

Ecological Management Services Ecological Management Services

BIODIVERSITY & FRESHWATER ASSESSMENT REPORT FOR THE PROPOSED PIVOT DEVELOPMENT ON DROOGFONTEIN NORTHERN CAPE

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For
EIMS

August 2025

DECLARATION OF CONSULTANT

I Natalie Birch declare that I –

- ☐ act as the independent specialist in this study;
- ☐ do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations 2014 amended, 2017;
- ☐ do not have and will not have any vested interest in the activity proceeding;
- ☐ have no, and will not engage in, conflicting interests in the undertaking of the activity;
- ☐ undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations 2014 amended 2017;
- ☐ will provide the competent authority with access to all information at my disposal regarding the study.



Natalie Birch Pr. Sci. Nat 400117/05

August 2025

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ABBREVIATIONS

ADE	Aquifer Dependent Ecosystems
BGIS	Biodiversity Geographical Information System
CBA	Critical Biodiversity Area
CITES	Convention on International Trade in Endangered Species
DAFF	The Department of Agriculture, Forestry and Fisheries
DAERL	Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
EIA	Environmental Impact Assessment
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
FEPA	Freshwater Ecosystem Priority Areas
GPS	Global Positioning System
GWC	Griqualand West Centre of Endemism
IUCN	International Union for Conservation of Nature
NCNCA	Northern Cape Nature Conservation Act
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas assessment
NPAES	National Protected Areas Expansion Strategy
PESEIS	Present Ecological State, Ecological Importance & Ecological Sensitivity
QDS	Quarter Degree Squares
SABAP	South African Bird Atlas Project
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SARCA	Southern African Reptile Conservation Assessment
SIBIS	SANBI's Integrated Biodiversity Information System
TOPS	Threatened or Protected Species

1. INTRODUCTION

The purpose of this project is to develop pivots under irrigation. In order to establish the required pivots natural vegetation under the pivots will have to be cleared.

An EIA process is required for this development, part of this process requires that a specialist biodiversity assessment of the site is undertaken. This report comprises the specialist biodiversity assessment for the site

The report was compiled by Dr N.V. Birch Pr. Sci Nat. (reg no 400117/05). Details of the specialist are attached in Appendix 3.

1.1. TERMS OF REFERENCE & SCOPE OF WORK

The scope of work for this study includes

Biodiversity assessment

- ☐ Review available information and documentation relating to the proposed development;
- ☐ A comprehensive investigation to identify potential floral species of special concern, this includes all IUCN listed species, TOPS listed species and species listed in schedule 1 and 2 of the NCNCA. These will be identified through the SANBI POSA database as well as other available literature and confirmed on site.
- ☐ A single field survey and literature review of the property to determine vegetation type and distribution. The survey will be undertaken to identify potential floral species of special concern.
- ☐ A single field survey and literature review to determine what red data faunal species could potentially occur within the study site. The habitat requirements of each red data species that could potentially occur on-site will be compared with the vegetation description. No onsite trapping of faunal species will be undertaken.
- ☐ Once the overall potential for occurrence of each red data species has been identified, each habitat type (based on the vegetation description and any factors identified as relevant to fauna) will be ranked in terms of conservation importance, as well as ecological sensitivity.
- ☐ The sites importance in terms of regional sensitivity will also be assessed
- ☐ The report and survey will comply with the assessment protocols.

Freshwater Assessment

- ☐ Review available information and documentation relating to the proposed development;
- ☐ A site visit and assessment of the site;
- ☐ Determine the Present Ecological State (PES) & Ecological Importance and Sensitivity (EIS) of any wetlands/pans
- ☐ Determine the impacts in terms of the characteristics of the freshwater ecosystem affected and associated with the proposed development;
- ☐ Describe and assess the significance of the proposed development on the ecosystem;

- Recommend mitigation measures to minimize the potential negative impacts on freshwater ecosystems;
- Provide comment on the impacts to the biodiversity and freshwater ecosystem as a consequence of the proposed development.

1.2. DATA SOURCING AND REVIEW

The data sources consulted and used where necessary in the study includes the following;

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (South African National Biodiversity Institute, 2006-2018)).
- Information on plant species recorded for the Quarter Degree Squares (QDS), was extracted from the POSA database hosted by SANBI. This is a much larger extent than the study area, but the data was extracted from a larger area to account for the fact that the area has probably not been well sampled in the past.
- The IUCN conservation status of the species in the list (Table 1.1) was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2020).
- Threatened Ecosystem data was extracted from the NBA Threat Status and Protection Level list (SANBI 2018).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2016 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (ADU Atlas, and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) Bates et al. (2014) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Bird species lists for the area were extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas was also consulted to ascertain if the site falls within the range of any range-restricted or globally threatened species.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site. For each species, the likelihood that it occurs at the site was rated according to the following scale:

- **Low:** The available habitat does not appear to be suitable for the species and it is unlikely that the species occurs at the site.
- **Medium:** The habitat is broadly suitable or marginal and the species may occur at the site.
- **High:** There is an abundance of suitable habitat at the site and it is highly probable that the species occurs there.
- **Definite:** Species that were directly or indirectly (scat, characteristic diggings, burrows etc.) observed at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2021-1) (See Table 1.1) and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

Table 1. The IUCN Red List Categories for fauna and flora. Species that fall within the categories in red and orange below are of conservation concern.

IUCN Red List Category

Critically Endangered (CR)

Endangered (EN)

Vulnerable (VU)

Near Threatened (NT)

Critically Rare

Rare

Declining

Data Deficient - Insufficient Information (DDD)

Data Deficient - Taxonomically Problematic (DDT)

Least Concern

The report layout is as follows in accordance with the assessment protocols 2020

Section	Requirements/Protocol	Position in Report
1	A specialist report prepared in terms of these Regulations must contain—	
(a)	Details of -	
	(i) the specialist who prepared the report; and	Cover page

	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 3
(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Page 2
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment; an indication of the quality and age of base data used for the specialist report; a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 1.3 & 3 Section 1.3 & 3 Section 6
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.2 & 3
(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 4 and Section 5
(g)	an identification of any areas to be avoided, including buffers;	Section 5
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitive of the site including areas to be avoided, including buffers;	Section 5
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6 and 7
(k)	any mitigation measures for inclusion in the EMPr;	Section 7
(l)	any conditions for inclusion in the environmental authorization;	Section 7
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 & 7
(n)	a reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorized; (ii) regarding the acceptability of the proposed activity or activities; and (iii) if the opinion is that the proposed activity of portion thereof should be authorised, any avoidance, management and mitigation	Section 7

	measures that should be included in the EMPr, and where applicable, the closure plan;	
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A at this stage,
(q)	any other information requested by the competent authority.	N/A at this stage

1.3. LIMITATIONS AND ASSUMPTIONS

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure a comprehensive database of plant and animal species are captured. However, this is rarely possible due to time and cost constraints and therefore these surveys usually represent a "moment in time" survey. The survey represents the summer/wet season survey as it was conducted in January. A plant species list was compiled for the site from the site visit, this was augmented by a list of species which are known from other studies to occur in the broad vicinity of the site. The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations. Protected tree species which are of concern within this area are easily accounted for as they are highly visible and timing of the survey does not influence the accuracy of their records.

2. REGULATORY AND LEGISLATIVE OVERVIEW

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

National Environmental Management Act (NEMA) (Act No 107, 1998):

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:

- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

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

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

NEM:BA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A TOPS permit is required for any activities involving any TOPS listed species.

National Forests Act (No. 84 of 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: “no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may

be stipulated". A permit is required for the destruction or transplant or transport of any protected tree species.

National Veld and Forest Fire Act (Act No. 101 of 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires. The Act provides for a variety of institutions, methods and practices for achieving the purpose such as the formation of fire protection associations. It also places responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

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

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

Northern Cape Nature Conservation Act, No. 9 of 2009: (NCNCA)

The Northern Cape Nature Conservation Act provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require.

Manipulation of boundary fences 19. No Person may –

(a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;

The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1. A permit is required for any activities which involve species listed under schedule 1 or 2. A permit obtainable from the DAERL permit office in Kimberly would be required for the site clearing. A permit would also be required to destroy or translocate any nationally or provincially listed species from the site. A single permit, which covers all of these permitting requirements as well as meets TOPS regulations, is used.

National Water Act, No 36 of 1998

This Act imposes 'duty of care' on all landowners, to ensure that water resources are not polluted. The following Clause in terms of the National Water Act is applicable in this case:

It stipulates that, "An owner of land, a person in control of land or a person who occupies or uses the land on which (a) any activity or process is or was performed or undertaken; which causes, has caused or likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring"

3. METHODOLOGY

A site survey, was undertaken 25-26 February 2025, a second site survey was undertaken on the 16 May 2025, and an additional survey was conducted in August 2025.

During the initial site visit, the different biodiversity features, habitat, vegetation and landscape units present at the site were identified and mapped in the field. Walk-through-surveys were conducted across the site and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbor or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site.

The second survey was conducted specifically to search for vulture breeding sites and other birds of conservation concern. This site survey was led by Angus Anthony, a vulture specialist who is currently monitoring vulture breeding sites on Dronfield. April - May see the vultures pairing off and building their nests and thus it is a good time to observe any potential nesting activity, which is why the additional site visit was conducted in May. East / West transects were inspected at about 750m to 1000m widths depending on tree density, within the suitable habitat sections. Many of the larger tree were inspected individually.

A protected tree density survey was conducted in August 2025 in order to quantify the number of protected trees that would be affected by the planned development. Given that the area was not uniform in terms of the tree density, the Point-Centered Quarter (PCQ) Method was employed to estimate tree density. However, a number of belt transects were also sampled across the property to provide additional information with respect to species richness and density.

Flora

Satellite images were used to identify homogenous vegetation/habitat units within the study area. These were then sampled on the ground with the aid of a GPS to navigate in order to characterise the species composition. The following quantitative data was collected:

- ☐ species composition,
- ☐ cover estimation of each species according to the Braun-Blanquet scale,
- ☐ vegetation height,
- ☐ amount of bare soil and rock cover,
- ☐ slope, aspect
- ☐ presence of biotic disturbances, e.g. grazing, animal burrows, etc.

Additional checklists of plant species were compiled by traversing a linear route and recording species as they were encountered. Searches for listed and protected plant species at the site were conducted and all listed plant species observed were recorded.

Fauna

The faunal study was undertaken as a desktop / literature survey combined with a field survey. The tasks included in each are given below.

Desktop/literature survey:

A desktop survey was undertaken to determine the red data reptile, amphibian, mammalian and bird species occurring in the quarter degree square in which the study area falls. The likelihood of red data species occurring on-site has been determined using the i) distribution maps in reference books and ii) a comparison of the habitat described from the field survey.

Field survey:

The habitats on-site were assessed to compare with habitat requirements of red data species determined during the literature survey. During the site visit the presence and identification of bird and mammal species was determined using the following methods / techniques:

- ☐ Identification by visual observation.
- ☐ Identification of bird and mammal calls.
- ☐ Identification of spoor.
- ☐ Identification of faeces.
- ☐ Presence of burrows and / or nests.

Wetland/pan assessment

Under Section 1(1)(xxiv) of the National Water Act (Act No. 36 of 1998) (NWA), a 'watercourse' is defined as:

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

This specialist study focused on the assessment of the pan located within the property. The following information sources were considered for the desktop assessment;

- ☐ Information as presented by the South African National Biodiversity Institutes (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (<http://bgis.sanbi.org>);
- ☐ A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Draft. Compiled by RQS-RDM (DWS, 2013);
- ☐ Aerial imagery (Google Earth Pro);
- ☐ Land Type Data (Land Type Survey Staff, 1972 - 2006);
- ☐ The National Freshwater Ecosystem Priority Areas (Nel, et al., 2011);
- ☐ Contour data.

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) was considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydro geomorphic (HGM) approach at higher levels, and also then includes structural features at the lower levels of classification (Ollis *et al.* 2013).

Criteria used in the assessment of impacts

The methodology used in the assessment of the identified impacts is provided in appendix 4

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The property under application is described as Remainder extent of the farm Droogfontein 62. The property is located approximately 20km north of Kimberley adjacent to the N12 within the Frances Baard District. The northern boundary of the property is located approximately 3km south of the Vaal River. The property was fenced to keep an assortment of game species, most of which have now been removed.



Figure 1 The location of the Farm Droogfontein 62 (red polygon) in relation to the Vaal river and Riverton

A soil suitability study was undertaken for the proposed project to determine which areas of the property were suitable for the development of irrigation ground. The results from this study are shown in Figure 2.

4.1. BROAD-SCALE VEGETATION PATTERNS

The vegetation within the study area is classified as Kimberley Thornveld (Mucina & Rutherford 2018)

Kimberley Thornveld is described as having a well-developed tree layer with *Vachellia erioloba*, *Vachellia tortilis* and *V. karroo* and *Boscia albitrunca*. The shrub layer is also described as well developed with occasional dense stands of *T. camphoratus* and *S. mellifera*. The grass layer is open with a lot of uncovered soil.

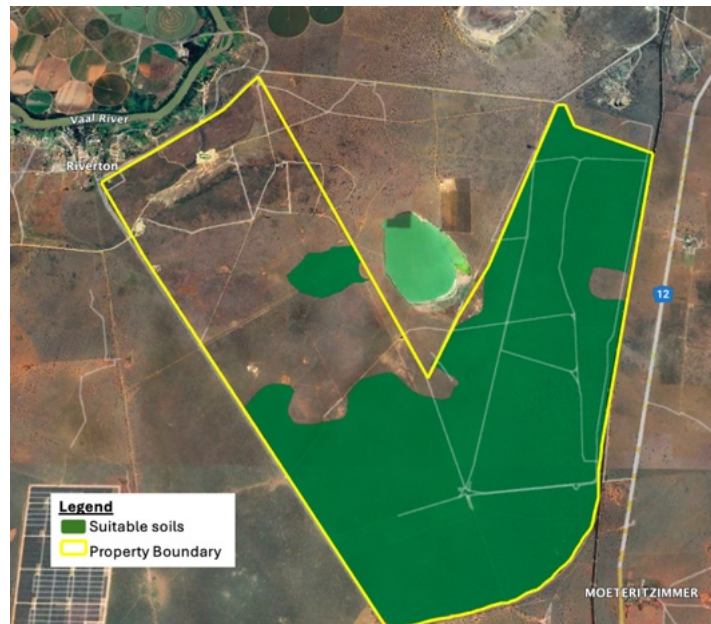


Figure 2 Areas of the property that are suitable for irrigation development in terms of soil type.

