SPECIALIST BIODIVERSITY REPORT

General Biodiversity and Ecology Report: Clearing of vegetation on portion 3 of the farm Doornpan 193-IP, JB Marks Local Municipality, North West Province

May 2021

Author
Danie van der Walt (*M.Sc.* Biol)

FAX ***086 603 8875***
CELL ***072 623 1845***
danie.aeb@gmail.com

P.O. BOX 2980
White River
1240

Afrika Enviro & Biology

Specialist Environmental & Biodiversity Assessments

Specialist declaration

I, Danie van der Walt, declare that -

- I act as an independent specialist in this application;
- I have performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity;
- I have expertise in conducting the specialist report relevant to this application, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the relevant environmental legislation, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in this project;
- I undertake to disclose to the applicant and the authorities all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this report are true and correct.

L.D. VAN DER WALT

Date: 2021-05-13

Executive Summary

The applicant intends to develop a low cost housing project on the site. As partial requirement for the EIA application a terrestrial ecological assessment was recommended by the environmental consultant. Afrika Enviro & Biology was appointed to conduct a site sensitivity verification and bio-ecological assessment to assist in recommending suitable locations for these activities in support of the application process.

The property is approximately 88.46Ha in size and is hexagonal in shape. It is located on the eastern section of the Schoonspruit Nature Reserve (Protected Area and Critical Biodiversity Area). The site is located immediately to the north west of Ventersdorp and adjacent to Tshing Township. The highest point is on the western horizon and the slope gently declines to the main drainage line on the eastern perimeter. On a regional scale the veld unit is classified as Vaal – Vet Sandy Grassland (Gh10). Gh10 occurs in North-West and Free State Provinces from its northern distribution, in an area south of Lichtenburg and Ventersdorp, stretching to Klerksdorp, Leeudoringstad, Bothaville and Brandfort in the south. This vegetation type is classified as *Endangered* because approximately 63% of it has been transformed. The vegetation on site is largely natural and modifications to the natural environment are limited to a solid waste dump site and dirt roads that crisscross the site. There are no prominent rocky outcrops present on site, potential wetland zones are present and were investigated. No Red Data Listed biota was recorded. The following habitats were defined on the study area:

Vegetation Community	**Ecological Sensitivity**
Modified land	Low
Themeda triandra climax grassland	Medium - High
Vachellia karroo woodland	Medium

Unfortunately, it is apparent that the Schoonspruit Game Reserve is not being maintained or managed by the authorities as a Protected Area as the following are facts were observed:

- Fences are down.
- Access control is absent.
- A landfill site has been established in the middle of the Game Reserve.
- Individuals are dumping waste at other places in the Game Reserve as well.
- There are no signs of natural grazers or browsers and instead communal cattle are using the reserve for grazing.
- The reserve is burnt frequently to enhance the regrowth of grass for grazing.
- Signs of overgrazing and bush encroachment are evident.

The proposed township establishment will transform an area of approximately 88.46Ha of the Protected Area which is also classified as a terrestrial and aquatic Critical Biodiversity Area (CBA1). The Technical Report of the North West Biodiversity Sector Plan, residential land uses are not compatible with the land management objectives of PAs, CBAs or ESAs, and should only be considered, subject to the necessary authorisations. However, no alternative sites are available. The preferred site has been selected with the consideration that services infrastructure and provision is available nearby and the new development area can be seen as a logical expansion of the existing township. The wetland assessment recommends that the wetland and drainage line is protected by a 20m buffer zone as measured from the edge of the 1:100 year floodline.

The single most important impact on biodiversity as consequence of transforming land is the loss of vegetation and loss and fragmentation of natural habitats and consequently the loss of fauna. This investigation reports that the habitats on the property are typical of the local environment and are degraded to some degree or other and no exceptionally rare, threatened or sensitive biota were recorded on site. The loss of habitat and indigenous vegetation posed by the proposed activity will be irreversible and can only be partially mitigated by conserving the wetland and hydrological features and strips of grassland and woodland within the protective buffer zone. The management authority of the Protected Area must comply with legislation and provide the finance and means to maintain the Game Reserve accordingly.

It is concluded that the Schoonspruit Nature Reserve is not functional or maintained as a Protected Area and is subject to several negative impacts. Subsequently the terrestrial vegetation assemblage and habitat on the site is degraded and the fauna potential is impoverished. Potential impacts posed by the proposed development can be mitigated to an acceptable level if the recommendations included with this report are followed.

CONTENTS

1. Introduction

1.1 **Background and objectives**

The applicant intends to develop a low cost housing project on the site. As partial requirement for the EIA application a terrestrial ecological assessment was recommended by the environmental consultant. *Afrika Enviro & Biology* was appointed to conduct a site sensitivity verification and bio-ecological assessment to assist in recommending suitable locations for these activities in support of the application process. The terms of reference for this investigation are as follows: Biodiversity Assessment with the following objectives:

- Site sensitivity verification (select suitable sites for the activity footprints)
- Important communities and habitats;
- Important- and indicator species and their relevance;
- Red Data potential and actual species found;
- Ecological mapping and sensitivity zoning of relevant areas;
- Habitat delineation;
- Invasive/Exotic species and weeds;
- Impact assessment, recommendations and mitigation measures;

For the purposes of this report, the site was investigated on 2021-05-12/3.

1.2 **Specialist report requirements**

With reference to Appendix 6 of the EIA regulations (2014) the specialist declaration is included on page 2 of this report and details and the specialist's curriculum vitae are included with Appendix 1.

2. Methods and Reporting

2.1 **Assumptions, uncertainties and limitations**

With reference to Appendix 6 of the EIA regulations (2014) the specialist declaration is included on page 2 of this report and details and the specialist's curriculum vitae are included with Appendix 1.

This investigation was conducted during the winter season when most flowering species of plants are either dormant (perennial plants) or dead (annual plants). This means that less diversity was recorded as opposed to an investigation during the growth season. If required by the authorities this investigation can be followed up with a spring and/or summer season investigation. However, the author is confident that the results obtained by the present study are of enough significance to make conclusions and recommendations regarding the subjects that were investigated.

The fauna investigation was not a comprehensive specialist survey but rather a desktop study verified by a site investigation and habitat availability. The reason being that specialist studies to cover each subject or taxon will require considerable time and the employment of additional specialists to complete. This will be a very expensive task and the results will be subjective as it is more than likely that only a small percentage of the fauna that actually have the potential of being present (or are actually present) will be recorded.

Furthermore, in recent time, reference and specialist literature, data basis', and distribution lists have become available that are accurate and reliable (fauna and flora). By employing these sources, a desktop investigation (supported by physical habitat investigations) of the potential fauna can be cross-referenced with the available habitat in order to predict the fauna potential of a specific area or habitat type. These results will be reliable to be used for planning purposes. The author has confidence that the results of the desktop study combined with the onsite assessments provide sufficient information to make conclusions and provide recommendations regarding the fauna assemblage of the site.

