GEOHYDROLOGY

GEOTECHNICAL

ENVIRONMENTAL

SOCIAL DEVELOPMENT

Terrestial Biodiversity Impact Assessment Report

A TERRESTIAL BIODIVERSITY IMPACT ASSESSMENT FOR THE PROPOSED CLEARANCE OF APPROXIMATELY 13 HA OF INDIGENOUS VEGETATION FOR ORCHARDS ON THE REMAINDER OF PORTION 37 AND PORTION 3 OF THE FARM SCHOONUITZICHT 10 LT IN THE LEVUBU AREA, ± 6.5 KM NORTHEAST OF THE ALBASINI DAM, MAKHADO LOCAL MUNICIPALITY, VHEMBE DISTRICT, LIMPOPO, LIMPOPO PROVINCE

December 2020

Prepared for: Muirhead & Roux CC
Compiled by Dr BJ Henning
Document version 1.0 – Draft

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December 2020

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Curriculum Vitae

CURRICULUM VITAE

B J Henning

PhD Plant Ecology

PERSONAL DETAILS

Name:	BAREND JOHANNES HENNING
Date of Birth:	1976-09-06
Profession/Specialization:	Senior Ecologist
Years with Firm:	6 years (previously 2006-2012 & since May 2020)
Nationality:	South African
Years' experience:	15 years

QUALIFICATIONS

University attended:	University of Pretoria, Pretoria (1995- 2002) PhD Plant Ecology, MSc (Botany), BSc (Hons.), BSc

COURSES

Advanced Wetland Course (UP CE, 2010)

Wetland Rehabilitation Course (UFS, 2015)

Course on wetland offsets (SANBI)

KEY QUALIFICATIONS AND EXPERIENCE

- Senior Ecologist / Soil Science Specialist for Ages Limpopo since September 2006 to 2012 and again since May 2020 involved in the following aspects:
    - Agricultural potential and land capability studies of soils on farms. (Reference: Mr Johan Botha, AGES Limpopo; 0152911577, Mr Herman Gildenhuys, Exigo; 0127512160;)
    - Spatial Development Frameworks;
    - Strategic Development Area Frameworks for local municipalities

  - Vegetation surveys, sensitivity and zoning analysis of development sites, including eco-estates, mines, residential developments, shopping centres, roads, water supply and other related infrastructure etc (Reference: Mr Johan Botha, AGES Limpopo; 0152911577, Mr Herman Gildenhuys, Exigo; 0127512160;)
  - Faunal analysis and scoping reports (Reference: Mr Johan Botha, AGES Limpopo; 0152911577, Mr Herman Gildenhuys, Exigo; 0127512160)
  - Avifauna studies related to solar plant and power line connection developments;
  - Wetland delineations and functional capacity assessments (completed advanced wetland course of the Continued Education Department, University of Pretoria 2010 as well as Wetland rehabilitation course of the University of the Free State);
  - Wildlife Management Plans and habitat assessment for rare and endangered game species;
  - GIS related functions;

- Senior Ecologist for Exigo (previously AGES Gauteng) November 2012 to April 2020. Involved in all of the abovementioned aspects;:
- Environmental Consultant for Envirodel Wildlife & Ecological Services cc and Dubel Integrated Environmental Services, Polokwane 2004 - 2006. Involved in the following aspects:
  - Wildlife management plans for game farms /reserves throughout the Limpopo Province
  - Environmental impact assessments (vegetation surveys and faunal scoping reports), habitat suitability analysis and report compilation.
  - Coordinating and performing grass monitoring surveys for the Limpopo Tourism and Parks Board
  - Soil potential studies.
- Environmental Consultant for Ficus – pro Environmental Services cc., Modimolle 2004 / 5. Involved mostly in fieldwork, report compilation or impact studies. Reference: Mr. R. Venter (0147173378)

- Subconsultant for AGES (Africa Geo-Environmental Services 2005-2006. Vegetation surveys and sensitivity zoning and analyses. Mr Johan Botha (0836449957)
- Eco-Agent environmental services cc, Pretoria 2002 - 2004. Involved in environmental impact studies. Prof G. J. Bredenkamp (0825767046), University of Pretoria.
- Enviroguard environmental services cc, Heidelberg 2002 - 2004. Involved in environmental impact studies. Prof L. R Brown (0825767046).
- GIS related aspects for all the above-mentioned aspects on projects

POSITION AND DUTIES

Employed as Senior Ecological Specialist. Main duties and responsibilities include:

- Compilation of project proposals;
- Conducting specialist assessments
    - Ecological assessments
    - Soils and Land use potential studies;
    - Wetland assessments;
    - Wetland rehabilitation plans;
    - Ecological & wetland monitoring;
    - Biodiversity Action & Management Plans;
    - Agricultural assessments;
    - Avifauna assessments;
    - Wildlife Management Plans and assessments.
    - Rehabilitation Strategy & Implementation Programmes (RSIPs)
- Liaison with clients;
- GIS and map compilation;
- Project admin and management;
- Integration and interaction with the environmental consultants;
- Travelling;
- Any ad hoc duties that may be given by immediate manager.

Declaration

I, DR BJ Henning declare that -

- I act as the independent specialist;
- I will perform the work relating to the project in an objective manner, even if this results in views and findings that are not favourable to the project proponent;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this project, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998; the Act), regulations and any guidelines that have relevance to the activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I will consider, to the extent possible, the matters listed in Regulation 18 of the NEMA EIA Regulations;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the project proponent and the competent authority 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 project; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority or project proponent;
- All the particulars furnished by me in this document are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the Act.

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SIGNATURE OF SPECIALIST

DECEMBER 2020

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NOTATIONS AND TERMS

Biota: living things; plants, animals, bacteria

Bottomland: the lowlands along streams and rivers, on alluvial (river deposited) soil.

Connectivity: in this context, referring to either the upstream-downstream or lateral (between the channel and the adjacent floodplain) connectivity of a drainage line. Upstream-downstream connectivity is an important consideration for the movement of sediment as well as migratory aquatic biota. Lateral connectivity is important for the floodplain species dependent on the wetting and nutrients associated with overbank flooding

Endorheic: closed drainage e.g. a pan.

Floristic: of flora (plants).

Floodplain: wetland inundated when a river overtops its banks during flood events resulting in the wetland soils being saturated for extended periods of time.

Gley: soil material that has developed under anaerobic conditions because of prolonged saturation with water. Grey and sometimes blue or green colours predominate but **mottles** (yellow, red, brown and black) may be present and indicate localised areas of better aeration.

Groundwater: subsurface water in the zone in which permeable rocks, and often the overlying soil, are saturated under pressure equal to or greater than atmospheric.

Horizon: see soil horizons.

Hydrophyte: any plant that grows in water or on a substratum that is at least periodically deficient in oxygen because of soil saturation or flooding; plants typically found in wet habitats.

Hydro-geomorphic: refers to the water source and geology forms.

Hydrology is defined in this context as the distribution and movement of water through a wetland and its soils.

Geomorphology is defined in this context as the distribution and retention patterns of sediment within the wetland.

Infilling: dumping of soil or solid waste onto the wetland surface. Infilling generally has a very high and permanent impact on wetland functioning and is like drainage in that the upper soil layers are rendered less wet, usually so much so that the area no longer functions as a wetland.

Mottles: soils with variegated colour patters are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.

Organic soil material: soil material with a high abundance of un-decomposed plant material and humus.

Palustrine (wetland): all non-tidal wetlands dominated by persistent emergent plants (e.g. reeds) emergent mosses or lichens, or shrubs or trees (see Cowardin *et al.*, 1979).

Perched water table: the upper limit of a zone of saturation in soil, separated by a relatively impermeable unsaturated zone from the main body of groundwater.

Permanently wet soil: soil which is flooded or waterlogged to the soil surface throughout the year, in

most years.

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as **riparian wetlands**. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Roughness coefficient: an index of the roughness of a surface; a reflection of the frictional resistance offered by the surface to water flow.

Runoff: total water yield from a catchment including surface and subsurface flow.

Seasonally wet soil: soil which is flooded or waterlogged to the soil surface for extended periods (>1 month) during the wet season but is predominantly dry during the dry season.

Sedges: grass-like plants belonging to the family *Cyperaceae*, sometimes referred to as nutgrasses. Papyrus is a member of this family.

Soil drainage classes: describe the soil moisture conditions as determined by the capacity of the soil and the site for removing excess water. The classes range from very well drained, where excess water is removed very quickly, to very poorly drained, where excess water is removed very slowly. Wetlands include all soils in the very poorly drained and poorly drained classes, and some soils in the somewhat poorly drained class. These three classes are roughly equivalent to the permanent, seasonal and temporary classes

Soil horizons: layers of soil that have uniform characteristics and have developed through pedogenic processes; they are bound by air, hard rock or other horizons (i.e. soil material that has different characteristics).

Soil profile: the vertically sectioned sample through the soil mantle, usually consisting of two or three horizons (Soil Classification Working Group, 1991).

Soil saturation: the soil is considered saturated if the water table or **capillary fringe** reaches the soil surface (Soil Survey Staff, 1992).

Temporarily wet soil: the soil close to the soil surface (i.e. within 50 cm) is wet for periods > 2 weeks during the wet season in most years. However, it is seldom flooded or saturated at the surface for longer than a month.

Terrain unit classes: areas of the land surface with homogenous form and slope. Terrain may be seen as being made up of all or some of the following units: crest (1), scarp (2), midslope (3), footslope (4) and valley bottom (5).

Transpiration: the transfer of water from plants into the atmosphere as water vapour

Unchanneled valley bottom: linear fluvial, net depositional valley bottom surfaces which do not have a channel. The valley floor is a depositional environment composed of fluvial or colluvial deposited sediment. These systems tend to be found in the upper catchment areas.

Vegetation is defined in this context as the vegetation structural and compositional state.

Water regime: when and for how long the soil is flooded or saturated.

Water Quality largely self-explanatory and reflecting the changes in quality as a consequence of

changes in land use or as a direct result of activities within the wetland itself that could lead to changes in the quality of the water flowing through and within the wetland

Waterlogged: soil or land saturated with water long enough for anaerobic conditions to develop.

Wetland: 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 under normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

Wetland catchment: the area up-slope of the wetland from which water flows into the wetland and including the wetland itself.

Wetland delineation: The determination and marking of the boundary of a wetland on a map.

LIST OF ABBREVIATIONS

Abbreviation	Description
ARC	Agricultural Research Council
C-Plan	Limpopo Conservation Plan
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DME	Department of Minerals and Energy Affairs
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPR	Environmental Management Programme Report
ENPAT	Environmental Potential Atlas
LEDET	Limpopo Department of Economic Development, Environment & Tourism
GIS	Geographic Information Systems
GPS	Geographical Positioning System
HGM	Hydro-Geomorphic
HFI	Hydrological Function and Importance
IHI	Index of Habitat Integrity
IUCN	World Conservation Union
MAE	Mean Annual Evaporation
MAMSL	Meter Above Mean Sea Level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
NEMA	National Environmental Management Act
PES	Present Ecological State
PESC	Present Ecological Status Class
PQ4	Priority Quaternary Catchment
QDS	Quarter Degree Square
SADC	Southern African Development Community
SANBI	South African National Biodiversity Institute
WMA	Water Management Area
WHO	World Health Organisation

1 ASSIGNMENT

AGES Limpopo (Pty) Ltd was appointed by Muirhead & Roux CC to conduct a terrestrial biodiversity impact assessment for the proposed development of new orchards on the Remainder of Portion 37 and Portion 3 of the farm Schoonuitzicht 10 LT in the Levubu area., Limpopo Province.

According to the national web-based environmental screening tool in terms of National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998), the site has a Medium or High sensitivity from a terrestrial sensitivity perspective (Animal and Plant Species protocols). A pre-screening site visit was therefore conducted to determine if a detailed terrestrial biodiversity assessment or a compliance statement would be sufficient. After the site visit the following was concluded:

- The site has a Medium to High Sensitivity from a terrestrial biodiversity perspective due to the presence of drainage channels, wetlands and indigenous woodland / forests.
- A detailed terrestrial biodiversity assessment should be conducted for the site.

The Basic Environmental Impact Assessment Report (BAR) will comply with the requirements of the Environmental Impact Assessment Regulations R982, promulgated on 4 December 2014 (as amended on 7 April 2017) in terms of Section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The following listed activities under Listing Notice 1, (Regulation R983) and Listing Notice 3, (Regulation R985) of 4 December 2014 (as amended on 7 April 2017) require a Basic Assessment to be conducted and authorization from the Limpopo Department of Economic Development, Environment & Tourism (LEDET).

- GNR 983, Activity 27 - The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.
- GNR 985, Activity 12 (a)(ii) - The clearance of an area of 300 square metres or more of indigenous vegetation; Within critical biodiversity areas identified in bioregional plans.

“indigenous vegetation” refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

According to the Forestry Act, 1998 (Act No. 84 of 1998) and the Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) permits will be required for the removal of any protected trees on the proposed lands.

This report will include a detailed impact assessment of the proposed development on the biodiversity. This assessment is essential as it will contribute to meeting the requirements of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) in compliance with Gazette No. 43310 Government Notice R320. The following regulations

apply for the proposed development:

The assignment is interpreted as follows: Compile an ecological study on the flora (vegetation units), fauna and general ecology of the site and determine the potential impacts of the proposed development on the fauna and flora of the area as well propose mitigation measures. The study will be done according to guidelines and criteria set by the Limpopo Department of Economic Development, Environment & Tourism (LEDET) for biodiversity studies. To compile this, the following had to be done:

1.1 INFORMATION SOURCES

- All relevant topographical maps, aerial photographs and information (previous studies and environmental databases) related to the ecological components in the study area;
- Requirements regarding the fauna and flora survey as requested by LEDET;
- Legislation pertaining to the fauna and flora study as relevant;
- Red data species list from the South African National Biodiversity Institute (SANBI).
- Information on plant and animal species recorded for the various Quarter Degree Squares was extracted from the SABIF/SIBIS database hosted by SANBI and the faunal databases hosted by the Animal Demography Unit (ADU). This includes is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself has not been well sampled in the past.
- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011), where relevant.
- Critical Biodiversity Areas were obtained from the various coverages produced by the Limpopo C-Plan (2014).

1.2 REGULATIONS GOVERNING THIS REPORT

1.2.1 National Environmental Management Act, 1998 (Act No. 107 of 1998) - Gazette No. 43310 Government Notice R. 320

This report was prepared in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Gazette No. 43310 Government Notice R. 320. Specialist reports includes a list of requirements to be included in a specialist report for an agricultural agr0-ecosystem assessment:

1. A specialist report or a report prepared in terms of these regulations must contain:
    a. Details of
        i. The specialist who prepared the report; and
        ii. The expertise of that specialist to compile a specialist report,

including a curriculum vitae;

b. A declaration that the specialist is independent in a form as may be specified by the competent authority;

c. An indication of the scope of, and purpose for which, the report was prepared;

d. The date and season of the site investigation and the relevance of the season to the outcome of the assessment;

e. A description of the methodology adopted in preparing the report or carrying out the specialized process;

f. The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;

g. An identification of any areas to be avoided, including buffers;

h. A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;

i. A description of any assumptions made and any uncertainties or gaps in knowledge;

j. A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;

k. any mitigation measures for inclusion in the EMPr;

l. any conditions for inclusion in the environmental authorisation;

m. any monitoring requirements for inclusion in the EMPr or environmental authorisation

n. a reasoned opinion –

    i. As to whether the proposed activity or portions thereof should be authorised and

    ii. If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr and where applicable, the closure plan;

o. A description of any consultation process that was undertaken during the course of preparing the specialist report;

p. A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

q. Any other information requested by the competent authority.

