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Ecological Assessment Report

Farm Doorns no 131 Agricultural Development, Ritchie, Northern Cape Province

October 2018

Compiled for:

ECO-CON ENVIRONMENTAL
BECAUSE A GOOD PLANET IS HARD TO FIND

Compiled by:

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Executive Summary

The project applicant, Sorgvry Landgoed BK proposes to develop a single cultivated centre pivot land of approximately 34 ha in size on a portion of land located on Portion 34 of the Farm Doorns no 131. The farm is situated approximately 800 m west of the town of Ritchie, Northern Cape Province. The purpose of the cultivation will be for commercial rotational planting and harvesting of maize and Lucerne. An irrigation pipeline required for the centre pivot land, will tie into the existing pump and piping network which is used for irrigation of other centre pivot lands in the area. The existing piping network extracts water from the Modder River which is situated approximately 1.2 km south of the assessment area.

The assessment area is approximately 80 ha in size. The majority of the assessment area is situated on a historic centre pivot land footprint while only the north-eastern portion is situated on natural virgin soil.

Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the Environmental 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 project 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 applicant as the independent ecological specialist to conduct the required Ecological study for the proposed project. This report constitutes the Ecological Assessment. A site visit/assessment for the proposed development footprint area was conducted on 6 September 2018. This date forms part of the commencement of the new growing 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 assessment 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 Northern Cape Nature Conservation Act (Act 9 of 2009). 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 impacts of the proposed project on the surrounding natural environment were identified, evaluated and rated. The Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the proposed project area were also assessed and rated.

Study Area

The assessment area consists of a single footprint area of approximately 80 ha in size of which only a single approximately 34 ha cultivated centre pivot land will be developed. The area is situated on Portion 34 of the Farm Doorns no 131 (SG 21 Digit Code: C03700000000131000034). The farm is situated approximately 800 m west of the town of Ritchie which forms part of the Sol Plaatjie Local Municipality. This in turn, forms part of the Frances Baard District Municipality, Northern Cape Province. Access to the assessment area is obtained via the N 12 national rad and subsequent dirt road from the south-east.

According to SANBI (2006-), the entire assessment area falls within the Kimberley Thornveld vegetation type (SVk 4) which is characterised by slightly irregular plains with a well-developed woody component (tree and shrub layer). The herbaceous layer is usually open with much uncovered soils. This vegetation type is classified as least threatened because of its broad distributions and it being mostly excluded from being utilised for intensive agricultural cultivation activities (SANBI, 2006-).

The entire assessment area is categorised as a Critical Biodiversity Area two (CBA 2) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province. Critical Biodiversity Areas are areas that are irreplaceable or near-irreplaceable (CBA 1), or reflect an optimum configuration (CBA 2) for reaching provincial biodiversity targets for ecosystem types, species or ecological processes (Collins, 2017). Such an area must be maintained in a natural or near-natural state in order to meet biodiversity targets (Collins, 2017).

Results and Conclusion

The assessment area is approximately 80 ha in size on which the project applicant proposes to develop a single cultivated centre pivot land of approximately 34 ha in size. The mechanical clearance of vegetation and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing natural surface vegetation on the assessment area.

The Kimberley Thornveld vegetation type (SVk 4) associated with the assessment area, is classified as least threatened (SANBI, 2006-). Although the entire assessment area is further categorised as a Critical Biodiversity Area two (CBA 2) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), the majority of the assessment area is situated on a historic centre pivot land footprint which is not reminiscent of the natural climactic state of the relevant vegetation type. Only the north-eastern portion is situated on natural virgin soil associated with the relevant vegetation type.

No Red Data Listed, provincially- or nationally protected or any other species of conservational significance were found to be present within the entire historic centre pivot land footprint. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

The woody component of the north-eastern portion of the assessment area is mainly dominated by tree and shrub individuals of the nationally protected species *Vachellia erioloba.* Approximately 53 individuals of this species are present of which 7 are large mature individuals (≥ 7 m in height) with broad tree canopies. These broad tree canopies house significant numbers of Cape Sparrow (*Passer melanurus*) nests and possibly also Great Sparrow (*Passer motitensis*) nests, which is provincially a protected species. Two individuals of the provincially protected forb species *Boophone disticha* and a single individual of the provincially specially protected species *Harpagophytum sp.* were also found to be present within the north-eastern portion of the assessment area. It is however highly likely that there could be more individuals of these species present. It is therefore recommended that an additional ecological walkthrough of the final development footprint area be conducted prior to commencement of the project during the flowering period of underground bulb plant species. This will ensure that no provincially protected or significant species have potentially been omitted.

The historic centre pivot land footprint is not necessarily viewed as being of high conversational significance, while the north-eastern portion of the assessment area is viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and nationally/provincially protected species. It is therefore recommended that the development of the new centre pivot land be focussed within this historic centre pivot land footprint and be kept away from the north-eastern portion of the assessment area.

Due to the flat topography of the broader landscape, no significant watercourses or water drainage lines are present within the assessment area. The ecological connectivity between the assessment area and the Modder River situated approximately 1.2 km south is also virtually cut off by the existing road networks, residential and other agricultural developments.

It is the opinion of the specialist that the potentially significant ecological impacts associated with the transformation of the CBA 2, destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area, terrestrial alien invasive species establishment, alteration/contamination of soil and groundwater characteristics/quality and potential over-extraction of irrigation water from the Modder River, can be suitably reduced and mitigated to within acceptable residual levels if the recommended Alternative 1 is developed. The project should therefore be considered by the competent authority for environmental authorisation and approval. The potential ecological impacts associated with Alternative 2 will however be significantly higher than those of Alternative 1 and it is therefore not recommended that Alternative 2 be considered for development.

The proposed development may however only continue 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 project. All necessary authorisations and permits must also be obtained prior to any commencement.

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Abbreviations

CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
MAP	Mean Annual Precipitation
NCPSBP	Northern Cape Provincial Spatial Biodiversity Plan 2016
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), Eco-Con Environmental, for the proposed project
- do not have or will not have any financial interest in the undertaking of the proposed project 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 project is not linked to approval or rejection of the project by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed project
- 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, Sorgvry Landgoed BK proposes to develop a single cultivated centre pivot land of approximately 34 ha in size on a portion of land located on Portion 34 of the Farm Doorns no 131. The farm is situated approximately 800 m west of the town of Ritchie, Northern Cape Province. The purpose of the cultivation will be for commercial rotational planting and harvesting of maize and Lucerne. An irrigation pipeline required for the centre pivot land, will tie into the existing pump and piping network which is used for irrigation of other centre pivot lands in the area. The existing piping network extracts water from the Modder River which is situated approximately 1.2 km south of the assessment area.

The assessment area is approximately 80 ha in size. The majority of the assessment area is situated on a historic centre pivot land footprint while only the north-eastern portion is situated on natural virgin soil.

Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the Environmental 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 project 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 applicant as the independent ecological specialist to conduct the required Ecological study for the proposed project. This report constitutes the Ecological Assessment.

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

- Georeferenced spatial information was obtained of the proposed project 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 proposed footprint area.

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2. Date and Season of Ecological Site Assessment

A site visit/assessment for the proposed development footprint area was conducted on 6 September 2018. This date forms part of the commencement of the new growing season. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

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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 Impact Assessment of the proposed project 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:

- Identify and list significant faunal and floral species encountered on the proposed project area and list any protected and/or Red Data Listed species.
- Determine and discuss the present condition and extent of degradation and/or transformation of the vegetation on the proposed project area.
- Determine and discuss the ecological sensitivity and significance of the proposed project area.
- Identify and delineate all watercourses/wetland areas potentially present on the proposed project area.
- Identify, evaluate and rate the potential impacts of the proposed project on the natural environment.
- Provide recommendations on mitigation and management measures in order to attempt to reduce/alleviate these identified potential impacts.
- Provide recommendations on the suitability of the potential development area.
- A digital report (this document) as well as the digital KML files of any identified sensitive areas will be provided to the applicant.