2.2 **General**

The author relied on aerial images and ortho photos to remotely assess the site before the actual on site investigation in order to get familiarized with the different features and vegetation communities (habitats) present within the affected areas. The information thus gathered was used for selecting survey sites and to identify possible sensitive areas. Problematic, as well as potential sensitive areas were identified during the site assessment and these were thoroughly investigated as explained in the following two sections. All literature and other references used to support findings and to assist in making conclusions are listed. Illustrations of the environment and typical habitats are included with section 4.

2.3 **Vegetation & habitats**

Floral diversity was determined by completing survey transects and sample sites along all the different habitats within the physiographic zones represented in the study area (Deal *et al*. 1989a). In order to attain scientifically reliable results, obviously distinct vegetation communities were surveyed by selecting representative sites in each homogenous unit (Mathews *et al.* 1992).

The vegetation units of Mucina & Rutherford (2006) are used as reference but where necessary communities are named according to a unit's diagnostic floral feature and/or topographical setting or other biophysical features (or a combination of several descriptive features). By combining the available literature with the survey results, stratification of vegetation communities was possible.

The survey transects and sites in the affected areas were also intensively searched for important species and the potential for Red Data Listed (RDL) and other important species were established and cross referenced with PRECIS Data for the relevant quarter degree grid/s (POSA) as obtained from the SANBI data base. The aim was to identify distinct vegetation types and to establish their integrity and representation in the study area. The vegetation and habitats are described on site and local level in section 4 of this report.

2.4 **Terrestrial Fauna**

The fauna investigation is based on a desktop study verified by cross reference with available habitats of the study area in order to establish the faunal potential. All fauna that were observed during field trips and floral surveys were also recorded. However, selected survey sites were searched for fauna and habitats were identified during the vegetation surveys so as to establish the faunal potential of a particular area. The fauna potential is discussed in section 5 of this report.

2.5 **Ecological importance and sensitivity rating of habitats**

By considering the results of all the above investigations, the authors allocate a qualitative sensitivity rating to the habitats that were identified, based upon its ecological importance and biodiversity value. A qualitative method was chosen at the first stage of assessment instead of a quantitative method in order simplify the procedure of assessment. In order to simplify the decision making process, a scale of *Low, Medium*, *High* and *Very High* is used, based upon biodiversity value and ecological functions (Table 1.1).

This method is used as a first level of expressing the sensitivity of a specific component and is not used in comparative assessments of alternatives where a quantitative approach will be more appropriate. Wetland and riparian sensitivity is measured only on its maintenance of biodiversity and basic ecological functions at this basic level of assessment.

Table 1.1 Criteria used for sensitivity rating of habitats

Ecological Importance/Biodiversity Value	**Sensitivity Rating**
Terrestrial and Riparian Communities	
Habitats and ecosystems that are regarded as pristine or largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged and the community is regarded as very important for the maintenance of biodiversity and rare and important taxa are present (e.g. occurrence of RDL, Endemic and/or Protected species). The local area is an important ecological support area and any external impacts will have a significant negative effect on its status.	*Very High*
Habitats and ecosystems which are regarded as ecologically important and sensitive and important for the maintenance of biodiversity. It may be linked to other important communities and provide an important refuge/corridor for biodiversity (fauna and flora). This rating can also be allocated due to the presence of one or more unique qualities (e.g. occurrence of RDL, Endemic and/or Protected species). The presence of unnatural impacts is low and can be managed.	*High*
Habitats and ecosystems which have a limited ecological function and a limited function for maintaining biodiversity. This may be due to homogenous habitat conditions and/or the negative effects of external impacts. External impacts can be managed and mitigated to reduce the significance of their magnitude.	*Medium*
Habitats and ecosystems which have been modified from the reference state with the result that habitats have been fragmented and the trend is in a negative direction. Ecological importance as well as biodiversity value is low. External impacts will not have a significant impact on its status.	*Low*
No ecological significance. Highly transformed, dominated by infrastructure development. Ecological functions may be considered irreversibly impaired.	*Very Low*

3. Background Information

3.1 **Biophysical description of the study area**

The study area is situated in the dry grassland biome which is a summer rainfall region with a mean annual precipitation of $\pm$ 530 m, where summers are mild to hot and winters very cold with frequent frost. Aeolian and colluvial sand overlay sandstone, shale, and mudstone of the Karoo Supergroup (mostly Ecca Group) as well as older Ventersdorp Supergroup Andesite and basement gneiss in the north. Soil forms are mostly Avalon, Westleigh, and Clovelly. The landscape is dominated

by plains with some scattered, slightly irregular undulating plains and hills. Low-tussock grasslands with strong karroid elements and the relative dominance of the grass species Themeda triandra

3.2 **Ecology & biodiversity**

Nationally, the vegetation type is classified as Dry *Cymbopogon-Themeda* Veld (VT 50) and *Cymbopogon-Themeda* Veld (VT 48) (Acocks, 1953) and Dry Sandy Highveld Grassland (LR 37) (Low and Rebelo, 1996). On a regional scale the veld unit is classified as Vaal – Vet Sandy Grassland (Gh10) according to Mucina & Rutherford (2006).

Gh10 occurs in North-West and Free State Provinces from its northern distribution, in an area south of Lichtenburg and Ventersdorp, stretching to Klerksdorp, Leeudoringstad, Bothaville and Brandfort in the south.

This vegetation type is classified as *Endangered* because approximately 63% of it has been transformed for commercial crop cultivation and grazing pressure from cattle and sheep. Only 0.3% of this vegetation type is statutorily conserved in Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit and Soetdoring Nature Reserves.

3.3 **Conservation planning**

Protected Areas

The proposed site is located within a proclaimed protected area, the Schoonspruit Nature Reserve which is listed on the register of Protected Areas, subject to the National Environment Management: Protected Areas Act (2003).

North West Biodiversity Sector Plan (2015)
https://conservationcorridor.org/cpb/READ_2015.pdf

The North West Biodiversity Sector Plan (MBSP) is a systematic conservation plan developed and adopted by the Province in order to aid in environmental and conservation planning of the province. The categories relevant to this project are projected in Appendix 2 and listed in Table 1.2.

Table 1.2 MBCP and NFEPA categories relevant to the site

Freshwater ecosystems / NFEPA inventory		
Category	**Subcategory**	**Content**
Critical Biodiversity Area (CBA1)		
Wetland clusters (NFEPA)	Dry Highveld Grassland Group 3	
FEPA River Reach Code: C24E020000	First order Reach Number C406	Class C: Moderately Modified
Terrestrial Ecology		
Category	**Subcategory**	**Content**
Critical Biodiversity Area (CBA1)	Irreplaceable	
Land Cover 2014	**Ecosystem**	**Status**
Grassland	Vaal-Vet Sandy Grassland (Gh10)	Endangered

4. Vegetation & habitat report and general biophysical descriptions

4.1 General site and activity descriptions

The property is approximately 88.46Ha in size and is hexagonal in shape. It is located on the eastern section of the Schoonspruit Nature Reserve. The site is located immediately to the north west of Ventersdorp and adjacent to Tshing Township. The highest point is on the western horizon and the slope gently declines to the main drainage line on the eastern perimeter. The vegetation on site is largely natural and modifications to the natural environment are limited to a solid waste dump site and dirt roads that crisscross the site. There are no prominent rocky outcrops present on site, potential wetland zones are present and were investigated. The following habitats were defined on the study area:

i) Modified land

A section of land was used previously as a borrow pit and until recently as an informal waste dumping site. The natural environment has been totally transformed as result of these activities. The vegetation consist largely of weeds and alien as well as indigenous invasive species: *Vachellia karroo, Pennisetum clandestinum, Tagetes minuta*, *Verbena officinalis*, *Conyza bonariensis*, *Achyranthes aspera*, *Avena fatua*, *Bidens bipinnata*, *Gomphrena celosioides*, *Physalis angulata*, *Oenothera rosea*, *Oenothera tetraptera*, and *Cirsium vulgare*. Due to the modified state of this land it is of low biodiversity and ecological sensitivity.