This Act also embraces all three fields of environmental concern namely: resource conservation and exploitation; pollution control and waste management; and land-use planning and development. The environmental management principles include the duty of care for wetlands and special attention is given to management and planning procedures.

1.2.2 Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA)

This Act regulates the utilization and protection of wetlands, soil conservation and all matters relating thereto; control and prevention of veld fires, control of weeds and invader plants, the prevention of water pollution resulting from farming practices and losses in biodiversity.

1.2.3 National Environmental Management Biodiversity Act (Act 10 0f 2004) (NEMBA)

The following aspects of the NEMBA (2004) are important to consider in the compilation of an ecological report. It:

- Lists ecosystems that are threatened or in need of national protection;
- Links to Integrated Environmental Management processes;
- Must be considered in EMPs and IDPs;
- The Minister may make regulations to reduce the threats to listed ecosystems.

1.2.4 The National Forest Act (Act 84 of 1998) (NFA)

In terms of section 15(1) of the National Forests Act, 1998, no person may cut, disturb, damage or destroy any protected tree; or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister of Agriculture, Forestry and Fisheries.

1.2.5 Limpopo Environmental Management Act (LEMA) No. 7 Of 2003

The LEMA (No. 7 of 2003) deals with the conservation of wild animals, freshwater fish and the conservation and protection of flora in the Limpopo Province. Animals and plants are both listed in the schedules with different degrees of protection afforded to each.

1.3 TERMS OF REFERENCE

1.3.1 Objectives

1. The primary aim of this project is to investigate options for enhancing and / or maintaining biodiversity to mitigate the impact of the development and related infrastructure with the overall objective of preventing further loss of biodiversity. The end product would be a tool for promoting and lobbying for the recognition of the importance of species habitat and habitat conservation. Options available to maintain

the current level of floral diversity include:

a. Protection of native vegetation restored elsewhere in return for unavoidable clearing;
b. Minimisation of habitat fragmentation;
c. Minimisation of any threats to the native flora and fauna and their habitats during the construction and operational phases of the developments and;
d. Rehabilitation to establish plant communities / landscaping that will provide future habitat values.

2. To produce a clear and agreed species and habitat priorities for conservation actions. This includes the following:

i. Determine the ecological impacts and actions the developments will have on the biodiversity on a species and habitat level;
ii. Conduct a risk analyses of the impacts identified to determine the significance of the impacts on the fauna and flora of the study area;
iii. Protection and enhancement of vegetation / habitats of high conservation value;
iv. The retention of a substantial amount of native vegetation / habitat of adequate size and configuration to promote the conservation of the existing flora communities;
v. The retention and / or creation of vegetation links, wildlife corridors and vegetation buffers wherever possible, subject to the appropriate bush fire risk management; and
vi. The protection of water quality in the locality so as not to threaten native aquatic flora that rely on the watercourse for survival.

3. Provide recommendations on the ecological mitigation measures to be implemented by the developer and the way forward.

1.3.2 Scope

1. Conduct a field study to determine the state of the vegetation on site:
   i. After studying the aerial photograph determine the previous state of the vegetation compared to the current state of the vegetation on site;
   ii. Conduct a site visit and list the plant species (trees, shrubs, grasses, succulents and other herbaceous species of special interest) present for plant communities still present after construction;
   iii. Identify potential red data plant species, possible encroacher species, medicinal plants of value and exotic plant species.

2. Determine the ecological impact the development will have on the fauna and flora of the site and conduct an impact rating assessment

3. Fauna scoping
    a. List the potential fauna (mammal species, red data birds, reptiles, amphibians, invertebrates) present linked to the specific potential habitats that occur as identified in the vegetation survey.
    b. Analyse the data and identify potential red data fauna species, as well as other endemic or protected species of importance.
    c. Indicate species mitigation measures and management measures to be implemented to prevent any negative impacts on the fauna of the area.

4. General
    a. Identify and describe ecologically sensitive areas. Create a sensitivity map to indicate specific sensitive areas based on various environmental parameters such as natural vegetation in a good condition, rockiness, slopes, flood lines etc.
    b. Identify problem areas in need of special treatment or management, e.g. bush encroachment, erosion, degraded areas, reclamation areas.
    c. Make recommendations, impact ratings and risk assessments for each specific impact.

1.3.3 Limitations and assumptions

- Maintaining due cognisance of the integrity and accuracy of the ecological survey, it should be stated that the ecological resources identified during the study do not necessarily represent all the ecological resources present on the property;
- To obtain a comprehensive understanding of the dynamics of communities and the status of endemic, rare or threatened species in an area, ecological studies should ideally be replicated over several seasons and over a few years. However, due to project time constraints such long-term studies are not feasible;
- Most threatened plant species are extremely seasonal and only flower during specific periods of the year,
- Most threatened faunal species are extremely secretive and difficult to survey even during thorough field surveys conducted over several seasons;

Thus, even though it might be assumed that survey findings are representative of the ecosystem of the site for the development activities, it should be stated that the possibility exists that individual plants species might have been missed due to the nature of the terrain and size of the study area. Therefore, maintaining due cognisance of the integrity and accuracy of the ecological survey, it should be stated that the ecological resources identified during the study do not necessarily represent all the ecological resources present on the property.

2 METHODS

2.1 VEGETATION SURVEY

Two basic methods were used during the vegetation survey:

- Line transects were walked on the site surveyed to record the plant species present. Rare and threatened plant species and any botanically sensitive sites or habitats were searched for in the various vegetation units.
- The Braun-Blanquet survey technique to describe plant communities as ecological units was also used for this study. It allows for the mapping of vegetation and the comparison of the data with similar studies in the area.

The site surveys were conducted on the 11th of November 2020. The relevance of the season (early summer months) had NO impact on the outcome of the assessment. The vegetation was in a moderate to good condition and most species could be identified, although some species might have been missed because of the dense vegetation cover along the ridge footslopes and plateaus.

2.1.1 Data recorded:

Plant names used in this report are in accordance with Arnold & De Wet (1993), except for a few newly revised species. A list of all plant species present, including trees, shrubs, grasses, forbs, geophytes and succulents were compiled. All identifiable plant species were listed. Notes were additionally made of any other features that might have an ecological influence as well as potential fauna habitat that might occur.

2.1.2 Red data species

A species list of the red data species previously recorded in the vicinity of the development was obtained from the South African Biodiversity Institute (SANBI), South Africa as classified by the IUCN red data list categories.

2.1.3 Protected trees

A species list of the protected tree species was obtained from the Department of Forestry. These trees are listed by the NFA (Act 84 of 1998) as protected.

2.1.4 Protected plants

A list of protected and specially protected plants was obtained from the LEMA.

2.1.5 Data processing

A classification of vegetation data was done to identify, describe and map vegetation types. The descriptions of the vegetation units include the tree, shrub and herbaceous layers.

Conservation priority of each vegetation unit was assessed by evaluating the plant species

composition in terms of the present knowledge of the vegetation of the Limpopo Province, as well as the vegetation type.

The following four conservation priority categories were used for each vegetation unit:

- High: Ecologically sensitive and valuable land with high species richness that should be conserved and no development allowed.
- Medium: Land that should be conserved but on which low impact development could be considered with the provision of mitigation measures.
- Medium-low: Land that has some conservation value but on which development could be considered with limited impact on the vegetation / ecosystem. It is recommended that certain sections of the vegetation be maintained.
- Low: Land that has little conservation value and that could be considered for developed with little to no impact on the vegetation / ecosystem.

2.2 FAUNA SURVEY

The fauna survey was conducted as follows:

- A site survey was done to identify potential habitats after identifying the vegetation units. Fauna observed on site or any specific indication of species was noted as confirmed in the species lists.
- A scoping survey was then conducted by comparing the habitat types identified with the preferred habitats of species occurring in the area.

2.2.1 Data recorded:

A list of all species of fauna and their status as observed on the site or that could potentially occur on the site. Notes were made of any specific sensitive or specialized habitats that occur on the site.

2.2.2 Red data species lists

A species list of the red data species of the different faunal classes was obtained from the following references:

- Red Data Book of the Mammals of South Africa (Friedman & Daly, 2004)
- The Atlas of the Southern African Birds - digital data on quarter degree grid data (Avian Demography Unit, University of Cape Town)
- Atlas and red data book of the frogs of South Africa, Lesotho and Swaziland (Minter et al. 2004)
- South African Red Data Book – Reptiles and Amphibians. National Scientific Programmes Report no. 151;

2.2.3 Data processing

A comparison of the habitats (vegetation units) occurring on the property was made to the preferred habitats of the faunal species. In addition to species observed on the site, lists of the potential mammal, bird, reptile, amphibian and insect species were compiled and mitigating measures recommended if needed.

2.3 IMPACT RATING ASSESSMENT MATRIX

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need.

The significance of the impacts will be determined through a synthesis of the criteria below (Plomp, 2004):

Probability. This describes the likelihood of the impact occurring:

- Improbable: The possibility of the impact occurring is very low, due to the circumstances, design or experience.
- Probable: There is a probability that the impact will occur to the extent that provision must be made, therefore.
- Highly Probable: It is most likely that the impact will occur at some stage of the development.
- Definite: The impact will take place regardless of any prevention plans, and there can only be relied on mitigation actions or contingency plans to contain the effect.

Duration. The lifetime of the impact

- Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.
- Medium term: The impact will last up to the end of the phases, where after it will be negated.
- Long term: The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.
- Permanent: Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale. The physical and spatial size of the impact

- Local: The impacted area extends only as far as the activity, e.g. footprint.
- Site: The impact could affect the whole, or a measurable portion of the above-mentioned properties.

- Regional: The impact could affect the area including the neighbouring areas.

Magnitude/ Severity. Does the impact destroy the environment or alter its functioning.

- Low: The impact alters the affected environment in such a way that natural processes are not affected.
- Medium: The affected environment is altered, but functions and processes continue in a modified way.
- High: Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Significance. This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.

- Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.
- Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.
- Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.
- High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The following weights will be assigned to each attribute:

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude/Severity	Low	2
	Medium	6
	High	8

Aspect	Description	Weight
Significance	Sum (Duration, Scale, Magnitude) x Probability	
	Negligible	<20
	Low	<40
	Moderate	<60
	High	>60

The significance of each activity will be rated without mitigation measures and with mitigation measures for the development.

The mitigation effect of each impact will be indicated without and with mitigation measures as follows:

- Can be reversed;
- Can be avoided, managed or mitigated;
- May cause irreplaceable loss of resources.

2.4 SENSITIVITY ASSESSMENT

The ecological sensitivity of any piece of land is based on its inherent ecosystem service and overall preservation of biodiversity.

2.4.1 Ecological function

The ecological function relates to the degree of ecological connectivity between systems within a landscape matrix. Therefore, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive and will be those contributing to ecosystem service (e.g. wetlands) or overall preservation of biodiversity.

2.4.2 Conservation importance

Conservation importance relates to species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation.

2.4.3 Sensitivity scale

- High – sensitive ecosystem with either low inherent resistance or low resilience towards disturbance factors or highly dynamic systems considered being important for the maintenance of ecosystem integrity. Most of these systems represent ecosystems with high connectivity with other important ecological systems or with high species diversity and usually provide suitable habitat for a few threatened or rare species. These areas should be protected;
- Medium – These are slightly modified systems which occur along gradients of disturbances of low-medium intensity with some degree of connectivity with other ecological systems or ecosystems with intermediate levels of species diversity but

may include potential ephemeral habitat for threatened species;

- Low – Degraded and highly disturbed / transformed systems with little ecological function and which are generally very poor in species diversity.

2.5 EIA SCREENING TOOL

The significance of a site or natural feature may only become apparent when it is evaluated in terms of a broader biodiversity context. Put differently, local impacts on biodiversity may seem unimportant, but can become highly significant when interpreted beyond the immediate boundaries of a site. Even if a locality has a history of disturbance such as alien infestation, cultivation or recurrent fires, and it does not host any plant or animal species of special concern, it may nevertheless be significant for biodiversity conservation when viewed from a landscape or even national perspective.

According to the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended, the following listed fauna species occur in the project area. This assessment will focus specifically on these species according to species protocols.

Flora:

- *Prunus Africana (*red stinkwood)
    - Sensitivity: Medium
    - Status: Vulnerable

Fauna:

- *Smithornis capensis (*African broadbill)
    - Sensitivity: High
    - Status: Vulnerable
- *Nettapus auratus* (African pygmy goose)
    - Sensitivity: High
    - Status: Vulnerable
- *Ciconia nigra* (Black stork)
    - Sensitivity: Medium
    - Status: Vulnerable
- *Crocidura maquasiensis* (Makwassie Musk Shrew)
    - Sensitivity: Medium
    - Status: Vulnerable

- *Dasymus robertsi (*African Marsh Rat)
    - Sensitivity: Medium
    - Status: Vulnerable
- *Cercopithecus albogularis schwarzi* (Samago monkey)
    - Sensitivity: Medium
    - Status: Endangered
- *Thoradiscus viridicrus (*Green-kneed Seedpod Shieldback*)*
    - Sensitivity: Medium
    - Status: Vulnerable

3 STUDY AREA

3.1 LOCATION AND DESCRIPTION OF ACTIVITY

The study area is situated within the Makhado Local Municipal area, approximately 6.5 km northeast of the Albasini dam on the Remainder of Portion 37 and Portion 3 of the farm Schoonuitzicht 10 LT (See locality map) – Figure 1.

At present bananas and macadamias are produced on the farms. The proposed development will entail the expansion of these orchards by clearing an additional ± 19 hectares of indigenous vegetation to plant banana and macadamia trees. The areas that were investigated are indicated on the included Google Earth image. The banana and macadamia trees will not be irrigated, although if needed water is available from the existing Registered Water Use for the farms.

The study area is located within the quaternary drainage region A91C that forms part of the Levubu and Letaba Water Management Area (WMA). The regional topography of the study area is classified as moderately undulating hills and mountains, with the soils mostly suitable for tree farming. Care will be taken to ensure that the proposed lands do not infringe on the 1:100-year flood line of the river. The aerial map of the project area is presented in Figure 2 and 4 blocks were investigated from an ecological point of view namely:

- Blok 8 (6 ha in size);
- Blok 13 (3 ha in size);
- Blok 14 (4 ha in size);
- Firebreak block (6 ha in size).

