Botswana - South Africa (BOSA) Transmission Interconnection Project

AQUATIC AND TERRESTRIAL ECOLOGICAL ASSESSMENT

EIA PHASE

REPORT V2

Prepared for:
AURECON South Africa (Pty) Ltd

Prepared by:

Scherman Colloty & Associates
Postnet Suite 25
Private Bag 1672
GRAHAMSTOWN
6140

Scherman Colloty and Associates cc
Environmental and Aquatic Management Consulting
(CK 2009/112403/23)

November 2017

SPECIALIST REPORT DETAILS

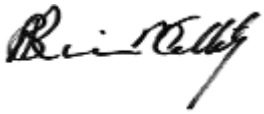
This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments.

Report prepared by: Dr. Brian Colloty Pr.Sci.Nat. (Ecology) / Certified EAP / Member SAEIES & SASAqS

Expertise / Field of Study of authors:

Brian holds the following degrees, BSc (Hons) Zoology, MSc Botany (Rivers), Ph.D Botany Conservation Importance rating (wetlands) and has conducted ecological assessments from 1996 onwards

I, **Dr. Brian Michael Colloty** declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs (DEA)



Signed:… …… Date: 22 November 2017……

Table of Contents

List of Tables

List of Figures

List of Plates

ACRONYMS

BOSA	Botswana - South Africa (BOSA) Transmission Interconnection Project
BSAP	Botswana Biodiversity Strategy and Action Plan
DWS	South African Department of Water and Sanitation
EIA	Environmental Impact Assessment
GA	General Authorisation
GIS	Geographic Information System
NSBA	South African - National Spatial Biodiversity Assessment
NWBSP	North West Biodiversity Sector Plan
SANBI	South African National Biodiversity Institute
SC&A	Scherman Colloty & Associates
WULA	Water Use License

1 Introduction

Scherman Colloty & Associates cc (SC&A) was appointed by Aurecon South Africa (Pty) Ltd (Aurecon) as independent specialists to evaluate the ecological (terrestrial and aquatic) importance and function of the environment within the proposed transmission line corridor as part of the Environmental and Social Impact Assessment (ESIA) application. Based then on the information contained in this report, the final alignment can then be designed, should the project then be approved.

This document follows on results obtained during a literature survey and observations made during previous studies within the study area and a preliminary site was conducted in October 2016 by the botanist. This aided in the characterisation of the main habitat units, current land use impacts and to visit selected areas with high importance. This information was also used in the pre-feasibility stage based on the MCDM process to define the most preferred alignment that was then taken forward into the Scoping and EIA phase.

Additional site visits were also conducted in July and August 2017 by the aquatic specialist after some rainfall had occurred within the region, however the region was still suffering from a drought, even though sporadic flooding had occurred in the Zeerust region, within the larger river systems. Additional information was then collected to aid in the impact assessment, focused on the preferred alignment

Several important national and provincial conservation plans were also reviewed, with the results of those studies being included in this report.

1.1 Terms of reference and methods

The main aim of this report is to investigate the ecological attributes of the study area by means of the following:

Aquatic and wetland assessment (excluding Avifauna)

- An aquatic biodiversity assessment of the study area using a desktop approach. This covered the study area and a 500m development buffer in relation to available information on the aquatic environment.
- Maps depicting demarcated aquatic and wetlands delineated to a scale of 1:10 000, following the methodology described by the DWS. This distinguished natural versus man-made systems, as verified during the site investigations
- Site investigation were conducted which included the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of any waterbodies, estimating their biodiversity, conservation and ecosystem function and importance with regard ecosystem services.
- Recommend buffer zones and No-go areas around any delineated aquatic units based on the relevant legislation or best practice.
- Provide mitigations regarding project related impacts, including engineering services that could negatively affect demarcated aquatic units.
- Recommend specific actions that could enhance the aquatic functioning in the areas, allowing the potential for a positive contribution by the project.
- Supply the client with geo-referenced GIS shape files of the waterbodies as per the required specifications supplied.

Terrestrial Ecology

A desktop and literature review of the area under investigation was conducted to collate as much information as possible prior to any detailed fieldwork. The purpose of the desktop assessment was to rank relevant areas according to their ecological sensitivity and to identify areas of least ecological risk.

All relevant literature was consulted. This included the South African Biodiversity Information Facility (SABIF, which includes the PRECIS plant distribution database), South African Bird & Herpetological Atlas Projects, relevant Red Data books, ordinances and all systematic bioregional / conservation plans in South Africa. Spatial data used in the Botswana National Biodiversity Strategy and Action Plan was also used, which indicates that the study area contains areas with HIGH Species Richness.

Fieldwork was limited to visual sightings by means of transect walks and plot-based sampling, while particular attention was paid to the occurrence Red Data species or Protected species.

Vegetation units were sampled by means of the following techniques as per each site:

- Data collection was plot-based and in the form of vegetation samples within selected reference areas to categorise the various vegetation units.
- Results from the data analysis provided a description of the dominant and typical species occurring on the site(s), and included:
    - Threatened, endemic or rare species, with an indication of the relative functionality and conservation importance of the specific community in the area under investigation
    - Invasive or exotic species present in the area
    - The functional and conservation importance of all vegetation communities in the area of investigation

Mammals were sampled by means of the following techniques:

- Fieldwork included visual sightings by means of transect walks to evaluate the presence of mammal taxa. During the site visits, specific attention will be given to signs (droppings, burrows, vocalisations, etc.) of taxa and the presence of suitable habitat
- A full list of species observed and expected to occur is included
- Specific reference is made to the occurrence of Red Data species

Herpetofauna (reptiles & amphibians) was sampled by means of the following techniques:

- Visual observations (including nocturnal surveys)
- Active searching techniques; and
- Vocalisations (for amphibians)

Invertebrates were sampled by means of the following techniques:

- Random linear transects using a standard handnet, where possible while focussing on specific indicator groups);
- All taxa caught, were identified to species level if appropriate literature is available (as in the case of butterflies and dung beetles), otherwise the concept known as RTU's (Recognisable Taxonomic Units) or morphospecies was applied;
- The presence of conservation important taxa (e.g. baboon spider & scorpion taxa) was also be verified by intensive searching of likely habitat types or burrows.

Additional information of faunal community residing on the area of investigation was sourced from distributional data/records (both recent and historical), relevant literature, the private sector and other atlas projects.

Habitat areas (based on the species compositions of the vegetation analysis, topography and soils) was ranked into high, medium or low classes in terms of their significance based on the Ecological Sensitivity and Conservation Importance. A sensitivity and habitat map (including buffer zones if applicable) was produced based on the above information.

Recommendations and mitigation measures, where required, are included in the report with proposed buffers if required.

In summary the following site visits were conducted:

- Terrestrial – October 2016
- Terrestrial & Aquatic – July 2017
- Aquatic – August 2017

Literature Consulted

- The occurrence and conservation status of mammal taxa were based on Friedmann & Daly (2004), while mammalian nomenclature was based on Skinner & Chimimba (2005);
- The occurrence of conservation important reptile taxa was based according to the dated assessment conducted by Branch (1988) and the South African Reptile Conservation Assessment (SARCA; www.saherps.net/sarca/index.php);
- Red Data categories and listings of amphibian taxa follow Minter *et al.* (2004).
- National Spatial Biodiversity Assessment, National Wetland Inventory (Wetland Inventory III) and the VegMap (Mucina & Rutherford, 2006) all found in the SANBI BGIS database site of the South African National Biodiversity Institute; which database also includes the mapping layers and metadata contained in the North West Biodiversity Sector Plan (2015) maps (http://bgis.sanbi.org);
- IUCN Red Data Lists;
- Botswana National Spatial Plan (in development);
- Botswana Conservation Management Plan (2014); and
- Botswana Biodiversity Strategy and Action Plan (2004, revised 2007).

Additional data or information was also obtained from past investigations conducted by the authors of this report.

1.2 Limitations

In order to obtain a comprehensive understanding of the dynamics of both the floral and faunal components of both the terrestrial and aquatic communities within a study, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints such long-term studies are not feasible and are mostly based on instantaneous sampling bouts.

It should be emphasised that information, as presented in this document, only has reference to the study area(s) as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

Furthermore, additional information may come to light during a later stage of the process or development and thus is based from the surveys or information obtained at the time of this report.

2 Project locality

The study area indicated in Figure 1 below, and includes a small cross border section between South Africa and Botswana. The proposed transmission lines will span from Isang (North of Mochudi) in the North, to the Proposed Watershed B substation near Tlapeng in the South.

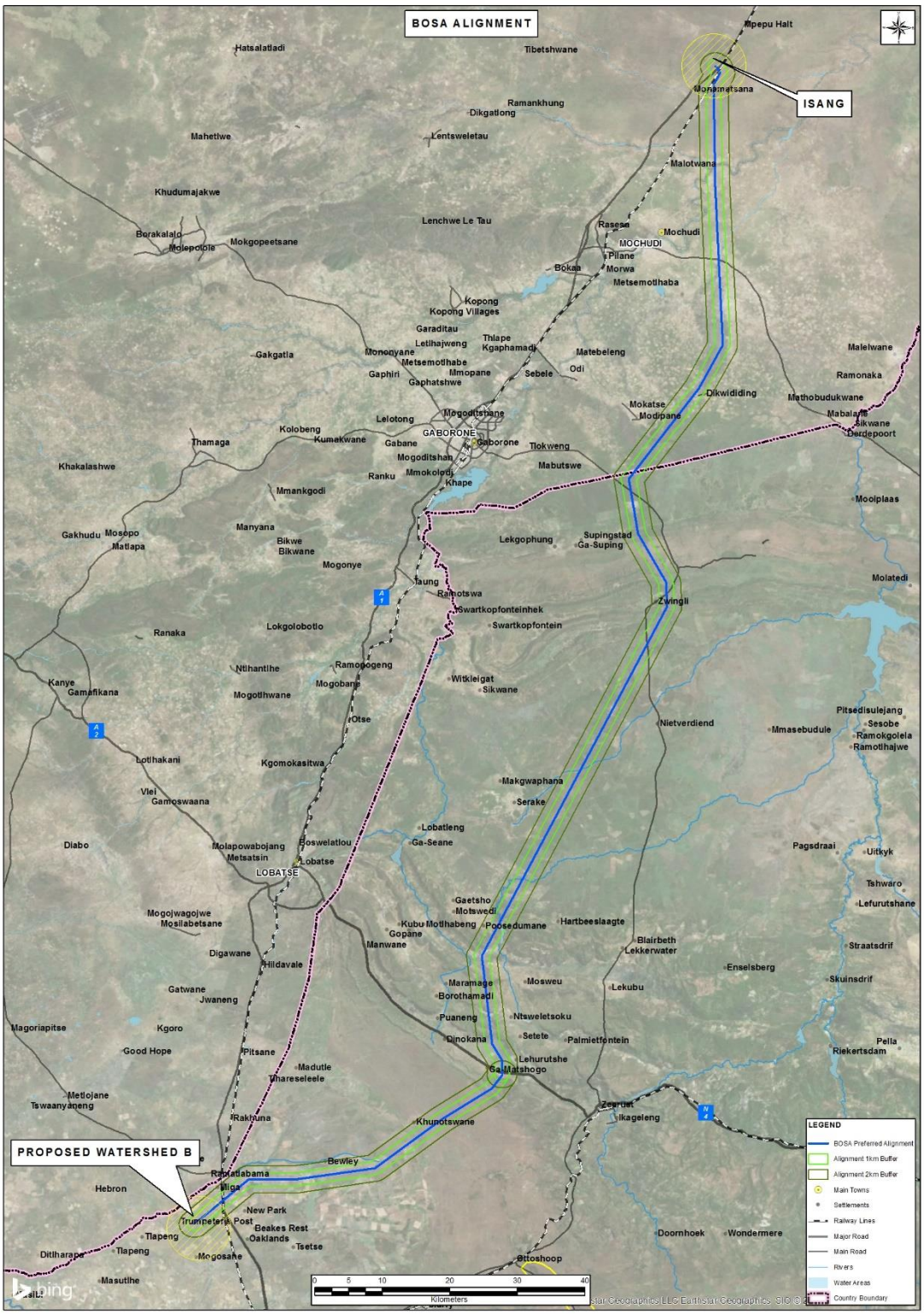


Figure 1: Study area including buffers showing the areas assessed

3 Project description

The Southern African Power Pool Coordination Centre ("SAPP CC") has initiated the Botswana - South Africa (BOSA) Transmission Interconnection Project on behalf of two sponsors; Eskom of South Africa and Botswana Power Corporation of Botswana.

The objective of the project includes aspects such as:

- Alleviate congestion on the Matimba-Phokoje-Insukamini line,
- Complement other regional supply initiatives by increasing the power transfers within the SAPP network,
- Increase stability in the power pool through additional interconnection between the strong versus weak networks, which has been a source of SAPP grid instability,
- Improve system control, adequacy and reliability, and
- Deepen regional integration that will facilitate improved electricity trading.

The Project is sponsored by Eskom of South Africa, and Botswana Power Corporation and is coordinated by the Southern African Power Pool Coordination Centre ("SAPP CC"). The support funds, administered by the Development Bank of Southern Africa (DBSA), have been sourced from the Infrastructure Investment Programme for South Africa and Project Preparation and Development Fund.