This area has been excavated and solid waste is dumped within and burned. It is of low ecological sensitivity.

ii) *Themeda triandra* grassland

This community covers the largest terrestrial extent of the site although local differences are present as discussed in this section. The grasses T*hemeda triandra* and *Setaria sphacelata* dominates on the alluvial soils of the valley bottom and floodplain. *Themeda triandra* and *Schizachyrium sanguineum* is found on the lower slopes and the last mentioned is replaced by *Cymbopogon pospischilii* on the higher slope. Other grasses present on the higher slope are *Triraphis andropogonoides, Aristida junciformis, Panicum gilvum* and *Melinis repens*. Common forbs and wild flowers in this community are species such as *Hibiscus pusillus*, *Helichrysum rugulosum*, *Anthospermum hispidulum*, *Gazania krebsiana, Hermannia depressa*, *Berkheya carlinopsis, B. setifera, Helichrysum nudifolium*, *H. allioides, H. acutatum, Senecio latifolius, Conyza podocephala, Hypoxis iridifolia* and *Cephalaria*

pungens. No Red Data Listed or Protected species were recorded. Small areas are invaded by *Asparagus laricinus* and *Seriphium plumosum (Stoebe vulgaris)* and larger areas are invaded by *Vachellia karroo* as described under the next heading. This habitat steadily being degraded by drivers but it still is representative of the Endangered Vaal – Vet Sandy Grassland Ecosystem and has a Medium – High ecological sensitivity.


The climax grassland is found on the middle slopes and the vegetation assemblage includes a wide diversity of grasses, forbs and wild flowers.


The grassland is under pressure from human induced drivers such as frequent fires and overgrazing which is progressively changing the structure of this ecosystem.

iii) ***Vachellia karroo* woodland**

This community consist of small to medium sized *Vachellia karroo* trees and is concentrated on the valley bottom on the eastern section of the site. Other woody species present where thickets are formed is *Ziziphus zeyherana, Asparagus laricinus, Searsia lancea, Searsia pyroides, Dichrostachys cinerea* and *Diospyros lycioides.* It can be reasoned that this community is a form of bush encroachment into the grassland community described under the previous heading. This is evident on historical Google imagery and is supported by observations made by Bredenkamp, Joubert and Bezuidenhout (1989) that described a similar community (*Acacia karroo* woodland) in the Potchefstroom-Fochville-Parys area and stated that this community is an encroachment of the *Acacia karroo* woodland into grassland communities. Bush encroachment is usually the consequence of a combination of drivers, for example:

- A frequently cited cause of bush encroachment is overgrazing, commonly a result of overstocking and fencing of farms, as well as the lack of animal rotation and land resting periods. According to the two-layer theory, grasses use topsoil moisture, while woody plants predominantly use subsoil moisture. If grasses are reduced by overgrazing, this reduces their water intake and allows more water to penetrate into the subsoil for the use by woody plants.
- A connected cause for bush encroachment is the reduction in the frequency of hot veldfires (controlling woody vegetation) whilst the frequency of cool veld fires (aimed at generating growth of grasses) increases.
- Rainfall and its variability is the key driver of vegetation growth and its composition, bringing about bush encroachment under certain rainfall patterns.
- The reduction of browsing by herbivores, e.g. when natural browsers are absent in the ecosystem, bushes grow undisturbed and with increasing size also become less susceptible to fire.
- Human population pressure can also be the cause for bush encroachment, when large trees are cut as building material or fuel. This stimulates re-growth and survival of younger trees.
- Climate change has been found to be a cause or accelerating factor for bush encroachment. This is because increased atmospheric CO2 concentrations foster the growth of woody plants.

This community has low floral diversity and fauna potential and is of Medium ecological sensitivity.

The Vachellia woodland is best established in the valley bottom and western slopes and is progressively replacing the grassland vegetation.

iv) **Wetlands and hydrological features**

It should be noted that this subject is assessed in detail in a dedicated Wetland Assessment Report completed by *Triplo4 Sustainable Solutions (Pty) Ltd* (2021). The area included with the 1:100 year floodline is the regulated area that is not treated in the Terrestrial Ecological report.

4.3 **Occurrence of important flora species**

Conservation-important, naturally occurring species can be categorized according to specific features that are important, usually due to rarity, habitat specificity, medicinal value, ecological value, endemism, over-exploitation, economic value or a

combination of these. Species of conservation importance are either categorized as Red Data Listed species (RDL species), according to specific scientifically researched criteria and administered by the South African National Biodiversity Institute (SANBI), or as Protected Trees and Plants by the National and Provincial nature conservation legislation. Legislation that protect flora in South Africa and specifically in Limpopo Province are the National Environmental Management Biodiversity Act of 2004 (NEMBA), the North West Biodiversity Management Act 4 of 2017 (NWBMA) and the National Forests Act of 1998 (NFA).

Using SANBI Data and literature references a Red Data List (RDL) for the local study area was compiled. The SANBI data base for the 2626BD grid indicate the presence of one Red Data Listed namely *Cleome conrathii* (Near threatened). This low number may reflect the paucity of floristic knowledge, rather than the true absence of plant taxa of conservation concern from the area. No RDL taxa were recorded and no protected species was recorded.

5. Terrestrial Fauna Report

The fauna investigation was not a comprehensive specialist survey but rather an overview of the available habitats and their potential to be utilized by fauna listed in the checklists prepared by a literature study. However, the site was investigated to record fauna that is actually present as well as field signs of fauna present. The results of the investigation follow under the following headings.

5.1 **Frogs**

A diverse range of frogs will utilize the aquatic and terrestrial habitats on the site. Nineteen frog species' range of distribution includes the study area. Several endemic species may be present (Table 3.1). The endemic taxa are not threatened. All frogs can be regarded as being sensitive to negative environmental drivers such as pollution and loss of natural habitat. No frogs were recorded.