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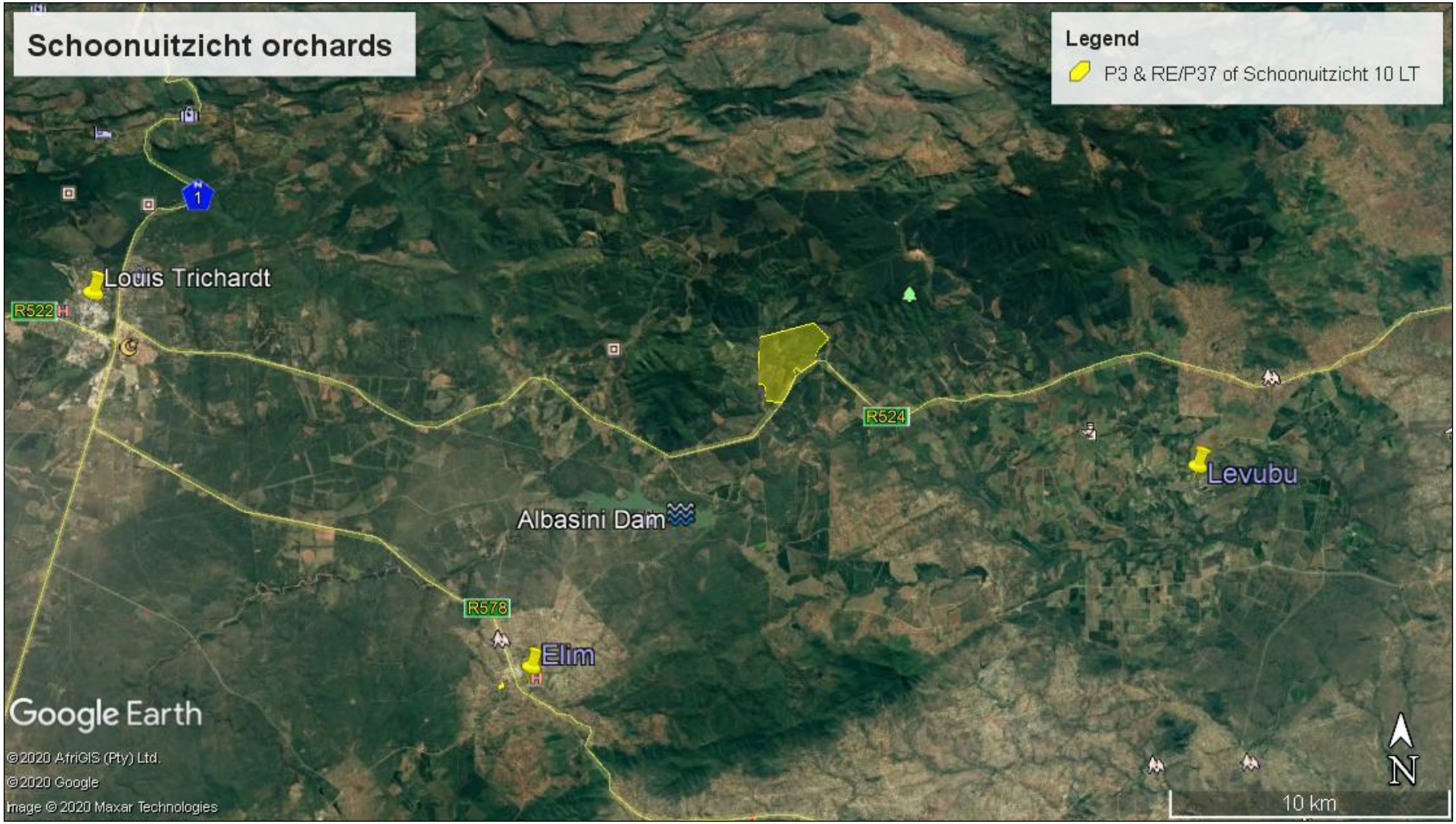

Figure 1. Regional location Map of the project area

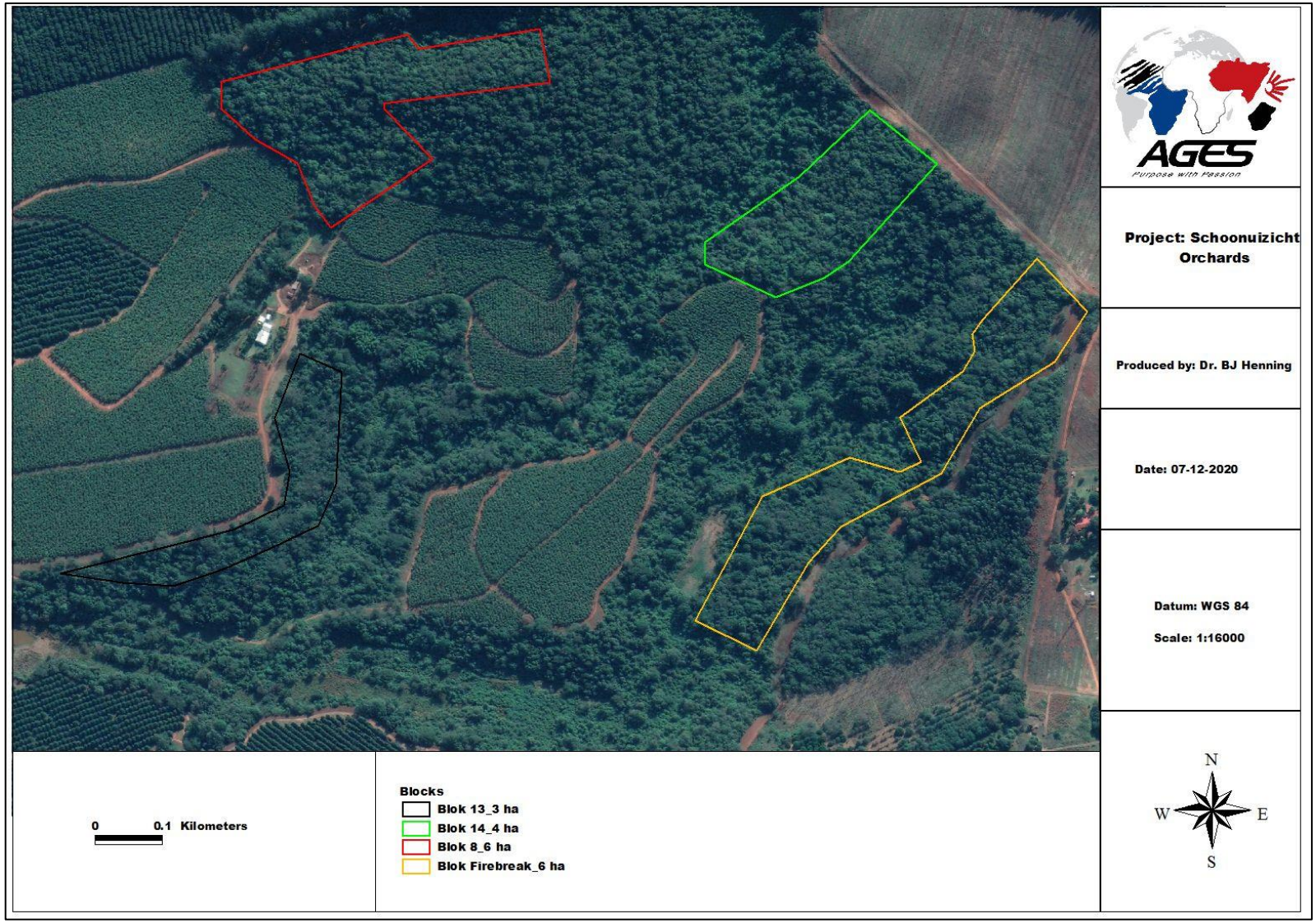

Figure 2. Aerial Map of the project area

3.2 LAND USE

The farm is currently zoned as agricultural. The surrounding land use of the area is avocado, macadamia and banana farming as well as forestry plantations, while more natural areas are used for cattle farming.

3.3 CLIMATE

Climate in the broad sense is a major determinant of the geographical distribution of species and vegetation types. However, on a smaller scale, the microclimate, which is greatly influenced by local topography, is also important. Within areas, the local conditions of temperature, light, humidity and moisture vary greatly, and it is these factors which play an important role in the production and survival of plants (Tainton, 1981). In terrestrial environments, limitations related to water availability are always important to plants and plant communities. The spatial and temporal distribution of rainfall is very complex and has great effects on the productivity, distribution and life forms of the major terrestrial biomes (Barbour et al. 1987). Furthermore, aspects like topography, slope and altitude may further result in differences in precipitation and water availability to plants within the study area. The spatial and temporal distribution of rainfall is very complex and has great effects on the productivity, distribution and life forms of the major terrestrial biomes (Barbour et al. 1987).

The area normally receives about 752mm of rain per year, with most rainfall occurring mainly during mid-summer. It receives the lowest rainfall (4mm) in June and the highest (154mm) in January. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures range from 22.9°C in June to 30.3°C in January. The region is the coldest during July when the mercury drops to 7.5°C on average during the night.

3.4 GEOLOGY AND SOIL TYPES

Geology is directly related to soil types and plant communities that may occur in a specific area (Van Rooyen & Theron, 1996). A Land type unit is a unique combination of soil pattern, terrain and macroclimate, the classification of which is used to determine the potential agricultural value of soils in an area. The land type unit represented within the study area include the Ab 107 and Ab108 land types (Land Type Survey Staff, 1987) (ENPAT, 2001). The land type, geology and associated soil types is presented in Table 1 below as classified by the Environmental Potential Atlas, South Africa (ENPAT, 2000).

Table 1 Landtypes, soils and geology of the proposed development

Landtype	Soils	Geology
Ab107	Red-yellow apedal, freely drained soils; red, dystrophic and/or mesotrophic	Grey biotite gneiss and migmatite; muscovite-biotite granite
Ab108	Red-yellow apedal, freely drained soils; red, dystrophic and/or mesotrophic	Basalt of the Sibasa Formation, Soutpansberg Group

3.5 HYDROLOGY AND DRAINAGE

The site is located within the A91C quaternary catchment and is situated in the Levuhu and

Letaba Water Management Area. Drainage occurs as sheet-wash into the drainage channels and wetlands on site that eventually drains into the major river namely the Levuhu River that occurs to the south of the site.

3.6 TOPOGRAPHY

When assessing the ecology of an area, it is important to know in which eco-region it is located. The study area falls within the Lowveld ecoregion. The topography is located at 800 - 960m above mean sea level (amsl). The project area is situated on moderately undulating hills and mountain footslopes.

3.7 VEGETATION TYPES

The vegetation according to Mucina and Rutherford (2006) is classified as Soutpansberg Mountain Bushveld. The Soutpansberg Mountain Bushveld comprises of low and high mountains, highest in the west, splitting into increased number of lower mountain ridges towards the east. Dense tree layer and poorly developed grassy layer. The topography of the east-west orientated ridges of the mountain changes drastically over short distances, resulting in orographic rain on the southern ridges, and a rainshadow effect on the northern ridges. Because of this topographic diversity, Soutpansberg Mountain Bushveld comprises of a complex mosaic of sharply contrasting kinds of vegetation within limited areas. The main vegetation variations within the Soutpansberg Mountain Bushveld are subtropical moist thickets (mainly along the lower-lying southern slopes, on steep clayey soils of volcanic origin), mistbelt bush clumps (within the mistbelt of the southern and central ridges of the mountain, on rugged quartzitic outcrops with shallow sandy soils), relatively open savannah sandveld (on both deep and shallow quarzitic sands along the relatively dry middle and northern slopes of the mountain), and arid mountain bushveld (along the very arid northern ridges of the mountain) (Mucina & Rutherford, 2006).

The Soutpansberg Mountain Bushveld vegetation type is VULNERABLE with a conservation target of 24%. Just over 2% statutorily conserved in the Blouberg, Happy Rest and Nwanedi Nature Reserves. A smaller area is conserved in other reserves. Some 21% is transformed, with about 14% cultivated and 6% plantations. High rural human population densities in some lower lying parts of the eastern section of the unit. Erosion is very low to moderate (Mucina and Rutherford, 2006).

4 RESULTS

4.1 VEGETATION UNITS

The proposed development is planned on a landscape that varies from slightly undulating footslopes to moderately undulating slopes that forms part of the footslopes of the Soutpansberg Mountains. The importance to survey the area as a whole to have a better understanding of the ecosystem and the potential impact of the development on the natural environment was identified as a key factor, and subsequently the property was completely

surveyed. The proposed development site currently represents farming land used for crop cultivation. The vegetation units on the site vary according to soil characteristics, topography and land-use. Most of the site has become encroached by dense stands of Mauritius thorn and other alien invasive species, while a few major drainage channels and valley bottom wetlands bisect the site. Vegetation units were identified and can be divided into 3 distinct vegetation units according to soil types and topography.

The vegetation communities identified on the proposed development site are classified as physiographic physiognomic units, where physiognomic refers to the outer appearance of the vegetation, and physiographic refers to the position of the plant communities in the landscape. The physiographic-physiognomic units will be referred to as vegetation units in the following sections. These vegetation units are divided in terms of the land-use, plant species composition, topographical and soil differences that had the most definitive influence on the vegetation units. Each unit is described in terms of its characteristics and detailed descriptions of vegetation units are included in the following section. A species list for the site is included in Appendix A, while a plant species list for the quarter degree grid square (QDS) is included in Appendix B. Photographs of each unit is included in the next section to illustrate the grass layer, woody structure and substrate (soil, geology etc.). The following vegetation units were identified during the survey.

- Degraded *Antidesma venosum – Caesalpinnia decapetala* low forest;
- *Anthocleista grandiflora – Bridela micrantha - Albizia adianthifolia* forest;
- Drainage features:
    - Drainage channels & riparian woodland (ravines);
    - Valleybottom wetlands with channel
    - Exorheic depressions;

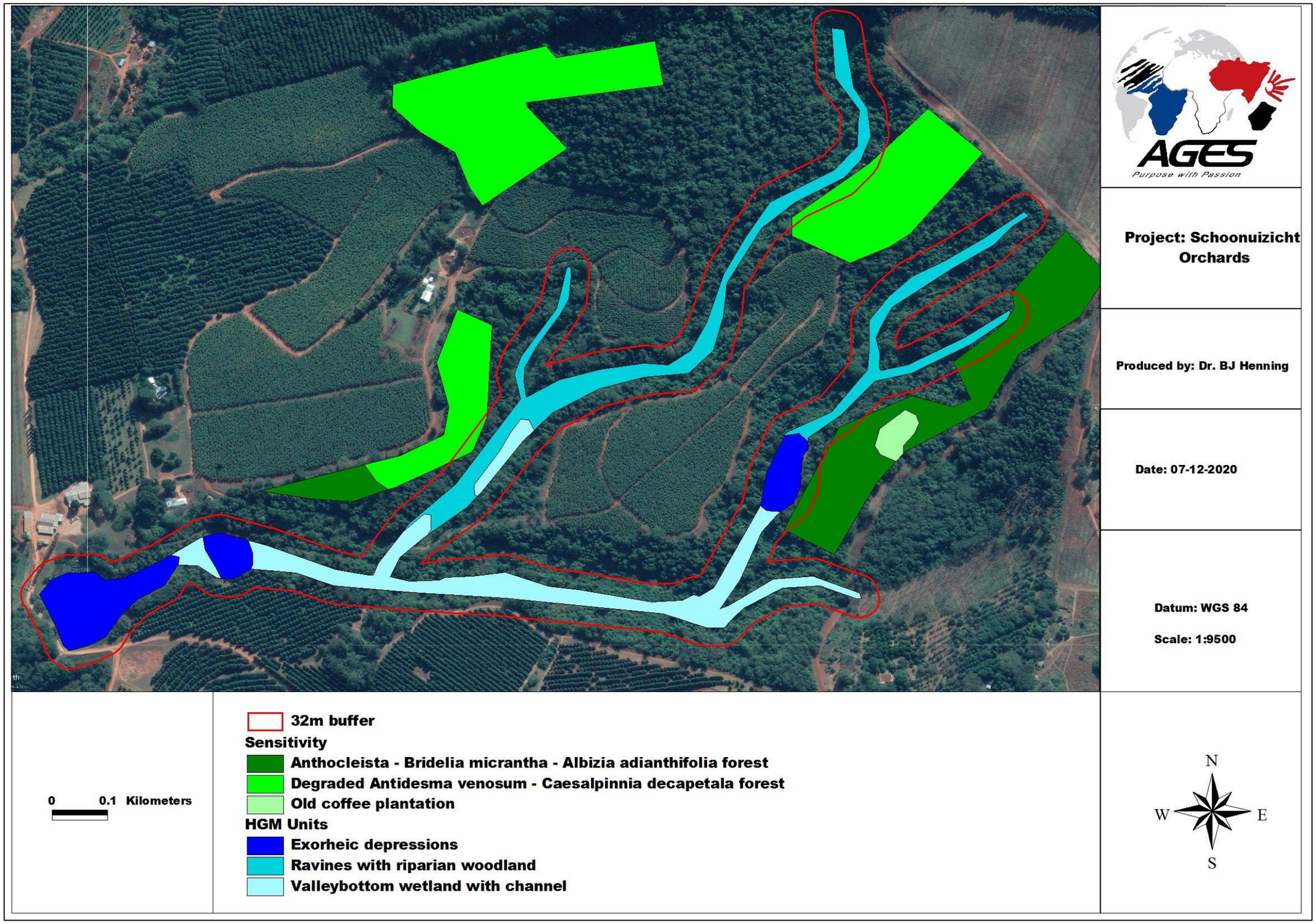

Figure 3. Vegetation Unit Map of the proposed development area

4.1.1 Degraded *Antidesma venosum – Caesalpinnia decapetala* low forest

This vegetation unit represents the semi-deciduous scrub forest which is a low canopy forest with a mix of woodland, riverine and Afro-montane tree species. This is a forest type that has recently spread across Soutpansberg and has unfortunately replaced much of the mixed grasslands that used to cover the mountains 100 years ago. This scrub forest type support various species associated with the Tzaneen Sour Bushveld such as *Antidesma venosum, Celtis Africana, Trema orientalis* and various forest species such as *Cussonia spicata, Bridelia micranta* and *Brachylaena discolor.* The lower shrub stratum has become invaded by alien invasive species such as *Caesalpinnia decapetala, Solanum mauritianum, Vernonia colorata, Lantana camara* and *Chromolaena odorata.*

The state of the vegetation is indicated in photograph 1, while the characteristics of the variations of this vegetation unit are summarized in Table 2.