The project is for a 400kV transmission power line. The proposed 210km transmission line stretches between the Mahikeng area in South Africa and Gaborone in Botswana, with the longest section (approximately 149km) of the line within South Africa There will be two transmission lines located 60m apart and 210km in length. The line will connect the existing Isang substation in Botswana to the proposed Watershed B substation in South Africa. The 1Ikm corridor was assessed along the 210km route to allow for micro-siting of the line within the corridor based on detailed assessment.

4 Route description

4.1 Constraints analysis

During the pre-ESIA phase, several alternative alignments and placements of the proposed alignment were analysed in terms of the possible constraints related to the aquatic and terrestrial environments. These constraints were identified for inclusion in a GIS database, allowing for the reduction / avoidance of any significant impacts prior the ESIA phase. The potential alignments were then rated or ranked for each option, together with all additional constraints, such as agriculture, social, heritage technical and engineer. These were then analysed using the Multiple-criteria decision-making (MCDM) approach.

The Environmental Constraints (EN1 – Biodiversity) were determined as follows and are discussed in greater detail in the remainder of this report:

- Terrestrial;
    - Sensitive or irreplaceable habitat (NWBSP & BBSAP)
    - Critical Biodiversity areas still intact (CBA1 & 2)
    - NEM:BA Threatened Ecosystems
    - Current and Future protected areas
    - Areas with endemic, endangered or vulnerable plant species
    - Unique habitats (e.g. Ridges and large rock outcrops)
    - Biodiversity priority areas (Botswana)
    - Protected areas and nature reserves
    - Threatened Ecosystems (where still intact)
    - Known sensitive habitats with high Species of Special Concern / Endemic

- Aquatic;
    - High value rivers or water resource areas
    - Wetlands and in particular wetland clusters
    - Alluvial floodplains
    - Critical Biodiversity Area and Ecological Support area, surrounding by intact habitat of vegetation

The above process was then used to finalise a preferred alignment for the ESIA (Figure 1).

4.2 Generalised vegetation description & ecological perspective

4.2.1 South Africa

The first round of transmission line alignments including buffer areas, pre-MCDM process to select preferred alignment, would have spanned 30 Vegetation Types as described by Mucina & Rutherford (2006, amended 2012). These span a variety of bioregions varying from Mesic (wet) grasslands in the East to drier Bushveld habitats to the west (Plate 1).

After the constraints analysis, the alignment was refined and only 9 vegetation units will be affected (Figure 2 & Table 1). This also avoided several of the Critically Endangered Ecosystems (vegetation units), as well as Protected Areas (Figure 3 & 4).

During the development of the North-West Province Biodiversity Sector Plan (2015), the Mucina & Rutherford vegetation type boundaries were revised and it was also determined that the Dwarsberg-Swartruggens Mountain Bushveld (Plate 2), Klerksdorp Thornveld and Zeerust Thornveld units are endemic to the Province (>80 % of the national extent occurs within the Province). These remained as such in the updated vegetation map contained in the NWBSP and summarised in Table 2).

During the ESIA site visits, each of the vegetation type regions were then visited to confirm the vegetation types, focusing on the conservation needy/important units, listed in the tables below.

Table 1: A list of the expected vegetation types located within the study area (Mucina & Rutherford, 2006).

#	SA veg Type Name	Biome	M&R Conservation Status	Bioregion
1	Carletonville Dolomite Grassland	Grassland	Vulnerable	Dry Highveld Grassland
2	Dwaalboom Thornveld	Savanna	Least Threatened	Central Bushveld
3	Dwarsberg-Swartruggens Mountain Bushveld	Savanna	Least Threatened	Central Bushveld
4	Eastern Temperate Freshwater Wetlands	Azonal	Least Threatened	Waterbodies
5	Highveld Salt Pans	Azonal	Least Threatened	Inland Saline Vegetation
6	Klerksdorp Thornveld	Grassland	Vulnerable	Dry Highveld Grassland
7	Madikwe Dolomite Bushveld	Savanna	Least Threatened	Central Bushveld
8	Mafikeng Bushveld	Savanna	Vulnerable	Central Bushveld
9	Zeerust Thornveld	Savanna	Least Threatened	Central Bushveld

Plate 1: All the study area was experiencing a drought during the time of the surveys and in particular the bushveld areas of Botswana and South Africa -Photo of the transition between Dwaalboom Thornveld and Transition Sandveld, 5 km north of Kopfontein in Botswana

Plate 2: A view of intact Dwarsberg - Swartruggens Mountain Bushveld, west of Lehurutshe, with degraded Carletonville Dolomite Grassland in the foreground

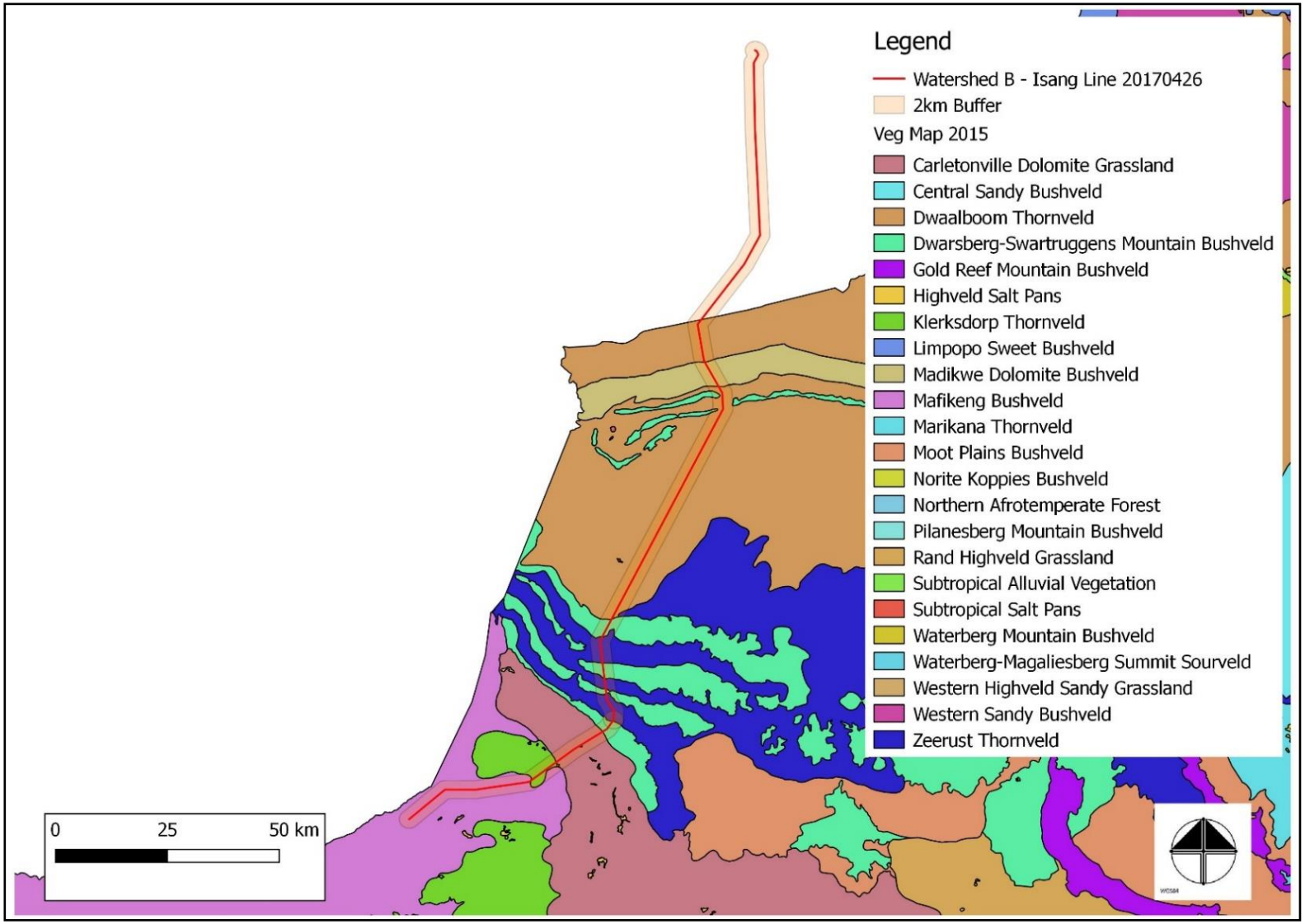


Figure 2: The vegetation types along the alignment as defined by Mucina & Rutherford (2006) & Schaller & Desmet, 2015 for the North West Province

The NWBSP (Table 2) indicates that vegetation units remain the same with the proposed alignment avoiding the expansive Highveld Alluvial Vegetation and Highveld Alluvial Vegetation – Peatland Wetlands (Schaller & Desmet, 2015) areas that would have been impossible to span. The latter is classified as Critically Endangered (Table 2).

The NWBSP also indicates an additional wetland vegetation type namely Subtropical Freshwater Wetlands (Table 2), not classified previously in the National Vegetation Map (Mucina & Rutherford, 2006), while 3 no longer fall within the Province once the boundaries had been redrawn. Therefore, a total of 10 vegetation units were confirmed within the South African portion of the study area. These 10 vegetation units cover a large portion of the North West Province (Figure 2). The updated vegetation units were based on the underlying geology, to better define the boundaries between grasslands and Thornveld. This was found to be valid, particularly in the southern half of the alignment, where there are several transitions between soils types do occur.

Table 2: Vegetation units as described in the updated mapping assessment as contained in the NWBSP (2015)

Where:
Ecosystem Threat Status: The "Best" Category includes Natural and Degraded vegetation as Natural, whilst the "Worst" Category has included the Degraded class within the Modified class. The "Predicted 2020" column is a prediction of what the ecosystem threat status will be at the current Rate of Change
CE = Critically Endangered
EN = Endangered
VU = Vulnerable

	SA Vegetation Type Name	NW Vegetation Type Name	Ecosystem Threat Status			ENDEMIC (Province Level)	Level of Protection
			BEST	WORST	PREDICTED 2020		
1	Carletonville Dolomite Grassland	Carletonville Dolomite Grassland					Poorly protected
2	Dwaalboom Thornveld	Dwaalboom Thornveld		VU			Poorly protected
3	Dwarsberg-Swartruggens Mountain Bushveld	Dwarsberg-Swartruggens Mountain Bushveld				Yes	Poorly protected
4	Eastern Temperate Freshwater Wetlands	Eastern Temperate Freshwater Wetlands					Not protected
5	Highveld Salt Pans	Highveld Salt Pans					Not protected
6	Klerksdorp Thornveld	Klerksdorp Thornveld	VU	VU	VU	Yes	Not protected
7	Madikwe Dolomite Bushveld	Madikwe Dolomite Bushveld					Moderately protected
8	Mafikeng Bushveld	Mafikeng Bushveld		VU			Not protected
9	Subtropical Freshwater Wetlands	Subtropical Freshwater Wetlands		EN			Not protected
10	Subtropical Salt Pans	Subtropical Salt Pans		EN			Not protected

Note the wetland types listed above are included in the Aquatic mapping units in this report (Figure 8).

4.2.1.1 Vegetation conservation importance and Species of Special Concern

Table 2 indicates the current Ecosystem Threat Status, as developed in the NWBSP (2015). This is an indicator of the Best, Worst and Predicted (2020) ecosystem status of each vegetation type, using present land cover (Figure 3). This is then coupled to the degree of modification / degradation as a threat indicator, noting that approximately 33% of the Province is already transformed (cultivation) (Figure 4). The predicted class is based on the current rate of change related to rate of land cover modification (Table 2).

Thus 6 of the 11 vegetation units have some form of Ecosystem Threat Status, which include, Critically Endangered, Endangered and Vulnerable. However, the Threatened Ecosystems as defined by the National Environmental Management Biodiversity Act, remain relevant as these must be considered within the ESIA listed activities in terms of NEMA in South Africa, which are based on the Conservation Status of the vegetation units define in Table 1. Figure 3 indicates that one such Threatened Ecosystem (Mafikeng Bushveld) occurs within the study area. Little to none of any of these listed vegetation units were found intact within the study area, and as discussed above have either been transformed or are showing high levels of bush encroachment. This was verified by visiting a representation of the same vegetation types within the surrounding protected areas and it was confirmed that intensive grazing has in deed impacted on the study area vegetation units.