Table 3.1 Frogs of the study area

Taxon **Common name**	**Habitat Preference**	**Status**
Amietophrynus garmani Eastern Olive Toad	Grassland biome. Under loose stones or tufts of grass.	Least Concern
Amietophrynus gutturalis Guttural Toad	Savanna, grassland, thickets,	Least Concern
Schismaderma carens Red Toad	Savanna, grassland, Rainfall >700mm.	Least Concern
Cacosternum boetgeri Common Caco	Wide variety of habitats. Savanna, fynbos, grasslands.	Least Concern
Amietia quecketti River frog	Grassland, fynbos. Permanent ponds, springs, dams.	Least Concern
Strongylopus fasciatus Striped stream frog	Widespread and variety of habitats. Tolerant.	Least Concern
Tomopterna cryptotis Tremelo sand frog	Widespread and variety of habitats. Tolerant.	Least Concern
Kassina senegalensis Bubbling Kassina	Widespread and variety of habitats. Tolerant.	Least Concern
Xenopus laevis Common Platanna	Aquatic biology. Permanent water.	Least Concern

5.2 **Reptiles**

The terrestrial habitats present in the study area will provide habitat for a diverse group of reptiles (Bates et al, 2014). The study area, possess 18 endemic and near endemic species all of which have the potential of being present in the study area (Table 3.2). However, the presence of reptiles will be subject to the availability and quality of habitat and ecological aspects such as the availability of food. Per example, the absence of rocky areas will eliminate species associated with this habitat from being present. Species that can be expected will be associated with grassland and the presence of water. No reptiles were recorded.

Table 3.2 Important reptiles of the low study area

Name	Habitat description	Status
Agama atra atra p214 Southern rock agama	Rock outcrops and mountain plateaus including escarpment mountains.	Endemic
Cordylus vittiver vittiver p195 Transvaal girdled lizard	Grassland: In cracks in small rock outcrops. Rocky outcrops in bushveld, open woodland, grassland crevices, under rocks.	Endemic
Elapsoidea sundevallii media p106 Highveld garter snake	Varied: coastal forest, Highveld grassland, arid and mesic savanna. Old termitaria and under stones.	Endemic Protected
Homoroselaps dorsalis Striped Harlequin snake	Highveld grassland. Feeds exclusively on thread snakes.	Endemic Protected
Homoroselaps lacteus p102 Spotted harlequin snake	Varied habitats, semi-arid to grassland, coastal bush. Under rocks, old termite mounds.	Endemic Protected
Hemachatus hemachatus p109 Rinkhals	Grassland. Highveld.	N-Endemic Protected
Lamprophis aurora p75 Aurora house snake	Uncommon. Savanna and grassland. Moister regions of SA.	Endemic Protected
Lamprophis guttatus p74 Spotted house snake	Rocky areas, preferring dry habitats.	Endemic Protected
Common slug eater *(Duberria lutrix lutrix)*	Grassland and savannah.	Endemic Protected
Thintailed legless skink (*Acontias gracilicauda*)	Mesic thicket and grassland. Compact moist soils.	Endemic
Pachydactylus vansoni p262 Van Son's thicktoed gecko	Land type: Varied – karroid veld, grassland and mesic savanna. Terrestrial; inhabits rocky outcrops and more frequently found under rocks or logs on soil; disused termitaria.	N-Endemic
Psammophylax rhombaetus p88 Spotted skaapsteker / Rhombic skaapsteker	Highveld grassland.	Endemic
Typhlops bibroni p55 Bibron's blind snake	Highveld grassland: Underneath rocks and in termitaria.	N-Endemic Protected
Cape thread snake / Lesser worm snake *(Leptotyphlops conjunctus conjunctus)*	Varied, burrow underground. Lives underground and only wriggle to surface after being flooded by heavy rains from their underground retreats.	N-Endemic Protected

5.3 **Birds**

The literature review indicates that a diverse group of birds may utilize the area. More than 200 species' range of distribution falls within the study area and are supported by the available habitats. Due to the topography and habitat types present in the study area, the expected birds will be limited to grassland and wetland specific species. Red Data Listed species expected for the larger study area are included with Table 3.3.

Table 3.3 Red Data and Endemic birds that may be present in the study area (Barnes, 2000).

Scientific name **Common name** (p Roberts)	**Habitat requirements**	**Red Data Status**	
		National	Global IUCN
Falco naumanni Lesser Kestrel (p545)	Semi-arid grassland. Avoid wooded areas; forage in agricultural fields. Grassy Karoo, Sweet and Mixed grassland, Central Kalahari vegetation.	VU	Least concern
Pnoencopterus ruber Greater flamingo (p605)	Shallow eutrophic wetlands; breeds on pans and mudflats.	NT	Least concern
Sagittarius serpentarius Secretary bird (p542)	Open country: Savannah, open woodland, grassland and dwarf shrubland.	VU	VU
Tyto capensis African Grass Owl	Rank grass and marshes are the preferred habitat. Usually in open habitat at fairly high altitudes.	VU	VU

Abbreviations as follows: CR=critically endangered; EN=endangered; VU=vulnerable; T=threatened; NT=near threatened; LC=least concern; DD=data deficient. Endemic status (SA = South Africa; Sthrn A = Southern Africa):

From the information included with Table 3 it can be concluded that several species of threatened birds that are associated with the grassland biome has the potential to use the available habitat. Their potential presence will however be low as most of these taxa (Table 3) are sensitive to disturbance and human traffic near to their nesting sites and will for this reason not use the available habitat in the immediate study area on a permanent basis as there is frequent human traffic and activities present. These species' occurrence will be largely limited to the larger fragments of natural habitats in the larger study area. In the following subsections the potential presence of several of the most important of these taxa are discussed as example.

The Lesser Kestrel (Falco naumanni) Fleischer, 1818 (Falconiformes: Falconidae),
This species may be present as a non-breeding visitor during the summer months. Its distribution and biology is explained henceforth: This species breeds in northern Africa, southwest to eastern Europe, Asia Minor, Iran, Mongolia and northern China and winters in sub-Saharan Africa, especially in eastern and southern Africa. The species is locally common in the core area of the wintering range in South Africa, but scarce elsewhere. The Lesser Kestrel is found in warm, dry, open or lightly wooded environments. In South Africa, it is concentrated in the grassy Karoo and the western fringes of the grassland biome. The species generally avoids foraging in transformed habitat, but occurs in some agricultural areas. The species is highly gregarious, especially at a rich food source. The species feeds mostly on arthropods and occasionally on small vertebrates such as small rodents, birds and reptiles. The main cause of its decline was habitat loss and degradation in its western Palearctic breeding grounds, primarily a result of agricultural intensification, but also afforestation and urbanization. In South Africa, key grasslands have been lost to agricultural intensification, afforestation and intensive pasture management. The use of pesticides may cause direct mortality, but is probably more important in reducing prey populations. The neglect or restoration of old buildings has resulted in the loss of nest-sites.

Grass Owl
The grass owl, *Tyto capensis*, range of distribution includes the study area and an exclusive investigation for its likelihood of presence as well as likelihood to use the site as a range was investigated. The grass cover and wetland/stream to the south-east of the site implies suitable habitat for the grass owl but surrounding human activities and frequent annual burning will discourage the presence of these owls.

