge

Various assumptions need to be made during the assessment process at the hand of the relevant specialist. It is therefore assumed that:

- an Environmental Authorisation was historically obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), for the existing informal residential expansion within the central and eastern portions of the assessment area
    - this is in accordance with the information received from the EAP.
- all relevant project information provided by the applicant to the ecological specialist was correct and valid at the time that it was provided.
- the proposed development area and design layouts as provided by the applicant, is correct and will not be significantly deviated from as this was the only area assessed.
- the public, local communities, relevant organs of state and landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed development during the EIA process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed development is based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints.
- the EIA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts associated with the construction and operational phases of the proposed development.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making.

Given that an EIA process involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the process, namely process-related and prediction-related.

- Uncertainty of prediction is critical at the data collection phase as observations and conclusions are made, only based on professional specialist opinion. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the EIA process. Continual two way communication and

coordination between EAP's and relevant authorities should however decrease the uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.

- The principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed development and the subsequent public reaction/opinion which will be received during the Public Participation Process (PPP).

Gaps in knowledge can be attributed to:

- The ecological assessment process was undertaken prior to the availing of certain information which would only be derived from the final development design and layout. The design layouts for the proposed residential development, had not been finalised yet at the time of the ecological assessment.
- Extensive existing residential transformation is evident within the local and broader surrounding areas surrounding the assessment area. The potential of future similar developments in the same geographical area, which could lead to further cumulative impacts, cannot be meaningfully anticipated. It is however highly likely and expected that further similar residential developments will take place in the broader area, over time.

EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner based on professional specialist opinion.

8. Results and Discussion

The assessment area consists of a single footprint area of approximately 153 ha in size. The proposed mixed residential/commercial development will in all probability completely transform the majority of the remaining natural surface vegetation within the assessment area.

8.1. Central and Eastern Portions of the Assessment Area

8.1.1. Current Existing Vegetation and Site Description

The entire central and eastern portions of the assessment area are occupied by an existing dense informal residential settlement, which has virtually completely transformed all previously existing natural surface vegetation. The remaining sparse vegetation present on most of the informal residential properties within the central and eastern portions of the assessment area, mainly consists of exotic and/or weeds and legally declared alien invasive species which serve ornamental-, consumption- and/or shading purposes. Small and medium sized tree individuals of the legally declared invasive species *Prosopis glandulosa* (Category 3) and the species *Vachellia karroo* are mostly scattered throughout the existing informal residential settlement portion. The assessment area is also completely isolated to the east by the existing Majwemasweu township.

The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the central and eastern portions of the assessment area, is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the central and eastern portions of the assessment area, will therefore not be practicably feasible.

No Red Data Listed-, provincially- or nationally protected species or any other species of conservational significance were found to be present within the central and eastern portions of the assessment area. The relevant Vaal-Vet Sandy Grassland vegetation type (Gh 10) associated with the assessment area, however usually houses numerous provincially protected species and it is therefore reasonably expected that the central and eastern portions of the assessment area would likely historically have housed individuals of such species.

The central and eastern portions of the assessment area do not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731). No conservationally significant or important bird species or locally distinct habitats were observed during the site assessment or are necessarily expected to utilise the central and eastern portions of the assessment area for breeding, foraging and/or persistence purposes.

The assessment area gently slopes in a westerly and south-westerly direction. A number of small first-order ephemeral water drainage lines therefore historically traversed the central and eastern portions of the assessment area. The flow regimes of these drainage lines have however been significantly impeded and impacted upon by the informal residential expansion and only small intermittent portions of these drainage lines still remain. Surface water flow however still takes place to a limited extent, through the informal residential settlement and it is therefore recommended that an adequate Erosion and Stormwater Management Plan be implemented during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to ensure continued surface water runoff flow within the broader water catchment and drainage area.

See photographs below.

Figure 4: Three images illustrating examples of the completely transformed landscape of the central and eastern portions of the assessment area, which is occupied by an existing dense informal residential settlement; the remaining small intermitted flow paths of some of the historic water drainage lines are also still evident

8.1.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the central and eastern portions of the assessment area is classified as Class F as it is critically/extremely modified. Transformation has reached a critical level and the ecosystem has been completely modified with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is deemed irreversible.

The historic Ecological Importance and Sensitivity (EIS) of the central and eastern portions of the assessment area would probably have been classified as Class C (moderate) as this area could have been viewed as being ecologically important and sensitive on local or possibly provincial scale. The area forms part of an Ecological Support Area two (ESA 2) and the broader surface water catchment and drainage area and would in all probability, historically have housed natural vegetation associated with the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10), which also usually houses numerous provincially protected species.

The central and eastern portions of the assessment area would therefore historically probably merely have been viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2), provincially protected species as well as the broader surface water catchment and drainage area. An Environmental Authorisation was however historically obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), for the existing informal residential expansion within the central and eastern portions of the assessment area. This is in accordance with the information received from the EAP.

8.2. Western Portion of the Assessment Area

The western portion of the assessment area along with the localised surrounding areas to the north, west and south, are currently undeveloped and constitute an open medium-height grassland landscape. The entire western portion of the assessment area and broader surrounding areas are however situated on old historically cultivated agricultural lands. Slight to moderate historic and continued long-term overgrazing of the subsequently established grassland, by livestock from the local community and subsequent sparse bush encroachment, is also evident. Confined portions of the area had been burnt at the time of the site assessment and it is reasonably assumed that the area is likely anthropogenically burnt on a regular basis.

The grassland landscape within the western portion of the assessment area is therefore not reminiscent of the natural climactic state of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10).

8.2.1. Current Existing Vegetation and Site Description

The grass species *Aristida spp., Eragrostis chloromelas, E gummiflua* and *Cynodon dactylon* are all well-represented and dominant within different areas of the western portion of the assessment area, which reiterates the historically disturbed and overgrazed state of the areas. Other grass species also found to be well-represented include *Eragrostis curvula, Aristida bipartita, Pogonarthria squarrosa, Heteropogon contortus, Melinis repens* and *Trichoneura grandiglumis.* Grass species found to be very sparsely present include *Themeda triandra, Cymbopogon pospischilii, Digitaria argyrograpta, Eragrostis superba* while the species *Hyparrhenia hirta* is merely present in small, very sparsely scattered isolated clumps.

It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local community in order to prevent continued significant overgrazing of surrounding undeveloped areas and to attempt to improve/restore the ecological condition, over time.

Small tree and shrub individuals of the woody species *Vachellia karroo, Searsia lancea, Asparagus sp.* as well as the legally declared invasive species *Prosopis glandulosa* (Category 3) are merely sparsely scattered throughout the grassland. It is recommended that all individuals of the identified alien invasive species must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014.

Due to the historic cultivation impact within the broader area, the western portion of the assessment area does not necessarily house a diverse forb or karroid shrub layer. Species found to be present mainly include *Felicia filifolia, F muricata, Nidorella anomala, Conyza bonariensis, Salvia runcinata, Ursinia nana, Blepharis mitrata, Suaeda fruticosa, Sesamum triphyllum, Melolobium candicans, Ledebouria marginata, Moraea pallida, Ruschia hamata* and *Phyla nodiflora.*

Individuals of the provincially protected species *Helichrysum nudifolium* were also found to be very sparsely present (≤ 15 individuals). A Provincial Flora Permit has to be obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), prior to the removal of any individuals of this species or any other provincially protected species individuals within the assessment area.

No Red Data Listed-, other provincially- or nationally protected species or any other species of conservational significance were found to be present within the western portion of the assessment area. The relevant Vaal-Vet Sandy Grassland vegetation type (Gh 10) associated with the assessment area, however usually houses numerous provincially protected species and it is therefore reasonably expected that the western portion of the assessment area would likely historically have housed individuals of such species. It is therefore recommended that an additional ecological walkthrough be conducted, prior to the commencement of the proposed development, during the flowering period of underground bulb plant species. This will ensure that no provincially protected or other conservationally significant species have potentially been omitted.

