AN ECOLOGICAL AND WETLAND ASSESSMENT OF THE SITE FOR THE PROPOSED VREDE RESIDENTIAL DEVELOPMENT VREDE,

FREE STATE PROVINCE

Commissioned by:

NSVT CONSULTANTS

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Compiled by Johann du Preez PhD PrSciNat (No 400271/07)(Botany & Ecology)

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EXECUTIVE SUMMARY

The study area is located on the west and north-facing slopes of a low hill west of Vrede. The aim of the proposed development is to expand the residential area in the Vrede area. The site was assessed for protected ecosystems and species, presence of wetlands and whether the site is suitable to develop in terms of an environmental perspective.

The site is situated on the vulnerable Frankfort Highveld Grassland (Gm6). No Red Data listed plant species or protected species were found on site. The site is relatively transformed due to human impacts such as vehicle tracks; grazing by communal cattle, fallow fields, donga erosion, etc.

DETEA regards all wetland areas as sensitive ecosystems. As a result thereof no development is allowed within 50m from the edge of the wetland or stream. The proposed development must take place outside the buffer zones that protect the wetlands. In terms of the PES and EIS scores the wetland has scored a **C** (Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged) and **0,5** respectively. Due to the presence of alien vegetation and eroded soil no protected species occur but there is still some ecosystem functions (water retention, bank stabilisation, erosion control, etc.) performed by the alien vegetation.

Recommendations:

- The proposed development must take place outside the buffer zones that protect the wetlands.
- Development/construction within the riparian area is regarded as a section 21(c) listed activity **(altering the bed, banks, course or characteristics of a watercourse)** and requires an application for a water use license to the Department of Water Affairs.
- Storm water infrastructure must be planned in such a way not to affect the donga or wetlands negatively.
- An Environmental Control Officer (ECO) must be appointed to oversee that the aspects stipulated in the Environmental Permit be carried out properly

DECLARATION OF INDEPENDENCE

I, Pieter Johannes du Preez, ID 6008215016087, declare that I:

- am the owner of EnviroNiche Consulting;
- act as an independent specialist consultant in the field of botany, ecology and vegetation science;
- am assigned as specialist consultant by NSVT Consultants for this proposed project;
- I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference;
- have or will not have any vested interest in the proposed activity proceeding;
- have no and will not engage in conflicting interests in the undertaking of the activity;
- undertake to disclose to the client and the competent authority any material, information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations 2006;
- will provide the client and competent authority with access to all information at my disposal, regarding this project, whether favourable or not.

PJ DU PREEZ PhD PrSciNat (No 400271/07)(Botany & Ecology)

1. ASSIGNMENT AND TERMS OF REFERENCE

EnviroNiche Environmental and Biodiversity Consultants were appointed by **NSVT Consultants** to undertake an independent ecological and wetland assessment of the proposed **Vrede residential development**. This assignment is in accordance with the EIA Regulations (No. R. 545, Department of Environmental Affairs and Tourism, 18 June 2010) deriving from Part 5 of the National Environmental Management Act 1998 (Act No. 107 of 1998) and the Water Act (Act 36 of 1998).

The assignment is interpreted as follows:

- To do an ecological assessment of the study area;
- To do a wetland/riparian zone assessment, delineation as well as to determine the wetland's present Ecological State (PES) and Ecological importance and Sensitivity (EIS)

2. ASSUMPTIONS AND LIMITATIONS

2.1 Assumptions

- The biodiversity on the construction site will be destroyed.

2.2 Limitations

- None.

3. STUDY AREA

The study area is located on a western and northern slopes of a low hill west of Vrede (Figure 1). The study area falls within the **Grassland Biome** and classified as belonging to the vulnerable Frankfort Highveld Grassland (Gm6) (Mucina & Rutherford 2006).

The aim of the proposed development is to increase the residential area in Vrede.