Major threats of this species that need to be considered to make any management plan effective, include the following:

- Complete loss of habitat due to mining activities, agricultural activities and urbanisation;
- Incompatible grazing and fires leading to habitat modification and displacement: As already mentioned, disturbances caused by trampling and heavy grazing pressures have a pronounced effect on the Grass-owl distribution. In addition, frequent fires prevent the development of dense rank grassland that is required by this species to breed successfully. On the other hand, overgrazing leads to wetland degradation and induce structural and floristic changes to the vegetation, which is often not optimal for Grass-owls to colonise. It should also be realised that wetland vegetation is highly palatable and attractive to large mammalian herbivores (cattle);
- Changes to the hydrological regime: Grass-owls frequently prefer moist dense grassland along wetland features. Therefore, any modification to the hydrological regime could bring changes to the vegetation structure. For example, too much run-off and an increase in wetness could lead to an increase in plant taxa such as *Phragmites australis* and *Typha capensis*, both unsuitable for Grass owls;

The Secretary bird (Sagittarius serpentarius) (J.F. Miller, 1779) (Falconiformes: Sagittariidae). This species is unlikely to be present but may be an infrequent visitor. is found throughout sub-Saharan Africa, absent from forested western Africa, the DRC and Somalia; it is found sparsely in the dry west of southern Africa and southern Mozambique. The species is found in open grassland with scattered trees, shrubland, open Acacia and Combretum savanna; it is absent from dense woodland and rocky hills. The Secretary bird feeds on a wide variety of animal prey, including large grasshoppers, amphibians, reptiles, birds, birds' eggs and rodents. Snake prey items include puff adder and cobra species. Although the species may benefit from deforestation, such positive effects may be outweighed by the negative impacts of spreading cultivation and urbanization. The excessive burning of grasslands may suppress populations of prey species, whilst the intensive grazing of livestock is also probably degrading otherwise suitable habitat. Disturbance by humans, probably most often herders, is likely to negatively affect breeding.

The Greater Flamingo (*Phoenicopterus roseus*) Pallas, 1811 (Ciconiiformes: Phoenicopteridae). This species is unlikely to be present at any time as its habitat requirements is not met on site. Its distribution and biology is explained henceforth:
It is found from southern Europe across the Arabian Peninsula and Iran to India and Pakistan; also south along the African coast to Senegal in the west and south along the Red Sea coast and Rift Valley to coastal Angola and South Africa. The species is widespread in southern Africa, most common on the central plateau when breeding and at other times common along the west coast. In southern Africa, the Greater Flamingo breeds at recently flooded, large, eutrophic, shallow saltpans. Otherwise, it is found at coastal mudflats, inland dams, sewage treatment works, small ephemeral pans and river mouths. It may be found in flocks numbering tens of thousands, often with Lesser Flamingos. The species wades in water up to belly depth, bill upside down, filtering small invertebrates from mud. It feeds on brine shrimps, brine flies, molluscs as well as diatoms. The species is monogamous, but changes mates between years; birds of the same age are most often paired. The species suffers

from low reproductive success if exposed to disturbance at breeding colonies, or if water levels surrounding nest sites lower. The lowering of water levels in lakes can also lead to hyper-salinity, which may affect food resources. Other threats to the species' habitat include effluents from soda-ash mining, pollution from sewage and heavy metal effluents from industries. The species also suffers mortality from lead poisoning, collisions with fences and power lines and from diseases such as tuberculosis, septicemia and avian botulism. Utilization in Egypt also affects the species; large numbers of adults are shot or captured to be sold in markets. Egg collection from colonies also occurs in some areas.

5.4 **Mammals**

Due to the degraded state of habitat on site and in the local area as well as the land uses and human traffic in the general area it is expected that only small mammals will be present. The reason being that larger mammals will be subject to negative activities such as hunting/poaching and the fact that the habitat is relatively small and will not be able to support larger mammals. Furthermore, the presence of mammals will be subject to the availability and quality of habitat and ecological aspects such as the availability of food. Two species of mammals were recorded: Mongoose and Ground Squirrel.

One RDL species has potential of being present and will be limited to the wetland habitat. This is the Swamp Musk Shrew, *Crocidura mariquensis* (A. Smith, 1844) (Soricomorpha: Soricidae) which is listed as Near Threatened. This is a common species in suitable habitat but has highly specific habitat requirements. The Swamp Musk Shrew occurs in close proximity to open water; it has a distinct preference for marshy ponds. The species also needs riverine and semi-aquatic vegetation such as reed beds. Nests of the Swamp Musk Shrew have been found in clumps of tussock grass and in debris about 300 mm above ground. Predators of the species include Common Fiscal, Barn Owl and African Grass Owl. The species is mainly nocturnal, but may be active during daylight hours. It is a particularly active and agile shrew, but is not known to be an aggressive species. There appear to be no major threats to this species as a whole; no direct conservation measures are in place for this species and it is unknown if the species is present within any protected areas.

5.5 **Invertebrates - Excluding Butterfly families**

Potentially, the natural habitats on site will offer refuge to all invertebrate groups with the available habitats on site. This consists of a large number of species for which field searches are too extensive to be accommodated for the present study. Picker *et. al.* (2002) can be referred to so as to get an idea of the large amount of invertebrate diversity that can be expected in the study area. If loss of habitat can be minimized, it is not expected that these taxa will be significantly affected by the proposed activity if habitat loss- and fragmentation is minimized.

.

5.6 **Invertebrates – Butterflies**

The natural habitats and vegetation on site will provide habitat for a diverse range of butterflies (Woodhall, 2005). Recent literature indicates that no endemic or RDL species are expected in the study area (Woodhall, 2005; Henning *et al*, 2009). If adequate mitigation and conservation of natural habitats are prerequisites for the development, butterflies will be able to survive on the natural habitats on site.

5.7 **Pollinators**

Pollinators provide an essential ecosystem service that result in the out-crossing and sexual reproduction of many plants. They benefit society by increasing food security in agricultural and natural ecosystem and they play an important role in conserving biological biodiversity (Eardly et al. 2006). Pollinator diversity includes an immense range of fauna, ranging from the tiniest invertebrates to relatively large vertebrates. Often, pollinators form part of a highly specific niche in pollinator-plant relationships and the ecosystem integrity as a whole. The loss of a single important habitat requirement (e.g. hides and cover objects, larval hosts, availability of water, etc.) for pollinators in an ecosystem could have far reaching effects, ultimately resulting in extinction. Fragmentation of habitats will undoubtedly also have a negative impact on the occurrence and distribution of pollinators and consequently on the genetic and population integrity of ecosystems. The successful survival of pollinators is thus further motivation for the conservation of undisturbed and unimpaired, interconnected ecological corridors crossing property boundaries in local areas.

5.8 **Synopsis of fauna assemblage**

With view of the consequences of past and present impacts and the frequent daily human activities on and around the development site, it is expected that fauna sensitive to these disturbances and impacts have already moved away or have been lost due to poaching. The fauna assemblage can thus be assumed to be impoverished and that only taxa that are visitors or are unaffected by these impacts will be present.