The western portion of the assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731).
No conservationally significant or important bird species or locally distinct habitats were observed during the site assessment or are necessarily expected to utilise the western portion of the assessment area for breeding, foraging and/or persistence purposes. Only common local resident bird species were found to be present.

No conservationally significant or important faunal species or locally distinct habitats were observed during the site assessment. Due to the presence of the existing informal residential settlement along with the continued long-term overgrazing by livestock from the local community, the western portion of the assessment area as well as the surrounding undeveloped areas, are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any conservationally significant or important faunal species would necessarily utilise the western portion of the assessment area or the surrounding undeveloped areas for breeding, foraging and/or persistence purposes, or would necessarily have historically utilised the central and eastern portions of the assessment area. Sporadic dens of burrowing mammals were however observed during the site assessment. The mobility of any such faunal species along with the vast, continuous surrounding undeveloped landscape to the north, west and south, also allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas.

See photographs below.

Figure 5: Three images illustrating examples of the historically cultivated and disturbed open medium-height grassland landscape associated with the western portion of the assessment area

The remnants of the small ephemeral water drainage lines, which historically traversed the central and eastern portions of the assessment area, continue to flow into the western grassland portion of the assessment area, to a limited extent. Two of these drainage lines eventually dissipate into the western grassland while the rest join two larger more significant first-order ephemeral water drainage lines, which flow along the northern/western- and the southern boundaries of the assessment area respectively. These two larger more significant drainage lines are viewed as playing an important role in the local water catchment and drainage towards the west and south-west.

Due to the lack of continuous water flow through the assessment area, these two larger more significant drainage lines possess no distinct riparian zone or significant variation in vegetation species composition relative to the surrounding grassland landscape. A significant increase in small to medium sized woody tree and shrub density of the species *Vachellia karroo* and *Searsia lancea* and to a lesser extent, the legally declared invasive species *Prosopis glandulosa* (Category 3), is however evident within and directly surrounding these two larger more significant drainage lines. A single medium sized tree individual of the exotic species *Schinus mole* as well as two small shrub individuals of the woody species *Buddleja saligna* were also found to be present within the southerly situated drainage line. The presence of the grass species *Themeda triandra* is significantly increased while the grass species *Setaria sphacelata* is also diagnostically present within and directly surrounding the two larger more significant drainage lines as well as the smaller drainage lines, which join them.

Although the western portion of the assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731), the larger more significant drainage lines provide locally unique and distinct woody habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are likely utilised by a wide variety of common and habitat-specific bird species for breeding, foraging and persistence purposes.

It is therefore recommended that the two larger more significant water drainage lines should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the two drainage lines and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines.

It is further recommended that an adequate Erosion and Stormwater Management Plan be implemented during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to ensure continued surface water runoff flow within the broader water catchment and drainage area.

See photographs below.

Figure 6: Three images illustrating examples of the two larger more significant ephemeral water drainage lines, which flow along the northern/western- and the southern boundaries of the assessment area respectively

8.2.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the western portion of the assessment area is classified as Class C as it is moderately modified. Moderate loss and transformation of natural habitat and biota have occurred, mainly due to the historic agricultural cultivation transformation and subsequent historic and continued long-term overgrazing by livestock from the local community, but the basic ecosystem functionality has still remained predominantly unchanged.

The Ecological Importance and Sensitivity (EIS) of the western portion of the assessment area is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on local or possibly provincial scale. The area forms part of an Ecological Support Area two (ESA 2) and the two larger more significant water drainage lines play an important role in the local water catchment and drainage.

The western portion of the assessment area is therefore merely viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2) as well as the broader surface water catchment and drainage area. It is the opinion of the specialist that the proposed development of the western portion of the assessment area should be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this ecological report must however be adequately implemented and managed for both the construction and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

8.3. Ecological Site Sensitivity Map

The site sensitivity map (see A3 sized map in the Appendices) below illustrates the boundary of the transformed central and eastern portions of the assessment area as well as the locations of the relevant water drainage lines.

EcoFocus Consulting (Pty) Ltd
Registration : 2017/223847/07
7 Edenglen, Waterberg Street, Langenhovenpark, Bloemfontein, 9330
T 072 230 9598
E ajhlamprecht@gmail.com

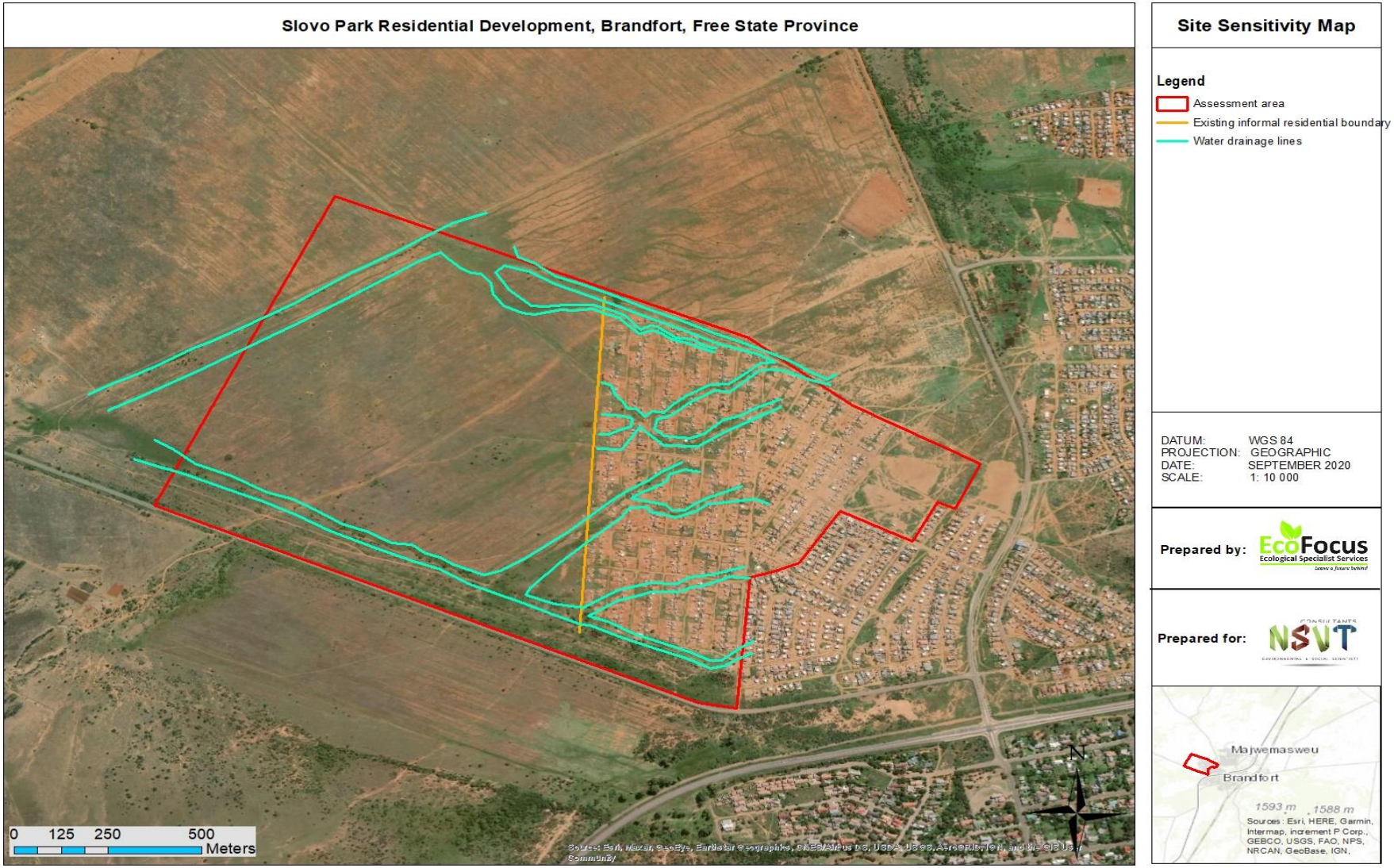

Figure 7: Site sensitivity map illustrating the boundary of the transformed central and eastern portions of the assessment area as well as the locations of the relevant water drainage lines