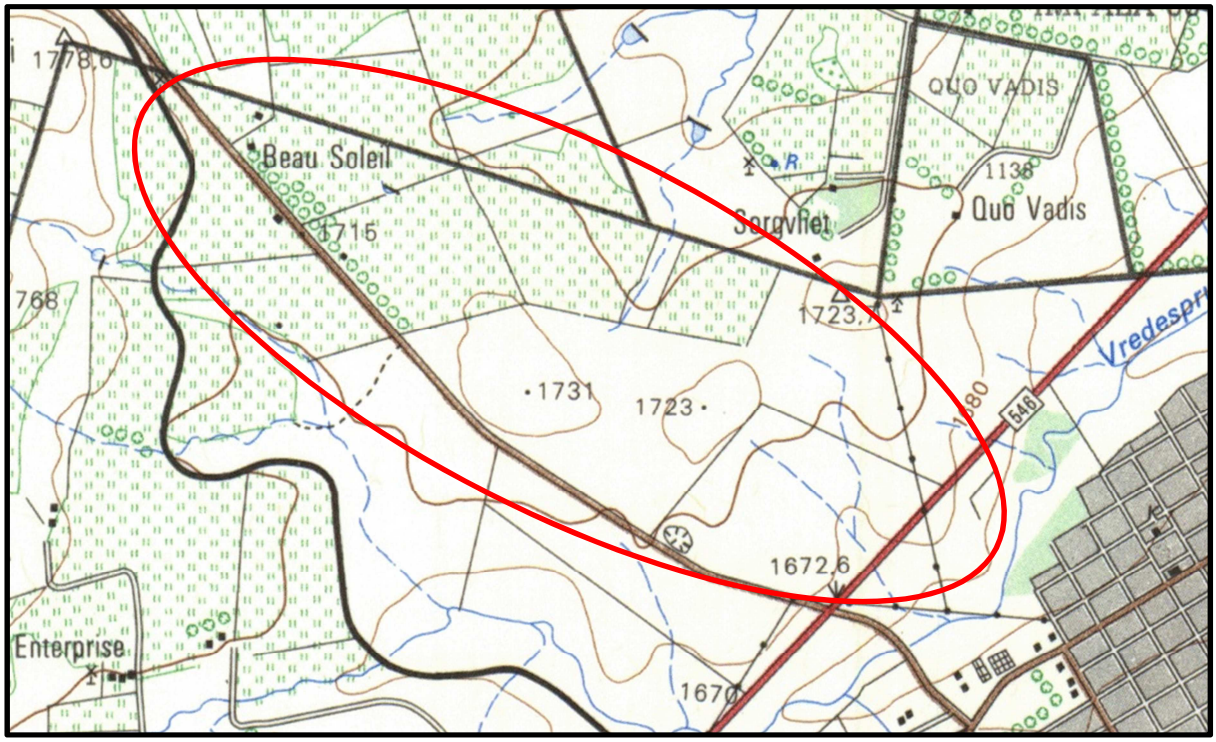

Figure 1: Topographic map of the study area (red circle).