4.2. PLANT COMMUNITY AND PANS DESCRIPTION

The vegetation within the study area is differentiated into two distinct vegetation type units, an open grassland and a Mixed *Vachellia* Savannah.

This Mixed *Vachellia* Savannah community contains a tree layer which is mainly comprised of *Vachellia erioloba* and *Vachellia tortilis*. Three vegetation strata are evident within this vegetation unit. There is a prominent tree layer between 2.5m – 5m, a shrub layer, between 1.5m – 2.5m and a grass layer with an average height of 50cm. *Vachellia erioloba*, and *Vachellia tortilis* are prominent within this vegetation type. The density of the trees varies across the landscape, with some areas forming a more open savannah, while other areas have dense pockets of trees and shrubs. Other species recorded included, *Asparagus glaucus*, *Zygophyllum lichtensteinianum*, *Lycium hirsutum*, *Helichrysum arenicola*, *Selago multispicata*, and *Melhania rehmannii*. Grass species within this vegetation community included, *Eragrostis lehmanniana*, *Schmidtia pappophoroides*, *Aristida congesta*, *Centropodia glauca*, *Enneapogon scoparius*, *Stipagrostis hirtigluma* *Stipagrostis uniplumis*, and *Tricholaena monachne*

The western portion of the property consists of open grasslands, there are however scattered individual trees within these grassy areas, with the density of trees and shrubs increasing towards the eastern section of the property where the Mixed *Vachellia* Savannah occurs. The grass sword within this grassy area was

dominated by *Eragrostis lehmanniana*, *Eragrostis curvula* and *Aristida congesta*. However, species such as *Themeda triandra*, *Sporobolus fimbriatus*, *Stipagrostis obtusa*, *Fingerhuthia africana*, and *Stipagrostis ciliata* were also noted to occur. *Pteronia glauca*, *Gazania krebsiana*, *Indigofera alternans* and *Jamesbrittenia foliolosa* were recorded within the grass sword.



Figure 3 Representation of the vegetation found within the study area

A large pan and a few smaller pans occur within the grassland area. Effluent water from Kamfers Dam was piped into the large pan for a number of years. Evidence of this pumping is still visible. The vegetation within the pan consists of species that prefer more moist environments, at the time of the survey there was no standing water present in this large pan.



Figure 4 The vegetation in and surrounding the pan



Figure 5 The study site showing identified NFEPA wetlands with a the 500m assessment zone (orange polygon) around the property boundary (red polygon)

The identified FEPA wetlands were all classified as depressions (wetland with closed (or near-closed) elevation contours, which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates). They were all classified as natural with a condition of AB (>75% Natural Cover).

The NFEPA wetland information is a course data set and must be ground truthed. During the field investigation it became apparent that one of the wetland's identified by the NFEPA was miss identified, as the area indicated on the map did in fact not show any signs of wetness or a significant depression. There was however a pan located slightly to the north of this area, which was not delineated on the NFEPA map. It is likely that this discrepancy in the mapping of the pan could be the result of a glitch in the digitizing process or some other error inducing factor like the pumping of effluent water into the system. The pan identified on the ground is what was assessed further for the purpose of this report (HGM 2).

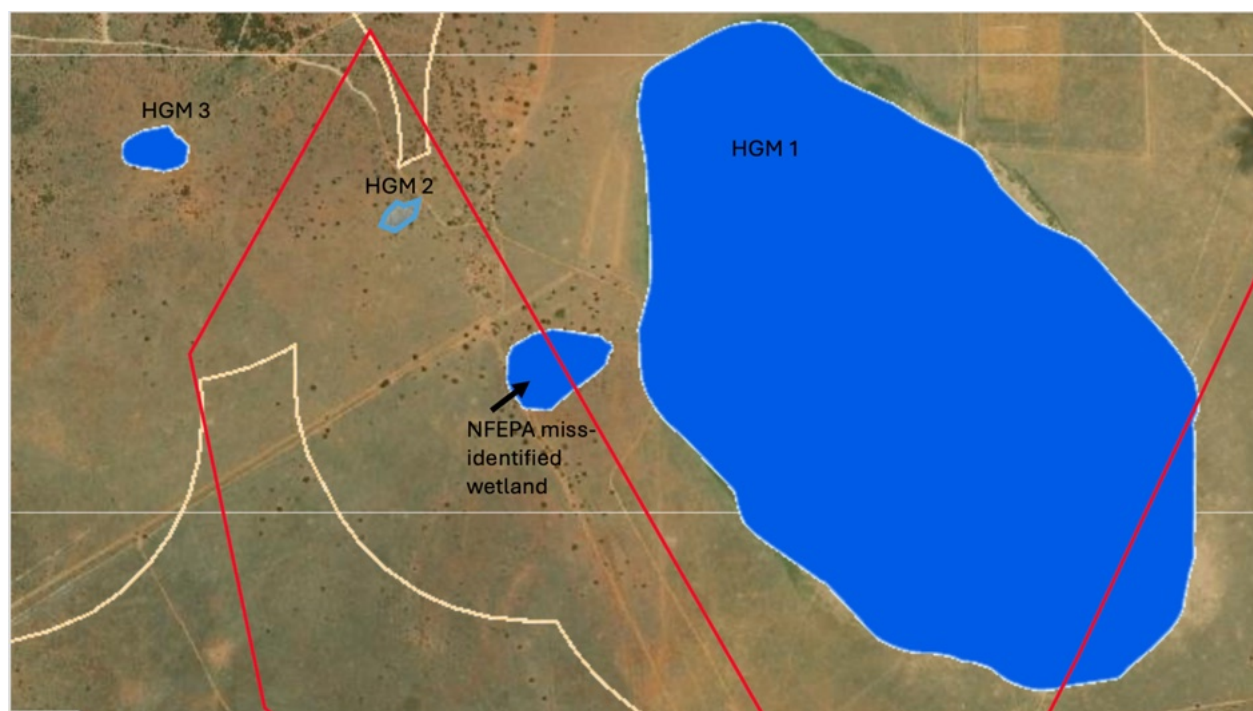


Figure 6 The location of the pans assessed for this report. HGM 2 is a pan that was not identified on the NFEPA database.

This assessment included assessing all the wetland indicators as well as assessing the Present Ecological Score (PES) or health of the wetland, the wetland's ability to provide goods and services (Eco-Services) and the Ecological Importance and Sensitivity (EIS) of the wetlands. The wetland classification for the assessed sites as per SANBI guidelines (Ollis *et al*, 2013) is given in the Table below.

Table 1: Classification as per SANBI guideline (Ollis *et al*, 2013)

Name	Description	Level 1	Level2	Level 3	Level 4
		System	NFEPA WetVEG Group	Landscape Unit	HGM
HGM1	Natural	Inland	Eastern Kalahari Bushveld group 4	Valley Floor	Depression
HGM 2	Natural	Inland	Eastern Kalahari Bushveld group 3	Bench	Depression
HGM 3	Natural	Inland	Eastern Kalahari Bushveld group 3	Bench	Depression

HGM1 is the largest of the pans and received the pumped effluent water, diverted from Kamfers Dam. This pumping has been suspended for a few years but evidence of this effluent pumping is still evident within the pan. HGM2 was the only pan that had some standing water present at the time of the survey.



Figure 7 The standing water visible within the small depression of the pan (HGM2).

The pans and their immediate surrounds showed poor soil hydromorphic characteristics. It was only in the center of the pans that there were positive soil wetness indicators. There were some facultative species noted but no obligate wetland species were observed at any of the sites during the sampling. Thus indicating that these areas are not saturated frequently or for very long periods of time.

Table 2: PES scores

HGM	Hydrology		Geomorphology		Vegetation		Overall PES	
	Rating	Score	Rating	Score	Rating	Score	Score	Class
HGM 1	C	2.4	B	1.5	B	1.6	1.8	B Natural with few modifications
HGM 2	B	1.2	B	1.5	B	1.1	1.2	B Natural with few modifications
HGM 3	B	1.9	B	1.5	B	1.2	1.5	B Natural with few modifications

The Ecosystem services provided by the HGM units present at the site were assessed and rated using the WET-EcoServices method (Kotze *et al.*, 2009). The summarised results for the HGM units are shown in Figure 6. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed. The HGMs on site had an INTERMEDIATE to MODERATELY average level of service.

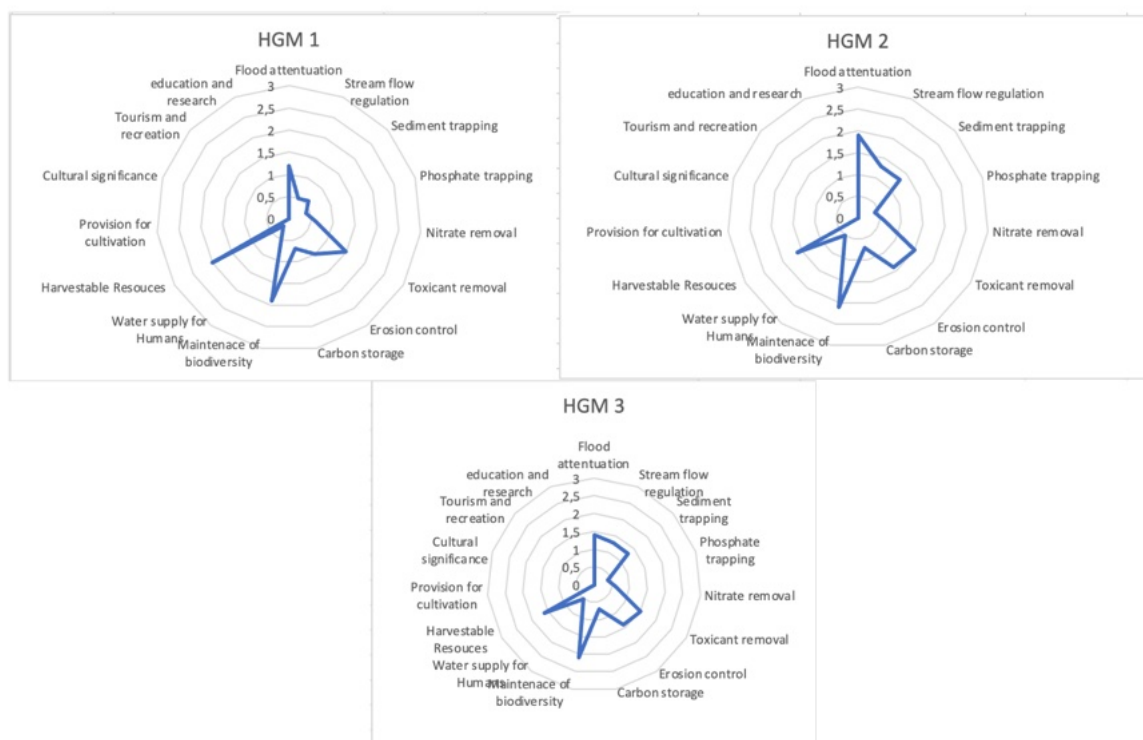


Figure 8 The spider diagram for Eco-Services rendered by the HGM units

The importance and sensitivity of water resources is determined in order to establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category. The results of the assessment are shown in Table 3.

Table 3: I&S and recommended EMC

	Importance & Sensitivity Category (mean value)	Recommended Ecological Management Class (EMC)
HGM 1	Moderate (1.9)	C
HGM 2	Moderate (1.1)	C
HGM 3	Moderate (1.6)	C

The wetland assessment methodology does not always reflect the true importance and character of the pans within the Northern Cape, as they often have long periods where there is no water saturation and thus many of the metrics used in the assessment are not relevant and skew the results. However, these pans form important biological links in the ecosystem, and therefore often more protection is warranted than what the outcome of the PESEIS would suggest. Thus, it is important that these areas are protected from development, in terms of buffer zones as well as appropriate linking corridors.

Figure 8 shows the delineated wetlands with the appropriate 100m buffer zone. The implementation of the buffer zone will assist that no activities encroach on the wetland areas and impact on the pans



Figure 9 Wetland delineation with the recommended buffer zone

4.3. POPULATIONS OF SENSITIVE AND/OR THREATENED SPECIES

FLORA

Historical records of Red List plant species were consulted in order to determine the likelihood of any such species occurring in the study area and these were searched for in the field. Plant species observed as well as a list of threatened plant species previously recorded in the quarter degree grids in which the study area is situated which was obtained from the South African National Biodiversity Institute, are listed in the table below

Table 4: Potential and recorded Protected Plant species on site

Species	Legislation	Conservation status	Potential of occurrence on site
<i>Vachellia erioloba</i>	National Forests Act 1998	Protected	Recorded on property
<i>Trachyandra saltii</i>	NCNCA	Schedule 2	Recorded on property
<i>Plinthus sericeus</i>	NCNCA	Schedule 2	Recorded on property
<i>Harpagophytum procumbens</i>	NCNCA	Schedule 1	Not recorded during survey but very high possibility of occurrence in the area
<i>Jamesbrittenia foliolosa</i>	NCNCA	Schedule 2	Recorded on property
<i>Jamesbrittenia albiflora</i>	NCNCA	Schedule 2	Not recorded in development footprint

<i>Duthiastrum linifolium</i>	NCNCA	Schedule 2	Not recorded during survey but very high possibility of occurrence in the area
<i>Brunsvigia radulosa</i>	NCNCA	Schedule 2	Recorded on property
<i>Boophone disticha</i>	NCNCA	Schedule 2	Recorded on property
<i>Aloe hereroensis</i>	NCNCA	Schedule 2	Not recorded during survey but very high possibility of occurrence in the area
<i>Aloe grandidentata</i>	NCNCA	Schedule 2	Not recorded during survey but very high possibility of occurrence in the area

Owing to the narrow temporal window of sampling some species may not have been recorded, this however does not preclude them from occurring within the development site. It is therefore recommended that prior to clearing an additional walk through is conducted. In order to remove species listed in Schedule 1 & 2 of the NCNCA, during site clearing activities an integrated permit application will have to be made to the DAERL to obtain the required permission to remove and/or translocate these species from site. In order to remove the protected trees a license application will have to be made to the Department of Forestry.

FAUNA

The property has previously been managed as a game farming operation. It was stocked with a variety of large and small game species, most of these animals have been removed since the purchase of the property, a limited amount of cattle is currently being grazed on the property. Disturbances that alter the natural environment have two effects namely, it may cause the loss of certain species due to the destruction of habitat. It may also cause the influx of other species previously unable to colonise an area owing to lack of suitable habitat or because they have been excluded through competition.