8.4. Species List for the Assessment Area

Table 5: Species list for the assessment area (Provincially protected species highlighted in yellow; legally declared invasive species highlighted in pink)

Graminoids	Forbs	Shrubs & trees
Aristida bipartita	*Blepharis mitrata*	*Asparagus sp.*
Aristida spp.	*Conyza bonariensis*	*Buddleja saligna*
Cymbopogon pospischilii	*Helichrysum nudifolium*	*Felicia filifolia*
Cynodon dactylon	*Ledebouria marginata*	*Felicia muricata*
Digitaria argyrograpta	*Melolobium candicans*	*Lycium ferocissimum*
Eragrostis chloromelas	*Moraea pallida*	*Prosopis glandulosa*
Eragrostis curvula	*Nidorella anomala*	*Suaeda fruticosa*
Eragrostis gummiflua	*Phyla nodiflora*	*Schinus molle*
Eragrostis superba	*Ruschia hamata*	*Searsia lancea*
Heteropogon contortus	*Salvia runcinata*	*Vachellia karroo*
Hyparrhenia hirta	*Sesamum triphyllum*	-
Melinis repens	*Ursinia nana*	-
Pogonarthria squarrosa	-	-
Setaria sphacelata	-	-
Themeda triandra	-	-
Trichoneura grandiglumis	-	-

9. Ecological Impact Assessment

The following section identifies the potential ecological impacts (both positive and negative) which the proposed development will have on the surrounding environment.

Once the potential ecological impacts are identified, they are assessed by rating their Environmental Risk after which the final Environmental Significance is calculated and rated for each identified ecological impact.

The same Environmental Risk rating process is then followed for each ecological impact to determine the Environmental Significance if the recommended mitigation measures were to be implemented.

The objective of this section is therefore firstly to identify all the potential ecological impacts of the proposed development and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance. The potential ecological impacts which are still rated as highly significant, even after implementation of mitigations, can then be identified in order to specifically focus on implement of effective management strategies for them.

9.1. Construction Phase

Transformation of vegetation on the assessment area associated with the Vaal-Vet Sandy Grassland vegetation type (Gh 10)

The assessment area consists of a single footprint area of approximately 153 ha in size. The proposed mixed residential/commercial development will in all probability completely transform the majority of the remaining natural surface vegetation within the assessment area.

According to SANBI (2006-2019), the entire assessment area falls within the Vaal-Vet Sandy Grassland vegetation type (Gh 10). This vegetation type is classified as Endangered (SANBI, 2006-2019).

The Vaal-Vet Sandy Grassland vegetation type (Gh 10) is also officially classified as a nationally listed Endangered ecosystem type in accordance with the Department of Environmental Affairs' (DEA) List of Nationally Threatened Ecosystems (Government Gazette No 34809, 9 December 2011).

The entire central and eastern portions of the assessment area are occupied by an existing dense informal residential settlement which has virtually completely transformed all previously existing natural surface vegetation. The assessment area is also completely isolated to the east by the existing Majwemasweu township. The central and eastern portions of the assessment area therefore scored a very low Present Ecological State (PES) value.

The western portion of the assessment area along with the localised surrounding areas to the north, west and south, are currently undeveloped and constitute an open medium-height grassland. The entire western portion of the assessment area and broader surrounding areas are however situated on old historically cultivated agricultural lands. Slight to moderate historic and continued long-term overgrazing of the subsequently established grassland, by livestock from the local community and subsequent sparse bush encroachment, is also evident. Confined portions of the area had been burnt at the time of the site assessment and it is reasonably assumed that the area is likely anthropogenically burnt on a regular basis.

The grassland landscape within the western portion of the assessment area is therefore not reminiscent of the natural climactic state of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10). The western portion of the assessment area therefore scored a moderate Present Ecological State (PES) value.

The significance of this potential impact was medium-high for the central and eastern portions of the assessment area but will be medium for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Transformation of an Ecological Support Area two (ESA 2) associated with the assessment area

The assessment area consists of a single footprint area of approximately 153 ha in size. The proposed mixed residential/commercial development will in all probability completely transform the majority of the remaining natural surface vegetation within the assessment area.

The entire assessment area falls within an Ecological Support Area two (ESA 2) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province.

The entire central and eastern portions of the assessment area are occupied by an existing dense informal residential settlement which has virtually completely transformed all previously existing natural surface vegetation. The assessment area is also completely isolated to the east by the existing Majwemasweu township. The central and eastern portions of the assessment area would probably have scored a moderate historic Ecological Importance and Sensitivity (EIS) value.

The central and eastern portions of the assessment area would therefore historically probably merely have been viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2), provincially protected species as well as the broader surface water catchment and drainage area.

The western portion of the assessment area along with the localised surrounding areas to the north, west and south, are currently undeveloped and constitute an open medium-height grassland. The entire western portion of the assessment area and broader surrounding areas are however situated on old historically cultivated agricultural lands. Slight to moderate historic and continued long-term overgrazing of the subsequently established grassland, by livestock from the local community and subsequent sparse bush encroachment, is also evident. Confined portions of the area had been burnt at the time of the site assessment and it is reasonably assumed that the area is likely anthropogenically burnt on a regular basis.

The grassland landscape within the western portion of the assessment area is therefore not reminiscent of the natural climactic state of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10). The western portion of the assessment area scored a moderate Ecological Importance and Sensitivity (EIS) value as the area forms part of an Ecological Support Area two (ESA 2) and the two larger more significant water drainage lines play an important role in the local water catchment and drainage.

The western portion of the assessment area is therefore merely viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2) as well as the broader surface water catchment and drainage area.

The significance of this impact was medium for the central and eastern portions of the assessment area but will be medium for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area

No Red Data Listed-, provincially- or nationally protected species or any other species of conservational significance were found to be present within the central and eastern portions of the assessment area. The relevant Vaal-Vet Sandy Grassland vegetation type (Gh 10) associated with the assessment area, however usually houses numerous provincially protected species and it is therefore reasonably expected that the central and eastern portions of the assessment area would likely historically have housed individuals of such species.

Individuals of the provincially protected species *Helichrysum nudifolium* were found to be very sparsely present (≤ 15 individuals) within the western portion of the assessment area. No Red Data Listed-, other provincially- or nationally protected species or any other species of conservational significance were found to be present within the western portion of the assessment area.

Although the central and eastern portions- as well as the western portion of the assessment area do not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731), the larger more significant drainage lines provide locally unique and distinct woody habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are likely utilised by a wide variety of common and habitat-specific bird species for breeding, foraging and persistence purposes.

No conservationally significant or important faunal species or locally distinct habitats were observed during the site assessment. Due to the presence of the existing informal residential settlement along with the continued long-term overgrazing by livestock from the local community, the western portion of the assessment area as well as the surrounding undeveloped areas, are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any conservationally significant or important faunal species would necessarily utilise the western portion of the assessment area or the surrounding undeveloped areas for breeding, foraging and/or

persistence purposes, or would necessarily have historically utilised the central and eastern portions of the assessment area. Sporadic dens of burrowing mammals were however observed during the site assessment. The mobility of any such faunal species along with the vast, continuous surrounding undeveloped landscape to the north, west and south, also allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas.

The significance of this potential impact was medium for the central and eastern portions of the assessment area but will be low for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Terrestrial and aquatic alien invasive species establishment

The remaining sparse vegetation present on most of the informal residential properties within the central and eastern portions of the assessment area, mainly consists of exotic and/or weeds and legally declared alien invasive species which serve ornamental-, consumption- and/or shading purposes. Small and medium sized tree individuals of the legally declared invasive species *Prosopis glandulosa* (Category 3) and the species *Vachellia karroo* are mostly scattered throughout the existing informal residential settlement portion.