6. Sensitivity and Impact Assessment

6.1 **Ecological sensitivity and buffers**

Sensitivity zoning (based upon natural integrity, fauna potential and ecological functions) for the different ecological units is delineated in Figure. 1 and summarized as follows:

Vegetation Community	**Ecological Sensitivity**
Modified land	Low
Themeda triandra climax grassland	Medium - High
Vachellia karroo woodland	Medium
Wetlands and hydrological features	*Refer to wetland report*

6.1 **Discussion and Impact Assessment**

Unfortunately, it is apparent that the Schoonspruit Game Reserve is not being maintained or managed by the authorities as a Protected Area as the following are facts were observed:

- Fences are down.
- Access control is absent.
- A landfill site has been established in the middle of the Game Reserve.
- Individuals are dumping waste at other places in the Game Reserve as well.
- There are no signs of natural grazers or browsers and instead communal cattle are using the reserve for grazing.
- The reserve is burnt frequently to enhance the regrowth of grass for grazing.
- Signs of overgrazing and bush encroachment are evident.

The proposed township establishment will transform an area of approximately 88.46Ha of the Protected Area which is also classified as a terrestrial and aquatic Critical Biodiversity Area (CBA1). The Technical Report of the North West Biodiversity Sector Plan, residential land uses are not compatible with the land management objectives of PAs, CBAs or ESAs, and should only be considered, subject to the necessary authorisations. However, no alternative sites are available. The preferred site has been selected with the consideration that services infrastructure and provision is available nearby and the new development area can be seen as a logical expansion of the existing township.

The single most important impact on biodiversity as consequence of transforming land is the loss of vegetation and loss and fragmentation of natural habitats and consequently the loss of fauna. This investigation reports that the habitats on the property are typical of the local environment and are degraded to some degree or other and no exceptionally rare, threatened or sensitive biota were recorded on site. The loss of habitat and indigenous vegetation posed by the proposed activity will be irreversible and can only be partially mitigated by conserving the wetland and hydrological features and strips of grassland and woodland within the protective buffer zone. The management authority of the Protected Area must comply with legislation and provide the finance and means to maintain the Game Reserve accordingly.

The following method of assessment was used:

- The *nature* of the impact entails a description of the cause of the impact, what will be affected and how it will be affected;
- The *extent* refers to the area where the impact will be significant e.g. on site, local area, regional, provincial, national or international;
- The *duration* refers to the lifetime of the impact:
  Short term; Medium term: 5-15 years; Long term: >15 years; Permanent
- The *probability* describes the likelihood of the impact occurring during the duration:
    - Improbable (Low likelihood)
    - Probable (Distinct possibility)
    - Highly Probable (Most likely)
    - Definite (Impact to occur regardless of any preventative measures)
- The *significance* is determined by analyzing the above subjects and is assessed as low, medium or high.

Impacts and consequences that were assessed are discussed in the section below.

1) **Loss and fragmentation of habitat**

Site preparation will include vegetation clearing leading to the loss and fragmentation of habitat. This impact has a high significance if it is not mitigated. Mitigation is considered bearing in mind that the relevant habitat is well represented in the remainder of the Protected Area and the impact consequence will be localized to the extent of the site. By considering the following mitigation measures the significance can be reduced to low.

- Select the site with the objective to minimize negative impacts on biodiversity and ecology (E.g. exclude sensitive areas such as rock outcrops, wetlands and streams).

- Conserve sensitive ecosystems (wetland and hydrological features).
- Limit the disturbance to the development footprint only.
- Conserve as much as possible of the natural vegetation within the immediate surroundings.
- Employ an alien invasive management plan to ensure that invasive vegetation does not establish on site or the surrounding area after completion.

2) **Loss of vegetation**
Site clearing will lead to the loss of indigenous vegetation. This impact has a high significance if it is not mitigated. With mitigation the significance can be reduced to medium. Mitigation is considered bearing in mind that the habitat is well represented in the surrounding local area as well and the impact consequence will be highly localized. The same mitigation measures given above will also serve this impact (all sites).

3) **Loss of important flora communities and individuals**
Site clearing will lead to the loss of important flora communities and individuals. This may include prominent stands of trees (e.g. riparian trees) or individual plants (e.g. RDL plants).
The following mitigation measures are proposed:

- Include all the measures listed under point (1).
- No individual plants of importance were recorded.

4) **Loss of fauna**
Site clearing will lead to the indirect (loss of habitat) and direct (physical) loss of fauna individuals. As the fauna potential is considered to be impoverished and considering that most fauna are quite mobile and will be able to move away from the development area once activities commence. The loss of habitat (limited to the development footprint) will not have a significant impact on the distribution and assemblage of fauna in the local area. The following mitigation measures are proposed:

- The potential loss of fauna and their habitat can be mitigated by employing the measures given under the abovementioned headings. Subsequently only a small area of habitat is lost (limited to the development footprint) which will not have a significant impact on the distribution and assemblage of fauna in the local area.
- Before construction commenced the site must be investigated for the possible presence of slow moving and sub terrain fauna.
- Once site preparation commences, any fauna that are disturbed and comes out of hiding must be allowed to escape to the natural surroundings.
- During the construction phase excavations must be monitored daily for trapped animals that must be assisted to escape or be removed by a suitably experienced person.

5) **Ecological connectivity and priority areas**
By conserving the wetland areas with a suitable buffer and implementing the abovementioned mitigation measures the potential impact on the local ecology and priority areas (CBAs) will be mitigated to an acceptable level. The managing

authority of this Protected Area must provide the means to maintain the Game Reserve as an area that adds value to the local municipality and the community.

7. Conclusion & recommendations

It is concluded that the Schoonspruit Nature Reserve is not functional or maintained as a Protected Area and is subject to several negative impacts. Subsequently the terrestrial vegetation assemblage and habitat on the site is degraded and the fauna potential is impoverished. Potential impacts posed by the proposed development can be mitigated to an acceptable level if the recommendations included with this report are followed.

8. References

Acocks, J. P. H. 1988. Veld types of South Africa. Botanical Research Unit. 146p.

Barnes, K.N. (ed.) 1998. The Important Bird Areas of Southern Africa. BirdLife South Africa, Johannesburg.

Bates, M.F., Branch, W.R., Bauer, M., Marais, J., Alexander, G.J. & De Villiers, M.S. (eds). 2014 Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. *Suricata 1*. SANBI, Pretoria.

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

Branch, B. 1997. Field guide to the snakes and other reptiles of Southern Africa. Struik Publishers, Cape Town. 328 pp.

Bromilow C. 1996. Probleemplante van Suid-Afrika. Briza, PTA. Pp 315

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

Ferrar, A.A. & Lötter, M.C. 2007. Mpumalanga Biodiversity Conservation Plan Handbook. Mpumalanga Tourism & Parks Agency, Nelspruit.

Deal, G.B. *et al*. 1989. The vegetation ecology of the eastern Transvaal escarpment. Bothalia Vol. 19, 1: pp53-110.

DWAF. 2005. A practical field procedure for the identification and delineation of wetlands and riparian areas. Department of Water Affairs and Forestry.

Eardly C., Roth D., Clarke J., Buchmann S. & Gemmill B. 2006. Pollinators and Pollination: A resource book for policy and practice. API. 77pp.

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

Golding, J. S. (Editor). 2002. Southern African Plant Red Data Lists. Southern African Botanical Diversity Network Report no.14. SABONET, PTA. Pp 237.

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. Volumes 1 & 2. BirdLife South Africa, Johannesburg.

Harrison, J.A. & Harebottle, D. 2002. Co-ordinated Waterbird Counts (CWAC) – Information Sheet No.1. Avian Demographic Unit, Cape Town.