It was not possible to compile a complete list of species present on the property during the field survey owing to the limited time frame of the assessment. It is therefore important to note that many species that potentially occur on-site may not have been identified thus emphasis was placed on the habitat in order to determine potential occurrence of species. The potential of occurrence is also assessed for the immediate surrounding area as to establish the possibility of ecological linking corridors for certain species.

Based on the bird species identified while on-site, the proposed development site hosts both grassland and bushveld bird species. The loose sandy soils which occur over a large portion of the study site, makes these areas suitable for burrowing mammals.

Reptiles Species of Conservation Concern

No red data terrapin, tortoises, snakes or lizards were identified as occurring in the quarter degree square, based on the distribution maps available in the South African Red Data Book for reptiles (Bates *et. al.* 2014) and The Southern African Reptile Conservation Assessment (SARCA). The conservation status was cross checked on the IUCN website to determine most recent status listing for these species. There are

however some species of reptiles that may occur in the area that are protected in terms of the NCNCA these are listed in the table below

Table 5: Protected Reptile species

Species	Legislation	Conservation status
<i>Chamaeleo dilepis</i>	NCNCA	Schedule 1
<i>Psammobates tentorius</i>	NCNCA	Schedule 2
<i>Geochelone pardalis</i>	NCNCA	Schedule 2
<i>Lamprophis fuliginosus</i>	NCNCA	Schedule 2
<i>Pseudaspis cana</i>	NCNCA	Schedule 2
<i>Prosymna sundevalli</i>	NCNCA	Schedule 2

Amphibians of Conservation Concern

No red data amphibians were identified as occurring in the quarter degree squares, based on the distribution maps available in the South African Red Data Book for amphibians (Minter *et al.*, 2004) Du Preez and Carruthers (2009) and the South African Frog Atlas project. There are however some species that are protected in terms of the NCNCA that may occur in the area, these are listed in the Table 6.

Table 6: Protected Amphibians

Species	Legislation	Conservation status
<i>Xenopus laevis</i>	NCNCA	Schedule 2
<i>Bufo gariepensis</i>	NCNCA	Schedule 2
<i>Bufo gutturalis</i>	NCNCA	Schedule 2
<i>Bufo garmani</i>	NCNCA	Schedule 2
<i>Tomopterna cryptotis</i>	NCNCA	Schedule 2
<i>Rana angolensis</i>	NCNCA	Schedule 2
<i>Rana fuscigula</i>	NCNCA	Schedule 2

Birds of Conservation Concern

A list of all red data bird species occurring in the quarter degree square, was extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas and from the Red Data Book of Birds (Taylor *et al* 2015) with the distribution being confirmed in Roberts – Birds of Southern Africa, 7th edition (Hockey *et al.*, 2005). The IUCN 3.1. status is also presented in the table. Based on an evaluation of the habitat requirements for these red data species, the potential of these species occurring either on-site or within 500m of the property boundary is provided in Table 4.4 below.

Fourteen red data bird species have been recorded for the quarter degree square, most of these species will utilise the site for foraging purposes but they may not be totally dependent on the site.

Table 7: Bird species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements ¹	Potential for Occurrence On-site and surrounding area
Blue Crane	<i>Anthropoides paradiseus</i>	Near Threatened Vulnerable	Grasslands, cultivated lands Karoo scrub and edges of vleis	Very Low – Edge of distribution range, vegetation too dense
Kori Bustard	<i>Ardeotis kori</i>	Near Threatened Near Threatened	Dry thornveld grassland, arid scrub requires the cover of some trees	High – Recorded in the area Suitable habitat occurs on site
Greater Flamingo	<i>Phoenicopterus ruber</i>	Near Threatened Least Concerned	Greater Flamingos forage on open shallow eutrophic wetlands, both inland and coastal, with a preference for saline and brackish waters	Variable – Only when standing water is present.
Lanner Falcon	<i>Falco biarmicus</i>	Vulnerable Least Concerned	Lanner Falcons are generally a cliff nesting bird, but have adapted to using the disused nests of Black and Pied crows, situated either in trees or on power lines For foraging purposes, Lanner Falcons utilise a wide range of habitats, from semi desert to woodland, agricultural land and also occurs in cities, but appear to prefer open habitats	High – Suitable foraging habitat occurs on site
Lesser Flamingo	<i>Phoenicopterus minor</i>	Near Threatened Near Threatened	The Lesser Flamingo forages on large brackish or saline, inland and coastal waters, shallow eutrophic wetlands, salt pans and sheltered coastal lagoons This species may use water bodies more saline than those used by the Greater	Variable – Only when standing water is present. Kamfers Dam located 14km south of the study site is a well-known breeding site for the lesser Flamingos, but unless the large pan on site has standing water it is not likely to attract these birds.
Secretary bird	<i>Asagittarius serpentarius</i>	Vulnerable Vulnerable	This species shows a preference for open country, mainly savannah, open woodland, grassland, dwarf shrubland, mountain slopes and man-made habitats such as grazing paddocks and fallow fields	High – Recorded on site. Suitable habitat occurs on site
African White backed Vulture	<i>Gyps africanus</i>	Critically endangered Critically endangered	Savannah and bushveld. Nest in tall trees (<i>Vachellia erioloba</i>).	High -Suitable foraging habitat on the property No nests were recorded within the planned development area, the size of the trees are not ideal for nesting sites
Cape Vulture	<i>Gyps coprotheres</i>	Endangered Endangered	Widespread in southern Africa where it can be found in open grasslands and woodlands, from sea	High -Suitable habitat on the property. However no nests were recorded

¹ Habitat requirements determined using the following reference material: Harrison *et al.*, 1997a; Harrison *et al.*, 1997b; ; Hockey *et al.*, 2005

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements ¹	Potential for Occurrence On-site and surrounding area
			level to very high mountains provided there are high cliffs to breed on. They can, however, roost on trees and pylons far away from their breeding sites.	within the planned development area
Martial Eagle	<i>Polemaetus bellicosus</i>	Endangered, <i>Vulnerable</i>	Woodland, savannah or grassland with clumps of large trees or power pylons for nest sites	High – Suitable habitat
Verreaux's Eagle	<i>Aquila verreauxii</i>	Vulnerable <i>Least Concern</i>	Verreaux's Eagle is a solitary nester that builds a massive stick structure on a rocky outcrop or cliff, or more rarely in a tree or on a power pylon	Moderate – no suitable nesting habitat some suitable foraging habitat
Tawny Eagle	<i>Aquila rapax</i>	Endangered, Vulnerable Protected (NEMBA)	Woodland and savanna to semi-arid savanna or grassland with scattered Acacia trees	Low for breeding Moderate for foraging
Black stork	<i>Ciconia nigra</i>	Vulnerable <i>Least Concern</i>	Marshes, dams rivers and estuaries breeds in mountainous regions	Variable – Only when standing water is present
Ludwig's Bustard	<i>Neotis ludwigii</i>	Endangered <i>Endangered</i>	Requires semi-arid dwarf shrublands, occasionally visiting the southern Kalahari.	High – Sufficient habitat in surrounding areas
Lappetfaced Vulture	<i>Torgos tracheliotos</i>	Endangered <i>Endangered</i>	Savannah; semi arid regions closely associated with <i>Vachellia</i> spp, <i>Bosica albitrunca</i> and <i>Terminalia pruniodes</i>	High Suitable habitat in surrounding areas

There has been a marked increase in White-backed Vultures breeding around Kimberley over the last four years, on Dronfield alone the number of breeding pairs has gone from 86 in 2021 to 138 in 2024 (A. Anthony pers. comm.), the lack of disturbance around a potential breeding area seems to be the main key in the breeding of White-backed Vultures around Kimberley.

Although there are stands of Camel Thorn woodland with some very large trees scattered through the wooded area, which would make suitable vulture nesting sites. No signs were found of African White-backed vultures nesting in any of the trees on this property.

Some 10 to 15 vultures were seen circling up into a thermal from the southern boundary, but they were at least two kilometres south of the farm and probably from Dronfield NR. Research on Dronfield Nature Reserve over the last 30 years has shown an active Northward movement in nesting activity adjacent to the N12, but no nesting has been observed North of the Dronfield West / East boundary, on Hakahana farm (A. Anthony pers.comm). A survey undertaken at the beginning of May 2025, in the woodland to the West of the railway line and South of the Droogfontein PV Farm revealed two African White-backed vulture nests. One active in an Eskom transmission line pylon and the other an inactive tree nest from last year. These nests are 5.5km from the southern most boundary of Droogfontein farm.

Mammals of Conservation Concern

A list of all red data mammal species occurring in the quarter degree squares, was extrapolated from the Red Data Book for Mammals (EWT, 2004) and the MammalMAP, the Mammal Atlas of Africa database. Based on an evaluation of the habitat requirements for these red data species (EWT, 2004; Skinner and Chimimba, 2005), the potential of these species occurring either on-site or within 500m of the property boundary is provided in the table below

Table 8: Mammal species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS ²	SUITABLE HABITAT ON-SITE ³	POTENTIAL FOR OCCURRENCE ON-SITE AND SURROUNDING AREA
South African hedgehog	<i>Atelerix frontalis</i>	Near Threatened	The South African Hedgehog is a nocturnal species that has been recorded to occur in grassland, resting curled up under matted grass, in debris under the shade of bushes or in holes under the ground	High – Area has sufficient grassland and bushes thus suitable habitat is present.
Brown hyaena	<i>Hyaena brunnea</i>	Near Threatened	They occur in semi-desert scrub, open scrub and open woodland savannah. As they are nocturnal, cover in which to lie in during the day is essential, such as dense shade or holes in the ground. This species has been reported in the general vicinity of the site, and it is possible that this species may currently visit the site as a vagrant when feeding.	Low – For the most part, the vegetation cover of the proposed development site is suitable however the substantial amount of agricultural activity and its proximity to human habitation make it unlikely that this animal will occur in the area
Spotted-necked otter	<i>Lutra maculicollis</i>	Vulnerable	Spotted-necked Otters are found in fresh water of large rivers with prominent pools, lakes, dams and well watered swamps. They occur in deeper water than the Cape Clawless Otter, but do not move far from the water margins They	Low – Although it is likely that it occurs around the river the proposed development site of the pivots is situated too far from the water margin

² Status based on listing in the National Red List of Mammals 2016

³ Habitat requirements determined using the following reference material: Skinner and Smithers, 1990; EWT, 2004; Skinner and Chimimba, 2005

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS ²	SUITABLE HABITAT ON-SITE ³	POTENTIAL FOR OCCURRENCE ON-SITE AND SURROUNDING AREA
			are also dependent on adequate cover of dense vegetation or holes in which to hide.	
Dent's Horseshoe Bat	<i>Rhinolophus denti</i>	Near threatened	Requires <i>substantial</i> cover such as caves and rock crevices.	Low – Roosting habitat in the form of rock crevices may be available in the old mining area adjacent to the site. However suitable roosting habitat is limited for this species, it is unlikely that this species would have colonised the study site.
Black-footed Cat	<i>Felis nigripes</i>	Vulnerable	Arid and mesic savanna and scrubland, prefer rocky areas	Moderate – limited suitable habitat
Temminck's ground pangolin	<i>Smutsia temminckii</i>	Vulnerable	Arid and mesic savanna and woodland with annual rainfall of 250-1,400 mm.	High – Suitable habitat within the study area.

4.4. CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

Kimberley Thornveld is classified as Least Threatened only 4.4% of this vegetation is formerly conserved and 26.4% is considered transformed, mostly by agricultural cultivation. Threats include bush encroachment mostly by *Senegalia mellifera* owing to overgrazing, cultivation and mining.

The proposed development area falls within a Critical Biodiversity Area 2 (CBA2). CBA2 are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and/or avoidance of conflict with other land or resource uses.

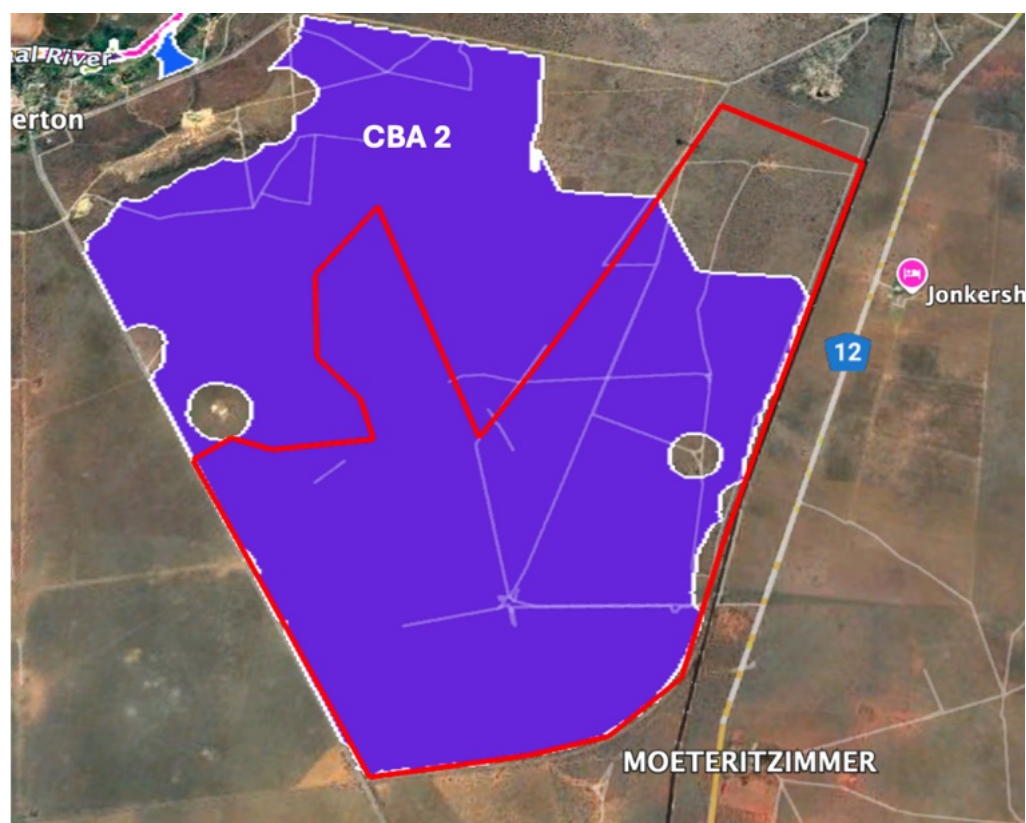


Figure 10 : The proposed development area overlaid with the Northern Cape Critical Biodiversity areas Map (2024)

This area has been categorised as a CBA 2 largely owing to the presence of threatened bird habitat, as well as reaching vegetation type targets.