Small tree and shrub individuals of the woody species *Vachellia karroo, Searsia lancea, Asparagus sp.* as well as the legally declared invasive species *Prosopis glandulosa* (Category 3) are merely sparsely scattered throughout the grassland within the western portion of the assessment area.

A significant increase in small to medium sized woody tree and shrub density of the species *Vachellia karroo* and *Searsia lancea* and to a lesser extent, the legally declared invasive species *Prosopis glandulosa* (Category 3), is however evident within and directly surrounding the two larger more significant drainage lines.

No other significant establishments of any alien invasive species were found to be present within the assessment area.

The assessment area and surrounding areas could however potentially be prone to significant alien invasive species establishment due to surface disturbances caused by construction activities. The presence of the numerous water drainage lines, which flow in a westerly and south-westerly

direction, could further also potentially act as significant transport/distribution vectors for numerous terrestrial and aquatic invasive species into the broader region.

The significance of this potential impact was low for the central and eastern portions of the assessment area but will be medium for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Surface material erosion

The westerly situated larger more significant water drainage line has formed erosion gullies in certain portions. No other significant soil erosion is however currently evident within or around the assessment area. The assessment area gently slopes in a westerly and south-westerly direction. The area could therefore be prone to slight soil erosion due to the loosening of materials and vegetation clearance caused by new construction activities.

The significance of this potential impact was low for the central and eastern portions of the assessment area and will also be low for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Dust generation and emissions

No signs of significant dust pollution is currently evident within or around the assessment area. The new construction activities associated with the proposed development, could however potentially result in significant fugitive dust emissions due to vegetation clearance and movement of machinery and equipment. Generated dust could spread into- and contaminate the surrounding undeveloped areas and the water drainage lines.

The significance of this potential impact was low for the central and eastern portions of the assessment area and will also be low for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Impeding and contamination of the flow regimes of the two larger more significant first-order ephemeral water drainage lines and the associated local water catchment and drainage area

The assessment area gently slopes in a westerly and south-westerly direction. A number of small first-order ephemeral water drainage lines therefore historically traversed the central and eastern portions of the assessment area. The flow regimes of these drainage lines have however been significantly impeded and impacted upon by the informal residential expansion and only small intermittent portions of these drainage lines still remain. Surface water flow however still takes place to a limited extent, through the informal residential settlement.

The remnants of these small ephemeral water drainage lines continue to flow into the western grassland portion of the assessment area, to a limited extent. Two of these drainage lines eventually dissipate into the western grassland while the rest join two larger more significant first-order ephemeral water drainage lines, which flow along the northern/western- and the southern boundaries of the assessment area respectively. These two larger more significant drainage lines are viewed as playing an important role in the local water catchment and drainage towards the west and south-west.

The activities associated with the construction phase could potentially result in contamination and impeding of natural surface water flow towards the water drainage lines due to artificial obstruction of flow during rainfall events and hydrocarbon or other chemical spills by construction machinery and equipment.

The significance of this potential impact was medium for the central and eastern portions of the assessment area and will also be medium for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.2. Operational Phase

Once the construction phase has been completed, the subsequent operational phase of the proposed development should not result in significant additional potential ecological impacts apart from the potential long-term ecological impacts discussed under heading 9.1. A number of potential ecological impacts identified for the construction phase, could however change in nature and increase in significance during the operational phase and will continue throughout the entire lifespan and operational phase of the proposed development. A number of lower significance new potential ecological impacts could also occur during the operational phase of the proposed development. The following continued and additional potential ecological impacts could take place during the operational phase:

Continued impeding of the flow regimes of the two larger more significant first-order ephemeral water drainage lines and the associated local water catchment and drainage area

The established residential development could potentially continuously impede on the natural surface water flow towards the water drainage lines, due to continued artificial obstruction of flow during rainfall events. This could result in gradual deterioration of the ecological integrity and -functionality of the drainage lines over time.

The significance of this potential impact will be medium for the central and eastern portions of the assessment area but medium-high for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Over-utilisation of potable water by the residential development

The established residential development will require significant volumes of potable water for domestic and commercial use. In accordance with the information received from the EAP, the development will tie into the existing municipal water, sewage and electrical infrastructure. The Masilonyana Local Municipality has confirmed that sufficient capacity is available.

The significance of this potential impact will be zero.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Sewage contamination of soil and groundwater

In accordance with the information received from the EAP, the development will tie into the existing municipal water, sewage and electrical infrastructure. The Masilonyana Local Municipality has confirmed that sufficient capacity is available.

The significance of this potential impact will be zero.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Contamination of the surrounding natural areas through domestic garbage/waste dumping

Disposing of domestic garbage/waste into the undeveloped surrounding areas, by occupants of the existing informal residential settlement, currently takes place extensively. Such anthropogenic activities tend to cause an ecological 'edge effect' which negatively impacts on the urban/rural interface area and the integrity of the surrounding undeveloped areas though expanding the negative anthropogenic footprint.

The new residential development could result in significant continued disposal and dumping of domestic waste/garbage into the surrounding undeveloped areas outside the residential footprint which could potentially have a slight to moderate negative impact on the ecological integrity and -functionality of the water drainage lines, over time.

The significance of this potential impact was low for the central and eastern portions of the assessment area but will be medium for the western portion of the assessment area.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.3. Cumulative Impacts

The entire central and eastern portions of the assessment area are occupied by an existing dense informal residential settlement which has virtually completely transformed all previously existing natural surface vegetation. The assessment area is also completely isolated to the east by the existing Majwemasweu township.

The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the central and eastern portions of the assessment area, is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the central and eastern portions of the assessment area, will therefore not be practicably feasible.

The western portion of the assessment area along with the localised surrounding areas to the north, west and south, are currently undeveloped and constitute an open medium-height grassland landscape. The entire western portion of the assessment area and broader surrounding areas are however situated on old historically cultivated agricultural lands. Slight to moderate historic and continued long-term overgrazing of the subsequently established grassland, by livestock from the local community and subsequent sparse bush encroachment, is also evident. Confined portions of the area had been burnt at the time of the site assessment and it is reasonably assumed that the area is likely anthropogenically burnt on a regular basis.

The grassland landscape within the western portion of the assessment area is therefore not reminiscent of the natural climactic state of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10).

Transformation of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10) and Ecological Support Area two (ESA 2) as well as the impeding and contamination of the flow regimes of the two larger more significant first-order ephemeral water drainage lines and the associated local water catchment and drainage area, were identified and addressed during the construction phase as significant potential long-term ecological impacts, associated with the proposed development. These impacts could cumulatively add to existing negative impacts caused by the Majwemasweu township within the broader local landscape to the east.

It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that these potential cumulative ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels by implementation of the recommended mitigation measures.

It is therefore not anticipated that the proposed development will necessarily add any significant residual cumulative ecological impacts to the surrounding environment if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to any commencement.

9.4. Risk Ratings of Potential Impacts

The following section provides the Environmental Risk as well as the Environmental Significance Ratings for the potential ecological impacts for the proposed development both before and after implementation of the recommended mitigation measures.

9.4.1. Construction Phase

Table 6: Environmental Risk and Significance Ratings

	Central and Eastern portions of the Assessment Area	Western Portion of the Assessment Area
Identified Environmental Impact	**Transformation of vegetation on the assessment area associated with the Vaal-Vet Sandy Grassland vegetation type (Gh 10)**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Irreversible (5)	Low (4)
Probability of Impact Occurrence	Definite (5)	Medium (3)
Cumulative Impact Rating prior to mitigation	Medium-High	Medium
Environmental Significance Score and Rating prior to mitigation	Medium-High (90)	Medium (51)

Mitigation Measures to be implemented	The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the central and eastern portions of the assessment area, is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the central and eastern portions of the assessment area, will therefore not be practicably feasible. The new development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. No site construction basecamps may be established within the surrounding undeveloped areas outside the proposed development footprint. Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the surrounding undeveloped areas outside the cordoned off area. Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities. Existing roads and farm tracks in close proximity to the proposed development construction footprint area must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented within the surrounding undeveloped areas outside the proposed development footprint area.