5. Methodology

- The proposed assessment 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 Northern Cape Nature Conservation Act (Act 9 of 2009).
- 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 project 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.

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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 project area was 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 impacts of the proposed project 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 environmental 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 on the proposed project area 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. Study Area

The assessment area consists of a single footprint area of approximately 80 ha in size of which only a single approximately 34 ha cultivated centre pivot land will be developed. The area is situated on Portion 34 of the Farm Doorns no 131 (SG 21 Digit Code: C03700000000131000034). The farm is situated approximately 800 m west of the town of Ritchie which forms part of the Sol Plaatjie Local Municipality. This in turn, forms part of the Frances Baard District Municipality, Northern Cape Province. Access to the assessment area is obtained via the N 12 national rad and subsequent dirt road from the south-east.

See locality map below.

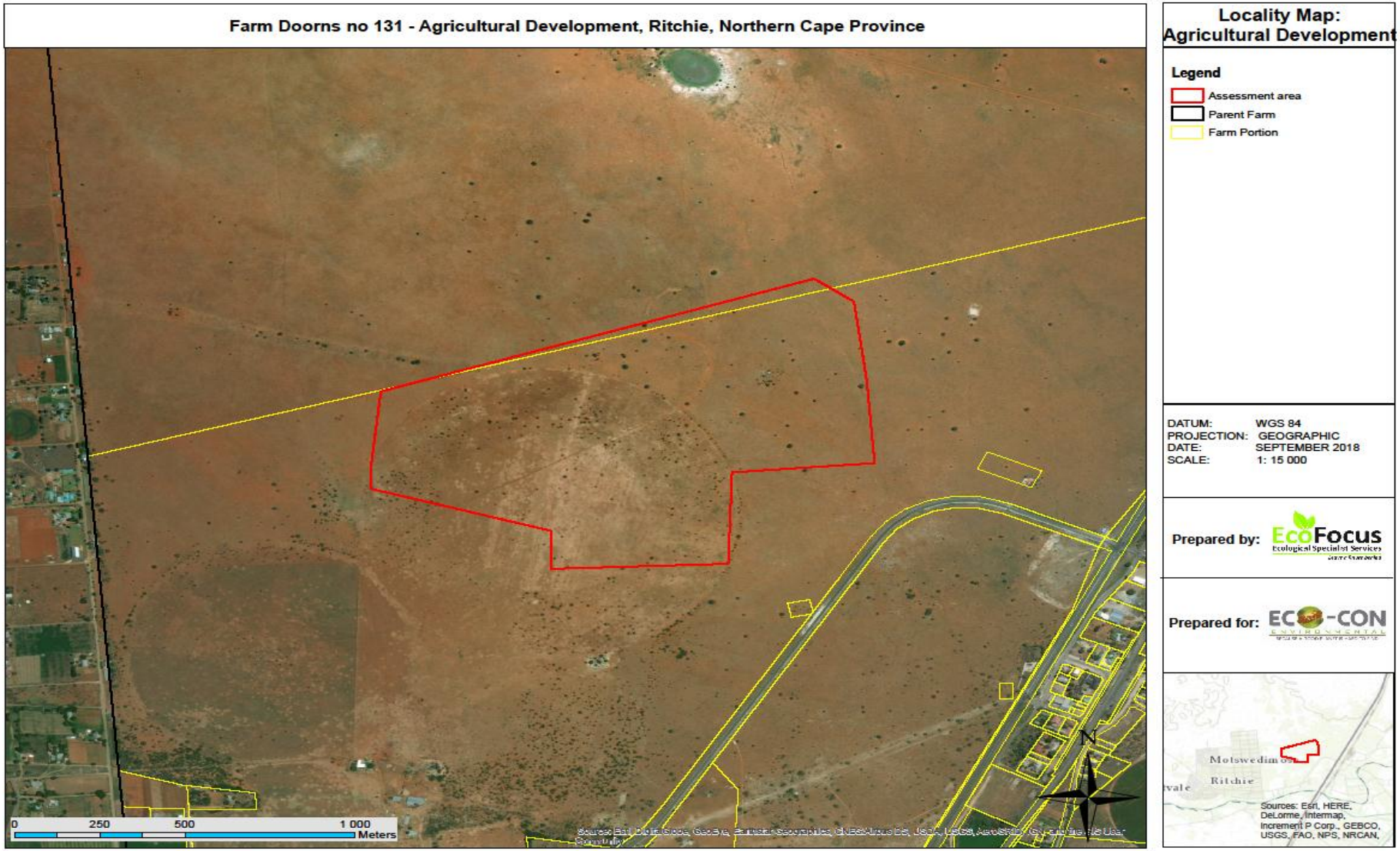

Figure 1: Locality map illustrating the assessment area (see A3 sized map in the Appendices)

6.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 453 mm (www.climate-data.org). The maximum average monthly temperature is approximately 24.6°C in the summer months while the minimum average monthly temperature is approximately 9.1°C during the winter. Maximum daily temperatures can reach up to 32.6°C in the summer months and dip to as low as -0.2°C during the winter.

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:

The flat to slightly undulating plains are characterised by Andesitic lavas of the Allanridge formation in the northern and western sections of the vegetation type. Deep sandy to loamy soils of the Hutton soil form are mainly present.

6.3. Vegetation and Conservation Status

According to SANBI (2006-), the entire assessment area falls within the Kimberley Thornveld vegetation type (SVk 4) which is characterised by slightly irregular plains with a well-developed woody component (tree and shrub layer). The herbaceous layer is usually open with much uncovered soils. This vegetation type is classified as least threatened because of its broad distributions and it being mostly excluded from being utilised for intensive agricultural cultivation activities (SANBI, 2006-).

The entire assessment area is categorised as a Critical Biodiversity Area two (CBA 2) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province. Critical Biodiversity Areas are areas that are irreplaceable or near-irreplaceable (CBA 1), or reflect an optimum configuration (CBA 2) for reaching provincial biodiversity targets for ecosystem types, species or ecological processes (Collins, 2017). Such an area must be maintained in a natural or near-natural state in order to meet biodiversity targets (Collins, 2017).

The mechanical clearance of vegetation and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing natural surface vegetation on the assessment area.

See vegetation and sensitivity maps below.