The study area is not considered a threatened ecosystem in terms of NEM:BA. The proposed development site borders a River FEPA, River FEPAs achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species. For river FEPAs the whole sub-quaternary catchment is shown as a FEPA, although FEPA status applies to the actual river reach shown on the map within such a sub-quaternary catchment. It does not fall within a strategic ground water resource area, nor does it fall within an important bird area, although it is located about 4km from the Dronfield Important bird area.

The project area does not fall within a NPAES focus area but is located approximately 11km North west of the Tarentaalrand Safari Lodge protected area.

4.5. ALIEN/INVASIVE SPECIES

The Conservation of Agricultural Resources Act (CARA) regulates and restricts the propagation, harboring and sale of invasive alien plant and weed species listed in a set of Regulations published in terms of the Act. CARA was amended in 2001 and is administered by the National Department of Agriculture. In addition, the Northern Cape Nature Conservation Act (Act 9 of 2009), Chapter 7 states

that no person may import, export, transport, possess or trade in an invasive species and that the owner of land upon which an invasive species is found, must take the necessary steps to eradicate or destroy such species. Schedule 6 of this Act lists a number of species classified as invasive.

The National Environmental Management: Biodiversity Act (NEMBA – Act no. 10 of 2004) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. All listed IAPs are divided into four categories in accordance with the Government Gazette Notice No. 40166 of July 2016 as listed below:

□ **Category 1a (PROHIBITED): Listed Invasive Species**

A person in control of a Category 1a Listed Invasive Species must comply with the provisions of section 73(2) of the Act; immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

□ **Category 1b (PROHIBITED / Exempted if in Possession or Under control): Listed Invasive Species**

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act. A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

□ **Category 2 (PERMIT REQUIRED): Listed Invasive Species**

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3. Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

□ **Category 3 (PROHIBITED): Listed Invasive Species**

Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and

prohibitions in terms of section 71A of the Act, as specified in the Notice. Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

Table 9: Alien and invasive species noted within in the proposed development footprint

Species		Category
<i>Argemone mexicana</i>	Yellow flowered Mexican Poppy	1b
<i>Prosopis cf. glandulosa</i>	Mesquite	3
<i>Opuntia humifusa</i>	Prickly pear	1b
<i>Argemone ochroleuca</i>	White flowered Mexican poppy	1b
<i>Datura ferox</i>	Large thorn apple	1

5. SITE SENSITIVITY

The classification of areas into different sensitivity classes is based on information collected at various levels. This includes the national conservation status of the vegetation, the presence of species of special concern and the condition of the vegetation

Vegetation types can be categorised according to their conservation status, which is in turn, assessed according to the degree of the transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. Sensitivity of habitats and sites within the area can be assessed using a combination of criteria as follows:

	Criterion	Definition
1	Conservation status of untransformed habitats occurring in the study area	The extent of each vegetation type occurring within the study area that is conserved and/or transformed relative to a targeted amount required for conservation
2	Presence and number of Red Data species and other species of special concern	Presence or potential presence of Red Data species within habitats
3	Within-habitat species richness of flora and the between-habitat (beta) diversity of the site	Presence or potential presence of Red Data Species within habitats.
4	The type or nature of topography of the site, ie presence of ridges koppies etc	Steepness and/or nature of topography in the study area.

5	The type and nature of important ecological processes on site, especially hydrological processes, ie wetlands drainage lines etc.	Habitats and/or terrain features that represent ecological processes such as water-flow migration routes etc.
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In order to advise the impact assessment and the proposed mitigation, a sensitivity map has been generated for the property using a number of criteria. In order to quantify and detail the sensitive areas in terms of the criteria used to assess sensitivity, the site was demarcated into a number of manageable blocks. A table was created to list each of the sensitivity criteria and a value assigned to each criteria. Each block was then assessed in terms of its relative sensitivity value. This produced a quantifiable sensitivity map. The criteria used to assess the sensitivity included;

Current state of degradation	1 = (80-100% degraded), Very degraded, highly transformed 2 = (60 -79% degraded), moderately transformed 3 = (40 – 59%) degraded, some transformation 4 = (20 -39% degraded, slightly transformed 5 = (0-19%) degraded Good condition
Slope & drainage	1 = Flat 2 = Gently undulating 3 = Slight slope 4 = Slope less than 5° 5 = Slope 5° or greater
Potential for erosion	1= Low 2 = Medium 3 = High
Presence of Red Data Species	0 = No 1 = Yes
Suitable habitat for RD species	0 = No 1 = Yes
Potential habitat fragmentation	1 = Low 2 = Low – moderate 3 = Moderate 4 = Moderate - high 5 = High
Importance to biodiversity& Ecosystem Functioning	1 = Low 2 = Low – moderate 3 = Moderate 4 = Moderate - high 5 = High

Areas have been classified as follows:

- **Low (0-9)** sensitivity areas are where disturbance has already taken place and further development will not have a significant environmental impact.
- **Moderate (10-20)** sensitivity areas: The vegetation and habitats in these areas are well represented in the surrounding region. It may include some potential habitat for red data species or the presence of limited red data species. Development in these areas, would be subject to guidelines and the mitigation measures.

- **High (21-23)** sensitivity areas included confirmed occurrence of numerous red data species, and ideal red data species habitat. Any development in these areas would have a significant environmental impact. Development may be permitted under strict development guidelines, such as under guarantee that similar areas would be conserved thus reducing the risk of development.
- **No-go areas (24-25)** very sensitive areas no development permitted

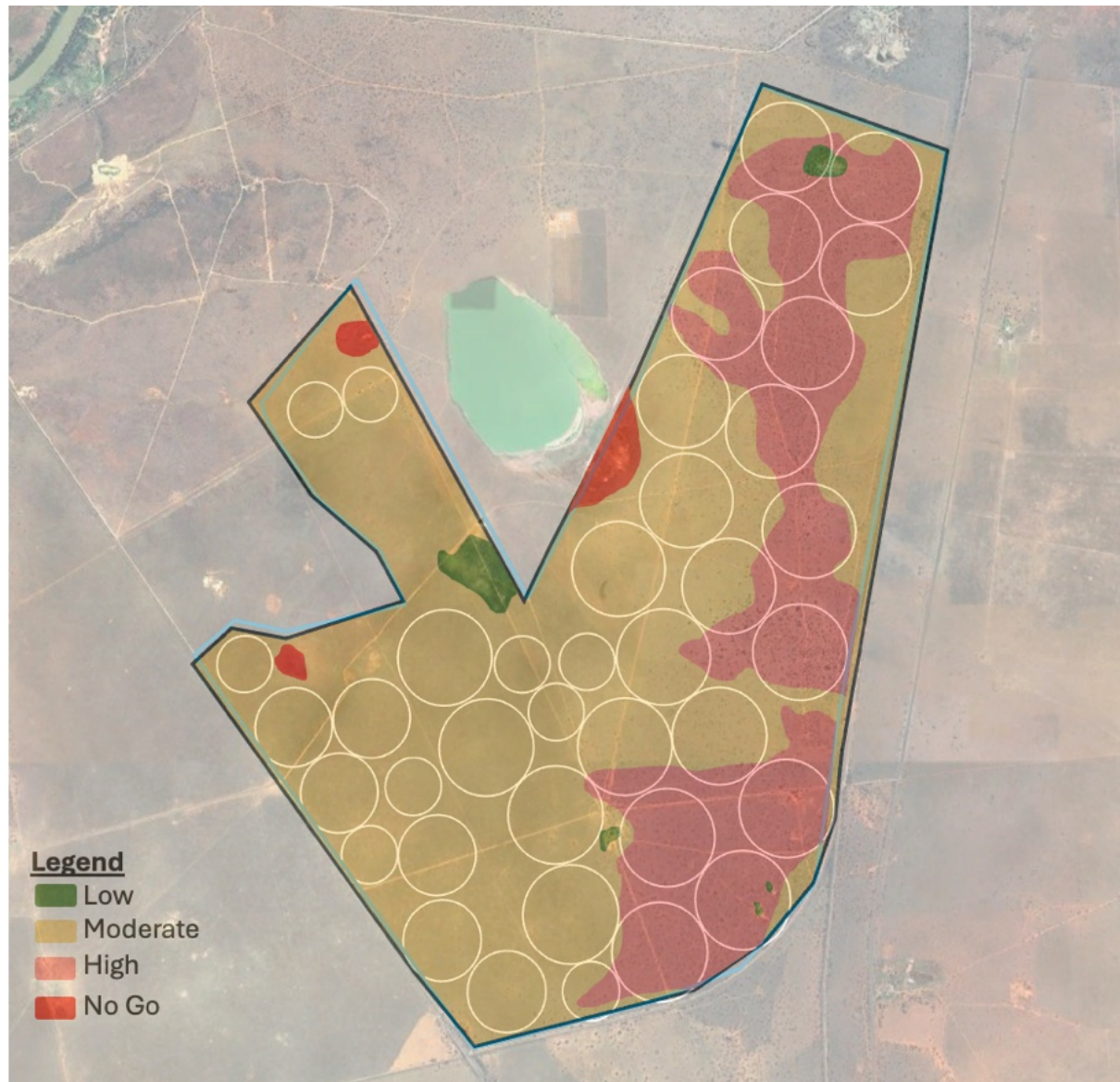


Figure 11 Site sensitivity map showing the proposed pivot layout

The no-go areas fall within the areas delineated as wetland (pans) including the proposed buffer zones as well as a small isolated rocky outcrop, these areas must be avoided and excluded from development.

The areas of high sensitivity are areas that contain a substantial number of large, protected trees (*Vachellia erioloba*), which serve as ideal habitat for a critically endangered species, namely the White-back Vulture. No nests were located on site, the nearest nesting activity that has been recorded is about 5.5km from the property's southern boundary.

The *Vachellia erioloba* is a protected species under the National Forests Act of 1998 (Act 84 of 1998). Larger trees are important as nesting and as perching sites but the groups of smaller trees provide a unique habitat acting as a nursery for other plant species and creating important habitats for faunal species. The density of these protected trees is not uniform throughout the property and some of the proposed pivots do not contain any protected trees, while others contain dense stands of protected trees. In order to determine the number of protected trees that would be affected by the proposed development a density survey was conducted within the proposed development footprint.

There is a woody plant density gradient across the study area where the woody density is greater in the south-eastern section of the property, the western portion of the proposed development footprint consists of open grassland, pivots within this area contain very few to no protected trees. The area indicated as High sensitivity contained a high density of protected trees and there are a number of proposed pivots located within this area. The woody component changes in terms of species composition and density from west to east across the property. The south-eastern section contained a higher woody species diversity, with species such as *Senegalia mellifera*, *Ziziphus mucronata* and *Grewia flava* occurring in the tree/shrub layer.

The density survey indicated that the proposed pivot layout would result in approximately 4803 protected trees being lost. As this is a large number of trees and many pivots are located in a high sensitive area, an alternative layout is required to reduce the impact to the protected trees. The soil analysis study undertaken as part of the ploughing certificate application, indicated that suitable soils were not evenly distributed throughout the proposed development area, thus there are limitations to the layout permutations as not all areas have been classified as suitable for irrigation development. There are also limitations in terms of economic viability and cycle intervals for the potato crops as this system relies on a critical time interval between potato crops in order to remove the risk of disease. Potato farming has to be carried out on a cyclical bases, with the soil being rested with sufficient intervals in order to prevent disease build up, the longer the rest cycle the more sustainable the system. If the period between potato crops is too short, the system will fail and the area will no longer be suitable for potato farming, this cycle and area planted also has to be financially viable.

An alternative option would be to reduce the number of pivots and reshuffle the position and size of the remaining pivots, which would reduce the amount of vegetation clearing and in so doing reduce the number of protected trees affected. The priority would be to remove as many pivots as possible from the areas of high sensitivity. Figure 12 shows the alternative proposed layout, and which pivots will be active during each phase of the cycle. 10 pivots have been removed from the areas of high sensitivity (high tree density).