Table 2. Botanical analysis and characteristics of the Degraded *Antidesma venosum – Caesalpinnia decapetala* low forest

State of the vegetation:	Degraded forests, sour bushveld
Need for rehabilitation	Medium
Conservation priority	Medium
Characteristics	Dense impenetrable thickets of Mauritius thorn in lower shrub stratum with tall / medium tall mixed forest / sour bushveld
Soils & Geology	Red apedal soils of the Hutton soil form
Dominant spp.	*Antidesma venosum, Celtis Africana, Trema orientalis, Cussonia spicata, Bridelia micranta, Brachylaena discolor, Caesalpinnia decapetala, Solanum mauritianum, Vernonia colorata, Lantana camara* and *Chromolaena odorata*
Density of woody layer	Trees: 10-15% (avg. height: 3-6m) Shrubs: 40-50% (avg. height: 1-2m)
Density of herbaceous layer	Grasses: 10-150% (avg. height: 0.8-1.2m) Forbs: <1% (avg. height: 0.8m)
Sensitivity	Medium
Red data species	None observed
Protected species	None observed

The following specific recommendations for the area should be adhered to

- The vegetation unit is classified as having a medium sensitivity due to the encroached state of the lower shrub stratum, although the woody stratum is intact in terms of indigenous species composition;
- The development can be supported in the area provided mitigation measures are implemented to prevent impacts on wetlands and drainage channels or any other red listed species habitat.

Photograph 1 Degraded *Antidesma venosum – Caesalpinnia decapetala* low forest in the project area

4.1.2 *Anthocleista grandiflora – Bridela micrantha - Albizia adianthifolia* forest

This vegetation unit represent tall forest and sour bushveld and represent a mixture of sour bushveld and forest species along the eastern section of the farm. The area can be considered as tall, pristine forest and the area forms an important corridor linking with the high-altitude forests such as Entabeni Forest. The lower shrub stratum is also largely intact with little invasion by alien species. The woody structure is dense thickets dominated by species such as *Anthocleista grandiflora, Albizia adianthifolia, Celtis Africana, Parinari curatellifolia, Nuxia congesta, Diospyros whyteana* and *Grewia occidentalis*. The soils are red apedal soils of the Hutton soil form and has a loamy-to clayey texture. The old coffee plantation also occurs within this forest, although no detailed survey of this area was considered necessary.

The characteristics of this vegetation unit are summarized in Table 3, while the state of the vegetation indicated in photographs 2 and 3.

Table 3. Botanical analysis and characteristics of the *Anthocleista grandiflora – Bridela micrantha - Albizia adianthifolia* forest

State of the vegetation:	Indigenous forest / sour bushveld in pristine state
Need for rehabilitation	Low
Conservation priority	High
Soils & Geology	Deep, red Hutton soils (loam to loamyclay) derived from quartsite
Density of woody layer	Trees: 15-25% (avg. height: 3-6m) Shrubs: 15-20% (avg. height: 1-2m)
Density of herbaceous layer	Grasses: 30-40% (avg. height: 0.8-1.2m) Forbs: <1% (avg. height: 0.8m)
Sensitivity	High
Red data species	None observed
Protected species	None observed

The following specific recommendations for the area should be adhered to

- The vegetation unit is classified as having a High Sensitivity due to the pristine state of the vegetation and unique habitat forming an important corridor between the low altitude forests and the mistbelt forests at the higher altitudes.
- **The development cannot be supported in this area and the area should be conserved as an important biodiversity hotspot**.

Photograph 2. *Anthocleista grandiflora – Bridela micrantha - Albizia adianthifolia* forest in the project area

Photograph 3. State of the pristine forests / sour bushveld along the eastern firebreak in the project area.

4.1.3 Drainage features

4.1.3.1 Drainage channels and riparian woodland

All rivers, wetlands and streams with their associated riparian vegetation in the project area are ecologically sensitive, forming important, limited and specialised habitats for several plant and fauna species. The species composition is unique and relatively limited in distribution and coverage. These habitats also form linear corridors linking different open spaces.

The drainage channels of the project area eventually flow into the Levuhu River that occurs to the south of the site. The riverine woodland and floodplains would be important dry season refuge areas for many fauna species in their natural state. It is also a centre of floral diversity. Riparian areas have been identified as important dry season refuge areas for a variety of large mammal species. The impacts on the sensitive riparian ecosystems, regardless of the source, need to be restricted. Impacts on this system include erosion, habitat loss and degradation and the associated impacts on faunal and floral diversity, dewatering of marshes and wetlands, water abstraction as well as increased sedimentation (SANParks 2003). Continued impacts on the riverine ecosystems may also ultimately reduce the capacity of this system to absorb dramatic flooding events. The band of trees that occurs along the channel can be classified as riparian vegetation. This vegetation is very important for connectivity with adjacent vegetation as well as a migratory route for riparian animals. The most abundant and

most conspicuous trees in the tall riparian woodland are *Ficus sycomorus, Xymalos monospora, Zanthoxylum davyi, Celtis africana, Nuxia floribunda, Rhoicissus tomentosa, Kiggelaria africana, Vepris lanceolata, Rapanea melanophloeos, Rothmannia capensis, Brachylaena discolor, Ficus craterostoma, Combretum kraussii, Trichilia dregeana, Trimeria grandifolia, Drypetes gerrardii* and *Oxyanthus speciosus* subsp. gerrardii. Other prominent woody species include *Diospyros whyteana, Maytenus undata, Searsia chirindensis, Cussonia spicata* and *Maesa lanceolata*. Typical grasses include Panicum maximum, Setaria meghaphylla and Oplismenus hirtellus. The shaded conditions also favour fern species such as *Thelypteris gueinziana* and *Pellaea calomelanos var. calomelanos.*

Most of the drainage channels on site are perennial. Channels are subdivided further within this level of the hierarchy into six geomorphological zones, as defined by Rowntree and Wadeson (2000). These zones are based largely on gradient which influences flow velocity and channel characteristics such as substratum particle size that are important characteristics of riverine habitat types. The following geomorphological zones occur in the project area and described as follows (after Rowntree and Wadeson 2000):

- Mountain stream: Steep-gradient stream dominated by bedrock and boulders, locally cobble or coarse gravels in pools. Reach types include cascades, bedrock fall, step-pool, plane bed. Approximate equal distribution of 'vertical' and 'horizontal' flow components;
- Transitional River: a moderately steep stream dominated by bedrock and boulders. Reach types include plain-bed, pool-riffle and pool-rapid. Usually present in confined or semi-confined valleys with limited floodplain development.

4.1.3.2 Depressions

The man-made dams in the project area represent depressions that are classified as exorheic depressions with channelled inflow (Photograph 4). As the definition of an Inland System includes all inland aquatic ecosystems (i.e. not just wetlands), lakes and other open waterbodies are considered to be types of Inland Systems in terms of the Classification System, even if they are artificial such as dams. Man-made dams are therefore classified as aquatic systems based on the fact that the landform characteristics of such systems fit the definition of a depression in that they typically have closed (or near closed) elevation contours and increase in depth from the perimeter to a central area of greatest depth. Lakes and other open waterbodies that have a maximum depth greater than two metres are called limnetic systems. The vegetation associated with the dams is mostly sedges and bulrushes depending on the depth of the water and the substrate. Species such as *Persicaria serullata, Typha capensis, Schoenoplectus corymbosus, Ludwigia stolonifer* and *Leersia hexandra* mostly grow along the shallow edges of dams and pans in the project area on a muddy substrate.

Photograph 4. Man-made dam (exorheic depression) on Portion 3 of the farm Schoonuitzicht within the project area

4.1.3.3 Valleybottom wetland with channel

This vegetation unit is confined to valley bottom wetlands in a pristine state (Photograph 5). Several wetlands were identified throughout the study region and were primarily rated as a High Sensitivity. Valley bottom wetlands are classified as low-lying, gently sloped areas that receive water from an upstream channel and/or form adjacent hillslopes, not subject to periodic over-bank flooding by a river channel. Surface water in the valley bottom wetlands of the study area flows only seasonally, although the channels are in most cases perennial. One type of valley bottom wetlands is associated with the study area as classified by Sanbi (2009) namely channelled valley bottom wetlands.

A channelled valley-bottom wetland is classified as a mostly flat valley-bottom wetland dissected by and typically elevated above a channel. Dominant water inputs to these areas are typically from the channel, either as surface flow resulting from overtopping of the channel bank/s or as interflow, or from adjacent valley-side slopes (as overland flow or interflow). Water generally moves through the wetland as diffuse surface flow, although occasional, short-lived concentrated flows are possible during flooding events. Small depressional areas within a channelled valley-bottom wetland can result in the temporary containment and storage of water within the wetland. Water generally exits in the form of diffuse surface flow and interflow, with the infiltration and evaporation of water from these wetlands also being

potentially significant (particularly from depressional areas). The hydrodynamic nature of channelled valley-bottom wetlands is characterised by bidirectional horizontal flow, with limited vertical fluctuations in depressional areas (SANBI, 2009).

The most abundant and most conspicuous plant species for the wetlands in the project area include diagnostic sedges such as *Cyperus albostriatus, Cyperus sphaerospermus, Bulbostylis hispidula, Pycreus polystachyos* and *Cyperus solidus*. Two locally prominent ferns were recorded as diagnostic species namely *Thelypteris confluens* and *Pteridium aquilinum*. Some of the diagnostic herbaceous species include *Persicaria decipiens, Gunnera perpensa, Drimia robusta, Kniphofia species, Schoenoplectus brachyceras, Dissotis canescens*, *Chironia purpurascens, Psoralea pinnata* and *Chironia palustris*.

Photograph 5. Valleybottom wetland in the southern section of the project area

The following are recommendations for the rivers, wetlands and riparian woodland in the area:

- The vegetation associated with the water courses has a high sensitivity with a high conservation priority. No major alteration of these important drainage areas is recommended, especially considering it to form part of an important catchment as well as an important corridor for various fauna. The potential to impact on the habitat is high and therefore a sufficient buffer zone of 32 meters is applicable for the development site or the floodline zone;

- All construction and maintenance activities should be conducted in such a way that minimal damage is caused to the drainage features on site. No development can be done within the floodline zone or within 500 meters of a wetland, or within 100 meters of a river, without a Water Use Licence.

4.2 FLORA: SPECIES LEVEL ASSESSMENT

South Africa has been recognized as having remarkable plant diversity with high levels of endemism. The major threats to plants in the study area are urban expansion, non-sustainable harvesting, collecting, overgrazing/browsing, mining and agriculture. The objective of this section was to compile a list of plant species for which there is conservation concern. This included threatened, rare, declining, protected and endemic species.

4.2.1 Species of conservation concern

Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient – Insufficient Information (DDD). It should also be noted that not all species listed as protected are threatened or vice versa.

Threatened species are also seen as indicators of the overall health of an ecosystem (Hilton-Taylor, 1996). No individuals of the endemic or biogeographically important plants listed by Mucina & Rutherford for the relevant vegetation types were observed during the survey as a result of the habitat not being suitable, while the degraded state of the vegetation for the remainder of the area makes the probability of findings these species improbable, even though it might have been previously found in the larger area. Habitat degradation is one of the main reasons for plant species becoming extinct in a particular area.

A list of SCC plant species previously recorded in the study area in which the proposed development is planned was obtained from the Plants of Southern Africa (POSA) database of SANBI. Figure 4 indicates the classification system used by Sanbi for SCC:

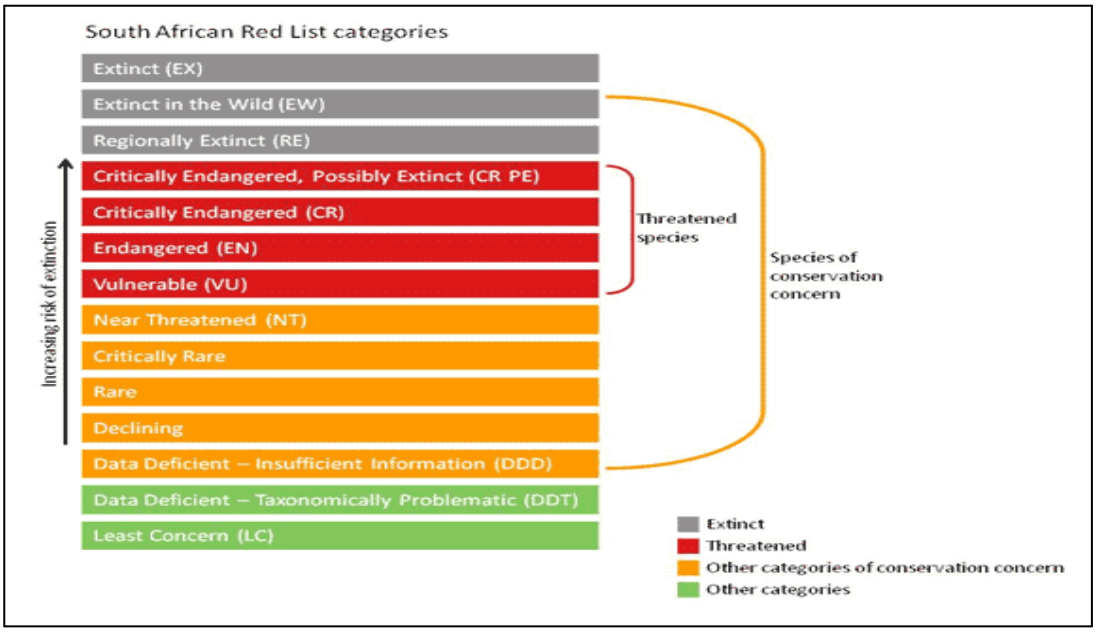

Figure 4. South African red list categories indicating the categories to be used for Species of Conservation Concern

The following threatened species and Species of Conservation Concern were listed for the Grid 2330AA (SANBI, POSA website October 2011) (Table 4):

Table 4. Red data species occurring in the QDS of the project area

Family	Genus	Sp1	IUCN
Apiaceae	*Alepidea*	*peduncularis*	Data deficient
Asphodelaceae	*Aloe*	*vogtsii*	Near Threatened
Proteaceae	*Serruria*	*nervosa*	Near Threatened

None of the listed species was documented during the survey and therefore no additional permits would be needed.