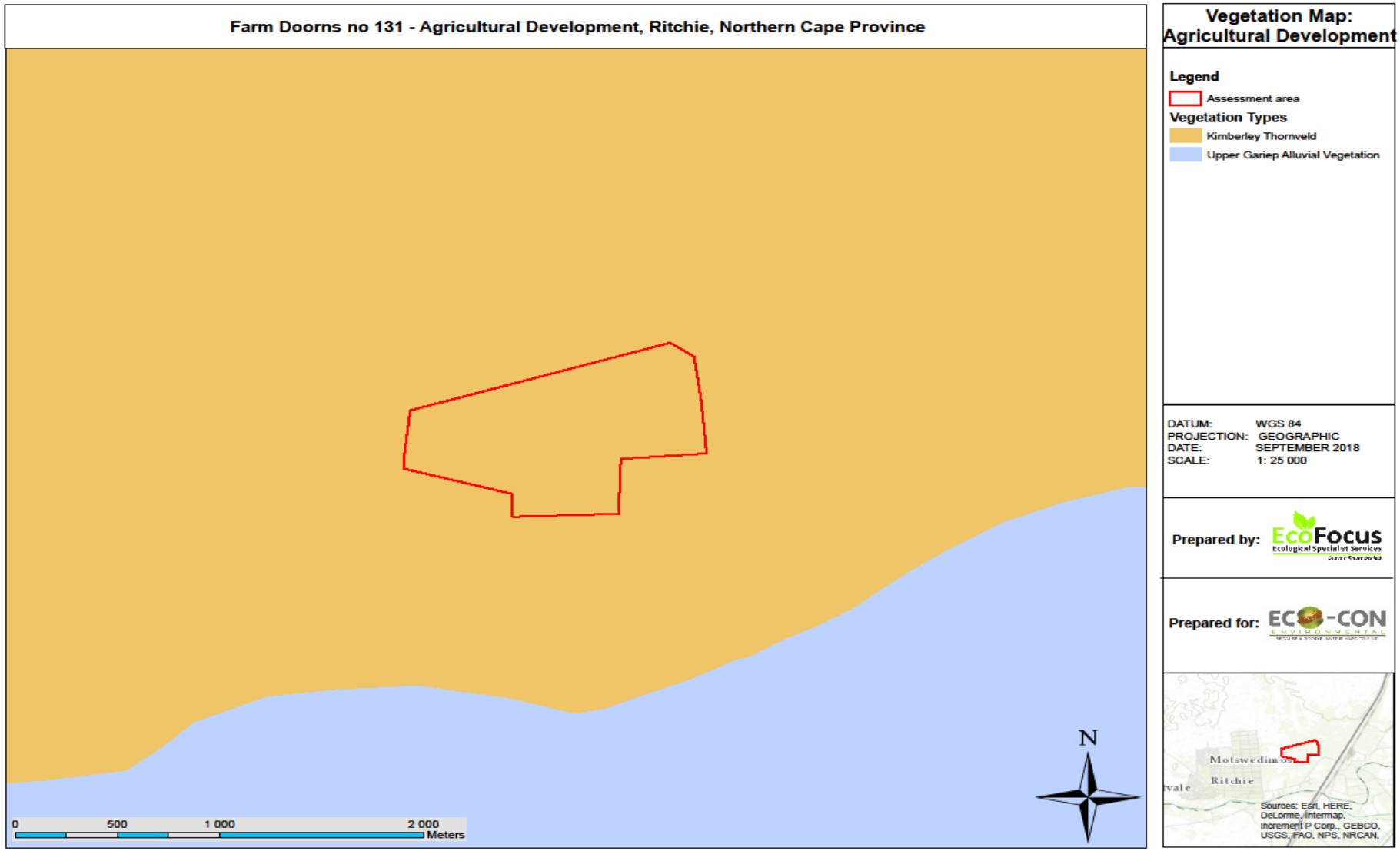

Figure 2: Vegetation map illustrating the vegetation type associated with the assessment area (see A3 sized map in the Appendices)

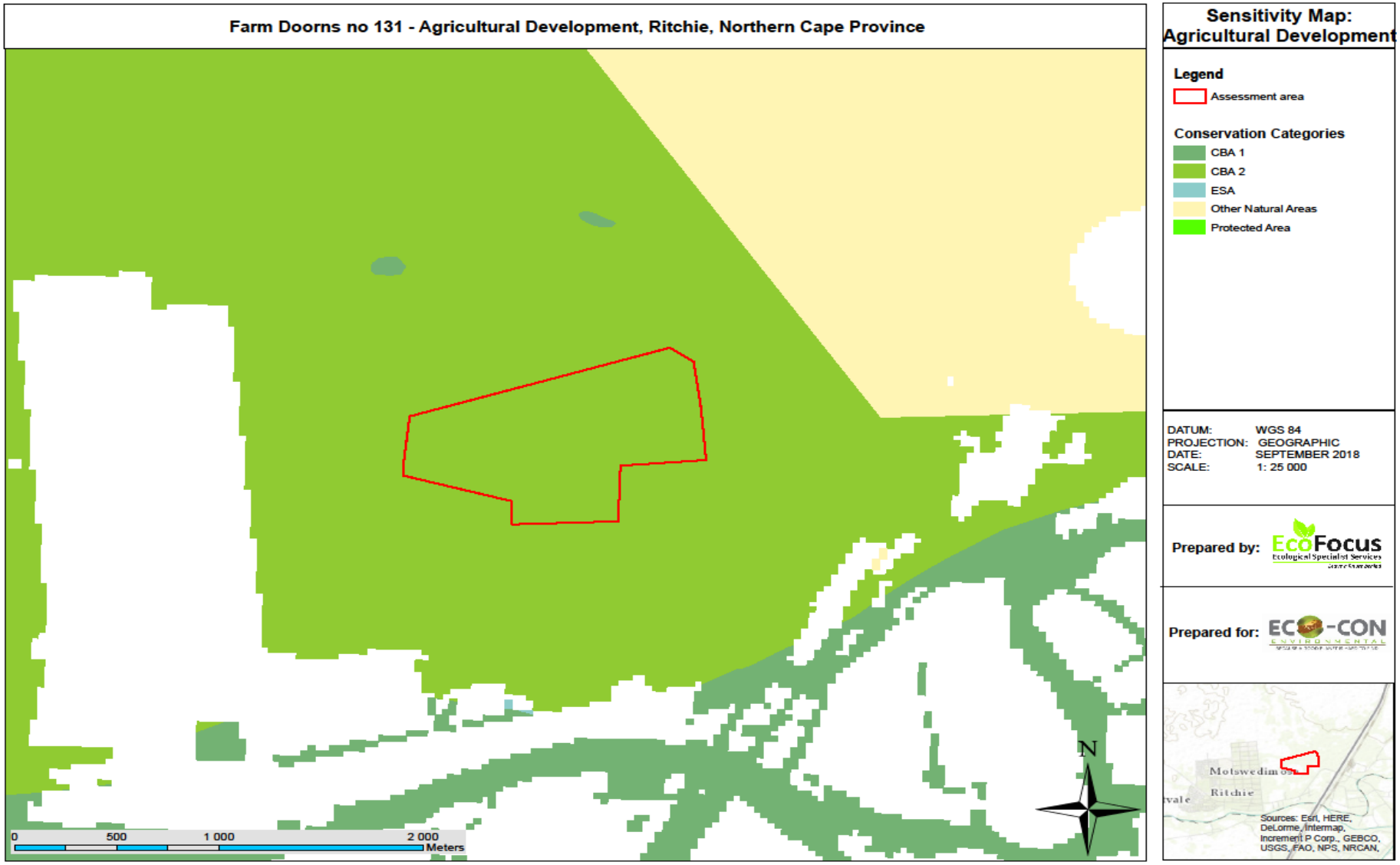

Figure 3: Sensitivity map illustrating the conservation status associated with the assessment area (see A3 sized map in the Appendices)

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:

- all relevant project information provided by the applicant and engineering design team to the ecological specialist was correct and valid at the time that it was provided.
- the proposed development area as provided by the engineering design team is correct and will not be significantly deviated from as this was the only area assessed.
- strategic level investigations undertaken by the applicant prior to the commencement of the Environmental Impact Assessment process, determined that the proposed development footprint represents a potentially suitable and technically acceptable location.
- the public, local communities, relevant organs of state and landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed project during the Environmental Impact Assessment 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 project 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 project.
- 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.
- The date on which the site assessment was conducted, forms part of the commencement of the new growing season. It must therefore be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

Given that an EIA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the EIA 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. Final certainty will only be obtained upon actual implementation of the proposed development. 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).
- A soil suitability assessment was also conducted which has indicated certain portions of the assessment area which are unsuitable for cultivation purposes. It is therefore assumed that these areas will be excluded from the development footprint.