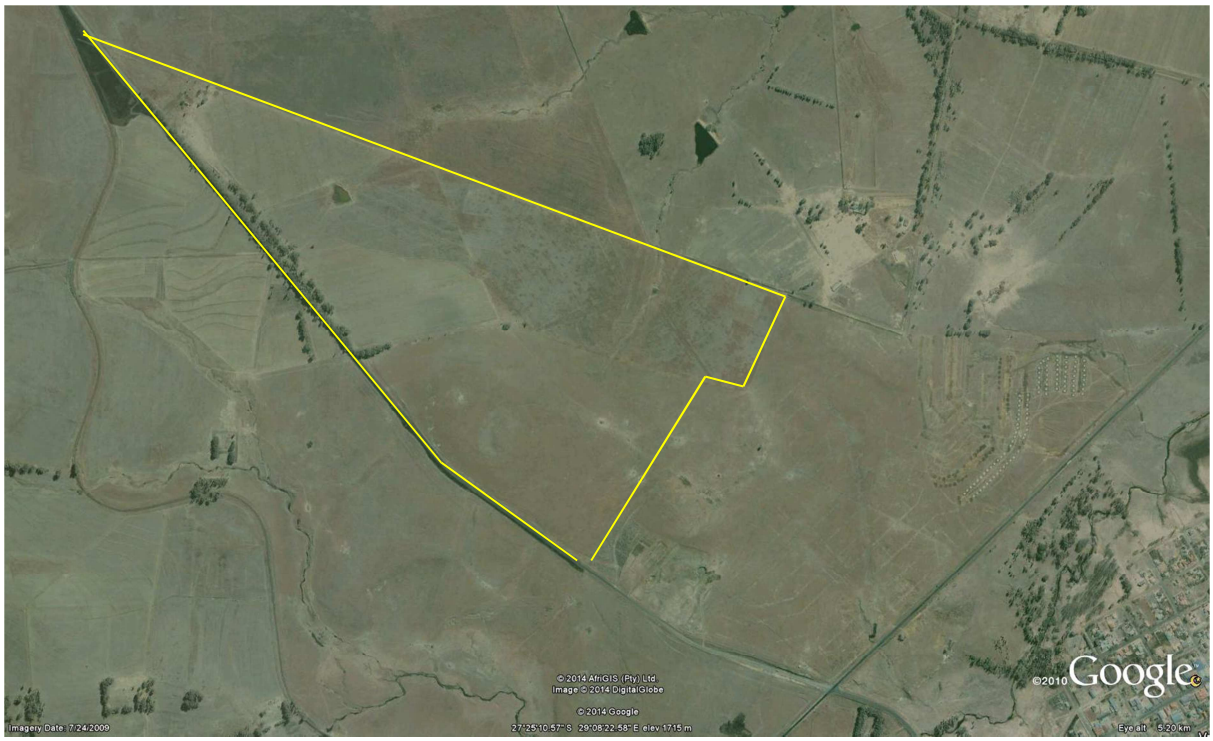

Figure 2: A Google Earth photo of the study area (yellow lines).

4. METHODS

The site visit was done on the **7 July 2014**.

4.1 Wetland delineation

4.1.1 Introduction

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

In 2005 DWAF published a wetland delineation procedure in a guideline document named “*A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas*” These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments. These guidelines state that a wetland delineation procedure must identify the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas and is that part of the wetland that remains flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.

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

- the terrain unit indicator,
- the soil form indicator,
- the soil wetness indicator and
- the vegetative indicator.

In addition the wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland; the wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive and a 30m buffer delineated around the edge of the wetland in which no development must be allowed to occur.

4.1.2 Desktop delineation

Use was made of 1:50 000 topographic maps, and geo-referenced Goggle Earth images to generate digital base maps of the study area onto which the wetland boundaries were delineated. A desktop delineation of suspected wetland areas was undertaken by identifying rivers and wetness signatures from the digital base maps. All identified areas suspected to be wetland were then further investigated in the field.

4.1.3 Site assessment

The area was traversed by foot and road to determine the presence of any wetland area/s. Notes were made of the broad ecological condition of the study site and any signs indicating the presence of a wetland. Delineation started in the lowest lying point of the site and auger samples were taken at approximately 2m intervals. A Dutch soil auger was used to extract the cores to a depth of 50cm.

The wetlands were subsequently classified according to their hydro-geomorphic determinants based on modification of the system proposed by Brinson (1993), and modified for use in South Africa by Marneweck and Batchelor (2002) and subsequently revised by Kotze *et al*. (2004). Notes were made on the levels of degradation in the wetlands based on field experience and a general understanding of the types of systems present.

4.2 Delineation of the riparian zone

The method of delineating riparian zones is largely based on geomorphological setting and/or vegetation indicators (DWAF, 2005). The riparian zone delineation method primarily uses: · the geomorphology or the shape of the river banks. The geomorphology involves the use geomorphological cues that include paired terraces, levees and sediment benches; the extent of riparian and or wetland vegetation as well as evidence of recent alluvial soils. An inflection point (edge of the flood zone where obligate riparian vegetation is no longer evident and where river flooding activities are no longer evident) between riparian area and upland slopes is taken as the edge of the riparian zone. For an accurate delineation of riparian zones in highly disturbed areas the method requires the location and use of reference sites. The reference site is used to provide an indication of the likely riparian

extent prior to disturbance.