	It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local community in order to prevent continued significant overgrazing of surrounding undeveloped areas and to attempt to improve/restore the ecological condition, over time.	
Cumulative Impact Rating after mitigation implementation	Medium	Low
Environmental Significance Score and Rating after mitigation implementation	Medium (57)	Low (42)
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Transformation of an Ecological Support Area two (ESA 2) associated with the assessment area**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Low (4)	Low (4)

Probability of Impact Occurrence	High (4)	Medium (3)
Cumulative Impact Rating prior to mitigation	Medium	Medium
Environmental Significance Score and Rating prior to mitigation	Medium (72)	Medium (54)
Mitigation Measures to be implemented	The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the central and eastern portions of the assessment area, is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the central and eastern portions of the assessment area, will therefore not be practicably feasible. It is recommended that the two larger more significant water drainage lines should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the two drainage lines and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines. It is further recommended that an adequate Erosion and Stormwater Management Plan be implemented during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to ensure continued surface water runoff flow within the broader water catchment and drainage area. It is also recommended that the development design layout for the new residential development should include adequate storm water management measures to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines.	

	The storm water management measures incorporated into the development layout designs should be inspected on a minimum biannual basis (twice a year). They must be adequately maintained to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines to ensure their continued flow and subsequent ecological functionality and –integrity. The new development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. No site construction basecamps may be established within the surrounding undeveloped areas outside the proposed development footprint. Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the surrounding undeveloped areas outside the cordoned off area. Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities. Existing roads and farm tracks in close proximity to the proposed development construction footprint area must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented within the surrounding undeveloped areas outside the proposed development footprint area.

	It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local community in order to prevent continued significant overgrazing of surrounding undeveloped areas and to attempt to improve/restore the ecological condition, over time.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (32)	Low (28)
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)

Reversibility of Impact	Irreversible (5)	Low (4)
Probability of Impact Occurrence	Medium (3)	Low (2)
Cumulative Impact Rating prior to mitigation	Medium	Low
Environmental Significance Score and Rating prior to mitigation	Medium (54)	Low (34)
Mitigation Measures to be implemented	A Provincial Flora Permit has to be obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), prior to the removal of any provincially protected species individuals within the assessment area. It is recommended that an additional ecological walkthrough be conducted, prior to the commencement of the proposed development, during the flowering period of underground bulb plant species. This will ensure that no provincially protected or other conservationally significant species have potentially been omitted. The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the central and eastern portions of the assessment area, is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the central and eastern portions of the assessment area, will therefore not be practicably feasible. It is recommended that the two larger more significant water drainage lines should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the two drainage lines and no development is allowed to take place within the buffered zone. This must be done in	

	order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines. The new development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. No site construction basecamps may be established within the surrounding undeveloped areas outside the proposed development footprint. Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the surrounding undeveloped areas outside the cordoned off area. Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities. Existing roads and farm tracks in close proximity to the proposed development construction footprint area must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented within the surrounding undeveloped areas outside the proposed development footprint area. It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local community in order to prevent continued significant overgrazing of surrounding undeveloped areas and

	to attempt to improve/restore the ecological condition, over time.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (30)	Low (14)
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Terrestrial and aquatic alien invasive species establishment**	
Magnitude of Negative or Positive Impact	Low (4)	Medium (6)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	High (4)

Cumulative Impact Rating prior to mitigation	Low	Medium
Environmental Significance Score and Rating prior to mitigation	Low (45)	Medium (68)
Mitigation Measures to be implemented	It is recommended that all individuals of the identified alien invasive species must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014. Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction and operational phases. Such a management plan must be compiled by a suitably qualified and experienced ecologist. Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant alien invasive species establishment. It is recommended that the two larger more significant water drainage lines should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the two drainage lines and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines.	
Cumulative Impact Rating after mitigation implementation	Low	Low

Environmental Significance Score and Rating after mitigation implementation	Low (22)	Low (26)
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Surface material erosion**	
Magnitude of Negative or Positive Impact	Very low (2)	Low (4)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low

Environmental Significance Score and Rating prior to mitigation	Low (36)	Low (42)
Mitigation Measures to be implemented	Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to prevent any significant soil erosion in and around the assessment area. It is also recommended that the development design layout for the new residential development should include adequate storm water management measures to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines. The storm water management measures incorporated into the development layout designs should be inspected on a minimum biannual basis (twice a year). They must be adequately maintained to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines to ensure their continued flow and subsequent ecological functionality and –integrity. Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant erosion from occurring.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (11)	Low (11)

	Central and Eastern portions of the Assessment Area	Western Portion of the Assessment Area
Identified Environmental Impact	**Dust generation and emissions**	
Magnitude of Negative or Positive Impact	Very low (2)	Low (4)
Duration of Negative or Positive Impact	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Moderate (3)	Moderate (3)
Probability of Impact Occurrence	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (36)	Low (42)
Mitigation Measures to be implemented	Implement suitable dust management and prevention measures during the construction phase of the proposed development.	

	Construction areas and –roads to be sufficiently wetted down during the new construction phase in order to prevent significant fugitive dust emissions. Adequate operational procedures for machinery and equipment must be developed in order to strictly govern and restrict movement of machinery in order to avoid unnecessary fugitive dust emissions and ensure environmentally responsible construction practices and activities. Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant dust emissions.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (11)	Low (22)
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Impeding and contamination of the flow regimes of the two larger more significant first-order ephemeral water drainage lines and the associated local water catchment and drainage area**	
Magnitude of Negative or Positive Impact	Low (4)	Medium (6)

Duration of Negative or Positive Impact	Long term (4)	Short term (2)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Medium	Medium
Environmental Significance Score and Rating prior to mitigation	Medium (72)	Medium (72)
Mitigation Measures to be implemented	Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to prevent any significant contamination of the drainage lines and to ensure their continued flow and subsequent ecological functionality and –integrity. It is also recommended that the development design layout for the new residential development should include adequate storm water management measures to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines.	

	The storm water management measures incorporated into the development layout designs should be inspected on a minimum biannual basis (twice a year). They must be adequately maintained to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines to ensure their continued flow and subsequent ecological functionality and –integrity. Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant contamination from occurring. It is recommended that the two larger more significant water drainage lines should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the two drainage lines and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines. If hydrocarbons or other chemicals are to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible from the water drainage lines. Hydrocarbon and other chemical storage areas must be adequately bunded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units. Adequate hydrocarbon and other chemical storage, handling, usage and emergency spill procedures must be developed and implemented and all relevant construction personnel must be sufficient trained on- and apply these procedures during the entire construction phase.

	A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation if required, in accordance with the National Water Act (Act 36 of 1998).	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (28)	Low (28)

9.4.2. Operational Phase

Table 7: Environmental Risk and Significance Ratings

	Central and Eastern portions of the Assessment Area	Western Portion of the Assessment Area
Identified Environmental Impact	**Continued impeding of the flow regimes of the two larger more significant first-order ephemeral water drainage lines and the associated local water catchment and drainage area**	
Magnitude of Negative or Positive Impact	Low (4)	Medium (6)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Medium	Medium
Environmental Significance Score and Rating prior to mitigation	Medium (68)	Medium-High (76)

Mitigation Measures to be implemented	Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to prevent any significant contamination of the drainage lines and to ensure their continued flow and subsequent ecological functionality and –integrity. It is also recommended that the development design layout for the new residential development should include adequate storm water management measures to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines. The storm water management measures incorporated into the development layout designs should be inspected on a minimum biannual basis (twice a year). They must be adequately maintained to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines to ensure their continued flow and subsequent ecological functionality and –integrity. The recommended minimum approximately 32 m buffer which must be placed around the two drainage lines, must be adequately maintained over time. No current or future development is allowed to take place within the buffered zone. If all the recommended mitigations measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued significant impediment of the larger more significant first order ephemeral water drainage lines and the associated local water catchment and drainage area.	
Cumulative Impact Rating after mitigation implementation	Low	Low

Environmental Significance Score and Rating after mitigation implementation	Low (26)	Low (30)
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Over-utilisation of potable water by the residential development**	
Mitigation Measures to be implemented	A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation in accordance with the National Water Act (Act 36 of 1998). Only the allotted water quantities as per the approved Water Use License are to be extracted. A flow meter is to be installed in order to enable monitoring and management water consumption. Water consumption figures must be submitted to the Department of Water and Sanitation (DWS) on a regular basis in order to ensure compliance with the allotted water quantities as per the approved Water Use License. Water saving initiatives must be implemented for the residential development. Environmentally responsible water use practices and activities must be adopted for the residential development.	