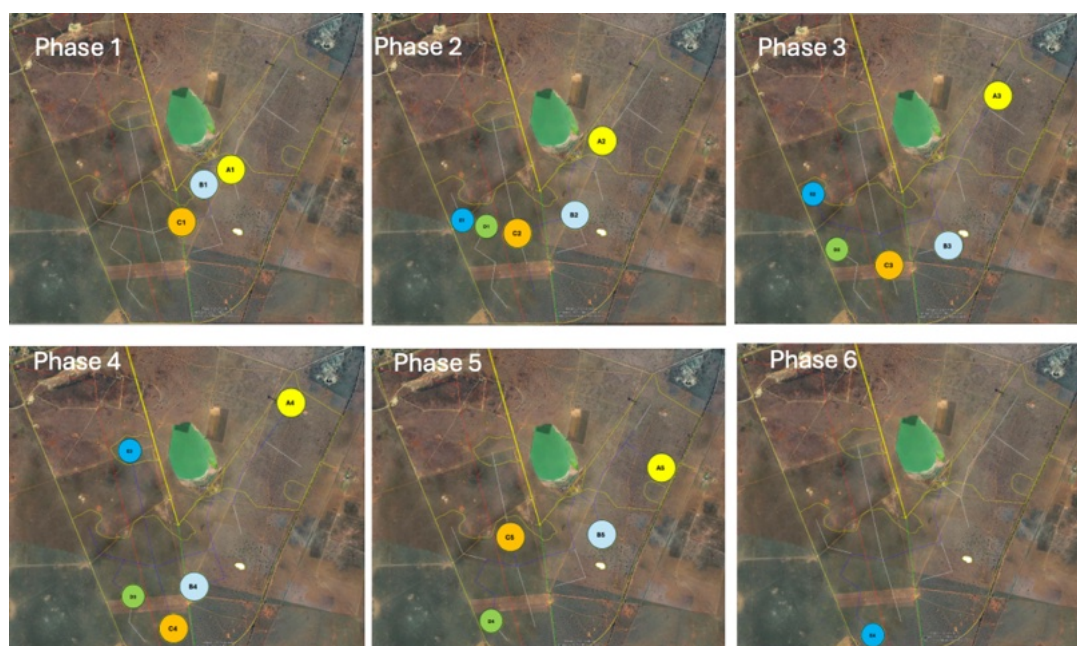


Figure 12 Alternative proposed layout of active pivots over the six year cycle

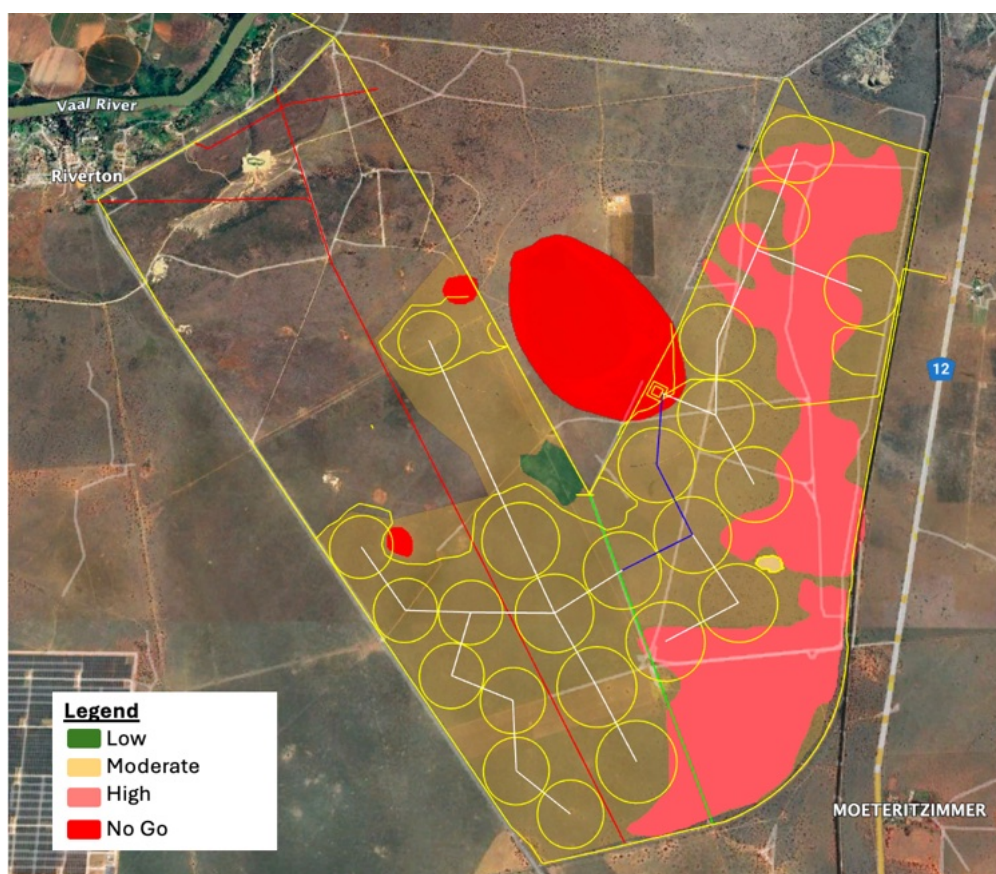


Figure 13 Site sensitivity map showing the alternative proposed pivot layout

The protected trees that will be lost with the alternative proposed layout will be as follows:

Phase 1: 292 (A1 has the highest number of protected trees)

Phase 2: 179 (A2 and B2 have highest number of protected trees)

Phase 3: 440 (A3 and B3 contain significant protected trees)

Phase 4: 642 (A4 has the highest density of protected trees)

Phase 5: 434 (A4 has highest density of protected trees)

Phase 6: 16

A total of 2003 protected trees have been calculated to be impacted by this alternative layout.

6. POTENTIAL IMPACTS

Typically, a development is divided into the construction phase and the operational phase. It is during this phase that most of the destruction of habitat and microhabitat takes place. For this development the construction phase will be considered as the initial clearing and preparation of the land. Planting and harvesting and subsequent successional phases will be considered the operational phase. The pivots will be run on a cyclic basis so only a few of the pivots will be operational at any one time, thus the construction and operational phases will run concurrently with pivots being at different phases of the successional process and development until all the pivots have been developed.

Two layout options will be assessed in terms of potential impacts. The proposed development option as presented in Figure 1 (the proposed layout) and the reduced number of pivots option as presented in Figure 12 (the alternative layout).

1. **Habitat fragmentation, Loss of Natural vegetation and Alien invasion.**

Vegetation clearing will occur as a result of the development of irrigation pivots. This loss of natural vegetation will cause fragmentation and habitat disturbance in the landscape. Disturbance within natural systems makes them more prone to invasion of alien species. The disturbance destroys primary vegetation. As primary vegetation is more functional in an ecosystem, this could irreversibly transform the vegetation characteristics and faunal populations in the area. Clearing of surface areas has the effect of creating unnatural open spaces through the vegetation and the matrix of the landscape. For the smaller species, it limits movement and restricts access to foraging sites. This results in reduced population density of prey species (invertebrates and / or smaller birds and / smaller mammals and / or herpetofauna) which then reduces the food availability for predators invertebrates and / or larger birds and / or larger mammals and / or herpetofauna). The changes in the vegetation structure also alter the availability of suitable cover for many faunal species. The significance of the loss of habitat and fragmentation may be lessened by creating suitable ecological corridors that ensure ecosystem connectivity.

Most of the planned development area falls within a CBA 2. In CBAs 1 & 2 rezoning of properties that will result in increased biodiversity loss is generally not advocated, as Critical Biodiversity Areas 1 & 2 are areas which include threatened species and/or threatened ecosystems that need to be kept in their natural

or near natural state. There is however already a railway line and a tarred road (N12) near the eastern boundary of the property and a gravel road on the western boundary as well as a mine and a solar power development to the north and the south of the property respectively, these structures/disturbances already significantly fragment the habitat within this CBA area. As this fragmentation impact is already present further development will increase the significance of the cumulative impact but will not create a new impact in terms of fragmentation.

The wetland including the buffer zone has been demarcated as a NO-GO area. The large pan has already been subject to some disturbance being the recipient of effluent water, but has been fairly robust in managing these disturbances, thus the location of pivots adjacent to the pans should not impact the functioning of this system significantly provided there is no disturbance within the bufferzone area.

Clearance of primary vegetation allows secondary pioneer species or invasive plants to enter and re-colonise disturbed areas, thus increasing the possibility of Alien species invading. Many alien species proliferate in disturbance areas such as the periphery of the irrigation lands. Invasive species affect our natural biodiversity in a number of ways. They may compete directly with natural species for food or space, may compete indirectly by changing the food web or physical environment, or hybridize with indigenous species. Rare species with limited ranges and restricted habitat requirements are often particularly vulnerable to the influence of these alien invaders. Invasive plants have claimed about 8 percent or 10 million hectares of land suitable for agricultural use in South Africa. These invasive alien plants steal about seven percent of South Africa's water bulk every year.

Mitigation:

Vegetation clearing should be restricted to areas of the pivots only. A management plan must be drawn up for the ecological corridor and other undeveloped portions of the property to best support the biodiversity and ecosystem connectivity in the area. The Alien vegetation that has grown as a result of land clearing must be removed by methods recommended by DWA. The avoidance of the no-go areas must be strictly enforced.

Impact Name	Habitat fragmentation, Loss of Natural vegetation and Alien invasion				
Alternative	Proposed Layout				
Phase	Construction & Operation				
Environmental Risk					
Attribute	Pre - mitigation	Post mitigation -	Attribute	Pre - mitigation	Post mitigation -
Nature of Impact	-1	-1	Magnitude	3	2
Extent of Impact	3	1	Reversibility	3	3
Duration	4	4	Probability	5	3

Environmental Risk (pre- mitigation)	-16.25
Environmental Risk (post-mitigation)	-7.5
Degree of confidence in impact prediction	HIGH
Cumulative Impacts	2
Degree of Potential irreplaceable loss of resources	1
Prioritisation Factor	1.13
Final Significance (Medium to low)	-8.44

Impact Name	Habitat fragmentation, Loss of Natural vegetation and Alien invasion				
Alternative	Alternate layout				
Phase	Construction & Operation				
Environmental Risk					
Attribute	Pre - mitigation	Post mitigation	Attribute	Pre - mitigation	Post mitigation
Nature of Impact	-1	-1	Magnitude	2	2
Extent of Impact	2	1	Reversibility	3	2
Duration	4	3	Probability	3	3
Environmental Risk (pre- mitigation)					-8.25
Environmental Risk (post-mitigation)					-6
Degree of confidence in impact prediction					HIGH
Cumulative Impacts					2
Degree of Potential irreplaceable loss of resources					1
Prioritisation Factor					1.13
Final Significance (Medium to low)					-6.75

2. Loss of Species of Conservation Concern

The clearing of vegetation will result in the loss of some protected flora. The cumulative impact of vegetation clearing and the subsequent loss of these protected trees for irrigation development in this area increases the significance of this impact as more of the vegetation type is transformed, however the development will not result in a loss of this resource from the area.

Birds of conservation concern occur in the area, the Dronfield IBA is located about 3km south of the site. No signs were found of African White-backed vultures nesting in any of the trees on this property during the field investigation, it is however probable that this area could form part of their foraging sites. Research on Dronfield Nature Reserve over the last 30 years has shown an active Northward movement in nesting activity adjacent to the N12, but no nesting has been observed North of the Dronfield West / East boundary, on Hakahana farm. Although this proposed development site has suitable trees for nest sites the disturbance from the roads and railway line is likely the reason no nesting activity has occurred in this area.

The reduction of suitable habitat from an area is always a cause for concern, and although suitable habitat may still be available it does impact on the number of these species that an area can carry.

Mitigation:

A search and rescue operation should be performed prior to clearing, it is however not a feasible or practical option with regard to the protected trees, so it's important to ensure that trees between the pivots remain undisturbed. Where possible trees should be avoided as much as possible, ie access roads between pivots can be re-routed to avoid clearing specific trees

Impact Name	Loss of Species of Conservation Concern						
Alternative	Proposed layout						
Phase	Construction & operation						
Environmental Risk							
Attribute	Pre - mitigation	Post mitigation	-	Attribute	Pre - mitigation	Post mitigation	-
Nature of Impact	-1	-1		Magnitude	4	3	
Extent of Impact	2	2		Reversibility	3	3	
Duration	4	4		Probability	5	4	
Environmental Risk (pre- mitigation)						-16.25	
Environmental Risk (post-mitigation)						-12	
Degree of confidence in impact prediction						HIGH	
Cumulative Impacts						2	
Degree of Potential irreplaceable loss of resources						1	
Prioritisation Factor						1.13	
Final Significance (Medium to High)						-13.50	

Impact Name	Loss of Species of Conservation Concern				
Alternative	Alternate layout				
Phase	Construction & operation				
Environmental Risk					
Attribute	Pre - mitigation	Post mitigation -	Attribute	Pre - mitigation	Post mitigation -
Nature of Impact	-1	-1	Magnitude	3	2
Extent of Impact	1	1	Reversibility	3	3
Duration	4	4	Probability	3	3
Environmental Risk (pre- mitigation)					-8.25

Environmental Risk (post-mitigation)	-7.5
Degree of confidence in impact prediction	HIGH
Cumulative Impacts	1
Degree of Potential irreplaceable loss of resources	1
Prioritisation Factor	1.00
Final Significance (Medium to low)	-7.50

3. Anthropogenic Disturbances, Intentional and/or accidental killing of fauna

Anthropogenic disturbances include aspects such as, vibrations caused by machinery & vehicles. These aspects will impact on invertebrate species more than any other faunal species. These anthropogenic disturbances impact on the way invertebrates forage. For example; some invertebrates use vibrations caused by their prey to locate and catch them. Vibrations caused by construction equipment will make this impossible. Smaller fauna will inevitably be killed during land clearing activities as these activities will destroy their habitat. In addition to unintentional killing of fauna, some faunal species, particularly herpetofaunal species, are often intentionally killed as they are thought to be dangerous.

Mitigation

There is unfortunately no mitigation for the vibrations caused by machinery/vehicles, except perhaps ensuring that activities are kept to a minimum. A search and rescue can be conducted prior to clearing activities, for example animals such as tortoises should be moved out of harm's way. As the killing of herpetofauna is considered a result of ignorance, this can be ameliorated through education. The labour force involved should be educated regarding the conservation importance of herpetofauna.

Impact Name	Anthropogenic Disturbances, Intentional and/or accidental killing of fauna						
Alternative	Proposed layout						
Phase	Construction & Operation						
Environmental Risk							
Attribute	Pre - mitigation	Post mitigation	-	Attribute	Pre - mitigation	Post mitigation	-
Nature of Impact	-1	-1		Magnitude	1	1	
Extent of Impact	1	1		Reversibility	2	2	
Duration	3	3		Probability	3	2	
Environmental Risk (pre- mitigation)						-6	
Environmental Risk (post-mitigation)						-3.5	
Degree of confidence in impact prediction						MEDIUM	
Cumulative Impacts						2	
Degree of Potential irreplaceable loss of resources						1	
Prioritisation Factor						1.13	

Final Significance(Low)	-3.94
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Impact Name	Anthropogenic Disturbances, Intentional and/or accidental killing of fauna						
Alternative	Alternate layout						
Phase	Construction & Operation						
Environmental Risk							
Attribute	Pre - mitigation	Post mitigation	-	Attribute	Pre - mitigation	Post mitigation	-
Nature of Impact	-1	-1		Magnitude	2	1	
Extent of Impact	1	1		Reversibility	2	2	
Duration	3	3		Probability	2	2	
Environmental Risk (pre- mitigation)						-4	
Environmental Risk (post-mitigation)						-3.5	
Degree of confidence in impact prediction						MEDIUM	
Cumulative Impacts						1	
Degree of Potential irreplaceable loss of resources						1	
Prioritisation Factor						1.00	
Final Significance(Low)						-3.50	

4. Sedimentation, contamination and disruption of freshwater ecosystems

It is important to maintain good hydrological functioning within the area as well as good vegetation cover to minimize sedimentation and erosion from runoff.

The development of the pivots has the potential to impact surface water run-off in terms of, quantity and quality as well as directional flow. As not all the pivots will be active at once, the inactive pivots will contain a vegetation cover, and the areas between the pivots will be kept natural, the disruption of the hydrological functioning should not be significant.