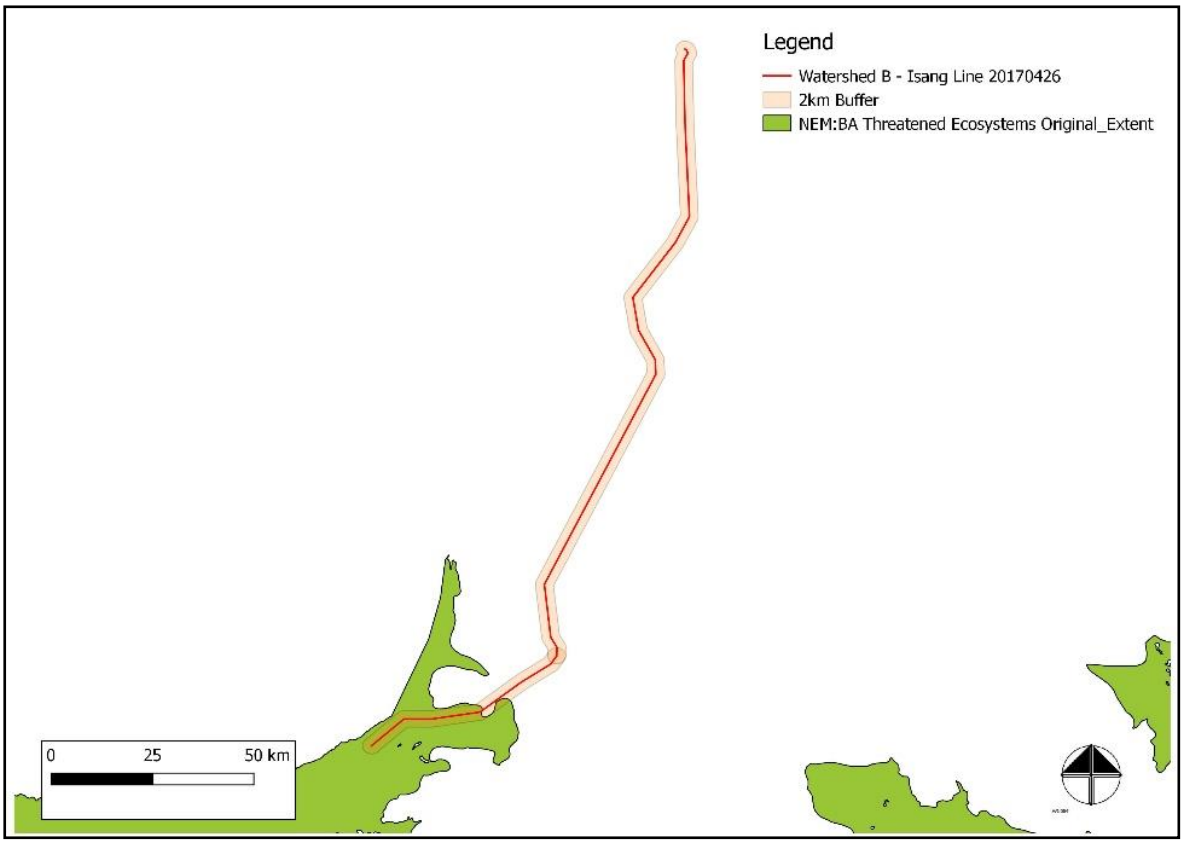


Figure 3: Spatial extent of Threatened Ecosystems listed by the National Environmental Biodiversity Act for the study area

4.2.1.2 Summary of field investigations

The 10 vegetation units were largely found to be accurate, i.e. descriptive of the extent and species associated within each vegetation type, except the current state was at times far removed from what was expected. Thus, levels of transformation of the various habitats was found to be far greater than what was indicated in the bioregional plans, especially for the last 180 km of the alignment (travelling southwards). Note that this comment only applies to the assessed vegetation within the alignment, while other areas are in better condition. However, this highlights the fact that the process to arrive at the selected alignment has thus avoided intact portions of the important habitats listed in Table 2, thereby achieving the first and preferred level of mitigation hierarchy, namely avoidance.

Thus, near natural habitat would only be associated with the 20-25km section of the alignment immediately south of the Botswana border near Kopfontein. Once the alignment crosses the R49 road, the general landscape (vegetation) deteriorates due agricultural practices such as cattle farming. Although the tree dominated or bushveld vegetation remains, i.e. cultivated areas only occur within the last 34km of the alignment near Mafikeng, the bushveld species composition does seem to have altered from what was expected. *Dichrostachys cinerea* (Sickle bush), often considered an invasive and thicket forming plant, dominates the northern half of the alignment. The transformation or invasion by this tree species is usually an indicator of over grazing.

Similarly, a large degree of transformation was also found within the Botswanan portion of the alignment, mostly due to intensive agriculture and grazing. Although several additional tree species (Appendix 2), were found north of Kopfontein, these are also indicators of bush encroachment (*Vachellia fleckii*).

Current land use has influenced these and the other vegetation types (Figure 4), either transformation through agriculture (30% of the Province) or being poorly represented within the various protected areas within the Province. During the field work, it was found that the estimation of transformation was accurate within the study area, but the remaining natural vegetation also showed a higher degree of transformation / change than what was anticipated, i.e. intact vegetation was severely encroached by *Vachellia karroo* (southern portion of alignment) and *Dichrostachys cinerea*. For the most part, the only vegetation units that were found to be in close to natural states were those associated with steep valleys (kloofs), ridges / mountain ranges, koppies / inselbergs.

In turn, these higher lying vegetation types or habitats supported a larger variety of plant and animal species than the lower lying areas, that are currently being used for intensive agriculture, grazing or built up areas. Based on data contained in the South African Biodiversity Information Facility, and other distributions maps that included Botswana, approximately 2216 flowering plant species are located within the study area. Most of these are directly associated with ridges or rocky outcrops and water courses. This was substantiated by the data collected during the site visits, with the highest number of tree and forb species being found within the ridges and koppies (Appendix 1). As a consequence these areas also contained the highest number of protected species (*Boscia* spp and *Vachellia erioloba* – Shepherd's trees and Camel Thorns), and should thus be avoided.

What was highlighted in this assessment was the importance of the role played by the protected areas in maintaining intact examples of the various vegetation units (Figure 4).

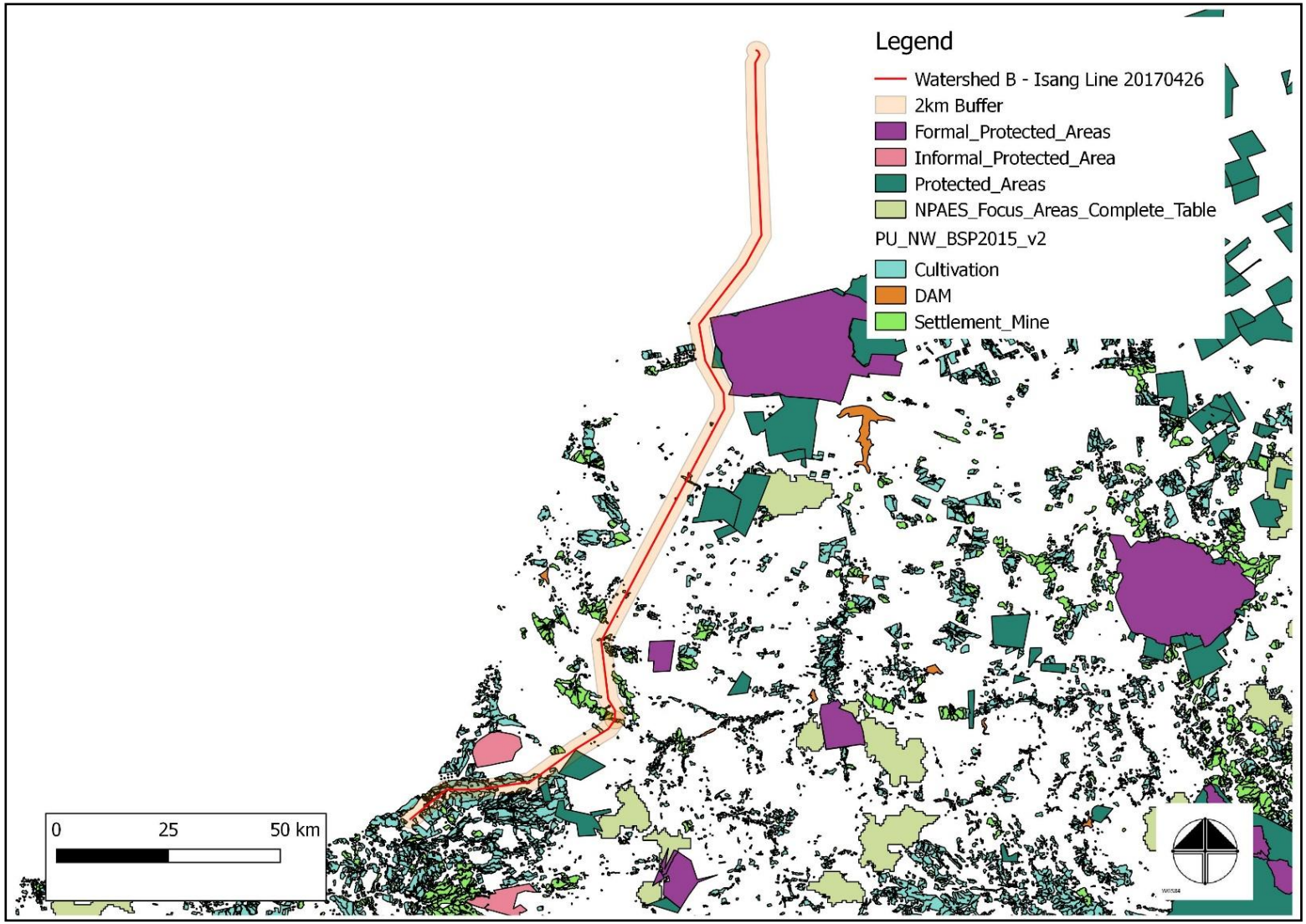


Figure 4: A map illustrating the land cover classes corresponding to the study area for the North West Province, and where all other areas not shown in the map are natural

A review of the potential plant Species of Concern was also conducted in this phase of the study, with a focus on sites as shown in Figure 5. Species which are highlighted by the NWBSP (2015) (Table 3) are of Conservation Concern and were confirmed based on the localities provided (Figure 5). Note these exclude other species listed under the National Forestry Act. Protected tree species were observed, although sporadically within the study area, and included *Boscia* (two species) and *Vachellia erioloba* (Camel thorn). As far as possible the preferred alignment was selected on the basis that it would avoid habitats that contain these species, but small populations / individual specimens could still occur. These will need to be verified during the micro siting process, i.e. these could be avoided.

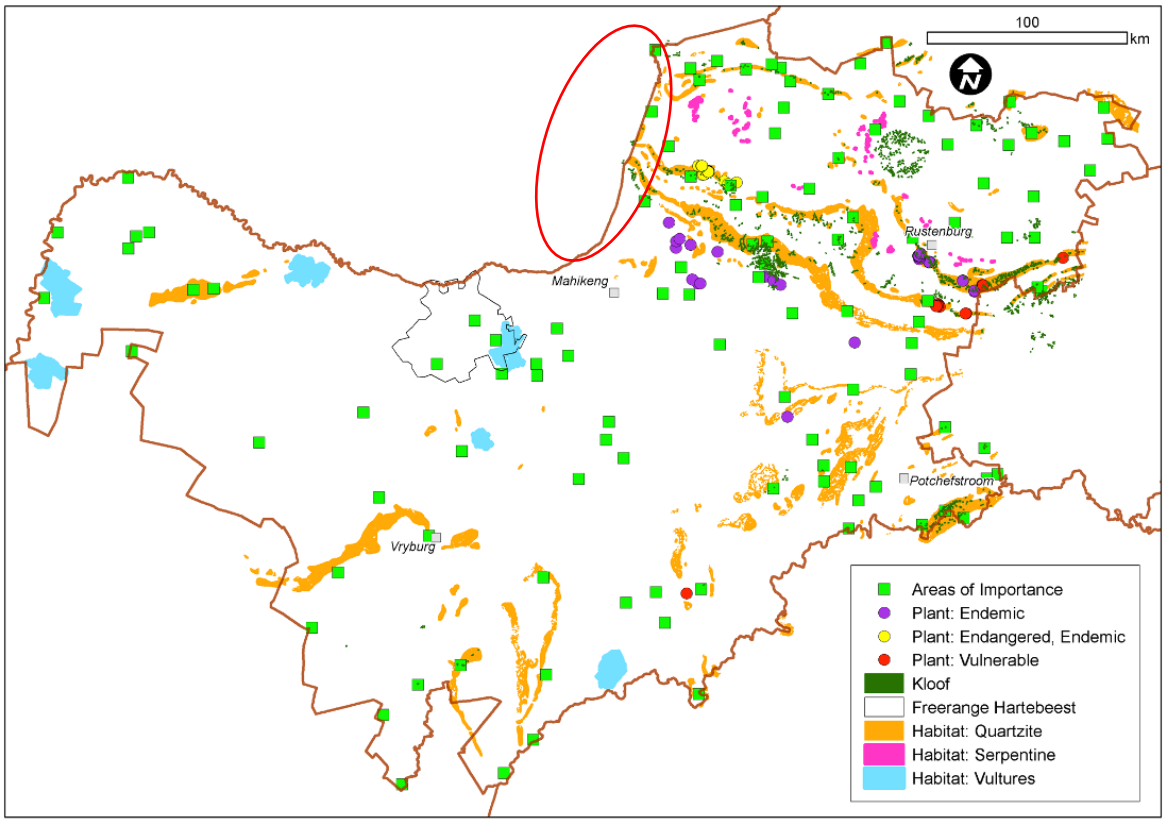


Figure 5: Species and habitats of special concern identified in the NWBSP (Source: Schaller & Desmet, 2015), where the final alignment will try and avoid all the areas shown within the red circle

Table 3: Plant species of conservation concern for the North West Province as the study area covers portions of all four Districts and based SANBI (redlist.sanbi.org) and Hahn (2013). (Where BP= Bojanala Platinum, NMM= Ngaka Modiri Molema, DKK= Dr Kenneth Kaunda and DRSM= Dr. Ruth Segomotsi Mompati). (Compiled by N. Hahn, Source Schaller & Desmet, 2015)