	Provide training interventions for the local community on the correct environmentally responsible water use practices and activities within the residential settlement.	
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Sewage contamination of soil and groundwater**	
Mitigation Measures to be implemented	An adequate sewage management system must be installed for the proposed development within the assessment area. Adequate leakage detection and prevention systems must be installed into the sewage management system in order to detect any potential leakages and subsequent contamination of underground water. If any leakages or overflows of the sewage management system occur, the competent authority must immediately be notified and the necessary steps must be followed by the applicant to locate and remediate the source of contamination and surrounding area, as soon as practicably possible.	
	Central and Eastern portions of the Assessment Area	**Western Portion of the Assessment Area**
Identified Environmental Impact	**Contamination of the surrounding natural areas through domestic garbage/waste dumping**	
Magnitude of Negative or Positive Impact	Low (4)	Low (4)

Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Moderate (3)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Medium
Environmental Significance Score and Rating prior to mitigation	Low (42)	Medium (56)
Mitigation Measures to be implemented	An active community waste clean-up initiative will have to be implemented in order to attempt to remove and adequately dispose of existing domestic garbage/waste scattered throughout the surrounding undeveloped areas. Continued domestic garbage/waste dumping within the surrounding undeveloped areas must be prevented. Implement adequate waste collection and disposal management measures and services for the new residential development in order to prevent undesired disposal/dumping into the surrounding undeveloped areas.	

	Provide training interventions for the local community on the correct management of domestic waste/garbage within the existing residential settlement.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (11)	Low (11)

10. Summary and Conclusion

The assessment area consists of a single footprint area of approximately 153 ha in size. The proposed mixed residential/commercial development will in all probability completely transform the majority of the remaining natural surface vegetation within the assessment area.

According to SANBI (2006-2019), the entire assessment area falls within the Vaal-Vet Sandy Grassland vegetation type (Gh 10). This vegetation type is classified as Endangered (SANBI, 2006-2019).

The Vaal-Vet Sandy Grassland vegetation type (Gh 10) is also officially classified as a nationally listed Endangered ecosystem type in accordance with the Department of Environmental Affairs' (DEA) List of Nationally Threatened Ecosystems (Government Gazette No 34809, 9 December 2011).

The entire assessment area falls within an Ecological Support Area two (ESA 2) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province.

Central and Eastern Portions of the Assessment Area

The entire central and eastern portions of the assessment area are occupied by an existing dense informal residential settlement, which has virtually completely transformed all previously existing natural surface vegetation. The remaining sparse vegetation present on most of the informal residential properties within the central and eastern portions of the assessment area, mainly consists of exotic and/or weeds and legally declared alien invasive species which serve ornamental-, consumption- and/or shading purposes. Small and medium sized tree individuals of the legally declared invasive species *Prosopis glandulosa* (Category 3) and the species *Vachellia karroo* are mostly scattered throughout the existing informal residential settlement portion. The assessment area is also completely isolated to the east by the existing Majwemasweu township. The central and eastern portions of the assessment area therefore scored a very low Present Ecological State (PES) value.

The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the central and eastern portions of the assessment area, is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within the central and eastern portions of the assessment area, will therefore not be practicably feasible.

No Red Data Listed-, provincially- or nationally protected species or any other species of conservational significance were found to be present within the central and eastern portions of the assessment area. The relevant Vaal-Vet Sandy Grassland vegetation type (Gh 10) associated with the assessment area, however usually houses numerous provincially protected species and it is therefore reasonably expected that the central and eastern portions of the assessment area would likely historically have housed individuals of such species.

The central and eastern portions of the assessment area do not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731). No conservationally significant or important bird species or locally distinct habitats were observed during the site assessment or are necessarily expected to utilise the central and eastern portions of the assessment area for breeding, foraging and/or persistence purposes.

The assessment area gently slopes in a westerly and south-westerly direction. A number of small first-order ephemeral water drainage lines therefore historically traversed the central and eastern portions of the assessment area. The flow regimes of these drainage lines have however been significantly impeded and impacted upon by the informal residential expansion and only small intermittent portions of these drainage lines still remain. Surface water flow however still takes place to a limited extent, through the informal residential settlement and it is therefore recommended that an adequate Erosion and Stormwater Management Plan be implemented during the construction and operational phases of the proposed development. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the west and south-west in order to ensure continued surface water runoff flow within the broader water catchment and drainage area. It is also recommended that the development design layout for the new residential development should include adequate storm water management measures to ensure that sufficient volumes and quality of surface water runoff from the footprint area is still channelled towards the water drainage lines.

The central and eastern portions of the assessment area would probably have scored a moderate historic Ecological Importance and Sensitivity (EIS) value. The central and eastern portions of the assessment area would therefore historically probably merely have been viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality

persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2), provincially protected species as well as the broader surface water catchment and drainage area.

Western Portion of the Assessment Area

The western portion of the assessment area along with the localised surrounding areas to the north, west and south, are currently undeveloped and constitute an open medium-height grassland landscape. The entire western portion of the assessment area and broader surrounding areas are however situated on old historically cultivated agricultural lands. Slight to moderate historic and continued long-term overgrazing of the subsequently established grassland, by livestock from the local community and subsequent sparse bush encroachment, is also evident. Confined portions of the area had been burnt at the time of the site assessment and it is reasonably assumed that the area is likely anthropogenically burnt on a regular basis.

The grassland landscape within the western portion of the assessment area is therefore not reminiscent of the natural climactic state of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10). The western portion of the assessment area therefore scored a moderate Present Ecological State (PES) value.

The grass species *Aristida spp., Eragrostis chloromelas, E gummiflua* and *Cynodon dactylon* are all well-represented and dominant within different areas of the western portion of the assessment area, which reiterates the historically disturbed and overgrazed state of the areas.

It is recommended that a sufficient grazing management plan and practices must be implemented for livestock of the local community in order to prevent continued significant overgrazing of surrounding undeveloped areas and to attempt to improve/restore the ecological condition, over time.

Small tree and shrub individuals of the woody species *Vachellia karroo, Searsia lancea, Asparagus sp.* as well as the legally declared invasive species *Prosopis glandulosa* (Category 3) are merely sparsely scattered throughout the grassland. It is recommended that all individuals of the identified alien invasive species must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014.

Due to the historic cultivation impact within the broader area, the western portion of the assessment area does not necessarily house a diverse forb or karroid shrub layer. Individuals of the provincially protected species *Helichrysum nudifolium* were also found to be very sparsely present (≤ 15 individuals). A Provincial Flora Permit has to be obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), prior to the removal of any individuals of this species or any other provincially protected species individuals within the assessment area

No Red Data Listed-, other provincially- or nationally protected species or any other species of conservational significance were found to be present within the western portion of the assessment area. The relevant Vaal-Vet Sandy Grassland vegetation type (Gh 10) associated with the assessment area, however usually houses numerous provincially protected species and it is therefore reasonably expected that the western portion of the assessment area would likely historically have housed individuals of such species. It is therefore recommended that an additional ecological walkthrough be conducted, prior to the commencement of the proposed development, during the flowering period of underground bulb plant species. This will ensure that no provincially protected or other conservationally significant species have potentially been omitted.

The western portion of the assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731).
No conservationally significant or important bird species or locally distinct habitats were observed during the site assessment or are necessarily expected to utilise the western portion of the assessment area for breeding, foraging and/or persistence purposes. Only common local resident bird species were found to be present.