Mitigation

Only the pivot footprint must be cleared and the lands planted as soon as possible after clearing. Erosion control measures must be in place to aid in the prevention of wash. Spot treatments of pesticide and herbicides reduce the risk of runoff and contamination of surrounding areas

Impact Name	Sedimentation contamination and disruption of freshwater ecosystems				
Alternative	Proposed Layout				
Phase	Construction & Operation				
Environmental Risk					
Attribute	Pre - mitigation	Post - mitigation	Attribute	Pre - mitigation	Post - mitigation
Nature of Impact	1	1	Magnitude	2	2
Extent of Impact	3	2	Reversibility	2	2

Duration	4	3	Probability	2	2
Environmental Risk (pre- mitigation)					--5.5
Environmental Risk (post-mitigation)					-4.4
Degree of confidence in impact prediction					Medium
Cumulative Impacts					1
Degree of Potential irreplaceable loss of resources					1
Prioritisation Factor					1.00
Final Significance (Low)					-4.5

Impact Name	Sedimentation contamination and disruption of freshwater ecosystems				
Alternative	Alternate Layout				
Phase	Construction & Operation				
Environmental Risk					
Attribute	Pre - mitigation	Post - mitigation	Attribute	Pre - mitigation	Post - mitigation
Nature of Impact	-1	-1	Magnitude	2	2
Extent of Impact	2	1	Reversibility	2	2
Duration	4	3	Probability	2	2
Environmental Risk (pre- mitigation)					--5
Environmental Risk (post-mitigation)					-4
Degree of confidence in impact prediction					Medium
Cumulative Impacts					1
Degree of Potential irreplaceable loss of resources					1
Prioritisation Factor					1.00
Final Significance (Low)					-4.0

7. RECOMMENDATIONS AND CONCLUSION

The area of the proposed development consists of mostly natural vegetation. The areas of highest conservation concern for this project is the area of the pans and their immediate surrounds and the areas containing large protected *Vachellia erioloba* trees.

The Northern Cape Critical Biodiversity area map has only recently been updated and published. The 2016 CBA map limited the area of the CBA 2 to the area immediately surrounding the pan leaving much of the property as unrestricted natural area which would allow for irrigation development. This was the position when the property was purchased to develop and when the application for irrigation development was made. The updated CBA map was not available when the initial application and pre-application meeting was held with DAERL. The updated CBA map shows most of the property now classified as a CBA2.

According to the update CBA map this area has been classified as a CBA 2, to meet vegetation type targets as well as the presence of threatened bird's habitat. There are no endangered or critically endangered flora or fauna on site that will be lost as a direct result of the proposed development, i.e. there are no irreplaceable features on site. The endangered and critically endangered bird species that occur in the area are not directly dependent on the site. Although protected trees will be lost from site, these trees are well represented in the immediate surrounds and therefore will not be lost from the area. Thus, the proposed development will not result in the loss of an irreplaceable biodiversity resource from the area.

The amount of effective mitigation measures that can be implemented to reduce the significance of this development on the biodiversity is however limited as it is not feasible to leave trees *in situ* within the footprint of the pivots and it is not practical to translocate the affected trees. But by altering the position of the pivots and reducing the number of pivots the impact to the protected trees can be greatly reduced. The alternate layout plan significantly reduces the number of protected trees that will be lost. The balance between development and protecting biodiversity hinges on sustainable practices that integrate economic growth with responsible resource use and conservation efforts, recognizing that biodiversity underpins essential ecosystem services. Planning layouts that create or maintain connected patches of habitat allows for species movement, genetic exchange, and the resilience of populations. The best ground in terms of agricultural potential is unfortunately associated with the protected trees within the Kimberley Thornveld vegetation type as these trees are found on the deep red soils which are ideal for agricultural development. Two site layout options have been presented for the development, the alternative option (reduced number of pivots) will result in significantly fewer protected trees being lost, as well as a large ecological corridor being established, within an area of high sensitivity (higher woody species diversity and larger camel thorn trees) and is therefore the preferred option.

It is important to maintain the integrity of the natural vegetation between the pivots and ensure that the undeveloped areas are managed to best support the biodiversity. Active management of alien vegetation growth within these areas and along the edges of the pivots is also really important.

There is however the issue of the development restriction of intensive agriculture within a CBA 2. The socio-economic gains from such an agricultural development therefore needs to be weighed up against the negative impact from development within a CBA 2. There is no irreplaceable biodiversity feature that will be lost as a result of the development, and the ecological corridor created by removing development from the high sensitive areas will help maintain ecosystem connectivity. The existing impact from the very busy railway line and N12 bordering the property decreases this areas suitability as a breeding area for the critically endangered African white-backed vulture.

The proposed development layout alternative will mitigate the impact on the biodiversity to a significance of medium to low. The key to ensuring that residual impacts are kept low is to ensure the ecological corridor is maintained as a functioning ecosystem and prevent future development within this area. It may be worthwhile to explore the possibility of formalizing a protection status for the ecological

corridor. There are various options, such as to declare the corridor a protected environment, establish a biodiversity agreement or a conservation servitude.

The declaration of protected environments is generally a process considered over multiple properties, but it is binding on the landowner and can be added as a title deed restriction. It is considered to be part of South Africa's protected area estate and contributes to meeting protected area targets.

A biodiversity agreement and a conservation servitude are both binding on the landowner. A biodiversity agreement is binding on the landowner in terms of a contract for a minimum of 5 years or longer, while a conservation servitude requires a notarial deed registered at the Deeds Registry for a minimum of 99 years and it is binding on successor in title, it also provides management conditions particular to the area in question. Input should be obtained from the various stakeholders to guide the decision of which options would be most appropriate.

8. REFERENCES

Alexander, G. & Marais, J. 2007. A Guide to the Reptiles of Southern Africa. Struik Nature, Cape Town.

BirdLife International 2012. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded January 2023

Branch W.R. (Ed) 1988: South African Red Data Book – Reptiles and Amphibians. NMB Printers, Port Elisabeth.

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

Du Preez, L. & Carruthers, V. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.

Fairbanks, D.H.K., Thompson, M.W., Vink, D.E., Newby, T.S., Van Den Berg, H.M. & Everard, D.A. 2000. The South African land-cover characteristics database: a synopsis of the landscape. S. Afr. J. Sci. 96: 69–82.

EWT, 2004. Red Data Book of the Mammals of South Africa: A conservation Assessment. Endangered Wildlife Trust, Johannesburg.

Hockey P.A.R., Dean W.R.J., and Ryan P.G. 2005. Robert's Birds of Southern Africa, seventh edition. Trustees of the John Voelcker Bird Book Fund, Cape Town.

Institute For Water Research, 2012. Implementing Uncertainty Analysis in Water Resources Assessment and Planning, Water Research Commission Project No: K5/2056, Institute for Water Research, Rhodes University.

Minter L.R., Burger M., Harrison J.A., Braak H.H., Bishop P.J., and Kloepfer D. (Eds), 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MBA Series #9. Smithsonian Institute, Washington DC.

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

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801

Skinner J.D., and Chimimba C.T. 2005: Mammals of the Southern African Subregion. Cambridge University Press, Cape Town.

Taylor, M., Peacock, F., Wanless, R.(eds) 2015. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Johannesburg.

Van Wyk, A.E. & Smith, G.F. 2001. Regions of floristic endemism in southern Africa. Umdaus press, Hatfield

APPENDIX 1

SPECIES LISTS

PLANT SPECIES CHECK LIST

Family		Ecology	IUCN	NCNCA	Forest Act
Amaranthaceae	<i>Salsola microtricha</i> Botsch.	Indigenous; Endemic	LC		
Amaryllidaceae	<i>Brunsvigia radulosa</i> Herb.	Indigenous	LC	Schedule 2	
Amaryllidaceae	<i>Boophone disticha</i> (L.f.) Herb.	Indigenous	LC	Schedule 2	
Asparagaceae	<i>Asparagus glaucus</i> Kies	Indigenous	LC		
Asphodelaceae	<i>Trachyandra saltii</i>	Indigenous; Endemic	LC	Schedule 2	
Asphodelaceae	<i>Aloe hereroensis</i> Engl.	Indigenous	LC	Schedule 2	
Asphodelaceae	<i>Aloe grandidentata</i> Salm-Dyck	Indigenous	LC	Schedule 2	
Asteraceae	<i>Chrysocoma ciliata</i> L.	Indigenous	LC		
Asteraceae	<i>Helichrysum arenicola</i> M.D.Hend.	Indigenous	LC		
Asteraceae	<i>Euryops asparagoides</i> (Licht. ex Less.) DC.	Indigenous	LC		
Asteraceae	<i>Nolletia chrysocomoides</i> (Desf.) Cass. ex Less.	Indigenous	LC		
Aizoaceae	<i>Plinthus sericeus</i> Pax	Indigenous	LC	Schedule 2	
Brassicaceae	<i>Lepidium africanum</i> (Burm.f.) DC.	Indigenous	LC		
Brassicaceae	<i>Heliophila minima</i> (Stephens) Marais	Indigenous	LC		
Cactaceae	<i>Opuntia humifusa</i> (Raf.) Raf				
Cleomaceae	<i>Cleome rubella</i> Burch.	Indigenous	LC		
Convolvulaceae	<i>Cuscuta appendiculata</i> Engelm.	Indigenous; Endemic	LC		
Cucurbitaceae	<i>Kedrostis crassirostrata</i> Bremek.	Indigenous	LC		
Cucurbitaceae	<i>Acanthosicyos naudinianus</i> (Sond.) C.Jeffrey	Indigenous	LC		
Cyperaceae	<i>Pseudoschoenus inanis</i> (Thunb.) Oteng-Yeb.	Indigenous	LC		
Ebenaceae	<i>Diospyros lycioides</i> Desf.	Indigenous	LC		
Fabaceae	<i>Vachellia erioloba</i> (E.Mey.) P.J.H.Hurter	Indigenous	LC		Protected
Fabaceae	<i>Vachellia tortilis</i> (Forssk.) Gallaso & Banfi				

Fabaceae	<i>Pomaria burchellii</i> (DC.) B.B.Simpson & G.P.Lewis	Indigenous	LC	
Fabaceae	<i>Senegalia mellifera</i> (Vahl) Seigler & Ebinger subsp. <i>detinens</i> (Burch.) Kyal. & Boatwr.	Indigenous	LC	
Fabaceae	<i>Prosopis glandulosa</i> Torr. var. <i>glandulosa</i>			
Gisekiaceae	<i>Gisekia pharnaceoides</i> L.	Indigenous	LC	
Hyacinthaceae	<i>Albuca</i> sp.			
Hyacinthaceae	<i>Albuca prasina</i> (Ker Gawl.) J.C.Manning & Goldblatt	Indigenous		
Iridaceae	<i>Duthieastrum linifolium</i> (E.Phillips) M.P.de Vos	Indigenous; Endemic	LC	Schedule 2
Malvaceae	<i>Hermannia bryoniifolia</i> Burch.	Indigenous; Endemic	LC	
Malvaceae	<i>Melhania rehmannii</i> Szyszyl.	Indigenous	LC	
Malvaceae	<i>Hermannia pulchella</i> L.f.	Indigenous	LC	
Menispermaceae	<i>Antizoma angustifolia</i> (Burch.) Miers ex Harv.	Indigenous	LC	
Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnh.			
Ophioglossaceae	<i>Ophioglossum reticulatum</i> L.	Indigenous	LC	
Ophioglossaceae	<i>Ophioglossum polyphyllum</i> A.Braun	Indigenous	LC	
Papaveraceae	<i>Argemone mexicana</i> L. forma <i>mexicana</i>	Naturalised		
Papaveraceae	<i>Argemone ochroleuca</i> Sweet subsp. <i>ochroleuca</i>	Naturalised		
Pedaliaceae	<i>Harpagophytum procumbens</i> (Burch.) DC. ex Meisn.	Indigenous Endemic	LC	Schedule 1
Poaceae	<i>Eragrostis curvula</i> (Schrad.) Nees	Indigenous	LC	
Poaceae	<i>Centropodia glauca</i> (Nees) Cope	Indigenous	LC	
Poaceae	<i>Aristida congesta</i> Roem. & Schult.	Indigenous	LC	
Poaceae	<i>Aristida congesta</i> Roem. & Schult.	Indigenous	LC	
Poaceae	<i>Stipagrostis uniplumis</i> (Licht.) De Winter	Indigenous	LC	
Poaceae	<i>Stipagrostis hirtigluma</i> (Steud.) De Winter	Indigenous	LC	

Poaceae	<i>Tricholaena monachne</i> (Trin.) Stapf & C.E.Hubb.	Indigenous	LC	
Poaceae	<i>Enneapogon scoparius</i> Stapf	Indigenous	LC	
Poaceae	<i>Aristida stipitata</i> Hack.	Indigenous	LC	
Poaceae	<i>Eragrostis pseudobtusa</i> De Winter	Indigenous; Endemic	NE	
Polygalaceae	<i>Polygala seminuda</i> Harv.	Indigenous	LC	
Ruscaceae	<i>Sansevieria aethiopica</i> Thunb.	Indigenous	LC	
Scrophulariaceae	<i>Selago mixta</i> Hilliard	Indigenous; Endemic	LC	
Scrophulariaceae	<i>Jamesbrittenia foliolosa</i> (Benth.) Hilliard	Endemic Indigenous	LC	Schedule 2
Scrophulariaceae	<i>Jamesbrittenia albiflora</i> (L.Verd.) Hilliard	Endemic Indigenous	LC	Schedule 2
Solanaceae	<i>Lycium pilifolium</i> C.H.Wright	Indigenous	LC	
Solanaceae	<i>Lycium hirsutum</i> Dunal	Indigenous	LC	
Solanaceae	<i>Lycium arenicola</i> Miers	Indigenous	LC	
Thymelaeaceae	<i>Lasiosiphon polycephalus</i> (E.Mey. ex Meisn.) H.Pearson		LC	
Zygophyllaceae	<i>Roepera lichtensteiniana</i> (Cham.) Beier & Thulin	Indigenous		

AVIFAUNAL SITE SURVEY REPORT

Survey of Droogfontein Boerdery



Vehicle route taken while on the Droogfontein survey looking for nesting African White-backed Vultures on 17 May 2025.

Rikus Roodt accompanied me on the survey of Droogfontein Farm on the 19th of May 2025. We drove to the northern boundary and then drove transects East / West at about 750m to 1000m widths depending on tree density. Many of the larger trees were inspected individually. See the above Google Earth screen shot of the recorded tracks.

No signs were found of African White-backed (*Gyps africanus*) vultures (AW-bV's) nesting in any of the trees surveyed on this property.

A pair of Secretary Birds (*Sagittarius serpentarius*) were seen hunting at "way point Sec Droog001" in the above screen shot. They were in breeding plumage, although the nesting season finished in March / April. There are two known active nests on Dronfield NR the closest of these nests being some 10km from this sighting. I would suggest this pair is centred on Jonkershoek or Hakahana farms and not on Dronfield Nature Reserve.

There are some nice stands of Camel Thorn (*Vachellia erioloba*) woodland with some very large trees scattered through the wooded area, which would make suitable vulture nesting sites.

Some 10 to 15 vultures were seen circling up into a thermal from the southern boundary, but they were at least two kilometres south of the farm and probably from Dronfield NR.