4.3 Wetland assessment

4.3.1 Present Ecological Status

The **Present Ecological State** (PES) refers to the current state or condition of a watercourse in terms of all its characteristics and reflects the change to the watercourse from its reference condition. The results from such an assessment are compared to the standard DWAF A-F ecological categories (Table 1) from where the PES/Habitat integrity of the wetland can be determined. The values give an indication of the alterations that have occurred in the wetland system.

Table 1: Present Ecological Status Categories of Wetlands (adapted from Kleynhans, 1996 & 1999).

ECOLOGICAL CATEGORY	SCORE	DESCRIPTION
A	>90-100%	Unmodified, natural
B	>80-90%	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged
C	>60-80%	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged
D	>40-60%	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred
E	>20-40%	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive
F	0-20%	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

4.3.2 Ecological Importance and Sensitivity

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

disturbance once it has occurred. The ecological importance and sensitivity categories are indicated in Table 2.

Table 2: Ecological Importance & Sensitivity Categories of Wetlands

EIS categories	Description
Low/Marginal	Not ecologically important and sensitive at any scale. Biodiversity ubiquitous and not sensitive to flow and habitat modifications. (Wetlands play an insignificant role in moderating water quality and quantity)
Moderate	Ecologically important and sensitive on provincial/local scale. Biodiversity not usually sensitive to flow and habitat modifications (Wetlands play an small role in moderating water quality and quantity)
High	Ecologically important and sensitive. Biodiversity may be sensitive to flow and habitat modifications (Wetlands play a role in moderating water quality and quantity)
Very high	Ecologically important and sensitive. On national even international level. Biodiversity usually very sensitive to flow and habitat modifications (Wetlands play a major role in moderating water quality and quantity)

5. WETLAND RESULTS & DISCUSSION

5.1 Site description

Town in the Free State enlarge over time. A need exists to expand the residential area of Vrede. The site is situated on the western side of the existing residential area (Fig 1 & 2). Two seasonal streams drain the area. The stream bed and stream bank vegetation can be regarded as being largely transformed due to human impacts such as, grazing practices, alien plant invasion, and crop farming.

A large percentage of the site has been ploughed in the past. These areas are now fallow fields with a poor vegetation cover (Fig 4, 5 & 6). A low hill exists on the southern side of the property. This area is covered by natural grassland.

Figure 3 is a sensitivity map of the area indicating the no-go areas (donga and wetlands) as well as the 50m buffer zones. Two seasonal drainage lines drain the northern parts of the

study area (Blue arrows – Fig 3). A small wetland (pan) also occurs west of the rocky outcrop (Yellow arrow – Fig 3).