Taxon	IUCN Status	IUCN Criteria	NH2013 Status	NH2013 Criteria	CITES	BP	NMM	DKK	DRSM
Brachystelma canum R.A.Dyer	CR	B1 ab(iii,v)	CR	B1 ab(iii,v)			Yes		
Brachystelma gracillimum R.A. Dyer	CR	B1 ab(iii,v)	CR	B1 ab(iii,v)			Yes		
Aloe braamvanwykii Gideon F. Sm. & Figueiredo	EN	A2c					Yes	Yes	Yes
Aloe peglerae Schönland	EN	A2d; B1 ab(ii,v)+2ab(ii,v)	VU	A2c, C1	2	Yes			
Euphorbia perangusta R.A. Dyer = E. knobelii Letty	EN	(A2ace; B1ab(ii,v)+2ab(iii,v)					Yes		
Anacampseros dicapitata P. Burgoyne & J. van Thiel	VU	D2	VU	D2		Yes			
Brachystelma incanum R.A.Dyer	VU	A2a	VU	A2a			Yes	Yes	
Ceropegia stentiae E.A. Bruce	VU	D2	VU	D2				Yes	
Cullen holubii (Burtt Davy) C.H.Stirt. = C. tomentosum (Thunb.) J.W.Grimes	VU	B1ab(iii)	LC			Yes	Yes		
Dicliptera magaliesbergensis K. Balkwill	VU	B1ab(iii)+2ab(iii)	VU	B1ab(iii)+2ab(iii)		?			
Ledebouria atrobrunnea S.Venter	VU	D2	LC			Yes			
Nerine gracilis R.A. Dyer	VU	B1ab(ii,iii,v)						Yes	
Prunus africana (Hook.f.) Kalkman	VU	A4acd; C1 + 2a(i)	VU	A4acd; C1 + 2a(i)	2	Yes	Yes		
Rennera stellata P.P.J. Herman	VU	D2	LC						Yes
Searsia maricoana (Moffett) Moffett = S. ciliata (Licht. ex Schult.) A.J. Miller	VU	D2	LC				Yes		Yes
Ceropegia turricula E.A.Bruce	NT	A2c					Yes		
Cineraria austrotransvaalensis Cron	NT	B1ab(iii)						Yes	
Cleome conrathii Burtt Davy	NT	D2				Yes	Yes	Yes	
Delosperma leendertziae N.E.Br.	NT	B1ab(iii)+2ab(iii)	DDT			Yes	Yes		
Drimia sanguinea (Schinz) Jessop	NT	A2d				Yes	Yes	Yes	
Kniphofia typhoides Codd	NT	A2ac				Yes		Yes	
Lithops lesliei (N.E.Br.) N.E.Br. subsp. lesliei	NT	A4acd					Yes	Yes	
Stenostelma umbelluliferum (Schltr.) Bester & Nicholas	NT	B1ab(ii,iii,iv,v)				Yes			
Gladiolus filiformis Goldblatt & J.C.Manning	Critical Rare		LC				Yes		
Ceropegia insignis R.A. Dyer	Rare		EN	B1 ab(i,ii,iii,iv)			Yes		
Frithia pulchra N.E.Br.	Rare		Rare			Yes			
Gnaphalium nelsonii Burtt Davy	Rare		Rare					Yes	
Miraglossum laeve Kupicha	Threatened		VU	D2				Yes	
Cineraria exilis DC.	DDT		DDT-VU	D2					Yes
Euphorbia knobelii Letty	DDT		EN	A2ace; B1ab(ii,v)+2ab(iii,v)	2		Yes		
Lessertia phillipsiana Burtt Davy	DDT		DDT-VU	D2				Yes	
Senecio holubii Hutch. & Burtt Davy	DDT		DDT-CR	B1 ab(iii,v)			Yes		
Barleria media C.B.Clarke	LC		VU	D2					Yes
Indigofera commixta N.E.Br.	LC		VU	D2				Yes	Yes
Lobelia cuneifolia Link & Otto var. *ananda* E. Wimm.	LC		VU	D2		Yes			
Sporobolus oxyphyllus L. Fish	LC		LC				Yes		

4.2.2 Botswana

Limited spatial information is available on the extent and types of vegetation found within the study area located within Botswana (Figure 1), and presently the vegetation units are limited to those found on the Botswana Ministry of Wildlife and Tourism website (Figure 6).

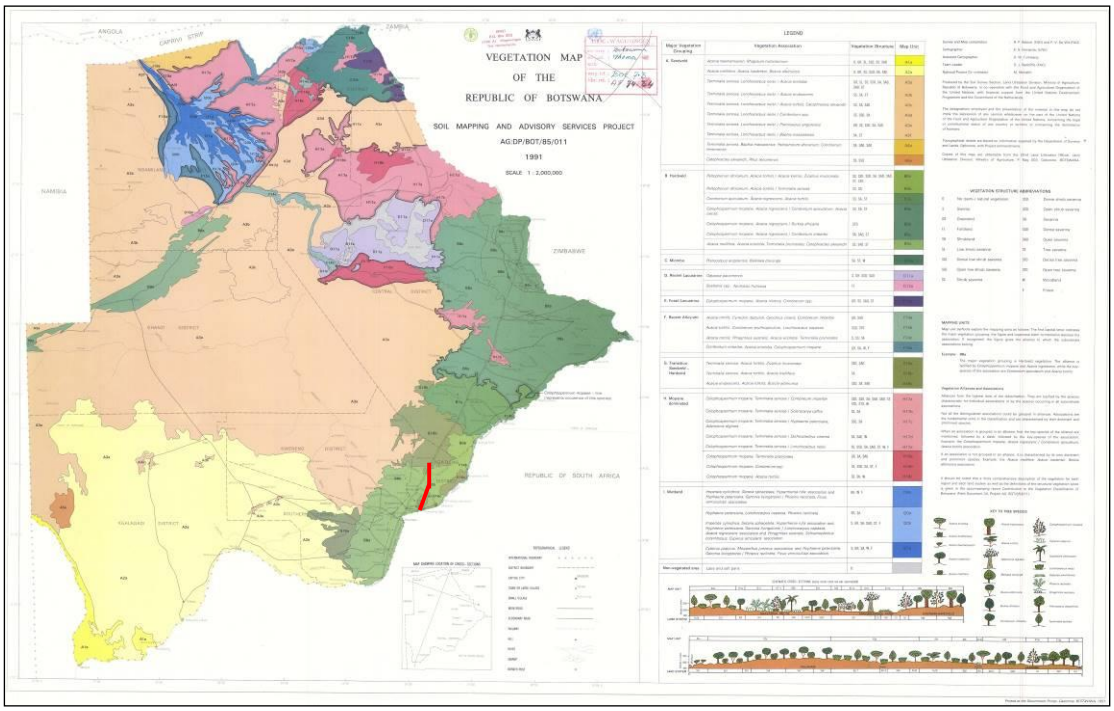


Figure 6: Vegetation map of Botswana (1991) with portion of BOSA study area shown in Red

Two Savanna / Woodland vegetation units are listed in Figure 6 within the study area and these include the following:

1. **B6b Hardveld**, composed of dominant tree species *Peltophorum africanum, Vachellia tortilis, V. karroo* and *Ziziphus mucronata* (Plate 3).
2. **G16a Transition Sandveld / Hardveld** dominated by *Terminalia sercicea*, *Vachellia tortilis,* and *Ziziphus mucronata*

Vegetation conservation importance and Species of Special Concern

Most of these vegetation types and the associated species are common and widespread, with similar habitats extending into both Zimbabwe and South Africa. However, based on a visual analysis of available satellite images, and a visit to the study area, most of the area with the exception of some water bodies, has undergone some form of transformation (residential, industrial or farming).

Plate 3: A view of the dry conditions observed in the Gaborone area, associated with the Hardveld vegetation type

Plate 4: Several large mammal's species such as Zebra and Blesbok were encountered in farms and game farms within the region

4.3 Fauna (Botswana & South Africa)

4.3.1 Mammals

The Southern African derived threatened status presented below follows the IUCN threatened status assessment conventions, which at times differs for the North West Province portion of the study area (Power, 2013), i.e. the NWBSP contains its own conservation assessment of species based on provincial scale population numbers and threats. A total of 24 threatened mammal species have been recorded to date by Friedmann and Daly (2004). This includes two (2) Critically Endangered species, four (4) Endangered species, four (4) Vulnerable species and 14 Near Threatened species, as listed below.

Critically Endangered:

- Black rhinoceros (Diceros bicornis minor) (IUCN Vulnerable),
- Short-eared trident bat (*Cloeotis percivali*) (IUCN Least Concern).

Endangered:

- African wild dog (*Lycaon pictus*),
- Oribi (*Ourebia ourebi*) (IUCN Least Concern),
- Tsessebe (*Damaliscus lunatus*) (IUCN Least concern) and
- White-tailed mouse (Mystromys albicaudatus).

Vulnerable:

- Cheetah (*Acinonys jubatus*) (IUCN Vulnerable),
- Ground pangolin (*Smutsia temminckii*) (IUCN Least Concern),
- Roan antelope (*Hippotragus equinus*) (IUCN Least Concern) and
- Sable (*Hippotragus niger*) (IUCN Least Concern).

Near Threatened:

- African marsh rat (Dasymys incomptus) (IUCN Least Concern),
- Brown hyaena (*Hyaena brunnea*) (IUCN Near Threatened),
- Darling's horseshoe bat (*Rhinolophus darlingi*) (IUCN Least Concern),
- Dent's horseshoe bat (*Rhinolophus denti*) (IUCN Least Concern),
- Geoffroy's horseshoe bat (*Rhinolophus clivosus*) (IUCN Least Concern),
- Honey badger (*Mellivora capensis*) (IUCN Least Concern),
- Rusty pipistrelle (*Pipistrellus rusticus*) (IUCN Least Concern),
- Schreibers' long-fingered bat (Miniopterus schreibersii) (IUCN Least Concern),
- Serval (*Leptailurus serval*) (IUCN Least Concern),
- Southern African hedgehog (*Atelerix frontalis*) (IUCN Least Concern),
- Spotted hyaena (*Crocuta crocuta*) (IUCN Least Concern),
- Spottednecked otter (Lutra maculicollis) (IUCN Least Concern),
- Straw-coloured fruit bat (*Eidolon helvum*) (IUCN Near Threatened) and
- Temminck's hairy bat (*Myotis tricolor*) (IUCN Least Concern).

The Southern African hedgehog is however considered to be worthy of a Vulnerable status (Power, 2013).

The following six (6) species were assessed by Friedmann and Daly (2004) as Least Concern but have an IUCN or globally threatened status (Power, 2013):

- African savanna elephant (*Loxodonta africana*) (IUCN Vulnerable),
- Black-footed cat (*Felis nigripes*) (IUCN Vulnerable),
- Hippopotamus (Hippopotamus amphibius) (IUCN Vulnerable),
- Leopard (*Panthera pardus*) (IUCN Near Threatened),
- Lion (*Panthera leo*) (IUCN Near Threatened) and
- White rhinoceros (*Ceratotherium simum*) (IUCN Near Threatened), of which the latter is under the threat of poaching, and is entirely conservation-dependent.

It should be noted that except for the meso-predators and bats, all of these species will only be found within protected areas within the study area. As anticipated none of these species were observed during the assessment, i.e. within the study area, and common or ubiquitous species such as Vervet monkeys (*Chlorocebus pygerythrus*), Baboons (*Papio ursinis*), Black-backed jackal (*Canis mesomelas*), Zebra (*Equus quagga*) and Blesbok (*Damaliscus pygargus*) (Plate 4) were observed.

4.3.2 Amphibians

Little is known or has been documented on the frog distribution within the Botswanan portion of the study area, but it has been assumed that the approximately 19 amphibian species are likely to occur due similar habitat availability and distribution range information. Those shown in bold were observed within the field surveys in Botswana and South Africa:

- *Amietia angolensis* (Common River Frog),
- *Amietia fuscigula* (Cape River Frog),
- *Cacosternum boettgeri* (Boettger's Caco),
- ***Strongylopus fasciatus* (Striped Stream Frog)**,
- ***Bufo garmani* (Eastern Olive Toad),**
- ***Bufo gutturalis* (Guttural Toad)**
- ***Amietophrynus rangeri* (Raucous Toad)**
- ***Schismaderma carens* (Red Toad)**
- ***Breviceps adspersus* (Bushveld Rain frog)**
- *Phyronomantis bifasciatus* (Banded Rubber Frog)
- ***Xenopus laevis* (Common Platanna)**
- *Ptychadena anchietae* (Plain Grass frog)
- *Ptychadena mossambica* (Broad Banded Grass Frog)
- *Tomopterna cryptosis* (Tremolo Sand Frog)
- *Tomopterna krugerensis* (Knocking Sand Frog)
- *Tomopterna natalensis* (Natal Sand Frog)
- *Chiromantis xerampelina* (Southern Foam Nest Frog) and
- ***Kassina senegalensis* (Bubbling Frog).**

Species of conservation concern

Currently, none of these frog species under consideration are Red listed, however Minter *et al.*, 2004 indicate that the Giant Bullfrog (*Pyxicephalus adspersus*) is regionally listed as Near Threatened within South Africa. This species is expected in portions of the study area, but due to the dry conditions none were observed. This species is expected to occur along wetland margins, near pans / depression and floodplains of rivers, particularly within the central portion of the study area.