Gaps in knowledge can be attributed to:

- The ecological study process was undertaken prior to the availing of certain information which would only be derived from the final project design and layout. The design layout had not been finalised yet at the time of the ecological study.
- The potential of future similar developments in the same geographical area, which could lead to cumulative impacts is highly likely as the broader area is known for its high agricultural cultivation potential.

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 is approximately 80 ha in size on which the project applicant proposes to develop a single cultivated centre pivot land of approximately 34 ha in size. Two proposed layout alternatives are provided for the centre pivot land namely Alternative 1 and Alternative 2.

The majority of the assessment area is situated on a historic centre pivot land footprint while only the north-eastern portion is situated on natural virgin soil.

The irrigation pipeline required for the centre pivot land, will tie into the existing pump and piping network which is used for irrigation of other centre pivot lands in the area. The existing piping network extracts water from the Modder River which is situated approximately 1.2 km south of the assessment area.

The mechanical clearance of vegetation and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing natural surface vegetation on the assessment area.

8.1. Current Existing Vegetation and Site Condition

The portion of the assessment area, situated on the historic centre pivot land footprint has been dormant in excess of ten years. This has allowed for a degree of recovery and ecological succession to take place. This portion constitutes a moderately dense shrubland with a well-established medium height grass layer. The shrubland is completely dominated/infested by the legally declared invasive species *Prosopis spp.* (Category 3) indicating the large degree of disturbance caused by the historic centre pivot land. Virtually no other shrub species were found to be present. The grass layer is mainly dominated by the species *Schmidtia pappophoroides* & *Eragrostis lehmanniana.* Other grass species also found to be present to a significantly lesser extent include *Enneapogon cenchroides, Aristida congesta, Aristida diffusa, Eragrostis echinochloidea* & *Cynodon dactylon.* A very low diversity of forb species is present and is mainly dominated by the species *Senecio hastatus, Arctotis venusta* & *Moraea pallida*. The species *Senna italica* & the legally declared invasive species *Argemone mexicana* (Category 1b) are also present but to a significantly lesser extent. This reiterates the level of disturbance caused by the historic centre pivot land. The historic centre pivot land footprint is therefore not reminiscent of the natural climactic state of the relevant Kimberley Thornveld vegetation type (SVk 4).

The historic centre pivot land footprint is traversed by a camp separation fence line which divides the area into an eastern and western portion. The species composition is similar for the two camps but the grass layer biomass of the western camp is significantly lower than that of the eastern camp. The reason for this seems to be that the western camp has likely been used as a winter camp for feeding of livestock.

No Red Data Listed, provincially- or nationally protected or any other species of conservational significance were found to be present within the entire historic centre pivot land footprint. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals. Therefore, due to the significant historic disturbances caused and the current legally declared invasive species infestation, it is recommended that the development of the new centre pivot land be focussed within this historic centre pivot land footprint.

Figure 4: Two images illustrating the moderate density of the legally declared invasive species *Prosopis spp.* (Category 3) within the historic centre pivot land footprint as well as the higher grass biomass of the eastern camp relative to the western camp

Figure 5: Two images illustrating the significantly lower grass layer biomass of the western camp relative to the eastern camp of the historic centre pivot land footprint

The north-eastern portion of the assessment area is situated on natural virgin soil and constitutes a sparse open savannah with a well-established medium height grass layer situated on deep red sandy Hutton soils. The woody component is mainly dominated by tree and shrub individuals of the nationally protected species *Vachellia erioloba.* Approximately 53 individuals of this species are present of which 7 are large mature individuals (≥ 7 m in height) with broad tree canopies. These broad tree canopies house significant numbers of Cape Sparrow (*Passer melanurus*) nests and possibly also Great Sparrow (*Passer motitensis*) nests, which is provincially a protected species. The shrub species *Vachellia karroo, Osteospermum spinescens, Lycium hirsutum* are sparsely scattered throughout the north-eastern portion of the assessment while the karroid shrub species *Hertia pallens, Felicia muricata, Crotolaria orientalis* & *Pentzia glubosa* are also moderately distributed throughout the area.

The grass and forb layer of the north-eastern portion has a similar species composition to that of the historic centre pivot land footprint. Two individuals of the provincially protected forb species *Boophone disticha* and a single individual of the provincially specially protected species *Harpagophytum sp.* were also found to be present within the north-eastern portion of the assessment area. It is however highly likely that there could be more individuals of these species present. It is therefore recommended that an additional ecological walkthrough of the final development footprint area be conducted prior to commencement of the project during the flowering period of underground bulb plant species. This will ensure that no provincially protected or significant species have potentially been omitted. Due to the significant presence of the nationally protected tree species *Vachellia erioloba* as well as the presence of the provincially protected and specially protected species, it is further recommended that the development of the new centre pivot land be kept away from the north-eastern portion of the assessment area.

Figure 6: Two images illustrating the sparse open savannah of the north-eastern portion of the assessment area dominated by the nationally protected species *Vachellia erioloba*

Figure 7: Image illustrating the presence of the provincially protected species *Boophone disticha*

Figure 8: Image illustrating the presence of the provincially specially protected species *Harpagophytum sp.*

Figure 9: Image illustrating the significant presence of Sparrow (*Passer spp.*) nests within the broad canopies of large mature *Vachellia erioloba* tree individuals

An old cement dam is present within the north-eastern portion of the assessment area which historically provided drinking water for livestock. The small confined local area surrounding the cement dam, has therefore been significantly disturbed by livestock trampling activities over time and the area has subsequently been infested by the legally declared invasive species *Prosopis spp.* (Category 3) & *Argemone mexicana* (Category 1b). The grass layer is also very sparse.

Figure 10: Image illustrating the significantly disturbed small confined local area surrounding the old cement dam which is present within the north-eastern portion of the assessment area

Due to the flat topography of the broader landscape, no significant watercourses or water drainage lines are present within the assessment area. The ecological connectivity between the assessment area and the Modder River situated approximately 1.2 km south is also virtually cut off by the existing road networks, residential and other agricultural developments.

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

The Present Ecological State (PES) of the historic centre pivot land footprint is classified as Class C as it is moderately modified. Significant loss and transformation of natural habitat and biota initially occurred during the historic active period of the centre pivot land, but due it having been dormant in excess of ten years, it has allowed for a degree of recovery and ecological succession to take place. Basic ecosystem functionality has therefore returned to the area.

The Present Ecological State (PES) of the north-eastern portion of the assessment area is classified as Class B as it is largely natural. A small change in natural habitats and biota may have taken place due to the presence of the old cement dam as well as the ecological 'edge effect' caused by the presence of the historic centre pivot land but the ecosystem functionality has remained essentially unchanged. Such anthropogenic activities tend to cause an ecological 'edge effect' which negatively impacts on the developed/natural interface area and the integrity of the surrounding natural areas and it expands the negative anthropogenic footprint.