4.2.2 EIA screening tool listed species

The surveys focused specifically on documenting the listed species *Prunus Africana*, a forest specialist tree species.

Prunus Africana is a medium to large, handsome evergreen tree with a spreading crown of 10 to 20 m when mature. It can become quite huge under frost-free conditions. The main stem is straight, with dark brown bark, cracking in a characteristic oblong pattern.

Prunus Africana was assessed as Vulnerable (VU) on the Red List of South African Plants. This species is protected in KwaZulu-Natal because of its bark which is very popular in the medicinal trade. The species has been over-exploited and is becoming rare in most areas.

Prunus Africana is confined to evergreen forests from near the coast to the mist belt and montane forests in KwaZulu-Natal, Eastern Cape, Swaziland, Mpumalanga, Zimbabwe and

tropical Africa. This It is a moderately fast-growing tree which is sensitive to heavy frost, preferring areas where there is regular rain; it will tolerate moderate frosts.

After the surveys the following can be concluded:

- The species potentially occur in the pristine forests adjacent to the firebreak on site, although this specific patch of forests will not be impacted by the development. The probability that any impact occurs on these species on the remainder of the site is considered low;
- The surveys also indicated that no individuals of this species occur on the proposed development footprint (except the firebreak block).

4.2.3 Endemic species

Approximately 2 500 to 3 000 vascular plant taxa comprising 1 066 genera and 240 families are known to occur in the Soutpansberg Mountain. This is a significant number if one hade to compare it to other regions. Altogether, 38 plants taxa are known to be endemic to the Soutpansberg, comprising 27 genera and 17 families. Of the known endemic taxa, no fever than 17 can be considered succulent, with eight being leaf succulents and nine stem succulents. Eight taxa can be considered trees, woody or semi-woody plants growing taller than 2 m. The greatest generic diversity within a family is displayed by the Asclepiadaceae with five genera and six species.

Aloe show the greatest species diversity with five species. The monotypic genus *Zoutpansbergia* is the only genus endemic to the mountain entailing one species. 24 species are found within the mist-belt with 13 restricted to. For these 13 species confined to the mist belt seven are succulents, two are trees, one an epiphyte one and one a herb.

Approximately 63% of the endemic species occur within the mist belt region where of no fever than 34% are restricted to it. In times of drought a large percentage of the high-altitude mountain flora survives on the mist. Very little is known about mist and its interaction with the environment. At Entabeni mist precipitation has been measured at an average of 1 366 mm per annum (Department of Environmental Affairs 1988). Considering Entabeni's average annual rainfall of 1 867 mm, the average total meteorological precipitation is 3 233 mm per annum.

Although no endemic species were documented during the surveys, the probability still exist that some of these species might occur in the lower shrub stratum. Monitoring should be conducted during the clearing of vegetation and should any of the species be found, the species should be transplanted until after clearance and then replanted in neighbouring habitats.

4.2.4 Protected tree species

The National Forest Act (no.84 of 1998: National Forest Act, 1998) provides a list of tree

species that are considered important in a South African perspective because of scarcity, high utilization, common value, etc. In terms of the National Forest Act of 1998, these tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by DWAF (or a delegated authority). Obtaining relevant permits are therefore required prior to any impact on these individuals. Taking cognizance of the data obtained from the field surveys, no protected tree species were documented within the study area.

4.2.5 Protected Plants (LEMA)

Plant species are also protected in the Limpopo Province according to the Limpopo Environmental Management Act. According to this ordinance, no person may pick, import, export, transport, possess, cultivate or trade in a specimen of a specially protected or protected plant species. The Appendices to the ordinance provide an extensive list of species that are protected, comprising a significant component of the flora expected to occur on site. Communication with Provincial authorities indicates that a permit is required for all these species, if they are expected to be affected by the proposed project.

After a detailed survey was conducted during November 2020, none of the listed protected species in the ordinance was found in the footprint areas of the project area.

4.2.6 Invasive alien species (CARA, 1983)

Invasive alien plants pose a direct threat not only to South Africa's biological diversity, but also to water security, the ecological functioning of natural systems and the productive use of land. They intensify the impact of fires and floods and increase soil erosion. Of the estimated 9000 plants introduced to this country, 198 are currently classified as being invasive. It is estimated that these plants cover about 10% of the country and the problem is growing at an exponential rate.

The Alien and Invasive Species Regulations (GNR 599 of 2014) are stipulated as part of the National Environmental Management: Biodiversity Act (10/2004). The regulation listed a total of 559 alien species as invasive and further 560 species are listed as prohibited and may not be introduced into South Africa. Below is a brief explanation of the four categories of Invasive Alien Plants as per the regulation.

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be

issued.

- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

The fight against invasive alien plants is spearheaded by the Working for Water (WfW) programme, launched in 1995 and administered through the DWA. This programme works in partnership with local communities, to whom it provides jobs, and also with Government departments including the Departments of Environmental Affairs and Tourism, Agriculture, and Trade and Industry, provincial departments of agriculture, conservation and environment, research foundations and private companies.

WfW currently runs over 300 projects in all nine of South Africa's provinces. Scientists and field workers use a range of methods to control invasive alien plants. These include:

- Mechanical methods - felling, removing or burning invading alien plants.
- Chemical methods - using environmentally safe herbicides.
- Biological control - using species-specific insects and diseases from the alien plant's country of origin. To date 76 bio-control agents have been released in South Africa against 40 weed species.
- Integrated control - combinations of the above three approaches. Often an integrated approach is required to prevent enormous impacts.

Vehicles often transport many seeds and some may be of invader species, which may become established along the roads through the area, especially where the area is disturbed. The development phase of the development will almost certainly carry the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that invasive alien species such as the seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites.

Continued movement of personnel and vehicles on and off the site, as well as occasional delivery of materials required for maintenance, will result in a risk of importation of alien species throughout the life of the project. The following alien invasives and exotic plant species were recorded on site during the surveys as stipulated in the Alien and Invasive Species Regulations (GNR 599 of 2014) (Table 6):

Table 5. List of exotic plant species of the study area

Species	Category
Caesalpinnia decapetala	1b
Chromolaena odorata	1b
Datura stramonium	1b
Eucalyptus camaldulensis	1b
Greyvillea robusta	3
Jacaranda mimosifolia	1b
Lantana camara	1b
Ligustrum spp.	1b
Melia azedarach	1b
Morus alba	2
Opuntia ficus indica	1b
Paraserianthus lophantha	1b
Psidium guajava	3
Ricinus communis	
Solanum mauritianum	1b
Tecoma stans	1b
Tithonia rotundifolia	1b
Toona ciliata	3
Xanthium strumarium	1b

4.2.7 General

An important aspect relating to the proposed development should be to protect and manage the biodiversity (structure and species composition) of the vegetation types which are represented on the proposed development site. Vegetation removal should be kept to the footprint areas of the proposed development. The unnecessary impact on the surrounding woodland and riparian areas outside the development area should be avoided as far as possible.

4.3 FAUNAL ASSESSMENT

4.3.1 Overview

A healthy environment is inhabited by animals that vary from micro-organisms to the birds and mammals. The species composition and diversity are often parameters taken into consideration when determining the state of the environment. A comprehensive survey of all animals is a time-consuming task that will take a long time and several specialists to conduct. The alternative approach to such a study is to do a desktop study from existing databases

and conduct a site visit to verify the habitat requirements and condition of the habitat. If any rare or endangered species are discovered in the desktop study that will be negatively influenced by the proposed development, specialist surveys will be conducted.

4.3.2 Results of desktop survey and site visits during November 2020

A survey was conducted during November 2020 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid.

The number of mammal species supported by a plant community depends on several factors like the primary production, seasonal availability of resources, floral heterogeneity, diversity of plant structure, nature of the substratum and previous history (Delany, 1982). Each mammal species has a particular niche, which can be regarded as the sum of all ecological requirements of a species namely food, space, shelter and physical conditions. Mills & Hes (1997) stated that the distribution and abundance of animal species does not rigorously follow that of plant communities or biomes. Instead, mammal species seem to have certain preferences for a specific habitat type (Skinner & Smithers, 1990). Several authors have shown this preference of mammals to certain habitats through analysis (Beardall et al. 1984; Ben-Shahar, 1991; Dekker et al. 1996). Two major fauna habitats were observed in the area namely:

- Wetlands / open water habitats;
- Forests / sour bushveld.

As a result of the decline and elimination of various large mammals and the introduction of livestock such as cattle and goats, secondary bush encroachment has replaced much of the original grassland vegetation. At present many rare and endangered mammals are still to be found within the Soutpansberg. Habitat degradation and poaching could have a marked influence on their survival.

The area represents a diverse vegetation structure and height class. A detailed species list for the fauna of the area is included in Appendix C, D and E.

4.3.2.1 Mammal Habitat Assessment and species survey

Background: The Soutpansberg has a remarkable diversity of mammals making up 60% of the total number of species that occur in South Africa. There are more mammal species in the Soutpansberg than in the Cape Floristic Kingdom (127). The whole of the Kruger National Park only contains two more species of mammals than the Soutpansberg. It is particularly rich in bats, carnivores and larger hoofed animals. Six species are listed in the SA Red Data Book on Mammals. Compared internationally, the mammal diversity of the Soutpansberg is impressive. It has more mammal species than 11 of the 27 recognized biodiversity hotspots of the world. For example, there are more mammal species in the Soutpansberg than in places like Central Chile (56) or Madagascar and the Indian Ocean Islands combined (112).

The Soutpansberg has more mammal species per unit area than seven of the eight hottest biodiversity hotspots of the world. The approximately twenty species of mammals that are dependent on or associated with forests probably require the most attention because this biotope has been under a lot of pressure. This includes some musk shrews, several bat species, the thick tailed bush baby, the samango monkey, the giant rat and red duiker. Biotopes that provide surface water and wet or marshy areas also require attention. Some shrews, bats, rodents, Cape clawless otter, and reedbuck are examples. The status of the grey rhebok needs to be determined.

Project area: Large mammals that occurred historically at the site, are absent from the area, owing to anthropogenic impacts in recent centuries. This loss of large species means that the mammal diversity at the site is far from its original natural state not only in terms of species richness but also with regards to functional roles in the ecosystem. The current and historic agricultural lands represent suitable foraging areas for certain rodent species such as African Molerat, Highveld Gerbil and Multimammate Mouse through the tilling opening up the soil surface, making many insects, seeds, bulbs and other food sources are suddenly accessible. Rodents construct burrows in the sandier soils and attract other predators such as the Yellow and Slender Mongoose. Low mammal diversity is expected from the transformed agricultural lands, transformed and degraded grasslands. Species likely to occur include urban exploiters such as Feral Cats, House Rat and House mouse.

Most of the habitat types are fragmented and the modified. Therefore, the expected mammalian richness on these areas is considered low. Antelope species such as duiker will roam freely through the area, although the numbers of this antelope species have declined because of habitat destruction. Smaller mammal species such as the red data samanago monkey, honey badgers and serval can become habituated to anthropogenic influences, while other species such as brown hyena will rather move away from the construction activities and will seldom use the area. Many of the bat species of conservation concern in the project area are cave-dependant for roosting. Any individuals that utilize the area would therefore either be foraging or migrating and would not be affected by the localized loss of habitat due to the development. The dominant species composition therefore comprises of widespread taxa with unspecialised life history traits.

Most mammal species are highly mobile and will move away during development. The impact will also be low if one compares the footprint of the development and the overall range of individual species. It is therefore considered highly unlikely that the species will be affected negatively by the development of the orchards. The connectivity of the project site to the remainder of the larger area is poor due to other orchards and roads. Of significance is the role of the river and riparian zone as zoogeographical dispersal corridor. These riparian zones and rivers are important due to the following for mammals:

- The endemic red duiker has been documented on site as one of the few remaining endemic antelope species in the Soutpansberg region;

- The forest provides foraging grounds for various red data bat species such as the Botswanan Long-eared Bat, Welwitsch's Myotis, Temminck's Myotis and Rusty Pipistrelle.

The use of trapping techniques was not deemed necessary due to the degraded state of the natural environment, although the development of the orchards will have a significant impact on any small mammal species that may occur within the study area.

The mammals are mostly represented by generalised species such as rodents, scrub hares, porcupines, bushpig and smaller antelope (bushbuck, steenbok, common duiker, red duiker) that will move through the area while foraging.

4.3.2.2 Avifaunal Habitat Assessment and species survey

Background: The whole greater Soutpansberg area, has a total indigenous avifauna of ± 510 species. This is 56% of the southern African avifauna and 76% of the South African terrestrial and freshwater avifauna when vagrants and oceanic species are excluded. If only the Soutpansberg mountain range itself is included, then the avifauna totals about 380–400 species.

Birds of prey are especially well represented, with 38 species, as are forest-living species, and species restricted to moist savanna (on SE side of mountain range) and to arid savanna (on NW side of the mountains). Some of the “special” species of the Soutpansberg are Cape Vulture, Crowned Eagle, Forest Buzzard, Bat Hawk, Crested Guineafowl, Blue-spotted Wood Dove, Knysna Turaco, Narina Trogon, African Broadbill, Grey Cuckoo-shrike, African Golden Oriole, Eastern Bearded Robin, Gorgeous Bush Shrike, Black-fronted Bush Shrike, Golden-backed Pytilia, Green Twinspot and Pink-throated Twinspot.

At least 6 Red Data-listed ‘vulnerable’ species occur here, and 11 ‘near-threatened’ species. Although not Red Data-listed, three other rare South African species also occur here — Blue-spotted Dove, Mottled Spinetail, Golden-backed Pytilia—and the Soutpansberg is the stronghold in South Africa for these species.

Project area: Two major bird habitat systems were identified within the borders of the study site, namely forests and open water or wetland habitats. Most bird species identified within the study area are common species known to nest within or utilise these habitats in the region and may be either permanently or occasionally present within the study area. According to Birdlife South Africa, the study area falls outside of any Important Bird Areas (IBA), identified within South Africa (www.birdlife.org.za), although the Soutpansberg IBA forms part of the project area.

The Muirhead dam and wetland area to the south of the proposed development blocks is the only reliable place in South Africa to find Blue-spotted Wood-dove, one of the region’s top 10 birds. Other species found on and around the dam are African Pygmy Goose, Horus Swift, Dark-capped Yellow Warbler, Red-backed Manakins and Lesser Moorhen.