4.3.3 Reptiles

52 taxa (comprising of 23 snake and 29 tortoise and lizard species [scincids & gekkonids]; Table 4) have been recorded from the study area (information obtained from the South African Reptile Conservation Assessment (SARCA). Again, it is assumed that similar species will occur within the Botswanan portion of the study area.

The expected richness represents an underestimation of the reptile diversity likely to occur. Therefore, it is possible that many more species could exist on the study sites although current distributional data is lacking in this regard.

Table 4 indicates the 14 species observed during the site visits in bold, however none of these are of conservation concern.

Table 4: An inventory of reptile species known to occur within the study area (Botswana & South Africa)

Scientific Name	Common Name	Conservation Status (IUCN Red List) – where not specifically indicated assessment is region
Acanthocerus atricollis	Southern tree agama	Least Concern
Acontias occidentalis	Savanna legless skink	Least Concern
Afroblepharus walhbergii	Wahlbergs's snake-eyed skink	Least Concern
Afrotyphlops bibronii	Bibron's blind snake	Least Concern – Near Endemic
Agama aculeata	Eastern ground agama	Least Concern
Agama atra	Southern rock agama	Least Concern
Aparallactus capensis	Black-headed centipede-eater	Least Concern
Atractaspis bibronii	Bibron's stiletto snake	Least Concern
Bitis arietans arietans	**Puff adder**	**Least Concern**
Boaedon capensis	Common house snake	Least Concern
Causus rhombeatus	Common night adder	Least Concern
Chamaeleo dilepis	**Common flap-necked chameleon**	**Least Concern**
Chamaesaura aenea	Coppery grass lizard	Near Threatened (Global)
Chondrodactylus terneri	Turner's gecko	Least Concern
Cordylus vittifer	Transvaal girdled lizard	Least Concern
Crocodilus niloticus	Nile Crocodile	Vulnerable (Regional)
Crotaphopeltis hotamboeia	Herald snake	Least Concern
Dasypeltis scabra	Rhombic egg-eater	Least Concern
Dendroaspis polylepis	Black mamba (more likely in Botswana)	Least Concern
Dispholidus typus	**Boomslang**	**Least Concern**
Gerrhosaurus flavigularis	Yellow-throated plated lizard	Least Concern
Hemachatus haemachatus	**Rinkhals**	**Least Concern (Global)**
Hemidactylus mabouia	**Common tropical house gecko**	**Least Concern**
Kinixys labatsiana	Lobatse hinged tortoise	Least Concern – Near Endemic
Lamprophis aurora	Aurora house snake	Least Concern
Lycophidion capense	Cape wolf snake	Least Concern
Lygodactylus capensis	**Common dwarf gecko**	**Least Concern**
Lygodactylus nigropunctatus	**Black-spotted dwarf gecko**	**Least Concern**
Meroles squamulosus	Savanna lizard	Least Concern
Monopeltis capensis	Cape spade-snouted worm lizard	Least Concern
Naja annulifera	Snouted cobra	Least Concern
Naja nivea	Cape cobra	Least Concern
Nucras hloubi	Holubs's sandveld lizard	Least Concern
Pachydactylus capensis	**Cape gecko**	**Least Concern**
Pelomedusa subrufa	**Marsh terrapin**	**Least Concern**
Philothamnus semivariegatus	**Spotted bush snake**	**Least Concern**
Psammobates oculifer	Kalahari tent tortoise	Least Concern
Psammophis brevirotris	Short-snouted grass snake	Least Concern
Psammophis subtaeniatus	Yellow-bellied grass snake	Least Concern
Psammophis trinasalis	Kalahari sand snake	Least Concern
Psammophylax rhombeatus	Spotted grass snake	Least Concern
Psammophylax tritaeniatus	Striped grass snake	Least Concern
Pseudaspis cana	**Mole snake**	**Least Concern**
Python natalensis	Southern African python	Least Concern
Rhinotyphylops lalandei	Delande;s beaked blind snake	Least Concern
Stigmochelys pardalis	Leopard tortoise	Least Concern
Trachylepis capensis	Cape skink	Least Concern
Trachylepis punctatissima	**Montane speckled skink**	**Least Concern**
Trachylepis varia	**Variable skink**	**Least Concern**
Varanus albigularis	**Southern rock monitor**	**Least Concern**
Varanus niloticus	**Nile monitor**	**Least Concern**

Species of conservation concern

Vulnerable: The Nile crocodile (*Crocodilus niloticus*) is found throughout the bushveld region but is rare in the North West Province and the study area in Botswana. Also as the transmission line would span any permanent water courses / waterbodies, this project would not impact on this species.

Near Threatened: The coppery grass lizard (*Chamaesaura aenea*) occurs marginally in the province, inhabiting montane grasslands on the eastern Highveld of the country. It is thought to be found in the eastern grasslands of the Dr Kenneth Kaunda District. No sign of this was observed during the site assessments.

Although the Southern African python (*Python natalensis*) is classified as Least Concern, it is evaluated as a species of special concern because it is used in the muti and pet trade industries; and is considered a problem species that necessitates removal. The species appears to be expanding its distribution range, which can only be to its benefit.

4.3.4 Invertebrates

The diversity and distribution of invertebrate insects was found to be closely related to firstly the availability of intact habitat, the selection of host plants (Lepidotera) and then the transition between biomes from Savanna in the north, grasslands in the central portion of the alignment to semi-arid savanna in the south. This is reflected in the abundance of insects observed, being higher within the northern and central portions of the study area, especially when intact grasslands, wetlands/dams or rivers were encountered, i.e. in the arid portions of the site near Mafikeng, species diversity and abundance was lower. Species observed during the surveys are listed below in Table 5 below and included mostly slow moving or ground dwelling species that were easily caught. Several bee, wasp and fly species were also observed, but none were caught for detailed species identification, as none of these are considered of conservation concern or would be impacted upon by a transmission line. No species of conservation concern were observed during the assessment

Table 5: Invertebrate species caught for detailed species identification during the various site visits both in South Africa and Botswana

Taxon	Common name	Conservation Status
Lepidoptera (Butterflies)		
Danus chrysippus aegyptius	African Monarch	Least concern
Melantis leda helena	Evening brown	Least concern
Henotesea perspicua perspicua	Marsh patroller	Least concern
Physcaeneura panda	Dark-webbed ringlet	Least concern
Ypthima granulosa	Granular ringlet	Least concern
Acraea caldarena caldarena	Black-tipped Acraea	Least concern
Acraea stenobea	Suffused Acraea	Least concern
Acraea oncaea	Window Acraea	Least concern
Acraea acara acara	Acara Acraea	Least concern
Hyalites rahira rahira	Marsh Acraea	Least concern
Aloeides damarensis	Damara copper	Least concern
Aloeides taikosama	Dusky copper	Least concern
Cupidopsis cissus cissus	Common meadow blue	Least concern
Colotis evenina evenina	Common orange tip	Least concern
Belenois aurota aurota	Brown-veined white	Least concern
Odonata (Damselflies and Dragonflies)		
Phaon iridipennis	Glistening demoiselle	Least concern
Platycypha caligata	Dancing jewel	Least concern
Lestes plagiatus	Highland spreadwing	Least concern
Lestes pallidus	Pallid spreadwing	Least concern
Lestes tridens	Spotted spreadwing	Least concern
Pantala flavescens	Wandering glider	Least concern
Phyllomacromia picta	Darting cruiser	Least concern
Anax tristis	Black emperor	Least concern
Africallagma glaucum	Swamp bluet	Least concern
Blattodea (Cockroaches)		
Periplaneta Americana	American cockroach	Least concern
Deropeltis erythrocephala	-	Least concern
Blatella germanica	German cockroach	Least concern
Hostilia spp.	-	Least concern
Isoptera (Termites)		
Hadotermes mossambicus	Northern harvester termite	Least concern
Macrotermes natalensis	Large fungus growing termite	Least concern
Odontotermes badius	Common fungus growing termite	Least concern
Mantodea (Mantids)		
Tarachodes spp.	Bark mantids	Least concern
Omomantis zebrata	Zebra mantid	Least concern
Miomantis spp.	-	Least concern
Polyspilota aeruginosa	-	Least concern
Orthoptera (Grasshoppers & Locusts)		
Acanthoplus armiventris	Corn cricket	Least concern
Phaneroptera	Leaf katydids	Least concern
Gryllus bimaculatus	Common cricket	Least concern
Lamarckiana spp.	Rain locusts	Least concern
Phymateus morbillosus	Common Milkweed locust	Least concern
Zonocerus elegans	Elegant locust	Least concern
Locustana pardalina	Brown locust	Least concern

4.4 Aquatic Environment (South African & Botswana)

As with the terrestrial environment, due to the spatial scale of the assessment, several different types of aquatic environments were confirmed within the study area (Figure 1).

These include:

1. Rivers and streams (Figure 7, Plates 5 & 6)
2. Open water bodies / lakes (Figure 8)
3. Wetlands (Figure 8)
4. Endorheic pans / depressions (Figure 8 and Plate 7)
5. Springs/eyes (Figure 8)
6. Artificial waterbodies (Figure 8)

Conservation importance and sensitivity

Due to the large number of waterbodies, the current state and importance of the affected wetlands was based on national inventories as well as site specific assessments. For now, the Aquatic Critical Biodiversity Areas (NWBSP, 2015) and Botswana Spatial Biodiversity Plan will refer (Figure 10). However, it is evident from a preliminary assessment of the main river and wetland systems that these are under pressure from development and are at times the only natural functioning systems within the cultivated landscapes. This elevates the importance of these systems in their role as ecological support areas and corridors.

This was confirmed in the available spatial databases that rated the study area systems between Moderately to Large Modified due to land use patterns (DWS, 2014). However due to the sensitivity of these systems and the potential for important fish habitat, the Ecological Importance and Sensitivity was rated as Moderate to High for the study area.