Although the Kimberley Thornveld vegetation type (SVk 4) associated with the assessment area, is classified as least threatened (SANBI, 2006-), the entire assessment area is categorised as a Critical Biodiversity Area two (CBA 2) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

No Red Data Listed, provincially- or nationally protected or any other species of conservational significance were found to be present within the entire historic centre pivot land footprint. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

The woody component of the north-eastern portion of the assessment area is mainly dominated by tree and shrub individuals of the nationally protected species *Vachellia erioloba.* Approximately 53 individuals of this species are present of which 7 are large mature individuals (≥ 7 m in height) with broad tree canopies. These broad tree canopies house significant numbers of Cape Sparrow (*Passer melanurus*) nests and possibly also Great Sparrow (*Passer motitensis*) nests, which is provincially a protected species. Two individuals of the provincially protected forb species *Boophone disticha* and a single individual of the provincially specially protected species *Harpagophytum sp.* were also found to be present within the north-eastern portion of the assessment area. It is however highly likely that there could be more individuals of these species present.

The Ecological Importance and Sensitivity (EIS) of the historic centre pivot land footprint is classified as Class D (low) as it is not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique. The Ecological Importance and Sensitivity (EIS) of the north-eastern portion of the assessment area is however classified as Class C (moderate) as it is ecologically important and sensitive on local or possibly provincial scale mainly due to the moderate presence of nationally and provincially protected species. Biodiversity may be sensitive to habitat modifications.

Although the historic centre pivot land footprint is not necessarily viewed as being of high conversational significance, the north-eastern portion of the assessment area is therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and nationally/provincially protected species.

8.3. Species List for the Assessment Area

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

Graminoids	Forbs	Shrubs & trees
Aristida congesta	*Arctotis venusta*	*Crotolaria orientalis*
Aristida diffusa	*Argemone mexicana*	*Felicia muricata*
Cynodon dactylon	*Boophone disticha*	*Hertia pallens*
Enneapogon cenchroides	*Harpagophytum sp.*	*Lycium hirsutum*
Eragrostis echinochloidea	*Moraea pallida*	*Osteospermum spinescens*
Eragrostis lehmanniana	*Senecio hastatus*	*Pentzia globosa*
Schmidtia pappophoroides	*Senna italica*	*Prosopis spp.*
-	-	*Vachellia erioloba*
-	-	*Vachellia karroo*

8.4. Ecological Sensitivity Map

The sensitivity map below illustrates the locations of the nationally protected tree species *Vachellia erioloba* individuals as well as the locations of the two provincially protected species individuals.

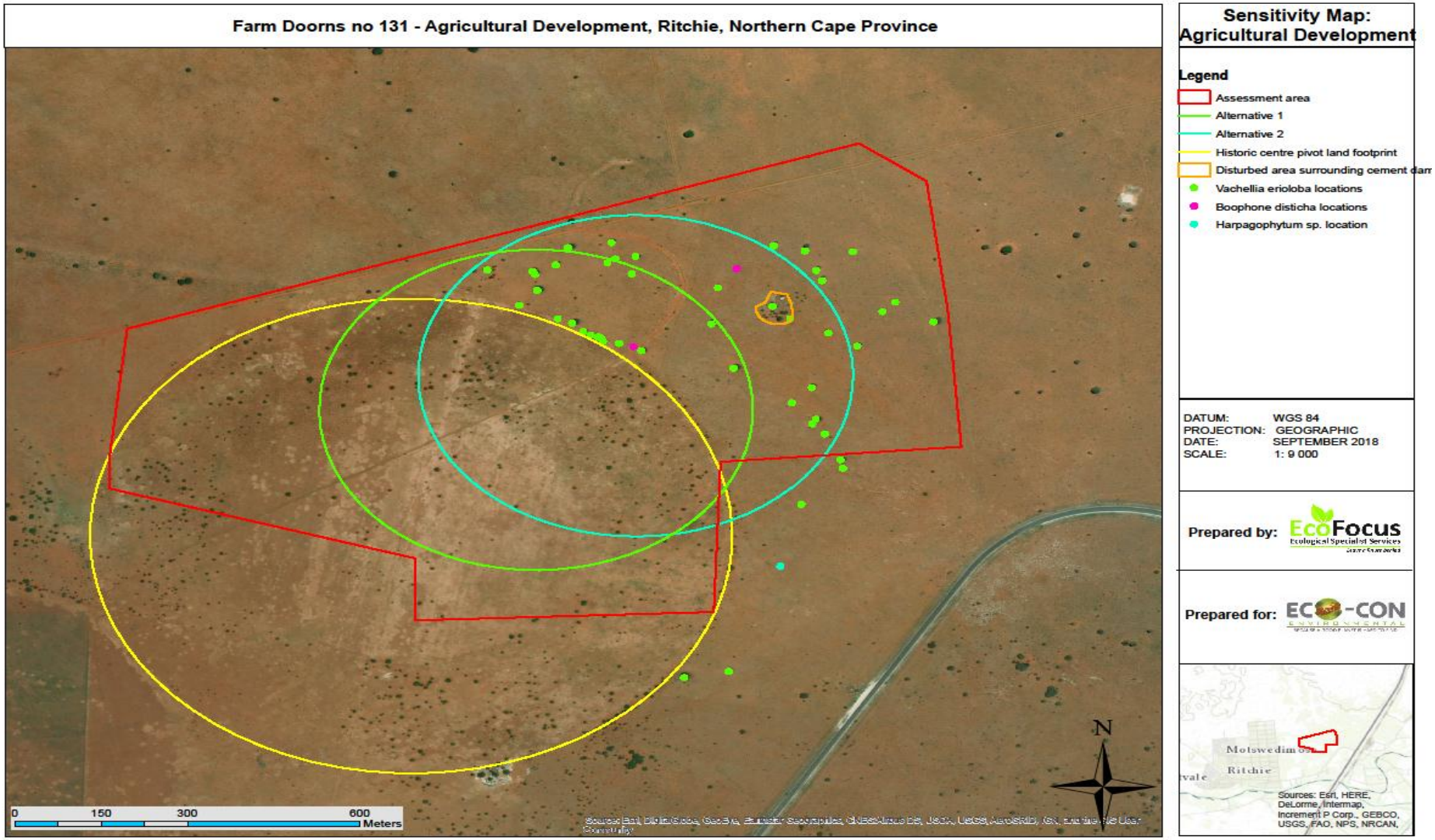

Figure 11: Sensitivity map illustrating the locations of the nationally protected tree species *Vachellia erioloba* individuals as well as the locations of the two provincially protected species individuals (see A3 sized map in the Appendices)

9. Ecological Impact Assessment

The following section identifies the potential ecological impacts (both positive and negative) which the proposed project 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 project 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 terrestrial vegetation on the assessment area associated with the Kimberley Thornveld vegetation type (SVk 4)

The assessment area is approximately 80 ha in size on which the project applicant proposes to develop a single cultivated centre pivot land of approximately 34 ha in size. The mechanical clearance of vegetation and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing natural surface vegetation on the assessment area.

The Kimberley Thornveld vegetation type (SVk 4) associated with the assessment area, is classified as least threatened (SANBI, 2006-) and the majority of the assessment area is situated on a historic centre pivot land footprint which is not reminiscent of the natural climactic state of the relevant vegetation type. Only the north-eastern portion is situated on natural virgin soil associated with the relevant vegetation type.

The irrigation pipeline required for the centre pivot land, will tie into the existing pump and piping network which is used for irrigation of other centre pivot lands in the area. The existing piping network extracts water from the Modder River which is situated approximately 1.2 km south of the assessment area.

The assessment area is very small relative to the broader surrounding natural areas associated with the relevant vegetation type, which are vast and relatively homogenous. The significance of this potential impact will be low for the Alternative 1 but medium for Alterative 2.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Transformation of a Critical Biodiversity Area two (CBA 2) associated with the assessment area

The mechanical clearance of vegetation and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing natural surface vegetation on the assessment area.