Henning G.A., Henning S.F. 1989. South African Red Data Book: Butterflies. South African National Scientific Programmes Report No. 158. 175pp.

Henning G.A., Henning S.F., Joannou J.G. & Woodhall S.E. 1997. Living Butterflies of Southern Africa. Umdaus Press.

Hockey P.A.R., Dean W.R.J., Ryan P.G., (eds) 2005. Roberts – Birds of Southern Africa, VII edition. The trustees of the John Voelcker Bird Book Fund, Cape Town. 1296pp.

Hilton-Taylor, C. 2007. IUCN Red List of threatened species. IUCN, Gland, Swit. UK.xvii + 61 pp

Hockey P.A.R., Dean W.R.J., Ryan P.G., (eds) 2005. Roberts – Birds of Southern Africa, VII edition. The trustees of the John Voelcker Bird Book Fund, Cape Town. 1296pp.

Kleynhans,C.J., Louw, M.D., Graham, M. 2009. Module G: EcoClassification and Ecostatus determination in River Ecoclassification: Index of Habitat Integrity (Section 1, Technical manual). Joint WRC and DWAF. WRC Report No. TT377/09

Kotze, D.C, Marneweck, G.C., Batchelor, A.L., Lindley, D. and Collins, N. 2005. *A technique for rapidly assessing ecosystem services supplied by wetlands.* WET-Ecoservices.

Lötter. M.C. 2006. Mpumalanga Biodiversity Conservation Plan CD-Rom. Mpumalanga Tourism & Parks Board, Nelspruit.

Low, A. B., Rebelo, A. G. 1996. Vegetation of South Africa, Lesotho and Swaziland. Department of environmental Affairs, Pretoria. 85 pp.

Marais J. 2004. A Complete Guide to the Snakes of Southern Africa. Struik.

Migdol I. 1987. Veldgids tot die Skoenlappers van Suid-Afrika. Struik. 256pp.

Minter L.R., Burger M., Harrison J.A., Braack H.H., Bishop P.J., Kloepfer D.(eds). 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institution, Washington, D.C. 360 pp.

Mucina, L. & Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho & Swaziland. *Strelitzia 19*. SANBI, Pretoria.

National Environmental Management Biodiversity Act of 2004 (NEMBA).

National Forestry Act of 1998 (NFA).

Mills G. & Hes L. 1997. The complete book of Southern African mammals. Struik. Cape Town, S.A. 356pp.

Nel, J., Maree, G., Roux, D., Moolman, J., Kleynhans, N., Silberbauer, M. & Driver, A. 2004. South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 2: River Component. CSIR Report Number ENV-S-I-2004-063. Council for Scientific and Industrial Research, Stellenbosch.

Onderstall, J.O. 1984. South African Wild Flower Guide: Transvaal Lowveld andEscarpment. CTP, Capetown. Pp 222

Palgrave, K.C. 1983. Trees of Southern Africa. Struik, Cape Town. Pp 959

PRECIS Data. National Biodiversity Institute of South Africa. Pretoria.

Roberts' Multimedia birds of southern Africa. 1997-2003. Southern African Birding cc. Westville South Africa.

Mackenzie & Roundtree, 2007. Unpublished Report: Draft riparian delineation methods prepared for the Department of Water Affairs and Forestry, Version 1

Pooley, E. (Editor). 1998. A Field Guide To the Wild Flowers of Kwazulu Natal and the Eastern Region. Natal Floral Publications Trust, Durban. Pp 630

Rouget M., Reyers B., Jonas Z., Desmet P., Driver A., Maze K., Egoh B., & Cowling R.M. 2004. Technical Report Volume 1: Terrestrial Component. In: South African National Biodiversity Assessment 2004: Priorities for biodiversity conservation in South Africa. Pretoria. SANBI.

Schmidt, E., Lotter, M., McCleland, W. 2002. Trees and shrubs of Mpumalanga and the Kruger National Park. Jacana, Jhb.

Skinner, J. D., Smithers, H. N. 1990. The mammals of the southern African subregion. University of Pretoria. 771 pp.

South African National Biodiversity Institute. 2007. National Red Data list of plants. Pretoria.

Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A., and Kieswetter, S.L. (eds). 1999. TOTAL

CWAC Report: Coordinated Waterbird Counts in South Africa 1992-1997. Avian Demographic Unit. University of Cape Town, South Africa.

Van Oudtshoorn F.P. 1991. Gids tot Grasse van Suid-Afrika. Briza, PTA. Pp 301.

Van Wyk, B.E. & Smith, G. 1996. Guide to the Aloes of South Africa. Briza, PTA.

Van Wyk, A.E. & Smith, G.F. 2001. Regions of Floristic Endemism in Southern Africa. Umdaus Press, Hatfield. 199pp.

Woodhall. S. 2005. Field guide to Butterflies of South Africa. Struik. 440pp.

Young, D.J., Harrison, J.A., Navarro, R.A., Anderson, M.D. and Colahan, B.D. (eds). 2003. Big Birds on Farms: Mazda CAR Report 1993-2001. Avian Demographic Unit. University of Cape Town, South Africa.

APPENDIXES

APPENDIX 1: SPECIALIST DETAILS

CURRICULUM VITAE
Louis Daniel van der Walt

1. Background Information

1.1 **Personal Details**

Name:	Louis Daniël van der Walt (Danie).
I.D. No.	6805305147080
Residential address:	01 Tambotie Street, Kingsview, White River.
Postal address:	P.O. Box 2980, White River, 1240.
Telephone:	(013) 256 9464 or 084 510 9054
Fax:	086 603 8875
Email:	danie.aeb@gmail.com
Marital status:	Married
Date of Birth:	1968-05-30
Nationality:	Republic of South Africa.

1.2 **Secondary Education**

Senior certificate examination at Linden Hoërskool, Johannesburg, 1985.

1.3 **Tertiary Education**

Completed the following degrees at the Rand Afrikaans University:

- **B.Sc. (Biol. Sciences)**, 1989: Majoring in Zoology and Botany.
- **B.Sc. Honoribus (Zoology)**, 1990: Subjects including Ichthyology & Aquaculture, Ecology, Physiology, Genetics, Entomology & Parasitology, Nematology, Evolution and Philosophy.
- **M.Sc. (Zoology) cum laude**, 1993. Title of script: An evaluation of the allozyme variation as well as the effect of cryopreservation of semen on the genetic selection of the African catfish (*Clarias gariepinus*).

Certified copies of these degrees and the abstract of the M.Sc. script are included with Appendix A.

1.4 **Accredited Courses**

I have successfully completed the following courses:

- Implementing integrated management systems (SHEQ): ISO9001, ISO14001 and OHSAS18001. Centre for Environmental Management, North-west University, Potchefstroom, October 30 – November 4, 2005.
- Wetland Training: Delineation, Functions and Rehabilitation of Wetlands. University of Pretoria, Rietvlei Nature Reserve, May, 2006.
- Environmental Impact Assessment (NEMA Regulations). Centre for Environmental Management, Northwest University, Potchefstroom, May, 2007.
- OHS Act and Regulations (Act 85 of 1993). Department of Labour, Gauteng, September, 2010.