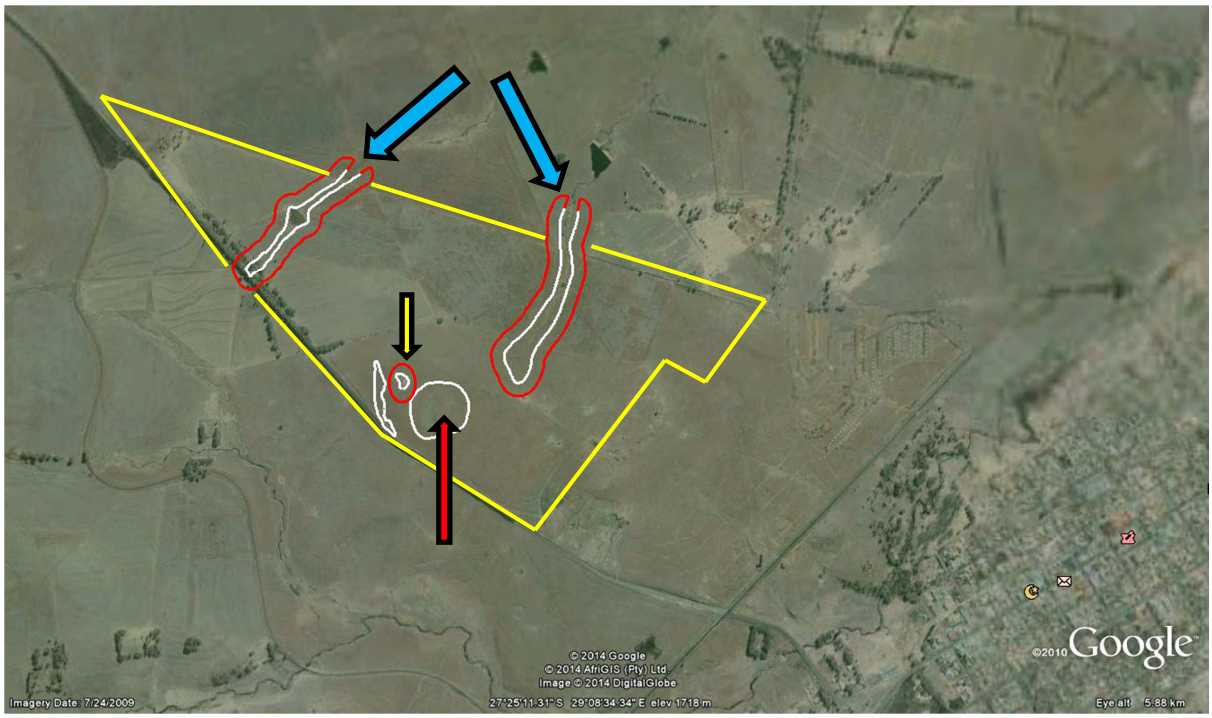

Figure 3: A Google Earth photo of the study area (yellow line) indicating sensitive areas.

Red arrow: Rocky outcrop with an archaeological terrain on it

Blue arrows: Wetland areas

Yellow arrow: Wetland area (pan)

Green arrow: Sandstone outcrop

5.2 Wetland assessment

5.2.1 Present ecological status (PES)

A mean Present Ecological Status (PES) value between 0 and 5 is obtained from the PES calculations and a PES class is attributed to the wetland based on Table 3. It should however be noted that if a score of less than 2 is attributed to any impact, the lowest rating is used to attribute PES class and not the mean.

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not the mean.

Table 3: PES calculation for the wetland areas

Criteria & attributes	Relevance	Score	Confidence
Hydraulic/Geomorphic			
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.	**2**	**4**
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities which reduce or changes wetland habitat directly or through changes in inundation patterns.	**2**	**5**
Biota			
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.	**2**	**5**
Indigenous Vegetation Removal Invasive plant encroachment	Direct destruction of habitat through any human activities affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion. Affect habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).	**1**	**5**
Alien fauna	Presence of alien fauna affecting faunal community structure.	**2**	**4**
Overutilisation of biota	Overgrazing, Over-fishing, etc.	**2**	
Mean		**1.8**	**4**
Class		**C**	

5.2.1.1 Present ecological status (PES) of the wetlands and donga

The results from the PES analysis indicate the wetland and riparian (donga) areas to be in PES class C (Table 3) indicating that the wetlands on site are moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. The wetlands are moderately modified and loss of natural habitat, biota and basic ecosystem functions occur due to erosion, alien plants, trampling of the vegetation, and overgrazing.

5.2.1.2 Ecological Importance and Sensitivity (EIS)

The EIS and functions were calculated using the new draft DWA guidelines and model, as developed by M. Rountree. Information was used form the SIBIS and VEGMAP products. A mean score between 0 and 4 is obtained, with 0 as the lowest and 4 as the highest score. No classification of the scores is given.

The wetland areas have an Ecological Importance and Sensitivity (EIS) score of 0,5 (Table 5). This is a value between 0 and 4, with 0 being very low and 4 very high. The wetland therefore has a low EIS score. It is regarded as being not ecologically important or sensitive with a low biodiversity and plays a low role in moderating water quality and quantity.

Table 5: EIS calculation of the wetland areas.