Although the entire assessment area is categorised as a Critical Biodiversity Area two (CBA 2) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), the majority of the assessment area is situated on a historic centre pivot land footprint which is not reminiscent of the natural climactic state of the relevant vegetation type. Only the north-eastern portion is situated on natural virgin soil associated with the relevant vegetation type.

Due to the flat topography of the broader landscape, no significant watercourses or water drainage lines are present within the assessment area. The ecological connectivity between the assessment area and the Modder River situated approximately 1.2 km south is also virtually cut off by the existing road networks, residential and other agricultural developments.

The assessment area is very small relative to the broader surrounding natural areas associated with the relevant vegetation type, which are vast and relatively homogenous. The significance of this potential impact will be medium.

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

The mechanical clearance of vegetation and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing natural surface vegetation on the assessment area.

No Red Data Listed, provincially- or nationally protected or any other species of conservational significance were found to be present within the entire historic centre pivot land footprint. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

The woody component of the north-eastern portion of the assessment area is mainly dominated by tree and shrub individuals of the nationally protected species *Vachellia erioloba.* Approximately 53 individuals of this species are present of which 7 are large mature individuals (≥ 7 m in height) with broad tree canopies. These broad tree canopies house significant numbers of Cape Sparrow (*Passer melanurus*) nests and possibly also Great Sparrow (*Passer motitensis*) nests, which is provincially a protected species. Two individuals of the provincially protected forb species *Boophone disticha* and a single individual of the provincially specially protected species *Harpagophytum sp.* were also found to be present within the north-eastern portion of the assessment area. It is however highly likely that there could be more individuals of these species present. The significance of this potential impact will be medium for the Alternative 1 but medium-high for Alterative 2.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Terrestrial alien invasive species establishment

The historic centre pivot land footprint is completely dominated/infested by the legally declared invasive species *Prosopis spp.* (Category 3). The legally declared invasive species *Argemone mexicana* (Category 1b) is also sparely scattered throughout the area. These individuals will in fact be removed during the construction phase which will prove to be beneficial to the environment.

No significant alien invasive species establishments were found to be present within the north-eastern portion of the assessment area. The small confined local area surrounding the old cement dam, has however been infested by the legally declared invasive species *Prosopis spp.* (Category 3) & *Argemone mexicana* (Category 1b) due to livestock trampling activities over time.

The assessment area and surrounding areas could potentially be prone to significant alien invasive species establishment due to surface disturbances and vegetation clearance caused by cultivation and construction activities. The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Surface material erosion

Due to the flat topography of the assessment area, there should be no possibility of any significant surface soil erosion taking place due to the loosening of materials and clearance of vegetation caused by construction activities. The significance of this potential impact will be zero.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Dust generation and emissions

The initial soil preparation and cultivation activities associated with the proposed project construction phase could 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 natural areas. The significance of this potential impact will be low.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.2. Operational Phase

Once the construction phase has been completed, there should be no significant additional potential ecological impacts associated with the operational phase over and above the already discussed long term impacts of the construction phase. The transformation of the relevant vegetation type and CBA 2 as well as the destruction of nationally/provincially protected species individuals/habitats and alien invasive species establishment were discussed and addressed during the construction phase as potential long term impacts.

A number of identified potential ecological impacts could however change in nature and increase in significance from the construction phase into the operational phase and will continue throughout the entire lifespan and operational phase of the proposed project. The following additional potential ecological impacts could therefore take place during the operational phase:

Continued dust generation and emissions

Continued soil preparation and cultivation activities associated with the proposed project operational phase could potentially result in significant continual fugitive dust emissions during the cultivation season. Generated dust could spread into- and contaminate the surrounding natural areas. The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Alteration/contamination of soil and groundwater characteristics/quality

Operation of the cultivated land could include significant continual irrigation, chemical and organic fertilisation as well as herbicide/pesticide treatment. This continued irrigation, fertilisation and herbicide/pesticide treatment over time will result in significant long term leaching of salts, chemicals and other inorganic elements into the soil and groundwater. This will potentially alter and negatively affect the soil characteristics as well as quality/characteristics of groundwater over time. This will constitute a long term effect which will gradually commence during the operational phase and will continue for the entire duration of the proposed project lifespan and significantly beyond. The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Over extraction of irrigation water from the Modder River

Significant quantities of water will be extracted from the Modder River for irrigation purposes. In accordance with the information received from the EAP, the proposed development will require approximately 11 000 m³ of irrigation water per hectare per annum in order to irrigate adequately. This equates to a total of approximately 374 000 m³ irrigation water required per annum. This could potentially lead to over extraction from the Modder River if not adequately managed. The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.3. Cumulative Impacts

The mechanical clearance and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing surface vegetation on the assessment area.

A significant number of other existing cultivation developments are present around the Modder River to the south which have cumulatively resulted in significant loss of natural habitat and extraction of water from the river. Due to the majority of the assessment area being situated on a historic centre pivot land footprint, which is not reminiscent of the natural climactic state of the relevant vegetation type, the development should not pose any significant cumulative impacts to the ecological connectivity and functionality of the broader habitat and ecosystem.

The transformation of the CBA 2, destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area and alteration/contamination of soil and groundwater characteristics/quality can be suitably reduced and mitigated to within acceptable levels by focussing the development of the new centre pivot land within the historic centre pivot land footprint and implementation of the recommended mitigation measures.

Over extraction of water from the Modder River could however cumulatively increase the ecological impact on the resource as significant volumes of water are collectively being extracted from the Modder River by the numerous existing cultivation developments. Irrigation and fertilisation practices must therefore be adequately managed in order to prevent over-irrigation. 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) and only the allotted water quantities as per the approved Water Use License are to be extracted.

Widespread infestations of the legally declared invasive species *Prosopis spp.* (Category 3) is a significant problem in the Northern Cape Province, which is specifically amplified by agricultural developments. The individuals present within the assessment area will in fact be removed during the construction phase which will prove to be beneficial to the environment. Implementation of an adequate Alien Invasive Species Establishment Management and Prevention Plan, will further prevent any significant establishments during the construction and operational phases which could cumulatively contribute to the provincial dilemma.

It is therefore not anticipated that the proposed development would pose any significant potential cumulative ecological impacts within the broader region if the recommended Alternative 1 is developed.

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 project both before and after implementation of the recommended mitigation measures.

9.4.1. Construction Phase

Table 6: Environmental Risk and Significance Ratings

	Alternative 1	Alternative 2
Identified Environmental Impact	**Transformation of terrestrial vegetation on the assessment area associated with the Kimberley Thornveld vegetation type (SVk 4)**	
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	Low (2)	Low (2)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	Medium (3)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (48)	Medium (64)

Mitigation Measures to be implemented	The new project 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. Natural veld situated around the proposed centre pivot land must not be impacted upon and must be left in situ. No site construction camps to be established within the surrounding natural areas outside the project footprint area. Adequately cordon off the construction area and ensure that no construction activities, machinery or equipment operate or impact within the natural surrounding areas outside the cordoned off area. Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented outside the footprint areas of the proposed development. Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction. Due to the significant historic disturbances caused by the historic centre pivot land and the current legally declared invasive species infestation, it is recommended that the development of the new centre pivot land be focussed within this historic centre pivot land footprint.