1.5 **Short Courses and Practical Workshops**

- Fish Index Validation: Field Testing. DWAF Guidelines. Waterval-Boven. August 2006
- Short Course: Soil Classification and Wetland Delineation. Terrasoil Science. Nelspruit. February 2009.
- SASS5 Biomonitoring Course. Nepid Consultants. Sabie. March 2013.

1.6 **Publications and contributions**

During my tertiary education as well as my professional career, I have published several scientific reports and attended and contributed to various workshops and congresses. These are listed in Appendix B.

2. Previous Employment and Experience

Rand Afrikaans University, JHB

January 1990 - December 1993: Laboratory and field assistant.
1992: Aquarium and Technical assistant to Department of Zoology.
Duties included:

- Managing the zoology aquarium;
- Designing and construction of fish breeding and holding systems;
- Technical and field assistant to various research projects;
- Mentor to students in methods to collect and identify wild fish specimens and aquatic invertebrate specimens;

Silver Creek Aquaculture, Hazyview

January 1994 - May 1997: Biologist and manager of aquaculture, specializing in African Sharptooth Catfish, Tilapia and the large scale production of ornamental fish.
Duties included:

- Designing and construction of fish breeding and holding systems;
- Developing and maintenance of production systems and methods;
- Genetic selection of brood stock;
- Artificial and controlled propagation of fish;
- Managing of abattoir and fish processing;
- Marketing of fish products.

Aquaculture Consultant and Biologist

May 1997 – Present. In parallel with my present full time occupation, I also manage my own aquaculture business, specializing in ornamental fish, e.g. Goldfish, Japanese Koi and tropical fish.
Duties include:

- Designing and construction of fish breeding and holding systems;
- Developing and maintenance of production systems and methods;
- Genetic selection of brood stock;
- Artificial and controlled propagation of fish;
- Diagnoses and treatment of fish diseases;

3. Present Employment

3.1 **Environmental Assessments**

Since 2004, I am employed as an Environmental Assessment Practitioner and Environmental Scientist. Under this appointment my work description entails the execution of the environmental impact assessment process as prescribed by the present EIA regulations. My duties include scoping and public participation, authority consultations, interpretation of scientific studies, impact assessments, report writing, etc. The main goal that I attempt with the EIA process is to investigate all the available alternatives and information in order to provide a basis for a manageable product or project that is environmentally sustainable and acceptable to all the stakeholders involved. Projects were completed under both ECA and NEMA regulations (Appendix C).

During five years of executing EIA's, I have covered many subjects, including ESKOM power lines and substations, communication towers, dam construction, township and industrial developments, abattoirs, subdivisions, filling stations, pipelines, borrow pits and roads, golf estates, country estates, etc. A list of EIA projects in which I was the leading agent is given

in Appendix C. It should be noted that, in the capacity of Biologist I also completed the biodiversity assessment reports, if so required, for these EIA projects.

3.2 **Biodiversity Consultations**

As part of my graduate and post graduate studies I was trained to do biodiversity assessments and monitoring and I assisted in several such research projects at the R.A.U. I was also fortunate enough to assist Dr. Andrew Deacon (South African National Parks Board, KNP, Skukuza) on many occasions in biodiversity assessments and monitoring projects. This training and the experience that I have gained as biologist I presently utilize to do biodiversity studies in several fields of study (as listed below), mainly for environmental processes (e.g. EIA, EMPR, EMP processes). These assessments and studies are compiled for specific terms of reference, e.g. basic assessments, scoping assessments, monitoring or comprehensive specialist surveys. For these biodiversity assessments I am subcontracted as *Afrika Enviro & Biology* in order to combine the specialist biological consultations under a single entity. I rely on my training as biologist to ensure that the assessments are conducted according to standard scientific methods and procedures in order to be scientifically correct and can therefore be used as reference by co-scientists.

3.3 **Present scope of work**

By combining my professional abilities as Environmental Scientist and Biologist, I am experienced in compiling the following environmental reports:

- Biodiversity Assessments (Inclusive of the above scope of work);
- Environmental Impact Assessments;
- Environmental Management Plans;
- Rehabilitation Plans;
- Environmental Compliance Monitoring and Reporting.

Completed biodiversity and aquaculture reports are available on request.

4. Experience and attributes

4.1 **Environmental Scientist and Biodiversity Consultant**

I have completed EIA projects as well as biodiversity assessments in a diverse range of environments and natural habitats, including very sensitive areas that required intensive research and detailed assessments. A short elaboration is as follows:

Due to Mpumalanga's diverse natural resources and topographic features, this province has several very special areas of natural and biological importance. Areas such as these where I have been fortunate enough to do assessments include:

- The Eastern Escarpment, including centrums of floral endemism such as Steenkamps Berg (Machadodorp – Dullstroom); the Wolkberg centre: Barberton, Pilgrims Rest and Lydenburg and its surrounds as well as Sekhukhune Land;
- The general Lowveld region stretching from Hazyview - Nelspruit - Komatipoort;
- The general Highveld area stretching from Delmas in the west to Dullstroom and Belfast in the east;

My area of work also covers other provinces, including Gauteng-, Limpopo- and North West Province. I have a comprehensive data basis for all of the areas mentioned above and I also have an impressive library, including all the most recent literature, as well as rare and out of print literature, to aid in research. Where necessary, the assessments include consultations and the co-operation of the relevant conservation authorities and scientists.

It should be noted that my reports is accepted by Mpumalanga Parks and Tourism Agency, Limpopo Parks and Tourism, Mpumalanga Department of Agriculture and Land Affairs, National Department of Water Affairs and Environment (DWA) and the National Department of Environmental Affairs and Tourism.

The integrity of my reports has never been questioned by any stakeholder and the quality and content of work has always been complimented.

5. Referees

Prof. G.J. Steyn. University of Johannesburg. Tel. 083 633 4665

L. Human, ESKOM Distribution Northern Region, P.O. Box 36099, Menlo Park, 0102
Tel. 083 233 6727

M. Mbuyane, Wandima Environmental Consultants, PO Box 1072, Nelspruit, 1200
Tel. (013) 752 5452

R. Luyt, Mpumalanga Department of Agriculture and Land Administration, Directorate Environmental Impact Management, Nelspruit
Tel. 082 672 7868

M. Lötter, Mpumalanga Tourism and Parks Agency: Scientific Services, Private Bag X1088, Lydenburg, 1020
Tel. (013) 235 2395

T. Dormehl, Dormehl Technology, PO Box 21103, Nelspruit, 1200
Tel. (013) 741 1739

Dr. A. R. Deacon, National Parks Board, Skukuza, Kruger National Park
Tel. (013) 735 4237

J. Fourie & Associates, Environmental Engineers, PO Box 431, Paardekraal, 1739 Tel. (011) 954 1537

Dr. P. Van Eeden, EnviroScience, PO Box 1343, Norkem Park, 1631,
Tel. 083 279 4419

A. Van der Merwe, Maleka Environmental Consulting, PO Box 14850, West Acres, Nelspruit, 1211 Tel. (013) 752 4231

APPENDIX 2: MBCP maps