The vegetation in between the drainage channels, orchards and wetlands is semi-deciduous scrub forest which is a low canopy forest with a mix of woodland, riverine and Afro-montane tree species. This is a forest type that has recently spread across Soutpansberg and has unfortunately replaced much of the mixed grasslands that used to cover the mountains 100 years ago. This scrub forest type support bird species such as the Orange Ground Thrush, Black-fronted Bush-Shrike, White-starred Robin, Green Twinspot, Knysna Turaco, Scaly-throated Honeyguide, Yellow-streaked Greenbul, Collared Sunbird and Brown Scrub-Robin, while it is also the most reliable site for African Broadbill. Other species often seen here are Eastern Nicator, Narina Trogon, Gorgeous Bush-Shrike and Red-faced Cisticola.

The region has a long history of agricultural and urban settlement and these areas support a relatively low faunal diversity, with few threatened or sensitive species. However, Savanna and grassland habitats are usually interconnected, allowing easy movement for fauna. The degraded habitat types associated with cultivation and urban areas still provide important feeding grounds to some fauna in the area. The abandoned croplands present in this landscape increase the connectivity by 25%. The old fields occur on small, isolated sections of the project area. Bird species such as crowned plovers, crested and crowned guineafowls, francolin species as well as the birds of prey the smaller bird species attract utilize these areas. Although this microhabitat is in a degraded state, the area is a popular habitat for bird species, especially as foraging area, while species such as crowned plover and other smaller non-passerine birds also breed on the ground in this area.

There is a long list of red data bird species that have a geographical distribution that includes the site. The presence of the habitat of these species is mostly confined to the riparian woodlands, forests and dams in the project area observed on site and in the larger area, although these habitats will not be impacted on by the proposed cropland developments and the probability of finding these species on site are low.

The dense forests and riparian woodland associated with the drainage channels and other smaller tributaries provide the most important habitat to red data and endemic avifauna:

- The riparian woodland provide habitat to red data birds such as the African broadbill, orange ground thrush, halfcollared kingfisher, bat hawk, crowned eagle and the endemic blue-spotted dove;
- The open water habitat associated with the dams in the project area provide habitat to red data birds such as pygmy geese and african finfoot.

4.3.2.3 Reptiles and Amphibians Assessment and species survey

The Soutpansberg has a relatively poor representation of frog species, an attribute shared with the fish. It is possible that the factors pertaining to the fish diversity are also relevant to those of the frogs. The only frog genus that has an endemic representative is *Breviceps*, a fossorial genus that is capable of aestivation. It is also the only group of frogs which do not need water for the development of their offspring making it more tolerable towards the

survival of droughts.

Breeding habitat of frogs and toads can be found in the small pockets of wetlands, dams and indigenous forests of the project site. These areas will not be affected by the development, although peripheral impacts should be avoided. The amphibians appear to be poorly represented on site, although the potential still exist that the red data *Breviceps sylvestris* could occur on site.

B. sylvestris inhabit Forest where they feed on insects, amphipods, isopods and other invertebrates. Major threats to the survival of this species are other agricultural practices (Harrison et al 2000; IUCN 2006; Minter 2004). Although populations existing in artificial habitats such as wooded parks and gardens, it is not known whether these populations are viable in the long term. Males have also been observed calling from the edges of pine plantations adjacent to natural breeding habitat, but they do not appear to move more than a few meters into the plantations and are not known to breed there successfully.

Breviceps sylvestris is the only frog species endemic to Limpopo Province) and is a threatened, red data species currently listed by the IUCN as Near Threatened (IUCN 2018). Accumulations of plant debris and mounds of loose soil produced by harvesting of the timber, grading of access roads, removal of stumps, etc., provide suitable nesting sites for *Breviceps*, and may partly account for the distribution pattern of the males encountered during the survey. The degraded state of the site makes the probability of finding this species on site low, although they will in all probability occur in the forest section to the west of the firebreak and small pockets of forest adjacent to the wetland that feeds the Muirhead Dams.

The Soutpansberg is known for its substantial number of restricted reptile species. Branch (ed.) (1988) considers the Soutpansberg and adjacent regions a sensitive area, having recorded eight restricted taxa of which seven are endemic to the mountain region. Reptile species such as the southern rock python, the black mamba, puff adder, boomslang, vine snake, spotted bush snake and several members of the green snakes (Philothamnus spp.) is expected to occur in the larger area, although the probability of documenting the snakes on site are high due to the connectivity of the site and presence of prey species such as rodents. The presence of these snakes is dependent on the presence of their prey species (rodents, frogs etc.), and therefore snakes might utilize this area from time to time. The general habitat type for reptiles consists of open to very dense bushveld, with limited available habitat for diurnally active and sit-and-wait predators, such as terrestrial skinks and other reptiles. Arboreal species are the more prominent components of the local herpetofauna.

4.3.2.4 Insects and invertebrates

Insects and spiders are very good indicators of the plant diversity and ecological sensitivity of an area. Butterflies can be used in the field as indicators of biodiversity. An insect and spider desktop survey were done in addition to the field observations.

All the potential invertebrate habitats are well represented by a high family richness of insects

and spiders. Spiders occur throughout all the habitats, and both web builders and active hunters find their ways in trapping and actively hunt around for potential food.

4.3.2.5 Red data species

According to the existing databases and field survey the following number of fauna species included in the IUCN red data lists can potentially be found in the study area (Table 6):

Table 6. Red data list of potential fauna for the study area

English Name	Conservation status	Probable habitat in area
MAMMALS		
Red Duiker	Near Threatened (2016)	Dense woodland
Leopard	Vulnerable (2016)	Dense woodland / riverine forest
Makwassie Musk Shrew	Vulnerable (2016)	Rocky habitats
Dark-footed Mouse Shrew	Vulnerable (2016)	Dense woodland / riverine forest
Rusty Pipistrelle	Near Threatened	Dense woodland
BIRDS (SABAP 2 LIST SPECIES)		
Bateleur	Endangered	Open woodland
Broadbill, African	Vulnerable	Riverine forest
Bustard, Black-bellied	Near threatened	Open woodland / grasslands
Eagle, Crowned	Vulnerable	Riverine forest
Eagle, Tawny	Endangered	Open woodland / grasslands
Falcon, Lanner	Vulnerable	Open woodland / grasslands
Finfoot, African	Vulnerable	Open water in riverine forest
Goose, African Pygmy	Vulnerable	Open water / dams
Hawk, Bat	Endangered	Woodlands
Kingfisher, Half-collared	Near threatened	Riverine forest / dams
Roller, European	Near threatened	Woodlands
Stork, Abdim's	Near threatened	Open woodland / grasslands
Stork, Black	Vulnerable	Open water / dams
Thrush, Orange Ground	Near threatened	Riverine forest
HERPETOFAUNA		
Transvaal Rain Frog	Near Threatened	Riverine forest
Nile Crocodile	Vulnerable (SARCA 2014)	Dams

The cumulative negative impacts of the proposed developments on the fauna of the area will be Moderate. Recommendations and mitigating measures need to be implemented to ensure the survival of these species other fauna habitats and feeding grounds as stipulated below:

- Some of the red data and other mammal species have a low probability of occurring in the area because of the following:
    - The anthropogenic influences of crop cultivation occurring in the surrounding area will cause some fauna to migrate from the area to more natural areas with less disturbance;

- The degraded and modified state of the lower shrub stratum of the woodlands and the secondary old fields is not suitable habitat for red data fauna species, and will only support general fauna such as birds, small antelopes and rodent species;
- Habitat not being suitable or marginal.

- If one considers the habitat descriptions of the red data species, some of them are limited in range or threatened as a direct result of habitat loss in the southern African subregion (e.g. red duiker), although many of the species in the table above are not limited by direct habitat loss due to their widespread occurrence (e.g. eagle species have large home ranges).
- The area in general is quite homogenous and therefore has a low potential for biodiversity considering the surrounding vegetation types, as well as the degraded areas.
- Development also will not influence the natural feeding and movement patterns of the existing fauna in the area considering that sensitive habitats will be avoided and buffered to prevent impacts. Peripheral impacts on the larger area should be avoided. The protection of different habitat types such as the riparian woodland in the area will be important to ensure the survival of the different animals due to each species' individual needs and requirements. Sufficient natural corridor sections should be protected around the proposed development footprints to allow fauna to move freely between the different vegetation units on the property. The conservation of the pristine forests, wetlands and riparian woodland would allow the species and their habitats to be preserved.

4.3.3 EIA screening tool listed species

Table 7 indicate the listed species for the project area according to the EIA screening tool:

Table 7 Listed fauna species for the project area according to the EIA screening tool, status and habitat

Species	Status	Habitat
*Smithornis capensis (*African broadbill)	Vulnerable	Forests / riparian woodland / semi-deciduous woodland
Nettapus auratus (African pygmy goose)	Vulnerable	Dams / wetlands
Ciconia nigra (Black stork)	Vulnerable	Forests / wetlands
*Crocidura maquasiensis (*Makwassie Musk Shrew)	Vulnerable	Wetlands / montane grassland
Cercopithecus albogularis schwarzi (Samago monkey)	Endangered	Forests / plantations / croplands
*Dasymus robertsi (*African Marsh Rat)	Vulnerable	Riparian woodland and open water (reedbeds) – Sand River only habitat in the area
Anthene minima minima (little hairtail butterfly)	Rare	Microphyllous woodland
*Thoradiscus viridicrus (*Green-kneed Seedpod Shieldback*)*	Vulnerable	Mostly confined to escarpment areas

4.3.3.1 African broadbill:

The African Broadbill population distribution in South Africa is highly fragmented with scattered populations in north-eastern Limpopo, Swaziland and north-eastern KwaZulu-Natal, and southwards to the Port Shepstone region in southern KwaZulu-Natal (Allan 2000). In Limpopo, Tarboton, Kemp and Kemp (1987) mentioned two records from Venda: one from Thate Vondo Forest and another from the Mutshindudu River Valley, but there are no recent records from these localities. The species was not recorded in Limpopo during SABAP1 and this sub-population was only 'rediscovered' in 1999, near Luvhuvu (Symes and Perrin 2000). The Limpopo sub-population appears to be restricted to the Luvhuvu River catchment and is known from Roodewal, Entabeni, Luvhuvu and Golwe. The status of the global population is unknown. A comparison of SABAP1 and SABAP2 reporting rates shows that during SABAP2 data gathering, the species was not reported from 16 of the quarter-degree grid cells in which it was recorded in SABAP1, and there is a higher reporting rate in SABAP1 compared to SABAP2 in five quarter-degree grid cells. Conversely, African Broadbills were recorded in nine quarter-degree grid cells in SABAP2, from which it was not reported during SABAP1. Three of these are from the population in north-eastern Limpopo. The major threat is habitat destruction through rural and urban expansion and agriculture. This has led to the disappearance of the nominate race from much of its former range in KwaZulu-Natal. Locally, commercial and subsistence deforestation cause habitat destruction. At Golwe, in north-eastern Limpopo, breeding success is poor (Engelbrecht and Nethonzhe 2008) and vervet monkeys *Chlorocebus pygerythru*s attracted to the edges of villages are responsible for the loss of many nests (GD Engelbrecht and C Nethonzhe, unpubl. data). The following actions are needed for future conservation of the species:

- A fine scale survey of the distribution of this bird species in the Soutpansberg (this to be done in such a way that it will provide a "baseline" against which future changes in the status of the area's bird species can be measured by repeating these surveys in all or parts of the range),
- Retrospective analyses of any regularly recorded areas to see if any trends in reporting frequency can be determined as an indicator of population changes in the native bird species in the Soutpansberg,
- Continuation of the monitoring of the breeding populations and nesting success of the species.

Probability of occurrence on site: Moderate due to the presence of low scrub and deciduous woodland as well as pristine forests;

Probability of impact during vegetation clearance: Moderate, although the conservation of the pristine forests adjacent to the firebreak and the riparian woodland will make the probability of impact moderate to low.

4.3.3.2 African pygmy goose:

The African pygmy goose is known to be nomadic. It can be found across a wide area of sub-Saharan Africa and Madagascar. It lives in habitats of slow flowing or stagnant water with a cover of water lilies (mostly inland wetlands, but also open swamps, farm dens, river pools, and estuaries). The African pygmy goose feeds mainly on the seeds of water lilies (*Nymphaea spp*.) but also on other floating seeds and small insects as well as other small invertebrates. They live in strong pair bonds that may last over several seasons and their breeding is triggered by rains.

A confirmed population of pygmy geese occur at the Muirhead Dams and wetlands that forms part of the project area.

Probability of occurrence on site: Confirmed for the dams and wetlands on site;

Probability of impact during vegetation clearance: Low, although the conservation of the dams and wetlands needs to be prioritized.

4.3.3.3 Black stork

The Black Stork is above all a forest species. They settle in old quiet forests where the nest is placed on a big tree, often near an open space (slopes, clear forests), which allows them an easy access. Their hunting field consists of streams and small rivers, of marshy ponds and of meadows with low vegetation. Couples are always several kilometers apart from one another.

Probability of occurrence on site: Moderate due to the presence of forests and wetlands on site;

Probability of impact during vegetation clearance: Moderate, although the conservation of the pristine forests adjacent to the firebreak, the wetlands and dams will make the probability of impact low.

4.3.3.4 Makwassie musk shrew:

This is a rare species endemic to South Africa, Swaziland and Zimbabwe, existing in moist grassland habitats in the Savannah and Grassland biomes. Although it has a wide inferred extent of occurrence (284,735 km^2), it appears to be patchily distributed. The habitat patches are severely fragmented as shrews have a poor dispersal ability, and continuing rates of urban and rural expansion (highest rates are 15% and 9%, respectively, in Limpopo Province) may have increased overgrazing and water abstraction, which may reduce the suitability of patches and the corridors between them. Similarly, we infer a continuing population decline based on high rates of habitat loss in all provinces, especially KwaZulu-Natal and North West (1.2% per year from 1994– 2011 and 0.5% per annum from 2006–2010, respectively

Key interventions include protected area expansion of moist grassland and riverine woodland habitats, as well as providing incentives for landowners to sustain natural vegetation around

wetlands and keep livestock or wildlife at ecological carrying capacity.

Little is known about the habitats and ecology of this species. Specimens have been found on rocky or montane grassland, such as recently in the Soutpansberg Mountains (Taylor et al. 2015). The main threats to shrews are the loss or degradation of moist, productive areas such as wetlands and rank grasslands within suitable habitat. The two main drivers behind this are abstraction of surface water and draining of wetlands through industrial and residential expansion, and overgrazing of moist grasslands, which leads to the loss of ground cover and decreases small mammal diversity and abundance (Bowland & Perrin 1989, 1993). Suppression of natural ecosystem processes, such as fire, can also lead to habitat degradation through bush encroachment or loss of plant diversity through alien invasive infestation, and is suspected to be increasing with human settlement expansion. There are also clear overlaps and synergistic effects between these threats.

Management of the species:

- Landowners and communities should be incentivised to stock livestock or wildlife at ecological carrying capacity and to maintain a buffer of natural vegetation around wetlands;
- Enforce regulations on developments that potentially impact on the habitat integrity of grasslands and wetlands
- Additional field surveys are needed to clarify and confirm the distribution of this species in the larger Soutpansberg area.

Probability of occurrence on site: Moderate to low due to the presence of wetlands in the area, although the Soutpansberg subpopulation occur in Montane Grasslands that do not occur on site;

Probability of impact during vegetation clearance: Low, due to the areas planned for clearance not representing optimal habitats. Impacts on wetlands should be minimized.