	Due to the significant presence of the nationally protected tree species *Vachellia erioloba* as well as the presence of the provincially protected and specially protected species within the north-eastern portion of the assessment area, it is recommended that the development of the new centre pivot land be kept away from the north-eastern portion as far as practicably possible. Alternative 1 is recommended for development due to its significantly lower impact on the north-eastern portion of the assessment area.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (26)	Low (26)
	Alternative 1	**Alternative 2**
Identified Environmental Impact	**Transformation of a Critical Biodiversity Area two (CBA 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	Medium (3)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Medium
Environmental Significance Score and Rating prior to mitigation	Medium (54)	Medium (68)
Mitigation Measures to be implemented	The new project 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. Natural veld situated around the proposed centre pivot land must not be impacted upon and must be left in situ. No site construction camps to be established within the surrounding natural areas outside the project footprint area. Adequately cordon off the construction area and ensure that no construction activities, machinery or equipment	

	operate or impact within the natural surrounding areas outside the cordoned off area. Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented outside the footprint areas of the proposed development. Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction. Due to the significant historic disturbances caused by the historic centre pivot land and the current legally declared invasive species infestation, it is recommended that the development of the new centre pivot land be focussed within this historic centre pivot land footprint. Due to the significant presence of the nationally protected tree species *Vachellia erioloba* as well as the presence of the provincially protected and specially protected species within the north-eastern portion of the assessment area, it is recommended that the development of the new centre pivot land be kept away from the north-eastern portion. Alternative 1 is recommended for development due to its significantly lower impact on the north-eastern portion of the assessment area.	
Cumulative Impact Rating after mitigation implementation	Low	Low

Environmental Significance Score and Rating after mitigation implementation	Low (28)	Low (28)
	Alternative 1	**Alternative 2**
Identified Environmental Impact	**Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats**	
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	Moderate (3)	Moderate (3)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	Medium (3)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Medium

Environmental Significance Score and Rating prior to mitigation	Medium (54)	Medium-high (80)
Mitigation Measures to be implemented	It is recommended that an additional ecological walkthrough of the final development footprint area be conducted prior to commencement of the project during the flowering period of underground bulb plant species. This will ensure that no provincially protected or significant species have potentially been omitted. A Provincial Flora Permit has to be obtained for any provincially protected species potentially found to be present within the assessment area prior to the commencement of any construction activities. A National Protected Tree Permit has to be obtained for all nationally protected tree species to be removed prior to the commencement of any construction activities. The new project 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. Natural veld situated around the proposed centre pivot land must not be impacted upon and must be left in situ. No site construction camps to be established within the surrounding natural areas outside the project footprint area. Adequately cordon off the construction area and ensure that no construction activities, machinery or equipment	

	operate or impact within the natural surrounding areas outside the cordoned off area. Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented outside the footprint areas of the proposed development. Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction. Due to the significant historic disturbances caused by the historic centre pivot land and the current legally declared invasive species infestation, it is recommended that the development of the new centre pivot land be focussed within this historic centre pivot land footprint. Due to the significant presence of the nationally protected tree species *Vachellia erioloba* as well as the presence of the provincially protected and specially protected species within the north-eastern portion of the assessment area, it is recommended that the development of the new centre pivot land be kept away from the north-eastern portion. Alternative 1 is recommended for development due to its significantly lower impact on the north-eastern portion of the assessment area.	
Cumulative Impact Rating after mitigation implementation	Low	Low

Environmental Significance Score and Rating after mitigation implementation	Low (28)	Low (28)
	Alternative 1	**Alternative 2**
Identified Environmental Impact	**Terrestrial 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	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Moderate (3)
Reversibility of Impact	High (2)	High (2)
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 (56)	Medium (68)
Mitigation Measures to be implemented	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. Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction. Natural veld situated around the proposed centre pivot land must not be impacted upon and must be left in situ.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (22)	Low (24)
	Alternative 1	**Alternative 2**
Identified Environmental Impact	**Surface material erosion**	
Mitigation Measures to be implemented	Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done in order to sufficiently manage storm water	

	runoff and clean/dirty water separation in order to prevent any significant erosion from occurring. Areas surrounding construction footprints must be adequately rehabilitated as soon as practically possible after construction.

	Alternative 1	**Alternative 2**
Identified Environmental Impact	**Dust generation and emissions**	
Magnitude of Negative or Positive Impact	Low (4)	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	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low

Environmental Significance Score and Rating prior to mitigation	Low (48)	Low (48)
Mitigation Measures to be implemented	Implement suitable dust management and prevention measures during the construction phase. 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 (27)	Low (27)

9.4.2. Operational Phase

Table 7: Environmental Risk and Significance Ratings

	Alternative 1	Alternative 2
Identified Environmental Impact	**Continued dust generation and emissions**	
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	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)
Probability of Impact Occurrence	High (4)	High (4)
Cumulative Impact Rating prior to mitigation	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (52)	Medium (52)

Mitigation Measures to be implemented	Implement suitable dust management and prevention measures during the cultivation season. Lands to be sufficiently irrigated prior to commencement of cultivation and planting activities in order to prevent significant fugitive dust emissions.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (30)	Low (30)
	Alternative 1	**Alternative 2**
Identified Environmental Impact	**Alteration/contamination of soil and groundwater characteristics/quality**	
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	High (4)	High (4)

Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Medium	Medium
Environmental Significance Score and Rating prior to mitigation	Medium (57)	Medium (57)
Mitigation Measures to be implemented	Irrigation and fertilisation practices must be adequately managed in order to prevent over-fertilisation or over-irrigation which could lead to significant leaching and contamination of groundwater. A suitably qualified and experienced agricultural specialist must be consulted in order to advise on appropriate management practices.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (32)	Low (32)
	Alternative 1	**Alternative 2**
Identified Environmental Impact	**Over extraction of irrigation water from the Modder River**	
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	High (4)	High (4)
Reversibility of Impact	Low (4)	Low (4)
Probability of Impact Occurrence	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Medium	Medium
Environmental Significance Score and Rating prior to mitigation	Medium (57)	Medium (57)
Mitigation Measures to be implemented	Irrigation and fertilisation practices must be adequately managed in order to prevent over-fertilisation or over-irrigation which could lead to significant leaching and contamination of groundwater. A suitably qualified and experienced agricultural specialist must be consulted in order to advise on appropriate management practices. 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). 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.	
Cumulative Impact Rating after mitigation implementation	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (32)	Low (32)

10. Summary and Conclusion

The assessment area is approximately 80 ha in size on which the project applicant proposes to develop a single cultivated centre pivot land of approximately 34 ha in size. The mechanical clearance of vegetation and soil preparation associated with the proposed agricultural development will in all probability completely transform the majority of the existing natural surface vegetation on the assessment area.

The Kimberley Thornveld vegetation type (SVk 4) associated with the assessment area, is classified as least threatened (SANBI, 2006-). Although the entire assessment area is further categorised as a Critical Biodiversity Area two (CBA 2) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), the majority of the assessment area is situated on a historic centre pivot land footprint which is not reminiscent of the natural climactic state of the relevant vegetation type. Only the north-eastern portion is situated on natural virgin soil associated with the relevant vegetation type.

No Red Data Listed, provincially- or nationally protected or any other species of conservational significance were found to be present within the entire historic centre pivot land footprint. It must however be noted that the time of the assessment was not necessarily favourable for successful identification of all plant species individuals.

The woody component of the north-eastern portion of the assessment area is mainly dominated by tree and shrub individuals of the nationally protected species *Vachellia erioloba.* Approximately 53 individuals of this species are present of which 7 are large mature individuals (≥ 7 m in height) with broad tree canopies. These broad tree canopies house significant numbers of Cape Sparrow (*Passer melanurus*) nests and possibly also Great Sparrow (*Passer motitensis*) nests, which is provincially a protected species. Two individuals of the provincially protected forb species *Boophone disticha* and a single individual of the provincially specially protected species *Harpagophytum sp.* were also found to be present within the north-eastern portion of the assessment area. It is however highly likely that there could be more individuals of these species present. It is therefore recommended that an additional ecological walkthrough of the final development footprint area be conducted prior to commencement of the project during the flowering period of underground bulb plant species. This will ensure that no provincially protected or significant species have potentially been omitted.