My research on Dronfield Nature Reserve over the last 30 years has shown an active Northward movement in nesting activity adjacent to the N12, as well as an increase in active nests over the last five years from 97 in 2020 to 138 in 2024. No nesting has been observed North of the Dronfield NR West / East boundary, on the farm Hakahana.

A survey two weeks ago in the woodland to the West of the railway line and South of the Droogfontein PV Farm revealed two African White-backed vulture nests. One active in an Eskom transmission line pylon and the other an inactive tree nest (*V. erioloba*) from last year. These nests are 5.5km from the southernmost boundary of Droogfontein Farm.

Given the Northward movement and increased number of breeding AW-bV's on Dronfield NR it is possible that the Camel Thorn woodland on eastern side of Droogfontein Farm could be used for breeding in the years to come.

The constraints to AW-bV breeding fall into four categories within a 100km radius of Kimberley:

- ☐ **Availability of breeding pairs.** This does not appear to be a constraint presently.
- ☐ **Availability of food.** This does not appear to be a constraint presently
- ☐ **Availability of trees to nest in.** There does not appear to be a shortage of nesting trees.
- ☐ **Disturbance during nesting.** This is the key aspect for successful breeding of this species. New colonies have established in areas with low disturbance. While nests built close to frequently used roads have been abandoned during incubation.

In the surveyed area of Droogfontein Farm there are many Camel Thorn trees that would be ideal nesting trees for AW-bV's.

However agricultural activity, adjacent to this woodland, would have a detrimental effect on AW-bV's nesting successfully.

Generally, around Kimberley, there is not a shortage of suitable nesting trees for AW-bV's and in areas of minimal disturbance they will nest in smaller trees in open grassland.

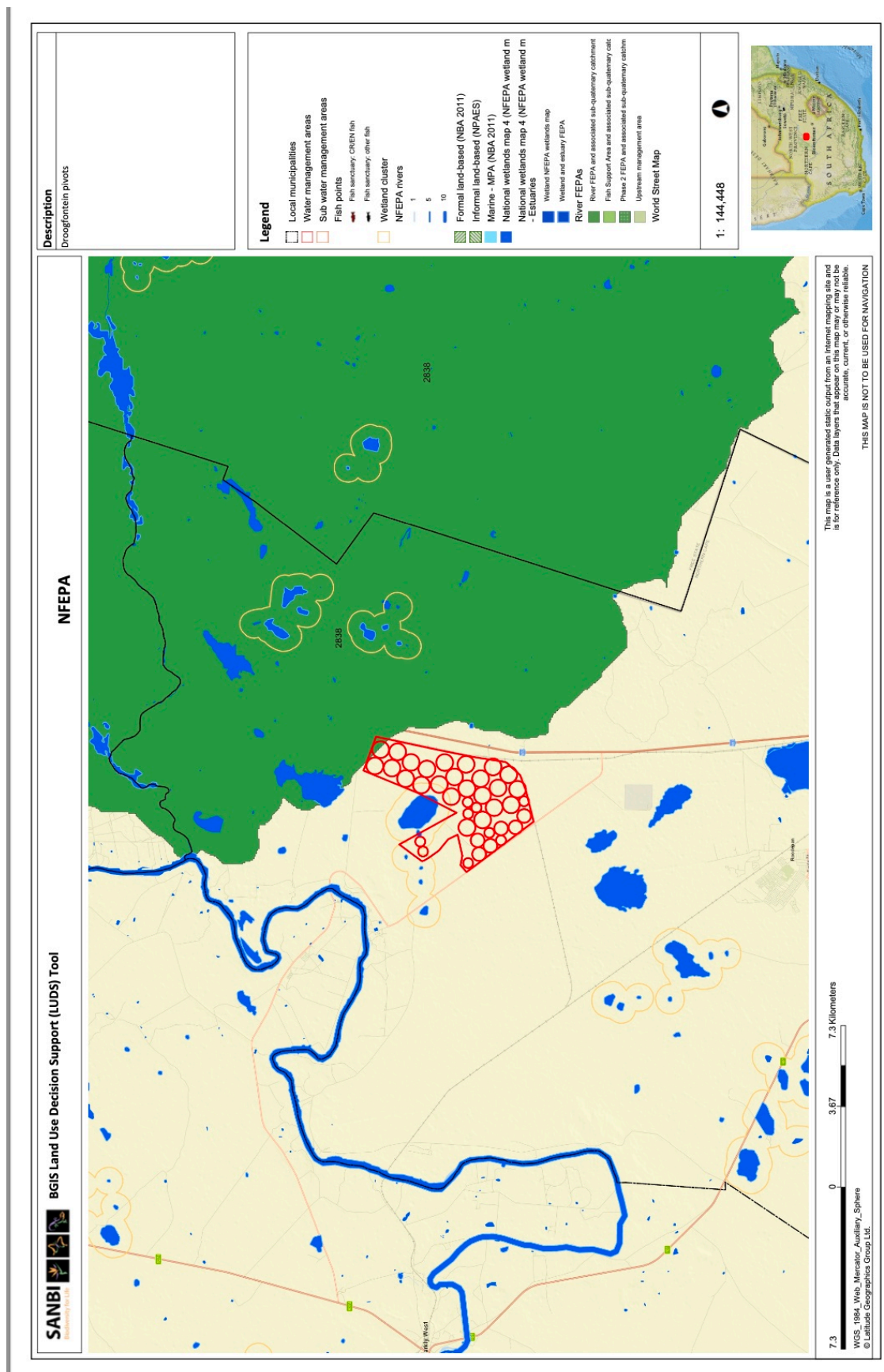
From a biodiversity point of view, it would be a shame to lose this area of Camel Thorn woodland. The current short duration high intensity grazing with cattle would benefit the biodiversity of this woodland over the long term. (I used this grazing system on Dronfield for 17yrs with very good results).

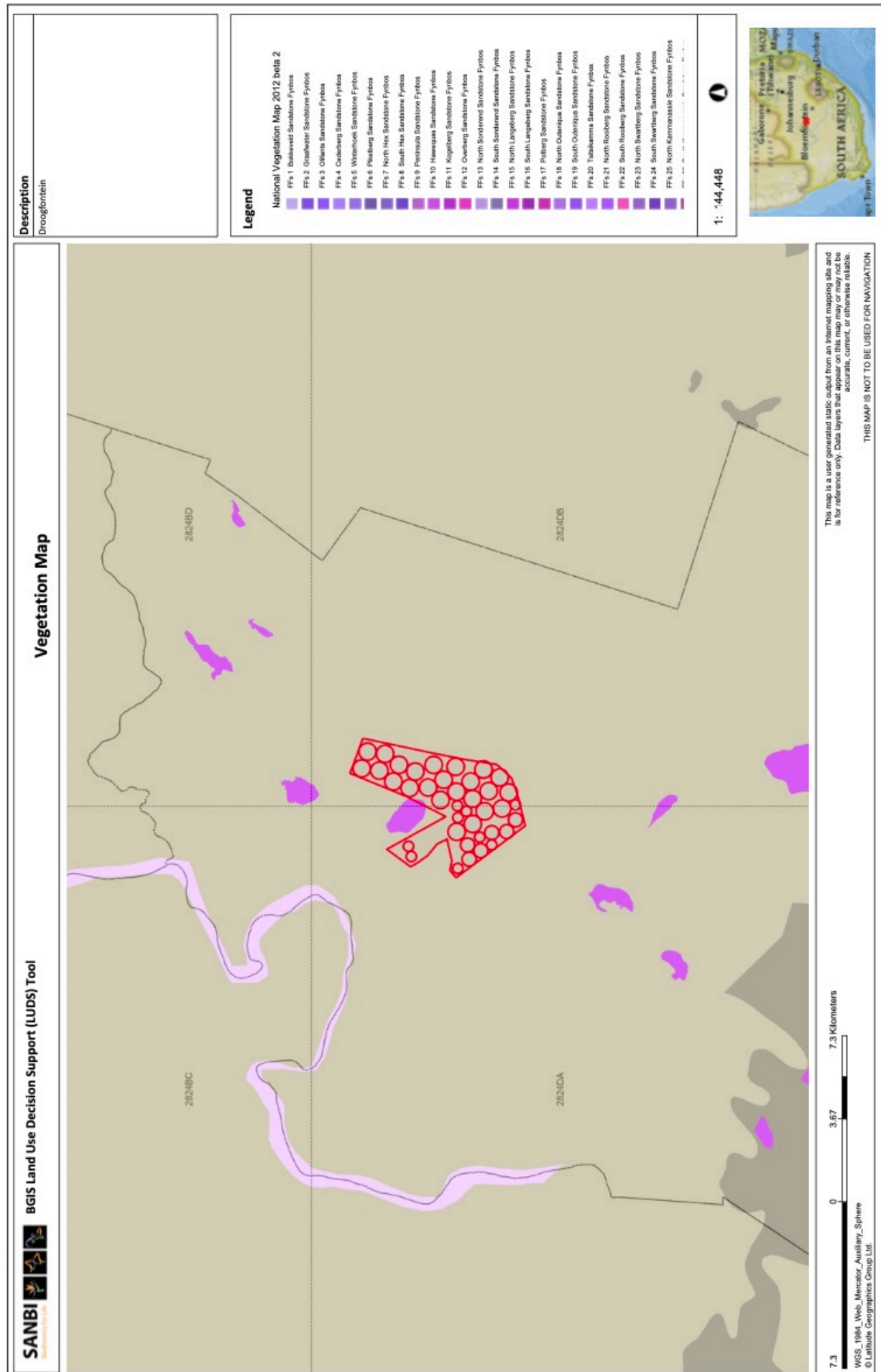
Angus Anthony

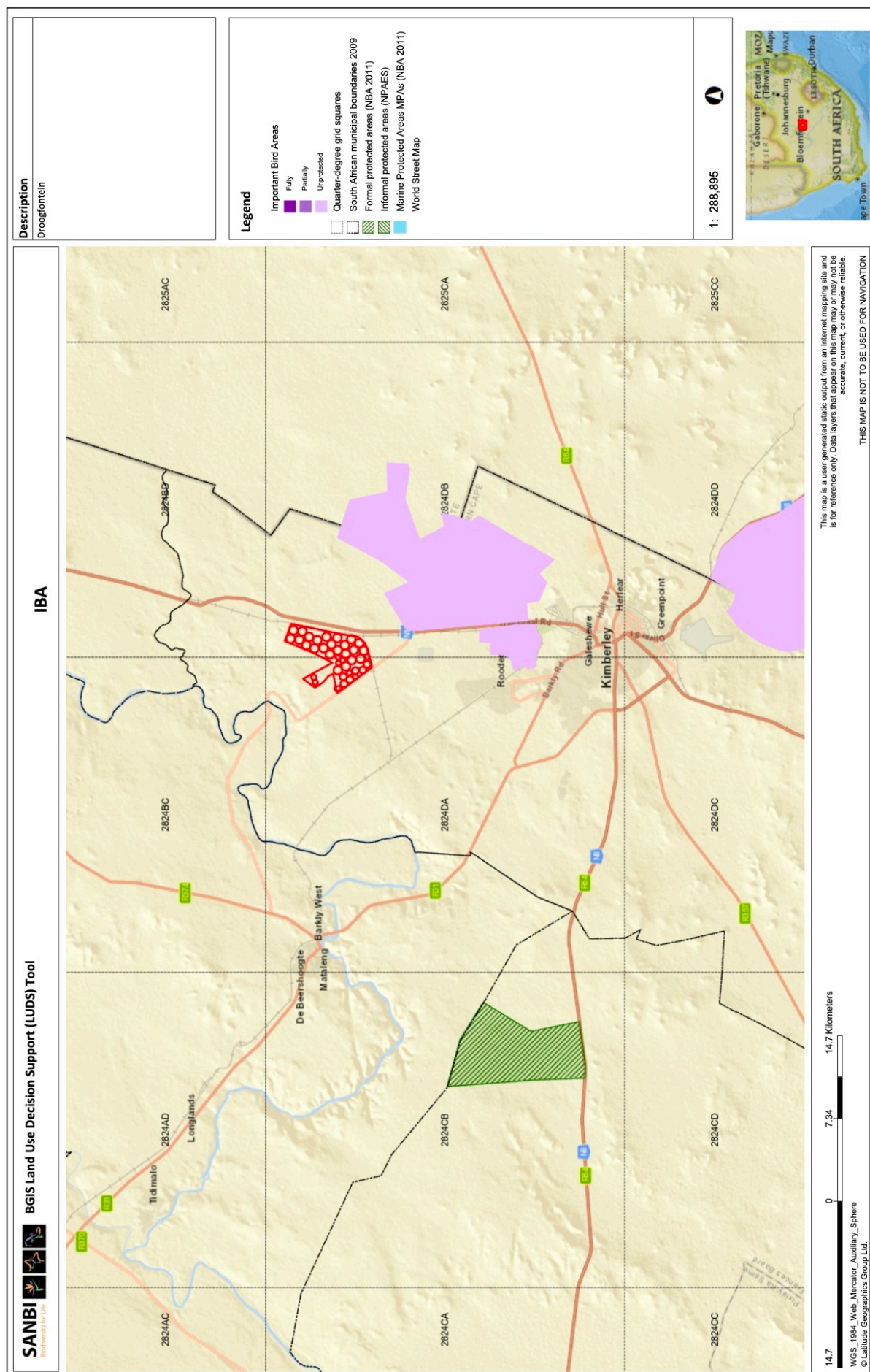
03 June 2025

APPENDIX 2

REGIONAL CONSERVATION PLANNING







APPENDIX 3

DETAILS OF SPECIALIST

ABRIDGED CURRICULUM VITA

NATALIE VIVIENNE BIRCH

Date of birth: 21 August 1972

QUALIFICATIONS

BSc (Rhodes University) – Botany and Zoology
 BSc (Hons) Wildlife Management, Pretoria University
 PhD (Rhodes University)

PHD DISSERTATION

Vegetation potential of natural rangelands in the mid Fish River Valley. Towards a sustainable and acceptable management system.

RESEARCH INTERESTS

My academic interests cover various areas dealing with ecological functioning, and wildlife management, with a special interest in the functioning and management of arid and semi arid rangelands.

ACADEMIC AWARD

Awarded a medal in 2001 by the Grassland Society of Southern Africa for: Outstanding Student in Range and Forage Science

PROFESSIONAL EXPERIENCE

1999 – 2000	<u>Eastern Cape Parks Board</u>	Ecologist
2000 -2002	<u>Coastal & Environmental Services</u>	Consultant
2003 – present	<u>Ecological Management Services</u>	Owner/Consultant

I am a founding member of Ecological Management Services, which is based in Kimberley, and we specialise in ecological management and impact assessment. Although we are based in Kimberley we cover most of South Africa and have projects in the Eastern Cape, Free State, North West Province, Northern Cape and Gauteng. We have undertaken impact assessments for various types of developments including urban and rural developments, agricultural developments, as well as developments within the mining sector. We also provide specialist input to various types of projects and have formulated biodiversity offset studies required to off set impacts from large developments.