No conservationally significant or important faunal species or locally distinct habitats were observed during the site assessment. Due to the presence of the existing informal residential settlement along with the continued long-term overgrazing by livestock from the local community, the western portion of the assessment area as well as the surrounding undeveloped areas, are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any conservationally significant or important faunal species would necessarily utilise the western portion of the assessment area or the surrounding undeveloped areas for breeding, foraging and/or persistence purposes, or would necessarily have historically utilised the central and eastern portions

of the assessment area. Sporadic dens of burrowing mammals were however observed during the site assessment. The mobility of any such faunal species along with the vast, continuous surrounding undeveloped landscape to the north, west and south, also allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas.

The remnants of the small ephemeral water drainage lines, which historically traversed the central and eastern portions of the assessment area, continue to flow into the western grassland portion of the assessment area, to a limited extent. Two of these drainage lines eventually dissipate into the western grassland while the rest join two larger more significant first-order ephemeral water drainage lines, which flow along the northern/western- and the southern boundaries of the assessment area respectively. These two larger more significant drainage lines are viewed as playing an important role in the local water catchment and drainage towards the west and south-west.

Due to the lack of continuous water flow through the assessment area, these two larger more significant drainage lines possess no distinct riparian zone or significant variation in vegetation species composition relative to the surrounding grassland landscape. A significant increase in small to medium sized woody tree and shrub density of the species *Vachellia karroo* and *Searsia lancea* and to a lesser extent, the legally declared invasive species *Prosopis glandulosa* (Category 3), is however evident within and directly surrounding these two larger more significant drainage lines. The presence of the grass species *Themeda triandra* is significantly increased while the grass species *Setaria sphacelata* is also diagnostically present within and directly surrounding the two larger more significant drainage lines as well as the smaller drainage lines, which join them.

Although the western portion of the assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731), the larger more significant drainage lines provide locally unique and distinct woody habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are likely utilised by a wide variety of common and habitat-specific bird species for breeding, foraging and persistence purposes.

It is therefore recommended that the two larger more significant water drainage lines should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the two drainage lines and no development is allowed to take place

within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines.

The western portion of the assessment area scored a moderate Ecological Importance and Sensitivity (EIS) value as the area forms part of an Ecological Support Area two (ESA 2) and the two larger more significant water drainage lines play an important role in the local water catchment and drainage.

The western portion of the assessment area is therefore merely viewed as being of low to moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, Ecological Support Area two (ESA 2) as well as the broader surface water catchment and drainage area.

Conclusion

Transformation of the relevant nationally Endangered Vaal-Vet Sandy Grassland vegetation type (Gh 10) and Ecological Support Area two (ESA 2) as well as the impeding and contamination of the flow regimes of the two larger more significant first-order ephemeral water drainage lines and the associated local water catchment and drainage area, were identified and addressed during the construction phase as significant potential long-term ecological impacts, associated with the proposed development. These impacts could cumulatively add to existing negative impacts caused by the Majwemasweu township within the broader local landscape to the east.

It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that these potential ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels by implementation of the recommended mitigation measures

The proposed development of the assessment area should therefore be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this ecological report must however be adequately implemented and managed for both the construction and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

11. References

Collins, N.B. 2017. Free State Province Biodiversity Plan: CBA map. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report.

Collins, N.B. 2017. Free State Province Biodiversity Plan: Technical Report v1.0. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report.

Conservation of Agricultural Resources Act (Act 43 of 1983)

Free State Nature Conservation Ordinance (No 8 of 1969)

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

National Environmental Management Act (Act 107 of 1998)

National Environmental Management: Biodiversity Act (Act 10 of 2004)

National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014

National Forests Act (Act 84 of 1998)

National Water Act (Act 36 of 1998)

South African National Biodiversity Institute (2006-2019). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors)

www.climate-data.org

12. Details of the Specialist

Adriaan Johannes Hendrikus Lamprecht (Pr.Sci.Nat)

M.Env.Sci. Ecological remediation and sustainable utilisation (NWU: Potchefstroom)

South African Council for Natural Scientific Professions (SACNASP): Professional Ecological Scientist (No 115601)

EcoFocus Consulting (Pty) Ltd

Physical Address: Edenglen number 7
Waterberg Street
Langenhovenpark
Bloemfontein, 9330

Mobile Phone: 072 230 9598

Email Address: ajhlamprecht@gmail.com

Abbreviated Curriculum Vitae

Qualifications

- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
  - 2010 - North West University Potchefstroom
- B.Sc Botany and Zoology (Cum Laude)
  - 2008 - North West University Potchefstroom

Accredited courses completed

- Implementing Environmental Management Systems ISO 14001
  - 2011 - North West University Potchefstroom
- Environmental Law for Environmental Managers
  - 2011 - North West University Potchefstroom
- SASS 5 Aquatic Biomonitoring Training Course
  - 2017 – GroundTruth Consulting

Professional registrations

- South African Council for Natural Scientific Professions **(SACNASP)**
  - Professional Ecological Scientist Registration number 115601

- International Association for Impact Assessment **(IAIA)**
    - Registration number 5232
- South African Green Industries Council (**SAGIC**) Invasive Species training
    - Registration number 2405/2459

Employment and Experience Background

Upon completion of his studies, Rikus started his career in 2011 as an **Environmental Professional in Training (PIT) at Anglo American Thermal Coal: Environmental Services.** He received environmental training and practical implementation experience in all environmental facets of the mining industry with the focus on: Environmental rehabilitation, land management (biodiversity and invasive species eradication), waste & water-, air quality-, game reserve-, environmental management and legislation, as well as corporate reporting. He was also appointed as the Biodiversity management custodian at Anglo American Thermal Coal collieries.

He was subsequently employed by **Fraser Alexander Tailings from October 2011 to the end of November 2015 as an Environmental Contracts Manager,** where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation work. He was responsible for all facets of project management, as well as implementation of rehabilitation and environmental strategies, by planning activities, organising physical, financial and human resources, delegating task responsibilities, leading people, controlling risks and providing technical support.

He conducted a significant amount of quantitative and qualitative ecological vegetation monitoring during his employment period with the company. Such monitoring mainly included environmentally rehabilitated mining areas in the open-cast coal-, gold-, platinum- and chrome mining industries situated in the Free State, Gauteng, Mpumalanga, North-West and Limpopo Provinces. He was involved with analysis, processing and interpretation of environmental monitoring data and compilation of high quality technical/scientific environmental monitoring reports for clients. He was subsequently further involved with providing adequate ecological management and maintenance recommendations for rehabilitated areas. He also provided technical/scientific environmental rehabilitation support to mining clients, with regards to sufficient soil preparation and amelioration, grassing processes, as well as grass species mixtures and ratios.

He was then employed by **Enviroworks Consulting from January 2016 to the end of May 2017 as a Senior Ecological Specialist** where he was responsible for virtually all Ecological, Aquatic and Wetland specialist assessments and reporting related to Environmental Impact Assessment (EIA) and Basic Assessment (BA) projects. He also completed numerous EIA and BA projects as the main project Environmental Assessment Practitioner (EAP).

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd, which provides high quality professional environmental and ecological specialist services and solutions to the industrial development-, construction-, mining-, agricultural and other sectors, at the end of May 2017.

He possesses significant qualifications, vast knowledge, skills and practical experience in the specialist field of ecological and environmental management. This, coupled with his disciplined, determined and goal-driven mind-set, as well as his high level of personal standards, ensure high quality, timely and outcomes based outputs and service delivery relating to any project.

Ecological & Wetland Specialist Assessment & Report Completion for the last two years

2020

- Proposed 120 ha Northern Cape Department Agriculture Hopetown Agricultural Development outside Hopetown, Northern Cape Province.
- Proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Stormwater Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- GIS Master Layout Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.