Plate 5: A typical watercourse located near Modipane in Botswana

Plate 6: A Dry river bed, near Gamotshogo in South Africa

Plate 7: One of the larger pans seen near Bewley 40km South West of Zeerust

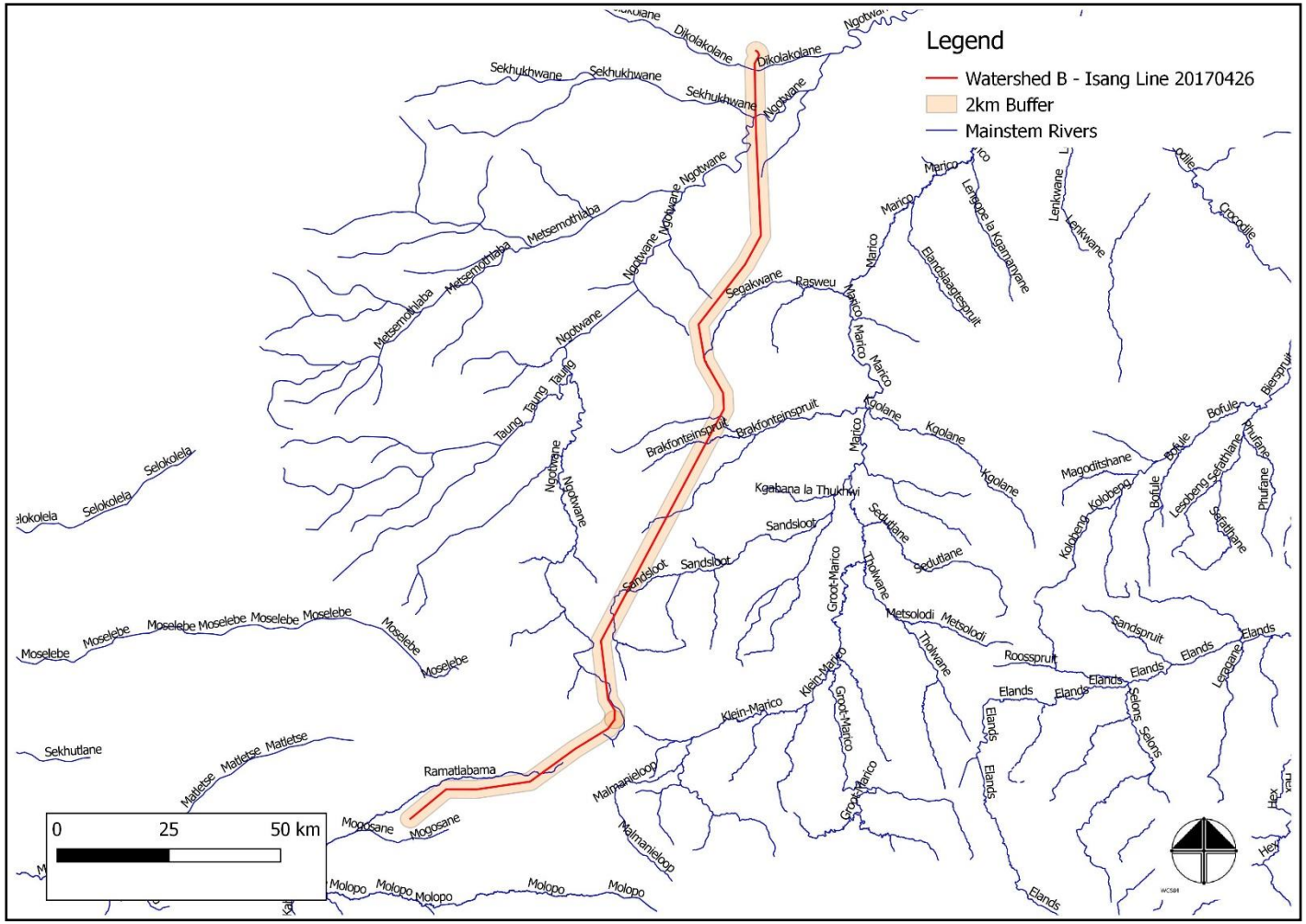


Figure 7: Mainstem rivers found within the study area

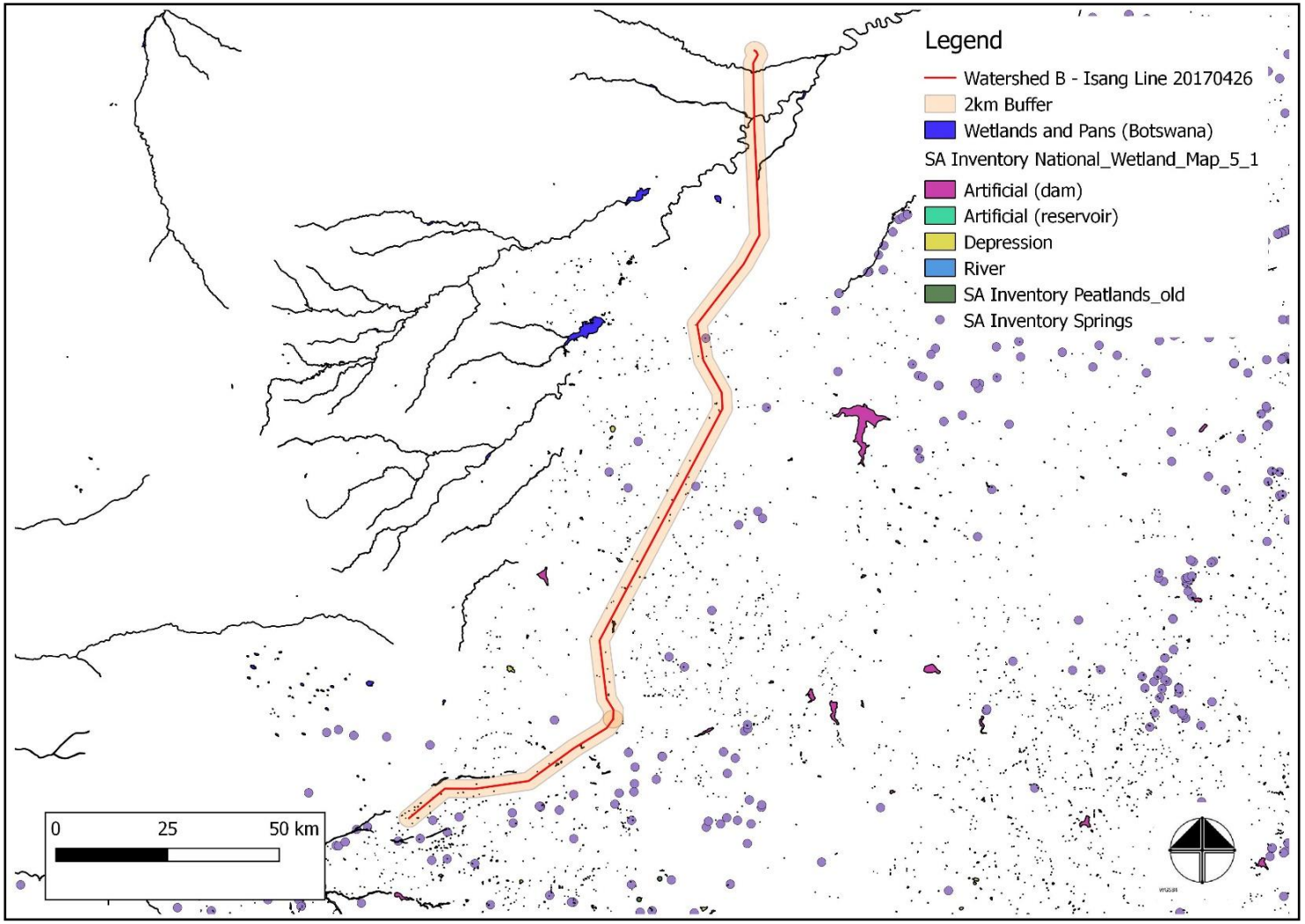


Figure 8: Known wetlands within the study area, consisting mostly of pans, riverine floodplains, alluvial systems and artificial dams within Botswana and South Africa

4.5 Ecosystem Services

The importance was also related to ecosystems service and social importance as rated by DWS (2014). However, in summary, ecosystem services include the numerous benefits derived directly or indirectly from the natural environment, from properly-functioning ecosystems. Collectively, these benefits are becoming known as 'ecosystem services', and are often integral to the provisioning of clean drinking water, the decomposition of wastes, and the natural pollination of crops and other plants. Other services include food, freshwater, fibre or aesthetic appreciation of an environment, soil formation, water purification, nutrient cycling or flood regulation (Ginsburg *et al*. 2010).

Due to the extent of the study area, this could not be rated for individual systems but was rated as follows for the broad aquatic units listed above and are found within the alignment (including buffer):

Hydrogeomorphic type	Ecosystem service	Social Importance	Regional importance of this HGM type
Rivers and streams	Hydrologic function in the maintenance of catchment base flow	Where surface water flows exist, rural communities will use as a water resource, but more important for livestock watering	LOW – limited or mostly ephemeral flows within study area
Open water bodies / lakes	Surface water storage and important for water flow and facultative vegetation	Livestock watering and recreational use	LOW – as most are outside of the study area or very small
Wetlands	Hydrological store within catchments, and passive treatment of water quality, while providing specialised habitat, nutrient cycling and flood regulation	Limited use of wetlands within the region as they are sparse and very small	LOW – sparse and have limited resources
Endorheic pans / depressions	Represent the highest proportion of aquatic habitat within the study area, and are important as ephemeral refugia for birds and unique wetland associated plants	Highly ephemeral and only used for short periods by livestock	High – due to habitat uniqueness and the high numbers of these systems
Springs/eyes	Hydrologic function in the maintenance of catchment base flow	Important water source for rural communities	High, due to baseflow maintenance but these are sparse within study area
Artificial waterbodies	Restrict catchment baseflow and can result in sedimentation erosion	Livestock water and recreational use	LOW – due to impact on natural hydrological regime

5 Biodiversity Conservation Plans

5.1 South Africa

Biodiversity Conservation Plans or Biodiversity Sector Plans are spatial tools used to define and then manage (Land Use Management Guidelines) important terrestrial and aquatic ecosystems. The North West Province, as indicated in this report, has just completed a detailed assessment and produced Critical Biodiversity and Ecological Support Area maps for both the terrestrial (Figure 9) and aquatic environments (Figure 10). These were used in the alignment selection process, which forms part of the alternatives discussion, i.e. select an alignment that would avoid as many CBAs as possible. However, as the proposed alignment will still intersect with some form of terrestrial CBA, the alignment can be micro-sited within the 1km corridor so that that is located within largely transformed sections of the CBAs. As discussed above, most of the corridor alignment is located within some form of transformed habitat, confirmed during the site visits. This would minimise both habitat fragmentation and or habitat destruction within a CBA.

Similarly, this was found true for the Aquatic CBA, with the selected alignment spanning sections of water courses that are in poor condition or during the micro-siting process be able to avoid any of the wetlands, particularly pans.

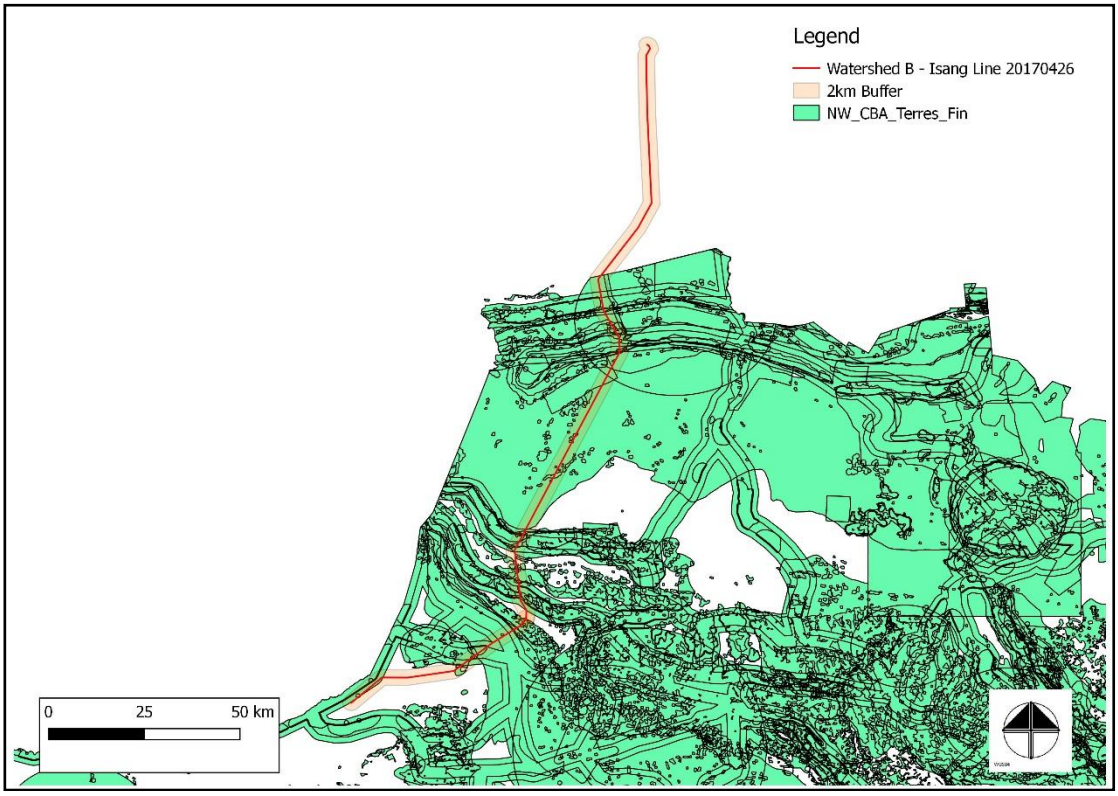


Figure 9: Terrestrial Critical Biodiversity and Support Areas as per the NWBSP (2015)

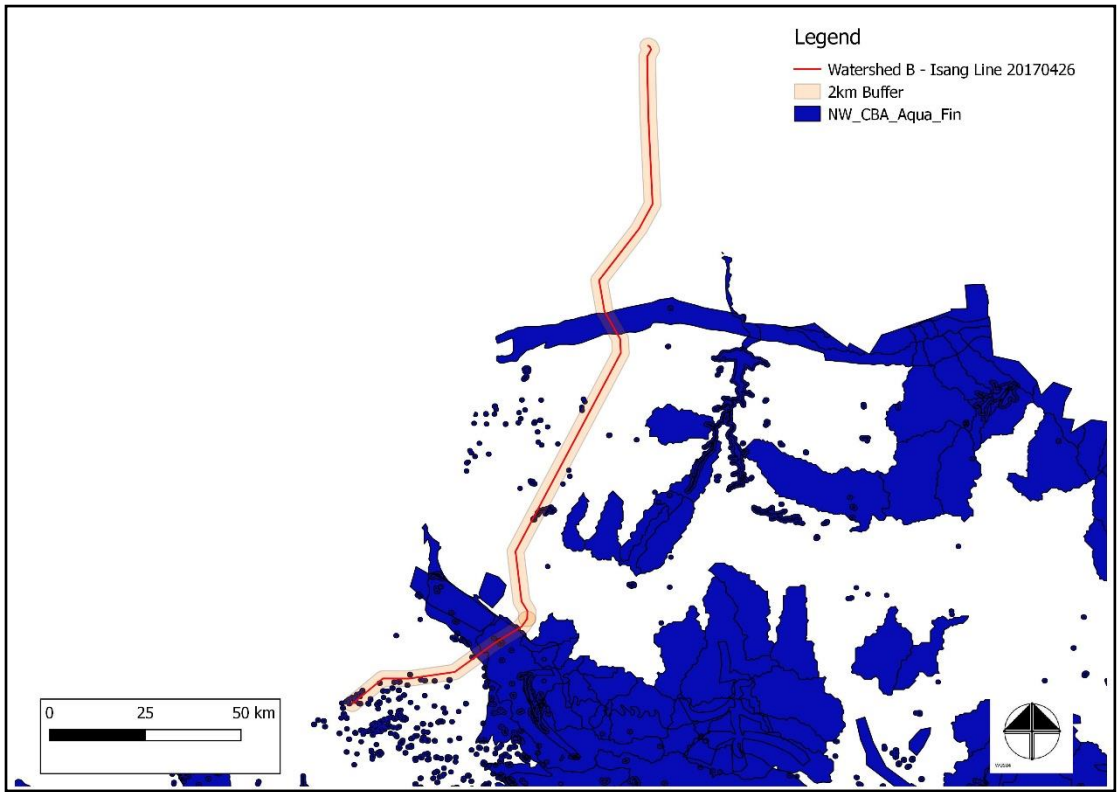


Figure 10: Aquatic Critical Biodiversity and Support Areas as per the NWBSP (2015)

5.1 Botswana

The Botswanan Ministry of Wildlife and Tourism has developed two important broad scale spatial management plans which includes the Botswana Conservation Plan (BCP) and the Botswana Biodiversity Strategy and Action Plan (BSAP) (updated 2007). The BCP is a document / project that is largely still being develop and focuses on strategic conservation areas such as the Tuli and Okavango areas at present.