4.3.3.5 African Marsh Rat:

The African marsh rat have been recorded from a wide variety of habitats, including forest and savannah, swampland and grasslands, but they rely on intact wetlands in these areas. They have not been recorded from agricultural landscapes or dam areas, and considering this aspect the probability of finding this species on the proposed development footprint areas is considered very low, although it might occur in the reedbeds of the Sand River system. They occur specifically in reedbeds and among semi-aquatic grasses in wetlands or swampy areas or along rivers and streams, as well as in grassy areas close to water wherein they co-occur with *Otomys spp*. (Skinner & Chimimba 2005).

Probability of occurrence on site: Moderate to low due to the presence of wetlands in the area although population was not confirmed;

Probability of impact during vegetation clearance: Low, due to the areas planned for clearance not representing ptimal habitats. Impacts on wetlands should be minimized.

4.3.3.6 Samango monkey

Samango Monkeys are primarily arboreal, utilising the canopy of evergreen forests, and their present distribution is indicative of very broad forest habitat tolerances (Lawes 1990). Within the assessment region, Samango Monkeys are associated with high-canopy, evergreen forests and are South Africa's only forest dwelling guenon. They inhabit a variety of indigenous forest types namely Afromontane Forests (including Mistbelt Forests), Coastal Forests (including Dune Forests), Scarp Forests as well as Riverine Forests (forest types follow von Maltitz et al. 2003). All three subspecies have been observed in human-modified habitat, including pine plantations, residential gardens and campsites (Lawes 1991; Chapman et al. 1998; B. Linden and K. Wimberger unpubl. data), but more research needs to be conducted to confirm that the species can use modified landscapes to disperse between forest patches. Meanwhile at a site with relatively high density of natural predators, *C. a. schwarzi* seemed to view humans as "shields" against terrestrial predators (for example, Leopards (*Panthera pardus*)), whereby they exploited experimental food patches at typically high-risk strata (ground level) more intensively in the presence of researchers (Nowak et al. 2014). Being arboreal monkeys, the density of food remaining in an experimental patch when a forager leaves was greatest at ground level relative to higher tree canopy levels, highlighting a strong vertical axis of fear (Emerson et al. 2011; Nowak et al. 2014). density estimates become available for the various forest types within the subspecies' ranges, especially for the largest forest patches, and when current occupancy of forest patches is more comprehensively mapped. Small forests are generally unable to support a troop of Samango Monkeys; thus, they are generally absent from forests smaller than 1.5 km² (Swart et al. 1993; Lawes 2002). Although it may be simplistic to define a subpopulation as a forest patch, Samango Monkeys are poor dispersers, in comparison to other forest-dwelling mammals, such as Blue Duiker, *Philantomba monticola* and Southern Tree Hyrax, *Dendrohyrax arboreus*, and are reluctant to disperse over open ground (Lawes et al. 2000). As such, most forest patches where they occur can be considered isolated or semi-isolated subpopulations.

Swart et al. (1993) found that if the density of this species falls below 30–40 individuals / km^2 they are at risk of local extinctions within 50 years as they are unable to withstand a further 30–35% reduction in size. Current population trend: Decreasing. We infer that the population is declining within the assessment region, due to ongoing loss and degradation of forests.

Continuing decline in mature individuals: Possibly, due to ongoing snaring for human consumption or indigenous medicine (muthi) trade, road collisions, electrocutions and killing by domestic dogs.

During periods of low fruit availability, other plant parts such as flowers and leaves/buds were

eaten (Linden et al. 2015; K. Wimberger unpubl. data). Using artificial food patch experiments, a population of *C. a. schwarzi* were shown to prefer high-energy foods (peanuts) and were the least likely to choose animal protein (cat food, Emerson & Brown 2012). Similarly, in a group of *C. a. schwarzi* one food item, namely figs, accounted for 26% of feeding time, indicating that Ficus spp. are perhaps a key resource for this subspecies (Linden et al. 2015).

Samango Monkeys typically live in large (up to 45 individuals) multi-female, single-male troops (Skinner & Chimimba 2005). The largest group size of *C. a. schwarzi* observed in the Soutpansberg comprises over 60 individuals (B. Linden pers. obs. 2012).

Recent research reveals the importance of Samango Monkeys in dispersing the seeds of fruit trees (for example, 52% of fruiting species eaten by C. a. schwarzi), especially those occurring in high-canopy forests (Linden et al. 2015). They may be particularly important dispersers for fig trees where these occur in their habitat (Linden et al. 2015). Samango Monkeys can be considered a flagship species for South African forests and they are often a tourist attraction with popular articles on forests, which describe hiking trails and other tourism activities, seldom failing to mention Samangos.

Probability of occurrence on site: Moderate due to the presence of forests on site;

Probability of impact during vegetation clearance: Moderate, although the conservation of the pristine forests and riparian woodland with fruit trees adjacent to the firebreak, will make the probability of impact low.

4.3.3.7 Little hairtail butterfly

In South Africa the taxon appears to be restricted to *Vachellia* savanna, which would appear to be the case also in neighbouring countries. Considering that none of the *Vachellia* savanna types occur on site, the probability of finding the species is considered very low. No sign of the species was documented during the surveys.

4.3.3.8 Green-kneed Seedpod Shieldback:

Considering the distribution map below it would appear as though this species prefer mountainous habitat associated with the Soutpanesberg and escarpment, although the species might forage into the project area occasionally. The agricultural habitat is however not considered as optimal. No signs of any individuals were confirmed for the project area.

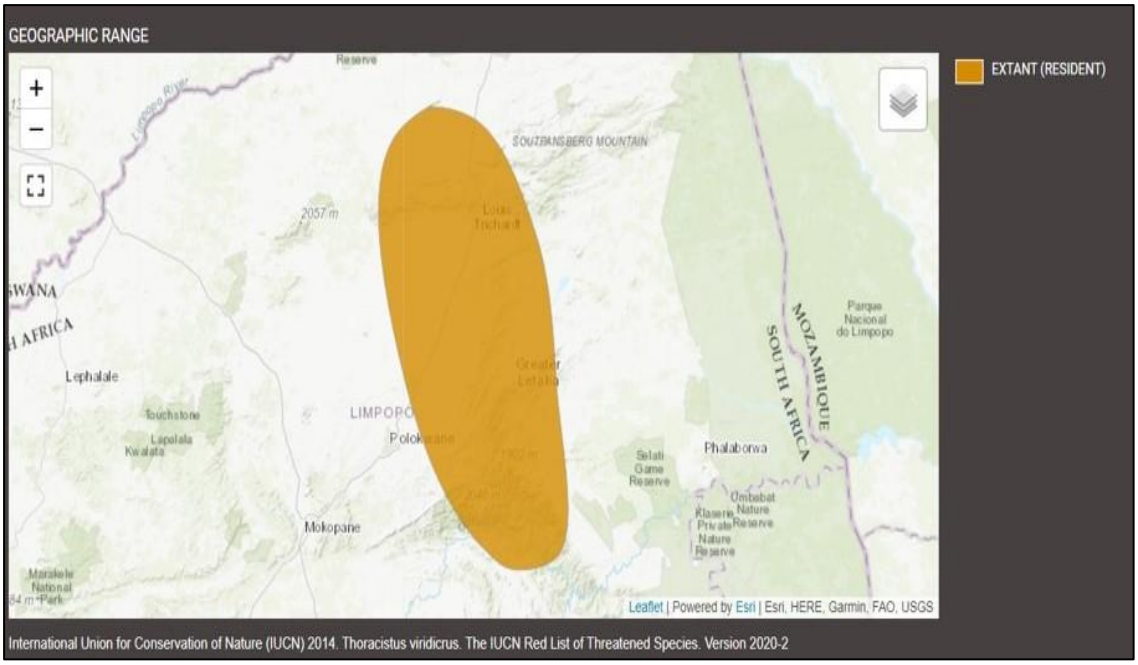

Figure 5. Distribution map of *Thoracistus viridicrus* (Green-kneed Seedpod Shieldback)

Probability of occurrence on site: Moderate due to the presence of mountainous areas;

Probability of impact during vegetation clearance: Low, due to the clearance areas not representing optimal habitats.

5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ON THE FLORA

The impact of the proposed clearance of the area for the proposed orchards will be on areas that vary from degraded (old fields) to pristine. The following section deals with the impacts and specific mitigation measures needed for the proposed developments from a biodiversity point of view. The impacts described below focused on the fauna and flora of the area.

5.1 DIRECT HABITAT DESTRUCTION

5.1.1 Description of impact:

The proposed orchards will result in loss of and damage to natural habitats. Rehabilitation of some of these areas would be possible but there is likely to be long-term damage in large areas. The impacts for the orchards footprint areas are permanent, although some rehabilitation would be possible alongside the impacted areas. Impacts are divided into impacts that occurred on the fauna and impacts on the flora as indicated below.

Most habitat destruction will be caused during the clearance of vegetation for the orchards. Vegetation communities are likely to be impacted on a small spatial scale in comparison to the extent of the vegetation communities' total area in the region.

The impact of the habitat destruction will be on the flora and fauna of the study area in the following ways:

- The construction will lead to the loss of individual plants such as grasses, forbs, trees and shrubs that will be cleared on the footprint area. This will mostly occur during the construction phase;
- Loss of threatened, near-threatened and endemic taxa: The anticipated loss of some of the natural habitats that support endemic species will result in the local displacement of endemic listed flora;
- Due to habitat loss and construction activities animals will migrate from the construction area and animal numbers will decrease;
- Loss of threatened, "near-threatened" and conservation important taxa: The anticipated loss of the natural woodland will result in the local displacement of some fauna species. In some cases, isolated populations of threatened fauna might be removed from the area, although no such populations or knowledge thereof was found in the study area. This impact could also take place because of hunting and snaring of animals in natural areas.
- Changes in the community structure: It is expected that the faunal species composition will shift, due to an anticipated loss in habitat surface area. In addition, it is predicted that more generalist species (and a loss of functional guilds) will

dominate the study area. Attempts to rehabilitate will attract taxa with unspecialised and generalist life-histories. It is predicted that such taxa will persist for many years before conditions become suitable for succession to progress.

5.1.2 Mitigation measures:

- The removal of plant species should only occur on the footprint area of the development and not over the larger area;
- Conduct flora species search and rescue efforts before ground clearing begins to reduce negative impacts on species of concern;
- Remove and relocate any plants of botanical or ecological significance as indicated by the ecologist or Environmental Control Officer (ECO);
- Vegetation to be removed as it becomes necessary;
- Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area;
- Monitoring should be implemented during the construction phase of the development to ensure that minimal impact is caused to the flora of the area;
- The ECO should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ECO should enforce any measures that he/she deem necessary. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation;
- Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications;
- Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during pipeline construction;
- Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors (refer to Appendix C) occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.
- A monitoring programme should be implemented to ensure the rehabilitation of areas is done sufficiently;
- All construction and maintenance activities should be conducted in such a way that minimal damage is caused to the drainage features on site. No development can be done within the floodline zone or within 500 meters of a wetland, or within 100 meters of a river, without a Water Use Licence.

5.2 HABITAT FRAGMENTATION

5.2.1 Description of impact:

The construction of the orchards will inevitably result in natural movement patterns being disrupted and, to a varying degree depending on how different species react to these barriers will result in the fragmentation of natural populations. The development will have a moderate impact in fragmenting the habitats on the property.

5.2.2 Mitigation measures:

- The conservation of corridors such as pristine forests, wetlands and riparian woodland that support red listed fauna habitats should be prioritized;
- All possible efforts must be made to ensure as little disturbance as possible to the sensitive habitats such as drainage channels during construction;
- Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place;
- Construction activities must remain within defined construction areas and the road servitudes. No construction / disturbance will occur outside these areas.

5.3 INCREASED SOIL EROSION AND SEDIMENTATION

5.3.1 Description of impact:

The construction activities associated with the developments may result in widespread soil disturbance and is usually associated with accelerated soil erosion. Soil, sediments and associated contaminants are transported into water bodies such as rivers and streams, resulting in the loss or alteration of habitats for aquatic organisms, as well as changes in water quality. Soil erosion also promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous flora.

5.3.2 Mitigation measures:

The following mitigation measures should be implemented to prevent erosion along sensitive soils, wetlands and drainage channels during the construction and operational phase of the orchards:

- Erosion and stormwater control should be addressed by a hydrological engineer in a detailed stormwater management plan;
- Cover disturbed soils as completely as possible, using vegetation or other materials;
- Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices.
- Protect sloping areas that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction

camp and Work Areas;

- Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth;
- Gravel roads must be well drained to limit soil erosion;
- Minimize clearance of vegetation. Retain natural trees, shrubbery, and grass species wherever possible.

5.4 SOIL AND WATER POLLUTION

5.4.1 Description of impact:

Construction work for the proposed orchards will always carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. The pollution could have a detrimental impact locally on plant communities or specific species or populations. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or ground water, leading to potential medium/long-term impacts on flora. During the constructional phase heavy machinery and vehicles as well as sewage and domestic waste from workers would be the main contributors to potential pollution problems.

Stream diversions could alter the characteristics of the drainage features. It could also increase the run-off during rain events.

5.4.2 Mitigation measures:

- Appropriate sanitary facilities must be provided during construction and all waste removed to an appropriate waste facility.
- Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously;
- Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off;
- Spill kits should be on-hand to deal with spills immediately;
- All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.

5.5 HABITAT DEGRADATION DUE TO DUST

5.5.1 Description of impact:

The environmental impacts of wind-borne dust, gases and particulates from the construction activities associated with the proposed development will have an impact on the vegetation of the area when

dust settles on plant material reducing the amount of light reaching the chlorophyll in the leaves, thereby reducing photosynthesis, which in turn reduces plant productivity, growth and recruitment. The following activities will typically cause air pollution:

- Land clearing operations and scraping;
- Materials handling operations (truck loading & unloading, tipping, stockpiling);
- Vehicle entrainment on paved and unpaved roads;
- Windblown dust-fugitive emissions (stockpiles).

One of the primary impacts associated with development activities on the biophysical environment is linked to emission of dusts and fumes from the transportation system. Dust pollution will impact the most severe during the construction phase on the flora of the surrounding areas. Construction vehicles and equipment are the major contributors to the impact on air quality. Dust is generated during site clearance for the construction of infrastructure. Diesel exhaust gasses and other hydrocarbon emissions all add to the deterioration in air quality during this phase. Vehicles travelling at high speeds on dirt roads significantly aggravate the problem.

Dust deposited on the ground may cause changes in soil chemistry (chemical effects) and may over the long-term result in changes in plant chemistry, species composition and community structure. Sensitivities to dust deposition of the various plant species present in the area are not known. It is therefore difficult to predict which species may be susceptible. Dust in the area will be greatly increased in the dry season due to the nature of the soil in the area.

Poor air quality results in deterioration of visibility and aesthetic landscape quality of the region, particularly in winter due to atmospheric inversions.

5.5.2 Mitigation measures:

- Implement standard dust control measures on access roads to the construction sites of the orchards, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) and chemical dust suppressants of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation;
- Soil dumps may be covered if necessary;
- A speed limit should be enforced on dirt roads (preferably 40km/h) during vegetation clearance and orchards establishment.

5.6 SPREAD AND ESTABLISHMENT OF ALIEN INVASIVE SPECIES

5.6.1 Description of impact:

The development of the proposed orchards almost certainly carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the

greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites.

Continued movement of personnel and vehicles on and off the site, as well as occasional delivery of materials required for maintenance, will result in a risk of importation of alien species throughout the life of the project.