A selection of recent work is as follows:

- ☐ Department of Agriculture Northern Cape—Hopetown Piggery
- ☐ Department of Agriculture Northern Cape—Phillipstown Piggery
- ☐ Department of Agriculture Northern Cape—Chikiana Piggery
- ☐ Department of Agriculture Northern Cape—De Aar Hydroponics
- ☐ Sidi Parani—Fertilizer granulation plant in Christiana
- ☐ Tiva Enviro Services - Biodiversity study for De Aar Hospital
- ☐ Ghaap Ostrich Abattoir—Biodiversity Study
- ☐ Amakhala Nature Reserve—Development of lodge facilities
- ☐ IG van der Merwe Trust—Residential development, Douglas
- ☐ Valrena Trust—Residential development along Vaal River
- ☐ Idstone Pty Ltd—Development of irrigation ground for seed potatoes production
- ☐ Tiaan Trust—Development of irrigation ground
- ☐ C F Scholtz & Seuns - Development of irrigation ground for growing of crops
- ☐ Kosie Smith Trust - Development of irrigation ground for growing seed potatoes
- ☐ Bakgat Trust—Development of irrigation ground for growing of crops
- ☐ Mount Carmel (pty) Ltd—Development of irrigation ground for growing of crops
- ☐ Koppieskraal Plase Rietrivier Beperk—Development of irrigation ground for seed potatoes production
- ☐ Genade Boerdery (PTY) Ltd—Development of irrigation ground for growing of crops
- ☐ Santarose Investments (Pty) Ltd - Development of irrigation ground for seed potatoes production
- ☐ Valrena Trust—Development of irrigation ground for growing of crops
- ☐ Middledrift Dairy Trust—Establishment of Dairy
- ☐ Eliweni Wildlife (Pty) Ltd - Lodge Development on Amakhala Nature Reserve
- ☐ Idstone Pty Ltd—Development of irrigation ground for the growing of seed potatoes
- ☐ Trisa Trust—Development of irrigation ground for the growing of seed potatoes
- ☐ GWK Pty Ltd—Development of irrigation pivots and vineyards
- ☐ Blair Athol Golf course development
- ☐ Rolfontein Nature Reserve lodge development
- ☐ SLR—Ecological Specialist survey for Kudumane Mine
- ☐ Biodiversity offset plan—UMK mine
- ☐ Biodiversity Action Plan for UMK mine
- ☐ Biodiversity offset Kudumane Mine
- ☐ IDC—Ecological Management & Business Plan: Siyancuma Women in Game Initiative
- ☐ Swanvest 123 Pty Ltd—Wolverfontein Breeding Facility
- ☐ De Beers—Ecological Evaluation and Management Plan for Kleinsee Game Farm
- ☐ Kalahari Oryx Game Reserve—Risk Assessment introduction of Lion
- ☐ Department of Land Affairs—Ecological Management and Business plan for Thwane Commonage
- ☐ Mauricedale Game Ranch—Paardefontein Specialist Vegetation Survey
- ☐ Santrosa Investments Pty Ltd—Olie Rivier Game Farm HA
- ☐ Manzi Safaris Habitat Assessment
- ☐ Thuru Lodge—Risk Assessment & Habitat Analysis
- ☐ Dugmore brothers—Habitat assessment Hartebeesthoek
- ☐ Schutte Boerdery Trust—Habitat Assessment Glenfrere
- ☐ F G. Taljaard—Habitat Assessment Namakwari Game Reserve
- ☐ Rivierfront Wild - Doornfontein Habitat Assessment
- ☐ Sijbbolet Trust—Hartsvally Habitat Assessment
- ☐ Raltefontein Habitat Assessment
- ☐ Kalahari Oryx Game Reserve—Specialist Vegetation survey

PROFESSIONAL ASSOCIATIONS

Grassland Society of Southern Africa

South African Council for Natural scientific Professions Registration number 400117/05

RESEARCH PUBLICATIONS

- Evans, N.V., Avis, A.M. and Palmer, A.R. 1997. Changes to the vegetation of the mid-Fish River valley, Eastern Cape South Africa, in response to land-use, as revealed by a direct gradient analysis. *African Journal of Range & Forage science*, **14**(2): 68-74.
- Birch N.V., Avis, A.M. and Palmer, A.R. (1999) The Effect Of Land-Use On The Vegetation Communities Along A Topo-Moisture Gradient In The Mid-Fish River Valley, South Africa. *African Journal of Range & Forage science*, **16**(1): 1-8
- Birch, N.V., Avis, A.M. and Palmer, A.R. 1999. Changes to the vegetation communities of natural rangelands in response to land-use in the mid-Fish River valley, South Africa. *People and Rangelands Building the Future* (Eds D. Eldridge & D. Freudenberger) pp.319-320 vol 1. Proceeding of the VI International Rangeland Congress, Townsville, Queensland, Australia

APPENDIX 4

IMPACT ASSESSMENT METHODOLOGY

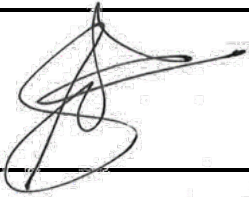

TITLE:

ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE



EIMS

ENVIRONMENTAL
IMPACT
MANAGEMENT
SERVICES

REV:	02	AUTHOR		APPROVED	
EFFECTIVE DATE:	NAME:	L. WHITLOW	NAME:	A. SMITH	
	DATE:	29 January 2025	DATE:	29 January 2025	
	SIGN:		SIGN:		
COPY / STATUS No:		MASTER COPY		DOCUMENT No:	PRO 106

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1. Purpose

The purpose of this procedure is to guide the undertaking of an impact and risk assessment process, as required under the regulations promulgated under the National Environmental Management Act (Act 107 of 1998 - NEMA).

2. Scope

This procedure provides the methodology to be applied to environmental impacts and risks identified during the Environmental Impact Assessment Process. The methodology ensures that consistent impact assessment rating is carried out that is legally compliant and aligned with EIMS's objective of providing a quality service.

3. References

GNR. 982 National Environmental Management Act (Act No. 107 of 1998): Environmental Impact Assessment Regulations, 2014 – hereafter referred to as the Regulations.

4. Additional Guidelines and References

Guidelines and Reference Docs (not exhaustive – please verify with the applicable competent authority).	
Compulsory Compliance: GNR. 982 National Environmental Management Act (Act No. 107 of 1998 - NEMA): Environmental Impact Assessment Regulations, 2014.	National
Companion Guideline for Implementation: Environmental Management Assessment Regulations, 2010 - GN 805/2012 (NEMA)	National
DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5, Department of Environmental Affairs and Tourism (DEAT), Pretoria	National

5. Definitions and Abbreviations

Refer to Chapter 1 of the Regulations.

6. Procedure

The impact significance rating methodology, as presented herein and utilised for all EIMS Impact Assessment Projects, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The approach may be altered or substituted on a case by case basis if the specific aspect being assessed requires such- such instances require prior EIMS Project Manager approval. The broad approach to the significance rating methodology is to determine the significance (S) of an environmental risk or impact by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relating this to the probability/ likelihood (P) of the impact occurring. The S is determined for the pre- and post-mitigation scenario. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the S to determine the overall final significance rating (FS). The impact assessment will be applied to all identified alternatives.

a. Determination of Significance

The final significance (FS) of an impact or risk is determined by applying a prioritisation factor (PF) to the post-mitigation environmental significance. The significance is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) * N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 1 below.

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Table 1: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. Highly localised, limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property or site boundary, or the area within a few hundred meters of the site)
	3	Local (i.e. beyond the site boundary within the Local administrative boundary (e.g. Local Municipality) or within consistent local geographical features, or the area within 5 km of the site)
	4	Regional (i.e. Far beyond the site boundary, beyond the Local administrative boundaries within the Regional administrative boundaries (e.g. District Municipality), or extends into different distinct geographical features, or extends between 5 and 50 km from the site).
	5	Provincial / National / International (i.e. extends into numerous distinct geographical features, or extends beyond 50 km from the site).
Duration	1	Immediate (<1 year, quickly reversible)
	2	Short term (1-5 years, less than project lifespan)
	3	Medium term (6-15 years)
	4	Long term (15-65 years, the impact will cease after the operational life span of the project)
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction/ operation/ decommissioning).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected, or affected environmental components are already degraded)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; moderate improvement for +ve impacts; or where change affects area of potential conservation or other value, or use of resources).
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease; high improvement for +ve impacts; or where change affects high conservation value areas or species of conservation concern)
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts; or disturbance to pristine areas of critical conservation value or critically endangered species)
Reversibility	1	Impact is reversible without any time and cost.

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	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring very high time and cost.
	5	Irreversible Impact.

Once the C has been determined, the significance is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 2.

It is noted that both environmental risks as well as environmental impacts should be identified and assessed. Environmental Risk can be regarded as the potential for something harmful to happen to the environment, and in many instances is not regarded as something that is expected to occur during normal operations or events (e.g. unplanned fuel or oil spills at a construction site). Probability and likelihood are key determinants or variables of environmental risk. Environmental Impact can be regarded as the actual effect or change that happens to the environment because of an activity and is typically an effect that is expected from normal operations or events (e.g. vegetation clearance from site development results in loss of species of concern). Typically the probability of an unmitigated environmental impact is regarded as highly likely or certain (management and mitigation measures would ideally aim to reduce this likelihood where possible). In summary, environmental risk is about what could happen, while environmental impact is about what does happen.

Table 2: Probability/ Likelihood Scoring

Probability	1	Improbable (Rare, the event may occur only in exceptional circumstances, the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <5% chance).
	2	Low probability (Unlikely, impact could occur but not realistically expected; >5% and <20% chance).
	3	Medium probability (Possible, the impact may occur; >20% and <50% chance).
	4	High probability (Likely, it is most probable that the impact will occur- > 50 and <90% chance).
	5	Definite (Almost certain, the impact is expected to, or will, occur, >90% chance).

The result is a qualitative representation of relative significance associated with the impact. Significance is therefore calculated as follows:

$$S = C \times P$$

Table 3: Determination of Significance

Consequence	5- Very High ¹	5	10	15	20	25
	4- High	4	8	12	16	20
	3- Medium	3	6	9	12	15
	2- Low	2	4	6	8	10
	1- Very low	1	2	3	4	5

¹ In the event that an impact or risk has very high or catastrophic consequences, but the likelihood/ probability is low, then the resultant significance would be Low-medium. This does in certain instances detract from the relative important of this impact or risk and must consequently be flagged for further specific consideration, management, mitigation, or contingency planning.

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		1- Improbable	2- Low	3- Medium/ Possible	4- High/ Probable	5- Highly likely/ Definite
	Probability					

The outcome of the significance assessment will result in a range of scores, ranging from 1 through to 25. These significance scores are then grouped into respective classes as described in Table 4.

Table 4: Significance Scores

S Score	Description
≤4.25	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
>4.25, ≤8.5	Low-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>8.5, ≤13.75	High-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>13.75	High (i.e. where the impact will have a significant environmental risk/ reward).

The impact significance will be determined for each impact without relevant management and mitigation measures (pre-mitigation significance), as well as post implementation of relevant management and mitigation measures (post-mitigation significance). This allows for a prediction in the degree to which the impact can be managed/mitigated.

b. Impact Prioritization

Further to the assessment criteria presented in the section above, it is necessary to consider each potentially significant impact in terms of:

1. Cumulative impacts; and
2. The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impacts' post-mitigation significance (post-mitigation). This prioritisation factor does not aim to detract from the significance ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the post-mitigation significance based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 5: Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.

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Irreplaceable Loss of Resources (LR)	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 5. The impact priority is therefore determined as follows:

$$\text{Priority} = CI + LR$$

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 1.5 (Refer to Table 6).

Table 6: Determination of Prioritisation Factor

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

In order to determine the final impact significance (FS), the PF is multiplied by the post-mitigation significance scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a factor of 0.5, if all the priority attributes are high (i.e. if an impact comes out with a high medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a higher significance).

Table 7: Final Environmental Significance Rating

Significance Rating	Description
<-25	Very High (Impacts in this class are extremely significant and pose a very high environmental risk. In certain instances these may represent a fatal flaw. They are likely to have a major influence on the decision and may be difficult or impossible to mitigate. Offset's may be necessary.
<-13.75 to -25	High negative (These impacts are significant and must be carefully considered in the decision-making process. They have a high environmental risk or impact and require extensive mitigation measures).
-8.5 to -13.75	Medium-High negative (i.e. Impacts in this class are more substantial and could have a significant environmental risk. They may influence the decision to develop in the area and require more robust mitigation measures).
<-4.25 to <-8.5	Medium- Low negative (i.e. These impacts are slightly more significant than low impacts but still do not pose a major environmental risk. They might require some mitigation measures but are generally manageable).

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Significance Rating	Description
-1 to -4.25	Low negative (i.e. Impacts in this class are minor and unlikely to have a significant environmental risk. They do not influence the decision to develop in the area and are typically easily mitigated.
0	No impact
1 to 4.25	Low positive
>4.25 to <8.5	Medium-Low positive
8.5 to 13.75	Medium-High positive
>13.75	High positive

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

7. Responsibilities

It is the responsibility of each EIMS employee, and each external Specialist appointed by EIMS to ensure that this procedure is carried out as described. All the personnel within the organization have the responsibility to report any deviations/changes from the procedures to management. This is to ensure that the necessary changes are documented after approval.

It is the responsibility of the consultant (as applicable) assigned with the task of report compilation to ensure that this methodology/ procedure is strictly applied. It is the responsibility of the assigned Consultant or Quality Reviewer to review and verify that the procedure has been complied with, and such documented at the specified quality check intervals.

8. Records

RECORD	STORAGE LOCATION	STORAGE SYSTEM	RESPONSIBLE PERSON	RETENTION PERIOD
Significance Rating Input Spreadsheet	Project File - /Server/assignments/ Job#/Records	Electronic- Scanned PDF	Project Manager	10 Years

9. Record of Changes, Revisions and Cancellations

RECORD OF CHANGES, REVISIONS AND CANCELLATIONS		
DATE	NATURE / DETAIL OF CHANGE	REV No.
3/12/2024	Update impact criteria descriptions.	01
29/01/2025	Corrections to Significance class numbering	02