The BSAP has identified several conservation objectives based on environmental status quos and threat levels. Areas, based on bioregions, were then ranked in terms of biodiversity priorities coupled to potential threats. The study area (Figure 11) has be ranked as having a Low Biodiversity Priority with regard future conservation needs or objectives.

The overall lack of species complexity and habitat diversity within this portion of the study area was also confirmed during the site visits. Habitat degradation in the form of subsistence farming and other development seems to greatly impacted on the region.

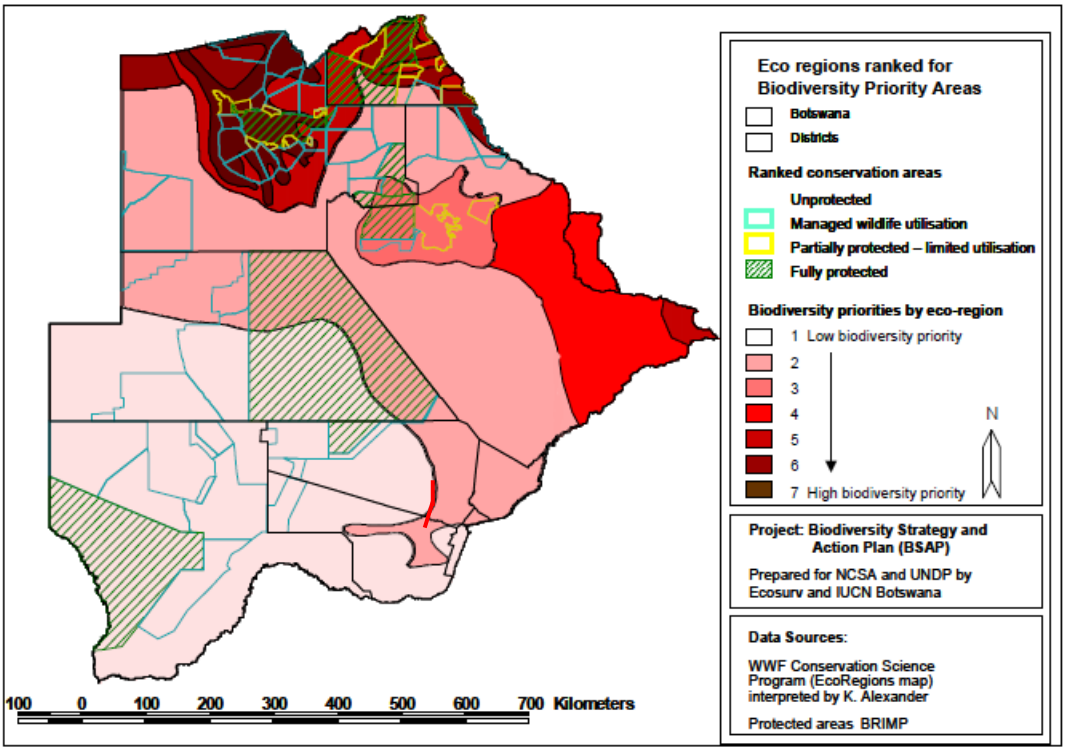


Figure 11: Results of the Botswana Biodiversity Strategy and Action Plan priority ranking exercise (SOURCE BSAP, 2007), with study area indicated by red line

6 Impact Assessment

Due to the nature of a transmission line, the greatest impacts anticipated are associated with the towers, access roads needed during construction and the substation footprints (not a component of this study). Thus, the following impacts were assessed based on the supplied methodology (Appendix 1):

The following direct and indirect impacts were assessed:

- Impact 1: Loss of intact vegetation units / terrestrial habitats
- Impact 2: Loss of Critical Biodiversity Areas and habitat fragmentation
- Impact 3: Loss of species of special concern
- Impact 4: Impact on terrestrial fauna
- Impact 5: Loss of riparian systems and disturbance of water courses in the construction, operational and decommissioning phases
- Impact 6: Increase in sedimentation and erosion in the construction, operational and decommissioning phases
- Impact 7: Potential impact on localised surface water quality during the construction and decommissioning phases
- Impact 8: Loss of wetlands
- Impact 9: Loss of ecosystem services
- Impact 10: The No-go Alternative
- Impact 11: Cumulative impacts

Note that alien plants are limited within the study area, and thus not assessed here, however careful monitoring during the construction and operational phase (usually and Eskom requirement) must take place.

The impact assessment due to the level of disturbance within the study area applies to both the Botswanan and South African portions of the alignment unless stated otherwise.

IMPACT DESCRIPTION: Impact 1: Loss of intact vegetation units / terrestrial habitats				
Predicted for project phase:		Construction		Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Long-term	Vegetation will require some form of rehabilitation	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Local I	The length of the transmission could impact large tracts of intact vegetation		
Intensity	High - negative	Considering new tracks and bush clearing of the servitude will required		
Probability	Fairly likely	Clearing will be required		
MITIGATION:				

- A detailed walkdown must be conducted to finalise the tower positions to minimise any impacts, avoiding rocky outcrops, intact habitat units and steep inclines and to allow for the avoidance of species of special concern
- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise impacts.
- This should also be coupled to a rehabilitation and monitoring programme for disturbed areas.
- An Environmental Control Officer (ECO), with a good understanding of the local flora must be appointed during the construction phase.
- The ECO must make clear recommendations with regards to the management of disturbed areas.
- All alien plant re-growth, which is currently limited within the greater region must be monitored and should it occur these plants should be eradicated.

POST-MITIGATION

Dimension	Rating	Motivation		
Duration	Short-term	Rehabilitation and monitoring will reduce timeframes and extent of impacts	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific			
Intensity	Moderate - negative	Avoidance of impacts and rehabilitation of disturbed areas will reduce the intensity of impacts		
Probability	Fairly likely	Clearing will be required		

IMPACT DESCRIPTION: Impact 2: Loss of Critical Biodiversity Areas and habitat fragmentation				
Predicted for project phase:		Construction		Decommissioning

PRE-MITIGATION

Dimension	Rating	Motivation		
Duration	Long-term	Rehabilitation and monitoring will reduce timeframes and extent of impacts	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Regional			
Intensity	High - negative	Avoidance of CBAs and rehabilitation of disturbed areas will reduce the intensity of impacts		
Probability	Fairly likely	Clearing will be required		

MITIGATION:

- Much of the impact on CBS has been avoided by careful selection of the preferred alignment. Because of the limited physical footprint associated with the access roads and the towers, habitat fragmentation can be limited. However, a detailed walkdown must be conducted to finalise the tower positions to minimise any impacts, avoiding rocky outcrops, intact habitat units and steep inclines. This will also allow for the avoidance of species of special concern.
- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise impacts. This should also be coupled to a rehabilitation and monitoring programme for disturbed areas.
- An Environmental Control Officer (ECO), with a good understanding of the local flora must be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the management of disturbed areas.
- All alien plant re-growth, which is currently limited within the greater region must be monitored and should it occur these plants should be eradicated.

POST-MITIGATION

Dimension	Rating	Motivation		
Duration	Short-term	Rehabilitation and monitoring will reduce		Significance: Low - negative

Extent	Regional	timeframes and extent of impacts	Consequence: Moderately detrimental	
Intensity	Moderate - negative	Avoidance of impacts and rehabilitation of disturbed areas will reduce the intensity of impacts		
Probability	Unlikely	Clearing will be required		

IMPACT DESCRIPTION: Impact 3: Loss of species of special concern				
Predicted for project phase:	Pre-construction	Construction	Operation – due to clearing of areas under the transmission line if required	Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Long-term	Most are slow growing or require specialised habitats	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Regional	Conservation concern extends beyond study area		
Intensity	High - negative	Loss of species of conservation concern that are mostly Vulnerable and in decline		
Probability	Fairly likely	Species are known		
MITIGATION:				
• A detailed walkdown must be conducted to finalise the tower positions to minimise any impacts, avoiding rocky outcrops, intact habitat units and steep inclines. • This will also allow for the avoidance of species of special concern. • Where total avoidance of these species is not possible the requisite permits from the respective authorities must be obtained.				
POST-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Short-term	Only large tree species could be affected	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Affected footprints can be reduced through avoidance		
Intensity	Moderate - negative	Conservation concern is high for most species		
Probability	Fairly likely	Species are known to occur		

IMPACT DESCRIPTION: Impact 4: Impact on terrestrial fauna (excluding birds)				
Predicted for project phase:	Pre-construction	Construction		Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Short-term	Movement of vehicles / work teams and clearing of vegetation	Consequence: Moderately detrimental	Significance: Moderate - negative
Extent	Local	The length of the transmission could impact large tracts of intact vegetation		
Intensity	High - negative	Considering new tracks and bush clearing of the servitude will required		

Probability	Fairly likely	Clearing will be required resulting in disturbance	

MITIGATION:

- A detailed walkdown must be conducted to finalise the tower positions to minimise any impacts, avoiding rocky outcrops, intact habitat units and steep inclines and to allow for the avoidance of reptile, amphibian and invertebrate habitat
- No hunting or trapping is permitted along the alignment
- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise impacts and allow for the slower moving species to move to other areas.
- Excavations must be fenced off to prevent some animals falling in.
- The contractor may under no circumstances make use of pesticide or poison to control unwanted animals.
- Workers should be educated so as not to kill any fauna found onsite.

POST-MITIGATION

Dimension	Rating	Motivation		
Duration	Short-term	Movement of vehicles / work teams and clearing of vegetation	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Local			
Intensity	Moderate - negative	Considering new tracks and bush clearing of the servitude will required		
Probability	Fairly likely	Clearing will be required		

IMPACT DESCRIPTION: Impact 5: Loss of riparian systems and disturbance of water courses in the construction and decommissioning phases

Predicted for project phase:		Construction		Decommissioning

PRE-MITIGATION

Dimension	Rating	Motivation		
Duration	Long-term	Disturbed systems within these ecotones cannot recover without intervention	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Sedimentation usually occurs within a 100 - 600m long reach		
Intensity	Moderate - negative	Habitats are already under pressure		
Probability	Fairly likely	If these systems are not spanned		

MITIGATION:

- All water courses must be excluded from any construction disturbance, together with a 32m buffer, thus no towers or new tracks should occur within these systems, i.e. only the cables can span the aquatic system
- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise impacts.
- This should also be coupled to a rehabilitation and monitoring programme for disturbed areas

POST-MITIGATION

Dimension	Rating	Motivation		
Duration	Short-term	Construction impact only (accidental)	Consequence: Slightly detrimental	Significance: Very low
Extent	Site-specific	With monitoring and rehabilitation		
Intensity	Moderate - negative	Short term within the site only		
Probability	Very unlikely	Avoidance of aquatic system will reduce probability		

IMPACT DESCRIPTION: Impact 6: Increase in sedimentation and erosion in the construction and decommissioning phases				
Predicted for project phase:		Construction		Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Long-term	Disturbed systems within these ecotones cannot recover without intervention	Consequence: Moderately detrimental	Significance: Low - negative
Extent	Local	Sedimentation usually occurs within a 100 - 600m long reach		
Intensity	Moderate - negative	Habitats are already under pressure		
Probability	Fairly likely	Avoidance of aquatic system will reduce probability		
MITIGATION:				
• All water courses must be excluded from any construction disturbance, together with a 32m buffer, thus no towers or new tracks should occur within these systems, i.e. only the cables can span the aquatic system • Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise impacts. • This should also be coupled to a rehabilitation and monitoring programme for disturbed areas				
POST-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Short-term	Construction impact only (accidental)	Consequence: Slightly detrimental	Significance: Very low
Extent	Site-specific	With monitoring and rehabilitation		
Intensity	Moderate - negative	Short term within the site only		
Probability	Very unlikely	Avoidance of aquatic system will reduce probability		

IMPACT DESCRIPTION: Impact 7: Potential impact on localised surface water quality during the construction and decommissioning phases				
Predicted for project phase:		Construction		Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Medium-term	Water quality issues can be persistent in the medium term due to factors such as downstream transport, accumulation in pools or bioaccumulation within plants and animals	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Most systems are ephemeral so will remain site specific		
Intensity	Moderate - negative	Sensitive species are known		
Probability	Fairly likely	Construction will take place in close proximity		
MITIGATION:				

- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination.
- Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion.
- Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. All construction camps, lay down areas, batching plants or areas and any stores should be more than 50m from any demarcated water courses.
- Chemicals used for construction must be stored safely on site and surrounded by bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early.
- Littering and contamination of water sources during construction must be prevented by effective construction camp management.
- Emergency plans must be in place in case of spillages onto road surfaces and water courses.
- No stockpiling should take place within a water course:
  - All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;
  - Stockpiles must be located away from river channels;
- Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks.
- The construction camp and necessary ablution facilities meant for construction workers must be beyond the 32m buffer described previously.
- No transmission line towers must be placed within any water courses or their 32m buffer or within 50m of any wetlands.