The historic centre pivot land footprint is not necessarily viewed as being of high conversational significance, while the north-eastern portion of the assessment area is viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and nationally/provincially protected species. It is therefore recommended that the development of the new centre pivot land be focussed within this historic centre pivot land footprint and be kept away from the north-eastern portion of the assessment area.

Due to the flat topography of the broader landscape, no significant watercourses or water drainage lines are present within the assessment area. The ecological connectivity between the assessment area and the Modder River situated approximately 1.2 km south is also virtually cut off by the existing road networks, residential and other agricultural developments.

It is the opinion of the specialist that the potentially significant ecological impacts associated with the transformation of the CBA 2, destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area, terrestrial alien invasive species establishment, alteration/contamination of soil and groundwater characteristics/quality and potential over-extraction of irrigation water from the Modder River, can be suitably reduced and mitigated to within acceptable residual levels if the recommended Alternative 1 is developed. The project should therefore be considered by the competent authority for environmental authorisation and approval. The potential ecological impacts associated with Alternative 2 will however be significantly higher than those of Alternative 1 and it is therefore not recommended that Alternative 2 be considered for development.

The proposed development may however only continue 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 project. All necessary authorisations and permits must also be obtained prior to any commencement.

11. References

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)

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)

Northern Cape Nature Conservation Act (Act 9 of 2009)

Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP) http://bgis.sanbi.org/Projects/Detail/203

South African National Biodiversity Institute (2006-). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/SpatialDataset/Detail/18, Version 2012.*

Van Oudtshoorn, F. 2004. Gids tot Grasse van SuidAfrika. 2nd Ed. Briza Publikasies.

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)

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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 Specialist Report Completion

2018

- Completion of a specialist ecological assessment and report for the proposed 30 ha Portion 30 of the Farm Lilyvale no 2313 Residential development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 20 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 19 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 135 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Completion of five specialist ecological assessments and reports for the proposed Dawid Kruiper Local Municipality Residential Developments around Upington, Northern Cape Province.
- Completion of a specialist Grazing and Erosion Management Plan for the Retiefs Nek no 123, outside Bethlehem, Free State Province.
- Completion of a specialist Grazing and Erosion Management Plan for the Dekselfontein no 317, outside Bethlehem, Free State Province.

- Completion of a specialist ecological assessment and report for a proposed 12 ha agricultural development project in Petrusville, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 270 ha industrial park development project in Secunda, Mpumalanga Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 233 ha industrial park development project in Sabie, Mpumalanga Province.
- Completion of a specialist ecological assessment and report for the proposed Dawid Kruiper Local Municipality Residential Development around Upington, Northern Cape Province.
- Completion of two specialist ecological assessments and reports for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Completion of two Alien Invasive Species Management Plans for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 15 ha agricultural development project outside Hopetown, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 169 ha industrial park development project in Sabie, Mpumalanga Province.
- Completion of a specialist Grazing and Erosion Management Plan for the Farm Barnea no 231, outside Bethlehem, Free State Province.
- Compilation of a GIS locality, vegetation and sensitivity map for the proposed 7.13 ha Karoo Hoogland Local Municipality Residential Development project in Sutherland, Northern Cape Province.
- Completion of a specialist 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.
- Completion of a specialist ecological assessment and report for a proposed 11.6 ha COGHSTA NEMA Section 24G residential development project in Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 3.26 ha COGHSTA NEMA Section 24G residential development project in Strydenburg, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 25.6 ha COGHSTA NEMA Section 24G residential development project in Loxton, Northern Cape Province.
- Completion of a specialist biodiversity offset feasibility assessment and report for a proposed 805 ha agricultural development project outside Douglas, Northern Cape Province.

- Completion of a specialist ecological assessment and report for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a specialist ecological exemption letter for the proposed Vanderkloof Tegnologie Chicken Abattoir development project in Petrusville, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Stormwater and Erosion Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a revised specialist ecological assessment and report for the proposed 17.7 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 113.3 ha Dawn Valley Estate development project in Bloemfontein, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Klipfontein no 71, outside Lindley, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Meyerskop no 1801, outside Bethlehem, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 2.24 ha Mullerstuine Cemetery development project in Vanderbijlpark, Gauteng Province.
- Completion of a specialist Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 5 Free State Province Sites.
- Completion of a specialist Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 6 Northern Cape Province Sites.

2017

- Completion of a specialist ecological assessment and report for the proposed Phethogo Consulting filling station development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 132 kV CENTLEC Harvard transmission line development project in Bloemfontein, Free State Province.

- Completion of a specialist ecological assessment and report for the proposed Zevenfontein filling station development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed Olifantsvlei Curro School development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed 23 ha Babereki Agricultural development project in Hartswater, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed Eikenhof Curro School development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed 40 ha CoGHSTA residential development project in Norvalspont, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 9 ha CoGHSTA residential development project in Williston, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for the proposed 100 ha Musgrave residential and commercial development in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 15 ha BVI Engineering Waste Water Treatment Works and associated pipeline development project in Britstown, Northern Cape Province.
- Completion of a specialist ecological walkthrough assessment and report and relocation of provincially protected species *Eucomis autumnalis* individuals for the Bloemwater 33.6 km Brandkop Bypass water supply pipeline in Bloemfontein, Free State Province.
- Completion and execution of a Species Relocation and Re-establishment Plan for 13 individuals of the provincially protected species, *Eucomis autumnalis,* for the Bloemwater 33.6 km Brandkop Bypass water supply pipeline in Bloemfontein, Free State Province.
- Completion of a specialist ecological exemption letter for the proposed Siloam Crematorium development in Welkom, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 0.5 ha Vuna Afrika Agricultural feedmill pelletizing plant development project outside Wepener, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 0.4 ha Olympic Flame filling station development project in Welkom, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 3000 ha agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 46.04 ha University, Industrial and Residential development project in Orania, Northern Cape Province.

- Completion of a specialist ecological assessment and report for a proposed 482 ha Piet Louw NEMA Section 24G agricultural development project outside Hopetown, Northern Cape Province.
- Completion of a specialist ecological assessment for a proposed 500 ha Wolfkop Valley Estate development project outside Bloemfontein, Free State Cape Province.
- Completion of a specialist Erosion and Rehabilitation Management Plan for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 4.1 ha Plot 31 Spitskop Residential development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 26.8 ha Oxidation Dam development project in Orania, Northern Cape Province.

2016

- Completion of a specialist ecological assessment and report for the proposed 3 km Olifantshoek Bulk Water Supply and reservoir development project in Olifantshoek, Northern Cape Province.
- Completion of two specialist ecological and wetland assessments and reports for the proposed respective 16 ha and 6 ha N8 highway gravel quarries development project near Ladybrand, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 100 ha De Eelt vineyard development project near Prieska, Northern Cape Province.
- Completion of two specialist ecological and wetland assessments and reports for the Lafarge cement production facility and quarry, respectively near Lichtenburg, North-West Province.
- Completion of a specialist ecological assessment and report for the proposed 12 ha Nooitgedacht Retirement Estate development project near Nelspruit, Mpumalanga Province.
- Completion of a specialist ecological assessment and report for the proposed 42 km Ventersburg Bulk Water Supply and reservoir development project between Ventersburg and Riebeeckstad, Free State Province.