ECOLOGICAL IMPORTANCE AND SENSITIVITY	Score (0- 4)	Confidence (1-5)	Motivation
Biodiversity support	**0.00**	**4.00**	
Presence of Red Data species	**0.00**	**4.00**	No known red data or protected species observed on site.
Populations of unique species	**0.00**	**4.00**	No unique plant or animal populations were observed
Migration / breeding / feeding sites	**0.00**	**4.00**	Highly unlikely. No breeding sites were observed with very few bird species seen.
Landscape scale	**0.80**	**5.00**	
Protection status of the wetland	**1.00**	**5.00**	Wetland does not have a high protection status. The wetland area is being used as a communal grazing area.
Protection status of the vegetation type	**0.00**	**5.00**	The wetland is located in a critically red vegetation type (Eastern Free State Sandy Grassland). Vegetation is burnt by local residents on an annual basis. Wetland does not have a high protection status
Regional context of the ecological integrity	**1.00**	**5.00**	The wetland is in PES class B. Wetland functions are still in place but does not have an importance in terms of a regional context
Size and rarity of the wetland type/s present	**1.00**	**5.00**	The wetland is not particularly large or rare, and has no vulnerable ecosystem present.
Diversity of habitat types	**1.00**	**5.00**	The wetland has a low species diversity as well as habitat diversity. The largest component of the natural vegetation has been impacted by grazing and alien invasive species.
Sensitivity of the wetland	**0.66**	**4.00**	
Sensitivity to changes in floods	1.00	4.00	No high runoff present in catchment due to the small size of the catchment
Sensitivity to changes in low flows / dry season	1.00	4.00	Minimally impacted by changes in flow. Receives water in rainy season and dry for largest part of the year.

Sensitivity to changes in water quality	0.00	4.00	The wetland receives storm water runoff of various qualities during the rainfall season.
ECOLOGICAL IMPORTANCE & SENSITIVITY	**0,5**	**4**	

5.3 CONCLUSION ON WETLAND STUDY

The seasonal streams and drainage lines drain from the slopes towards the north. The slopes of the donga are full of erosion gullies caused by cattle and goats footpaths and previous crop production activities. The vegetation is to a large extent degraded due to overgrazing and trampling.

5.4 Detailed vegetation description of the stream and wetland

The azonal vegetation in and along donga is frequently subjected to disturbance such as erosion of the soil and/or the deposition of sediment. Most of the species are pioneers which can tolerate these disturbances. The vegetation of the wetlands is dominated the exotic grasses *Bromus catharticus*, and *Paspalum dilatatum* (Bromilow 2001). The sedges are *Mariscus congestus* and *Typha capensis,* the exotic forbs *Amaranthus caudatus, Argemone subfusiformis, Bidens bipinnata, Chenopodium album, Oenothera rosea, Rumex crispus, Tagetes minuta Verbena bonariensis, V. braziliensis,* and *V tenuisecta.* No trees occur in the wetlands.

The wetland is dominated by hygrophilous grasses such as *Agrostis lachnantha, Helictotrichon turgidulum, Paspalum dilatatum, Imperata cylindrical, Bromus catharticus*, as wel as sedges such as *Scirpus burkei, Cyperus longus* and *Schoenoplectus* spp.

6. GENERAL CONCLUSION & RECOMMENDATIONS (Figs 1 - 11)

A remnant of the vulnerable Frankfort Highveld Grassland (Gm6) occurs around the rocky outcrop. No Red Data listed plant species or protected species were found on site but burrows of the Sungazer Lizard (*Gordylus giganteus*), Ground squirrel (*Xerus inauris*) and Yellow mongoose (*Cynictis penicillata*) were found. The grassland on the rocky outcrop is relatively pristine and a few stone kraals, ash heaps and potsherds were found (Fig 10) –

indicating that this area has been occupied in the past.

DETEA regards all wetland areas as sensitive ecosystems. As a result thereof no development is allowed within 50m from the edge of the wetland or stream. The proposed development must take place outside the sensitive sites as indicated in Figure 3.

In terms of the PES and EIS scores the wetland has scored a **C** (Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged) and **0,5** respectively. Due to the presence of alien vegetation and eroded soil no protected species occur but there is still some ecosystem functions (water retention, bank stabilisation, erosion control, etc.) performed by the alien vegetation.