- Preliminary Ecological Specialist Findings and Opinion Letter for the proposed 294 ha Northern Cape Department Agriculture Bucklands Agricultural Development, Douglas Northern Cape Province.
- Proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.
- Proposed 2064 ha Free State Strategic Solar Project Development outside Bethulie, Free State Province.
- Proposed 7.83 ha Carpe Diem Raisins NEMA Section 24G Evaporation Pond Development project outside Upington, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 7.83 ha Carpe Diem Raisins NEMA Section 24G Evaporation Pond Development project outside Upington, Northern Cape Province.
- Desktop Protected Species and Alien Invasive Species Management Plan for a proposed Northern Cape N 8 & N 10 highway maintenance project between Britstown, Prieska, Groblershoop and Upington, Northern Cape Province.
- Proposed 10.7 ha Dikgatlong Local Municipality NEMA Section 24G residential development in Barkly West, Northern Cape Province.
- Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Tweefontein no 3344, outside Newcastle, KwaZulu-Natal Province.
- Grazing and Invasive Species Management Plan for the Farm Malpha Noord no 1063, outside Senekal, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Mizpah no 706, outside Memel, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Welgelegen no 102, outside Clarens, Free State Province.
- Proposed 2.43 ha Zeekoefontein Resort development project in Vaal Oewer, Gauteng Province.

- Grazing and Invasive Species Assessment for the Farm De Hoek no 1238, outside Bethlehem, Free State Province.
- Proposed 236 ha Northern Cape Department Agriculture Bucklands Agricultural Development outside Douglas, Northern Cape Province.
- Proposed 9.1 ha Motheo College Expansion NEMA Section 24G development in Bloemfontein, Free State Province.
- Proposed 84.7 ha Sol Plaatje Local Municipality Residential development project in Kimberley, Northern Cape Province.
- Proposed 201 ha Siyathemba Local Municipality Residential development project in Prieska, Northern Cape Province.
- Proposed 60.2 ha Siyancuma Local Municipality Residential development project in Douglas, Northern Cape Province.
- Proposed 58.9 ha Maremane Communal Property Association Residential development project in Maremane, Northern Cape Province.

2019

- Water Use License Application (WULA) Risk Assessment for a proposed Kopanong Local Municipality Bridge Upgrading development project in Philippolis, Free State Province.
- Proposed 4.9 ha Royal Vision Developments Gravel Quarry development project outside Kroonstad, Free State Province.
- Proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.
- Proposed 42.7 ha Arborlane Estates (Pty) Ltd NEMA Section 24G agricultural development project outside Augrabies, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.
- Proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.
- Watercourse delineation and report for a proposed 5.36 ha Filling Station and Shopping Centre Development project in Thaba Nchu, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.

- Grazing and Invasive Species Management Plan for the Farm Driefontein no 274, outside Ficksburg, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- GIS Master Layout Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Proposed 535 ha Farms Bultfontein & Folmink agricultural development project outside Prieska, Northern Cape Province.
- Proposed 6.42 ha Phokwane Local Municipality Residential development project in Jan Kempdorp, Northern Cape Province.
- Stormwater Management Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- GIS Master Layout Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Proposed 13.8 ha Phokwane Local Municipality Cemetery expansion project in Jan Kempdorp, Northern Cape Province.
- Proposed 19.9 ha Vergenoeg NEMA Section 24G residential development project in Wesselsbron, Free State Province.
- Proposed 20.5 ha Khalinkomo NEMA Section 24G residential development project in Wesselsbron, Free State Province.
- Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Zaaihoek no 1251, outside Vrede, Free State Province.
- Grazing and Invasive Species Management Plan for Plot 19 of the Farm Ballyduff no 1594, in Bethlehem, Free State Province.

EcoFocus Consulting (Pty) Ltd
Registration : 2017/223847/07
7 Edenglen, Waterberg Street, Langenhovenpark, Bloemfontein, 9330
T 072 230 9598
E ajhlamprecht@gmail.com

- Grazing and Invasive Species Management Plan for the Farm Mooiuitzicht no 205, outside Bethlehem, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Rietfontein no 1457, outside Bethlehem, Free State Province.
- Proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed Kopanong Local Municipality Bridge Upgrading development project in Philippolis, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Grazing and Invasive Species Management Plan for the Farm Erfenis no 1014, outside Bethlehem, Free State Province.
- Proposed 35 ha Gladiam Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Grazing and Invasive Species Management Plan for the Farms Liebenbergsvlei no 148 & Aasvogelkrans no 96, outside Bethlehem, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Dwarsberg no 350, outside Paul Roux, Free State Province.
- Proposed 50 ha Siyathemba Local Municipality residential development project in Prieska, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 35 ha Gladiam Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 35 ha Gladiam Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Stormwater Management Plan for a proposed 35 ha Gladiam Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.

- Grazing and Invasive Species Management Plan for the Farm Waterval West no 653, outside Steynsrus, Free State Province.
- Proposed 7.6 ha Annie van den Hever NEMA Section 24G agricultural development project outside Hanover, Northern Cape Province.
- Revision of a proposed 535 ha Farms Bultfontein & Folmink agricultural development project outside Prieska, Northern Cape Province.

2018

- Proposed 30 ha Portion 30 of the Farm Lilyvale no 2313 Residential development project in Bloemfontein, Free State Province.
- Proposed 20 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Proposed 19 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Proposed 135 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Five proposed Dawid Kruiper Local Municipality Residential Developments around Upington, Northern Cape Province.
- Grazing and Erosion Management Plan for the Farm Retiefs Nek no 123, outside Bethlehem, Free State Province.
- Grazing and Erosion Management Plan for the Farm Dekselfontein no 317, outside Bethlehem, Free State Province.
- Proposed 12 ha agricultural development project in Petrusville, Northern Cape Province.
- Proposed 270 ha industrial park development project in Secunda, Mpumalanga Province.
- Proposed 233 ha industrial park development project in Sabie, Mpumalanga Province.
- Proposed Dawid Kruiper Local Municipality Residential Development around Upington, Northern Cape Province.
- Two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Two Alien Invasive Species Management Plans for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 15 ha agricultural development project outside Hopetown, Northern Cape Province.
- Proposed 169 ha industrial park development project in Sabie, Mpumalanga Province.

- Grazing and Erosion Management Plan for the Farm Barnea no 231, outside Bethlehem, Free State Province.
- GIS locality, vegetation and sensitivity map for the proposed 7.13 ha Karoo Hoogland Local Municipality Residential Development project in Sutherland, Northern Cape Province.
- Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Drafting of an official Environmental Policy for Teambo Facilitators (Pty) Ltd in Bloemfontein, Free State Province.
- Proposed 11.6 ha COGHSTA NEMA Section 24G residential development project in Douglas, Northern Cape Province.
- Proposed 3.26 ha COGHSTA NEMA Section 24G residential development project in Strydenburg, Northern Cape Province.
- Proposed 25.6 ha COGHSTA NEMA Section 24G residential development project in Loxton, Northern Cape Province.
- Biodiversity offset feasibility assessment and report for a proposed 805 ha agricultural development project outside Douglas, Northern Cape Province.
- Proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Ecological exemption letter for the proposed Vanderkloof Tegnologie Chicken Abattoir development project in Petrusville, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Stormwater and Erosion Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Revision of a proposed 17.7 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Proposed 113.3 ha Dawn Valley Estate development project in Bloemfontein, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Klipfontein no 71, outside Lindley, Free State Province.

- Grazing and Invasive Species Management Plan for the Farm Meyerskop no 1801, outside Bethlehem, Free State Province.
- Proposed 2.24 ha Mullerstuine Cemetery development project in Vanderbijlpark, Gauteng Province.
- Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 5 Free State Province Sites.
- Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 6 Northern Cape Province Sites.
- Proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Proposed 545 ha residential development project in Leandra, Mpumalanga Province.
- Proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Protected Species Relocation Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Grazing Management Plan for the Farm Fairdale no 1048, outside Vrede, Free State Province.
- Proposed 14.4 ha Frankfort Landfill Site expansion project in Frankfort, Free State Province.