POST-MITIGATION

Dimension	Rating	Motivation		
Duration	Short-term	Spills should be contained	Consequence: Slightly detrimental	Significance: Very low
Extent	Site-specific	Ephemeral = low flows to disperse contaminants		
Intensity	Moderate - negative	Sensitive species are known		
Probability	Very unlikely	Due care is exercised		

IMPACT DESCRIPTION: Impact 8: Loss of wetlands				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Long-term	Rehabilitation options limited	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Regional	High number of pans		
Intensity	High - negative	Unique and important habitats		
Probability	Fairly likely	Access tracks and towers within wetlands		
MITIGATION:				
• No transmission line towers must be placed within any water courses or their 32m buffer or within 50m of a wetland				
POST-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Short-term	Construction / temporary track that is completely rehabilitated	Consequence: Slightly detrimental	Significance: Very low
Extent	Site-specific	Small temporary accidental impact		
Intensity	Moderate - negative	Accidental impact as no direct activities would be allowed within the wetlands		
Probability	Very unlikely	All wetlands with buffers = No-Go		

IMPACT DESCRIPTION: Impact 9: Loss of aquatic ecosystem services				
Predicted for project phase:		Construction		Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Short-term	Rehabilitation options limited	Consequence: Highly detrimental	Significance: Moderate - negative
Extent	Site-specific	High number of pans		
Intensity	Moderate negative	Loss of access to services or a deterioration in the quality of the benefit		
Probability	Fairly likely	Access tracks and towers within wetlands		
MITIGATION:				
• No transmission line towers must be placed within any water courses or their 32m buffer or within 50m of a wetland				
POST-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Short-term	Construction / temporary track that is completely rehabilitated	Consequence: Slightly detrimental	Significance: Very low
Extent	Site-specific	Small temporary accidental impact		
Intensity	Moderate - negative	Accidental impact as no direct activities would be allowed within the wetlands		
Probability	Very unlikely	All wetlands with buffers = No-Go		

IMPACT DESCRIPTION: Impact 10: The No-Go Alternative				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration	Long-term		Consequence: Slightly detrimental	Significance: Low - negative
Extent	Regional			
Intensity	Moderate - negative			
Probability	Fairly likely	Habitat degradation will continue regardless of the project		
MITIGATION:				
None as applicant is not a landowner at present				
POST-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration				N/A – Current land use patterns will continue regardless of project.
Extent				
Intensity				
Probability				

IMPACT DESCRIPTION: Impact 11: Cumulative Impacts				
Predicted for project phase:	Not Applicable as this project would result in a new transmission line servitude with no others such lines in close proximity.			
PRE-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration				
Extent				
Intensity				
Probability				
MITIGATION:				
•				
POST-MITIGATION				
Dimension	**Rating**	**Motivation**		
Duration				
Extent				
Intensity				
Probability				

7 Conclusion and recommendations

A diverse range of habitats, which range from important (mostly aquatic) to transformed have been identified in this assessment. However due to the nature of transmission line and its limited physical disturbance, the overall impacts were rated as low with mitigation. This applied to both the Botswanan and South African portions of the preferred alignment. This was due to a similarity in current land use practices that have resulted in loss of important habitat for most portions of the route, and hence its selection as a preferred alignment.

The only issue that needs to be highlighted is the high number of wetlands and protected plant species within the South African portion of the alignment. However, due to the selection of a preferred alignment most of the significant impacts can be avoided. Altough it is still recommended that should the project proceed that a detailed walk down be completed, that will allow for the micro-siting of the towers to further reduced the significance of the impacts, i.e. avoid any wetlands (including buffers), span water courses and avoid any protected plant species, including protected trees listed in this report. This must influence the final positioning the towers for the transmission line, to uphold the post mitigation impact ratings indicated in this report.

The walkdown will also allow for the detail required for any plant search and rescue permits and respective Water Use Licenses (mainly activities within 500m of a wetland). Careful consideration should also be given at this point to selecting suitable access routes to minimise the impact of new tracks or roads, as well as clearing of the final servitude. This process would also largely avoid any impacts on the aquatic environment, coupled to the fact that water courses (including 32m buffer) and wetlands (including 50m buffer) must be avoided.

With this in place, the authors of this report feel that the impacts of the proposed project on the biophysical environment are within acceptable limits.

8 References

Botswana Biodiversity Strategy and Action Plan (2007). Ministry of Wildlife and Tourism

Branch, W. R. 1988. South African Red Data Book – Reptiles and Amphibians. South African National Scientific Programmes Report No. 151.

Davies et al. 1994. A guide and strategy for their conservation In: V.H. Heywood & A.C. Hamilton (eds.) Centres of plant diversity. Volume 1, 227-235. IUCN Publications Unit, Cambridge.

Friedmann,Y. & Daly, B. 2004. Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG South Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.

Ginsburg, E. Crafford, J.G. Harris, K.R. Wilkinson, M. and Mashimbye, D. Framework and Manual for the evaluation of aquatic ecosystems services for the Resource Directed Measures WRC Project No. K5/1644

Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds.). 1997. The Atlas of Southern African Birds. Vol. 1 & 2. BirdLife South Africa, Johannesburg.

Henning, G.A., Terblanche, R.F. & Ball, J.B. (eds.) 2009. South African Red Data Book: butteflies. SANBI Biodiversity Series 13. South African National Biodiversity Institude, Pretoria.

Minter, L.R., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J. & Kloepfer, D. 2004. Atlas and Red data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institution, Washington, D.C.

Mucina, L. and Rutherford, M.C. (2006). South African vegetation map. South African National Biodiversity Institute – Accessed: http://bgis.sanbi.org/vegmap/map.asp, 18 September 2009.

Mucina, L., Rutherford, M.C., Powrie, L.W., van Niekerk, A. & van der Merwe, J.H. (eds), with contributions by 47 others... 2014. Vegetation Field Atlas of Continental South Africa, Lesotho and Swaziland. Strelitzia 33. South African National Biodiversity Institute, Pretoria.

Ollis, D.J., Snaddon, C.D., Job, N.M. & Mbona, N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African National Biodiversity Institute, Pretoria.

Palmer, M.W., Earls, P.G., Hoagland, B.W., White, P.S. and Wohlgemuth, T., 2002: Quantitative tools for perfecting species lists. Environmetrics, 13, 121-137.

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

Schaller, R. and Desmet, P.G. (2015) North West Biodiversity Sector Plan Technical Report. North West Provincial Government, Mahikeng. November 2015

Skinner, J.D. & Chimimba, C.T. (Revisers). 2005. Mammals of the Southern African Subregion. Cambridge University Press, London.

Skinner, J.D. & Smithers, R.H.N. 1990. The Mammals of the Southern African Subregion. University of Pretoria, Pretoria, RSA.

www.sabap2.adu.org.za

www.saherps.net/sarca/index.php

9 Appendix 1 – Impact Assessment Methodology as supplied by Aurecon

Methodology for impact assessment

The assessment of the significance of impacts for a proposed development is by its nature, a matter of judgement. To deal with the uncertainty associated with judgement and ensure repeatable results, Aurecon rates impacts using a standardised and internationally recognised methodology adhering to ISO 14001 and World Bank/IFC requirements.

Consequence Criteria

For each predicted impact, criteria are applied to establish the significance of the impact based on likelihood and consequence, both without mitigation being applied and with the most effective mitigation measure(s) in place.

The criteria that contribute to the consequence of the impact are **intensity** (the degree to which pre- development conditions are changed), which also includes the **type of impact** (being either a positive or negative impact); the **duration** (length of time that the impact will continue); and the **extent** (spatial scale) of the impact. The sensitivity of the receiving environment and/or sensitive receptors is incorporated into the consideration of consequence by appropriately adjusting the thresholds or scales of the intensity, duration and extent criteria, based on expert knowledge. For each impact, the specialist applies professional judgement to ascribe a numerical rating for each criterion according to the examples provided in **Table 2, Table 3** and **Table 4** below.

Table 2: Definition of Intensity ratings

Rating	Criteria	
	Negative impacts (-)	Positive impacts (+)
Very high (-/+ 4)	Very high degree of damage to natural or social systems or resources. These processes or resources may restore to their pre-project condition over very long periods of time (more than a typical human life time).	Great improvement to ecosystem or social processes and services or resources.
High (-/+ 3)	High degree damage to natural or social system components, species or resources.	Intense positive benefits for natural or social systems or resources.
Moderate (-/+ 2)	Moderate damage to natural or social system components, species or resources.	Average, on-going positive benefits for natural or social systems or resources.
Low (-/+ 1)	Minor damage to natural or social system components, species or resources. Likely to recover over time. Ecosystems and valuable social processes not affected.	Low positive impacts on natural or social systems or resources.
Negligible (0)	Negligible damage to individual components of natural or social systems or resources, such that it is hardly noticeable.	Limited low-level benefits to natural or social systems or resources.

Table 3: Definition of Duration ratings

Rating	Criteria
2	**Long-term**: The impact will continue for 6-15 years.

1	**Medium-term:** The impact will continue for 2-5 years.
0	**Short-term:** The impact will continue for between 1 month and 2 years.

Table 4: Definition of Extent ratings

Rating	Criteria
2	**Regional:** The impact will affect the entire region
1	**Local:** The impact will extend across the site and to nearby properties.
0	**Site specific:** The impact will be limited to the site or immediate area.

The consequence is then established using the formula:

Consequence = type x (intensity + duration + extent)

Depending on the numerical result, the impact's consequence would be defined as either extremely, highly, moderately or slightly detrimental; or neutral; or slightly, moderately, highly or extremely beneficial. These categories are provided in **Table 5** below:

Table 5: Application of Consequence ratings

Rating	Significance rating
-8	Extremely detrimental
-7 to -6	Highly detrimental
-5 to -4	Moderately detrimental
-3 to -2	Slightly detrimental
-1 to 1	Negligible
2 to 3	Slightly beneficial
4 to 5	Moderately beneficial
6 to 7	Highly beneficial
8	Extremely beneficial

Significance criteria

To determine the significance of an impact, the **probability** (or likelihood) of that impact occurring is also taken into account. In assigning probability the specialist takes into account the likelihood of occurrence but also takes cognisance of uncertainty and detectability of the impact. The most suitable numerical rating for probability is selected from **Table 6** below:

Table 6: Definition of Probability ratings

Rating	Criteria
4	**Certain/ Definite:** There are sound scientific reasons to expect that the impact will definitely
3	**Very likely:** It is most likely that the impact will occur.

2	**Fairly likely:** This impact has occurred numerous times here or elsewhere in a similar environment and with a similar type of development and could very conceivably occur.
1	**Unlikely:** This impact has not happened yet but could happen.
0	**Very unlikely:** The impact is expected never to happen or has a very low chance of occurring.

The significance is then established using the following equation:

Significance = consequence[1] x probability

Depending on the numerical result of this calculation, the impact would fall into a significance category of negligible, minor, moderate or major, and the type would be either positive or negative. Examples of these categories are provided in **Table 7**:

Table 7: Application of significance ratings

Rating	Significance rating
-4	Very high - negative
-3	High - negative
-2	Moderate - negative
-1	Low - negative
0	Very low
1	Low - positive
2	Moderate - positive
3	High - positive
4	Very high - positive

Confidence rating

Once the significance of an impact occurring without mitigation has been established, the same impacts will be assigned ratings after the proposed mitigation has been implemented.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts. The specialists appointed to contribute to this impact assessment have empirical knowledge of their respective fields and are thus able to comment on the confidence they have in their findings based on the availability of data and the certainty of their findings. As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale (**Table 8**). The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

[1] The term consequence is used in this methodology instead of magnitude (as included in the definition of "significant impact" in GNR 982. Furthermore, the specialists themselves translate their subjective judgements into numerical ratings to determine the significance score. As this "translation" is undertaken by the specialists themselves, it is asserted that outcomes will be accurately interpreted.

Table 8: Definition of Confidence ratings

Rating	Criteria
Low	Judgement is based on intuition and there some major assumptions used in assessing the impact may prove to be untrue.
Medium	Determination is based on common sense and general knowledge. The assumptions made, whilst having a degree of uncertainty, are fairly robust.
High	Substantive supportive data or evidence exists to verify the assessment.

Mitigation of Potential and Residual Impacts

The significance of the impacts identified during the scoping phase will be assessed during the impact assessment phase. The specialists will recommend measures to mitigate the impacts.

The implementation of the mitigation measures is ensured through the ESMP. The ESMP will be used to enforce the mitigation measures and ensure that the impacts of all phases of the proposed project are properly managed and addressed. The ESMP will meet all the requirements of the South African NEMA and Botswana EIAA.

10 Appendix 2 -Plant species list

Dichrostachys cinerea
Abutilon austro-africanum
Aptosimum elongatum
Aristida bipartita
Bothriochloa insculpta
Combretum hereroense
Combretum imberbe
Cymbopogon pospischilii
Digitaria eriantha
Diospyros lycioides subsp. lycioides
Eragrostis curvula
Euclea undulata
Grewia flava
Heliotropium ciliatum
Hirpicium bechuanense
Ischaemum afrum
Kalanchoe rotundifolia
Kohautia caespitosa subsp. brachyloba
Nidorella hottentotica
Panicum maximum
Pavonia burchellii
Rhynchosia minima
Searsia lancea
Sehima galpinii
Setaria incrassata
Solanum delagoense
Talinum caffrum
Tarchonanthus camphoratus
Vachellia erioloba
Vachellia erubescens
Vachellia fleckii
Vachellia hebeclada subsp. hebeclada
Vachellia mellifera subsp. detinens
Vachellia nilotica
Vachellia tenuispina
Vachellia tortilis subsp. heteracantha
Ziziphus mucronata