Recommendations:

- The proposed development must take place outside the buffer zones that protect the wetlands.
- Development/construction within the riparian area is regarded as a section 21(c) listed activity **(altering the bed, banks, course or characteristics of a watercourse)** and requires an application for a water use license to the Department of Water Affairs.
- Storm water infrastructure must be planned in such a way not to affect the donga or wetlands negatively.
- An Environmental Control Officer (ECO) must be appointed to oversee that the aspects stipulated in the Environmental Permit be carried out properly

7. REFERENCES

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APPENDIX A

Figure 4: View of the study area (between yellow lines).

Figure 5: Another view of the study area (between yellow lines).

Figure 6: A Southern Bald Ibis on the degraded fallow field.

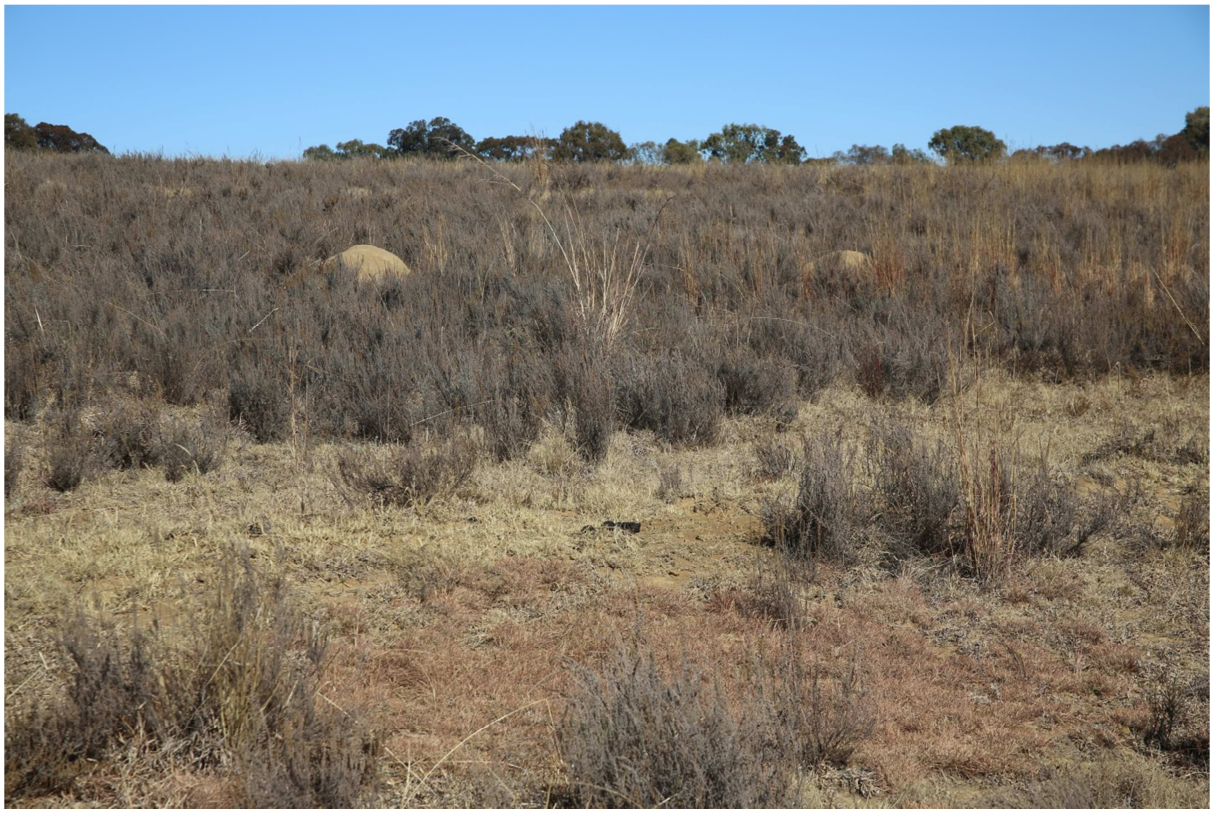

Figure 7: A section of the fallow fields has been invaded by Slangbos (*Seriphium pumilum*)

Figure 8: A small pan near the rocky outcrop. Note the trampling effect caused by cattle

Figure 9: Arrows indicate remnants of a stone kraal.

Figure 10: Arrows indicate pot sherds present on site.

Figure 11: Sungazer lizard burrow.