5.6.2 Mitigation measures:

- Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA or in terms of Working for Water guidelines. The control of these species should even begin prior to the construction phase considering that small populations of these species was observed during the field surveys;
- Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Alien invasive tree species listed by the CARA regulations should be eradicated;
- Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish;
- A plan should be developed for control of noxious weeds and invasive plants that could occur because of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the way weeds spread, and methods for treating infestations. Require the use of certified weed-free mulching. Prohibit the use of fill materials from areas with known invasive vegetation problems. The spread of invasive nonnative plants should be avoided by keeping vehicles and equipment clean and reseeding disturbed areas with native plants;
- Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme should be implemented to ensure that the species' do not spread to surrounding natural ecosystems.

5.7 NEGATIVE EFFECT OF HUMAN ACTIVITIES

5.7.1 Description of impact:

An increase in human activity on the site and surrounding areas is anticipated. The risk of wood harvesting, poaching and fires is increased which could have a definite impact on the flora and fauna of the larger area. If staff compounds are erected for workers, the risk of

pollution because of litter and inadequate sanitation and the introduction of invasive flora are increased. The presence of many regular workers during the construction phase on site over a protracted period will result in a greatly increased risk of uncontrolled fires arising from cooking fires, improperly disposed cigarettes etc.

5.7.2 Mitigation measures:

- Staff should not be accommodated on site. No temporary accommodation must be erected on the site. Adequate rubbish bins and sanitation facilities should be provided to construction workers;
- The ECO should regularly inspect the site, including storage facilities and compounds. A monitoring programme should also be implemented around these areas to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds;
- Maintain proper firebreaks around entire development footprint.
- Educate construction workers regarding fire risks and the occurrence of important resources in the area and the importance of protection;
- Construction activities must remain within defined construction areas and the road servitudes. No construction / disturbance will occur outside these areas.
- Construction activities must be restricted to working hours Monday to Saturday, unless otherwise approved by the appropriate competent person in consultation with the affected residents.
- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g. courtship, nesting) seasons. In addition, control pets to avoid harassment and disturbance of wildlife.
- Campfires at construction sites must be strictly controlled to ensure that no veld fires are caused.

5.8 ROAD MORTALITY

5.8.1 Description of impact:

Large numbers of fauna are killed daily on roads. They are either being crushed under the tyres of vehicles in the case of crawling species, or by colliding with the vehicle itself in the case of avifauna or flying invertebrates. The impact is intensified at night, especially for flying insects, as result of their attraction to the lights of vehicles.

5.8.2 Mitigation measures:

- More fauna is normally killed the faster vehicles travel. A speed limit should be enforced (speed on site max 30 km/hour; Outside of the site 60 km/h. In Rain max 20 km/h). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their

negative consequences).

- Travelling at night should be avoided or limited as much as possible. No travelling at night should be allowed without approval by site manager.

5.9 IMPACT ASSESSMENT MATRIX

Table 8 indicate the impacts described above and specific ratings of significance the impact will potentially have on the major ecosystems during the proposed development activities:

Table 8. Impact assessment Matrix for the proposed development

Nr	Activity	Impact	P	D	S	M	Significance anticipated before construction without any management measures		Mitigation Measures	P	D	S	M	Significance assessed after construction if monitoring and rehabilitation are implemented	
Pre-Construction and Construction Phase									**Pre-Construction and Construction Phase**						
1	Clearing of vegetation for cropland areas, access roads etc.	Habitat destruction	5	5	1	8	70	High	See section 5.1.2	5	5	1	6	60	Moderate
2	Clearing of vegetation for cropland areas, construction of infrastructure, access roads etc.		5	5	1	8	70	High	See section 5.2.2	5	5	1	6	60	Moderate
3	Exposure of soils to rainfall and wind during construction	Soil erosion	4	4	2	8	56	Moderate	See section 5.3.2	4	3	1	6	40	Low
4	Spillages from vehciles during construction	Spillages of harmful substances	2	4	2	6	24	Low	See section 5.4.2	2	3	1	2	12	Negligible
5	Exposure of soils to rainfall and wind during construction and rehabilitation	Dust contamination	5	4	3	8	75	High	See section 5.5.2	5	3	2	2	45	Moderate
6	Continued movement of personnel and vehicles on and off the site during the construction phase, as well as occasional delivery of materials required for maintenance	Spread of alien invasive species	4	4	3	6	52	Moderate	See section 5.6.2	4	3	2	2	36	Low
7 / 8	Construction of infrastructure, access roads etc.	Negative effect of human activities on flora / road mortailities of fauna	4	3	2	6	44	Moderate	See section 5.7.2 & 5.8.2	4	3	2	2	28	Low

6 SENSITIVITY ANALYSIS AND CONSERVATION ANALYSIS TOOLS

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects and will form an important part of the sensitivity analysis. Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed and have a high sensitivity as they are necessary for overall functioning. In addition, sensitivity analysis in the field based in much finer scale data can be used to ground truth the larger scale assessments and put it into a more localised context.

6.1 CRITICAL BIODIVERSITY & ECOLOGICAL SUPPORT AREAS OF THE PROJECT AREA

The purpose of the Limpopo Conservation Plan version 2 (LCPv2) is to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas (CBA) and associated land-use guidelines).

The Limpopo Conservation Plan categories for the developments are presented in Figure 5. The following can be concluded regarding developments:

- The proposed cropland footprints are in CBA1 areas, although only one of these areas were confirmed as CBA1 during the ecological surveys namely the Firebreak Block. The other blocks should classify as ESA2 zones or Other Natural Areas based on the state of the vegetation. The management objective for this area is to maintain ecosystem functionality and connectivity allowing for limited loss of biodiversity pattern.
- Areas associated with drainage channels and riparian woodland should be classified as ESAs, while the wetland areas and dams should be classified as CBA2.

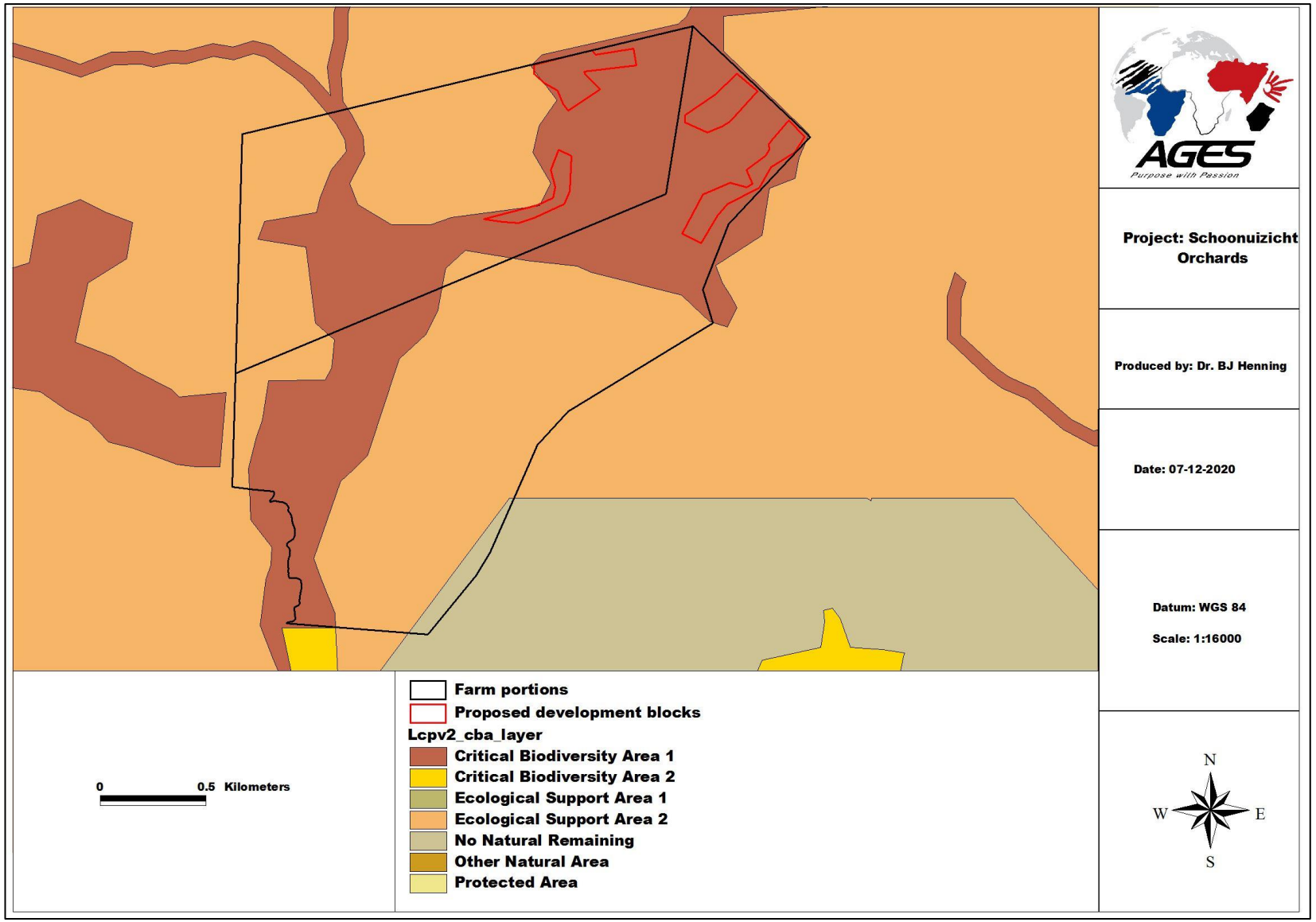

Figure 6. Limpopo C-Plan Map for the project area

6.2 PROTECTED AREAS NETWORK AND NATIONAL PROTECTED AREAS EXPANSION STRATEGY (NPAES)

Officially protected areas, either provincially or nationally that occur close to a project site could have consequences as far as impacts on these areas are concerned. For the proposed development site and associated infrastructure however, two small Únknown" protected areas occur to the east of the proposed orchards sites (Figure 7).

The NPAES are areas designated for future incorporation into existing protected areas (both National and informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning. The project area is not linked to any NPAES.

Figure 7. Location of the project area in relation to listed protected areas

6.3 IMPORTANT BIRD AREAS

An Important Bird Area (IBA) is an area recognized as being globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide. At present, South Africa has 124 IBA's, covering over 14 million hectares of habitat for our threatened, endemic and congregatory birds. Yet only approximately 40% of the total land surface covered by our IBA's are legally protected. The BirdLife SA IBA programme continues a programme of stewardship which will ultimately achieve formal protection (Birdlife, 2013). The project area forms part of the Soutpansberg (Figure 8).

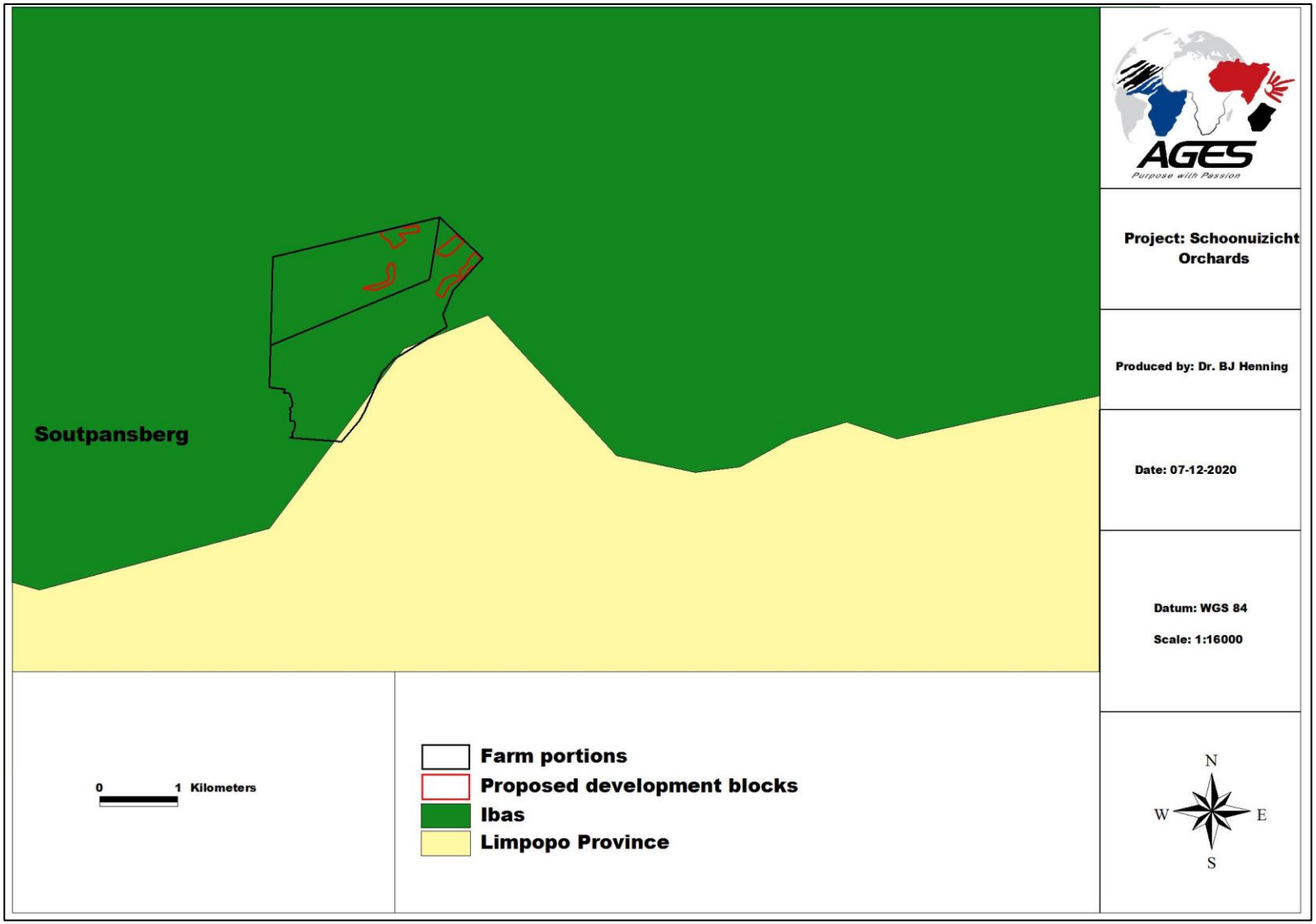

Figure 8. IBAs near the project area (Birdlife SA)

6.4 NATIONALLY THREATENED ECOSYSTEMS

The list of national Threatened Ecosystems has been gazetted (NEM:BA: National list of ecosystems that are threatened and in need of protection) and result in several implications in terms of development within these areas. Four basic principles were established for the identification of threatened ecosystems. These include:

- The approach must be explicit and repeatable;
- The approach must be target driven and systematic, especially for threatened ecosystems;
- The approach must follow the same logic as the IUCN approach to listing threatened species, whereby a few criteria are developed, and an ecosystem is listed based on its highest-ranking criterion; and
- The identification of ecosystems to be listed must be based on scientifically credible, practical and simple criteria, which must translate into spatially explicit identification of ecosystems.

Areas were delineated based on as fine a scale as possible and are defined by one of several assessments: These areas are essential for conservation of the country's ecosystems as well as meeting conservation targets. The proposed development footprint is located directly east and north of the Listed Threatened Ecosystem, the Tzaneen Sour Lowveld (Figure 9).

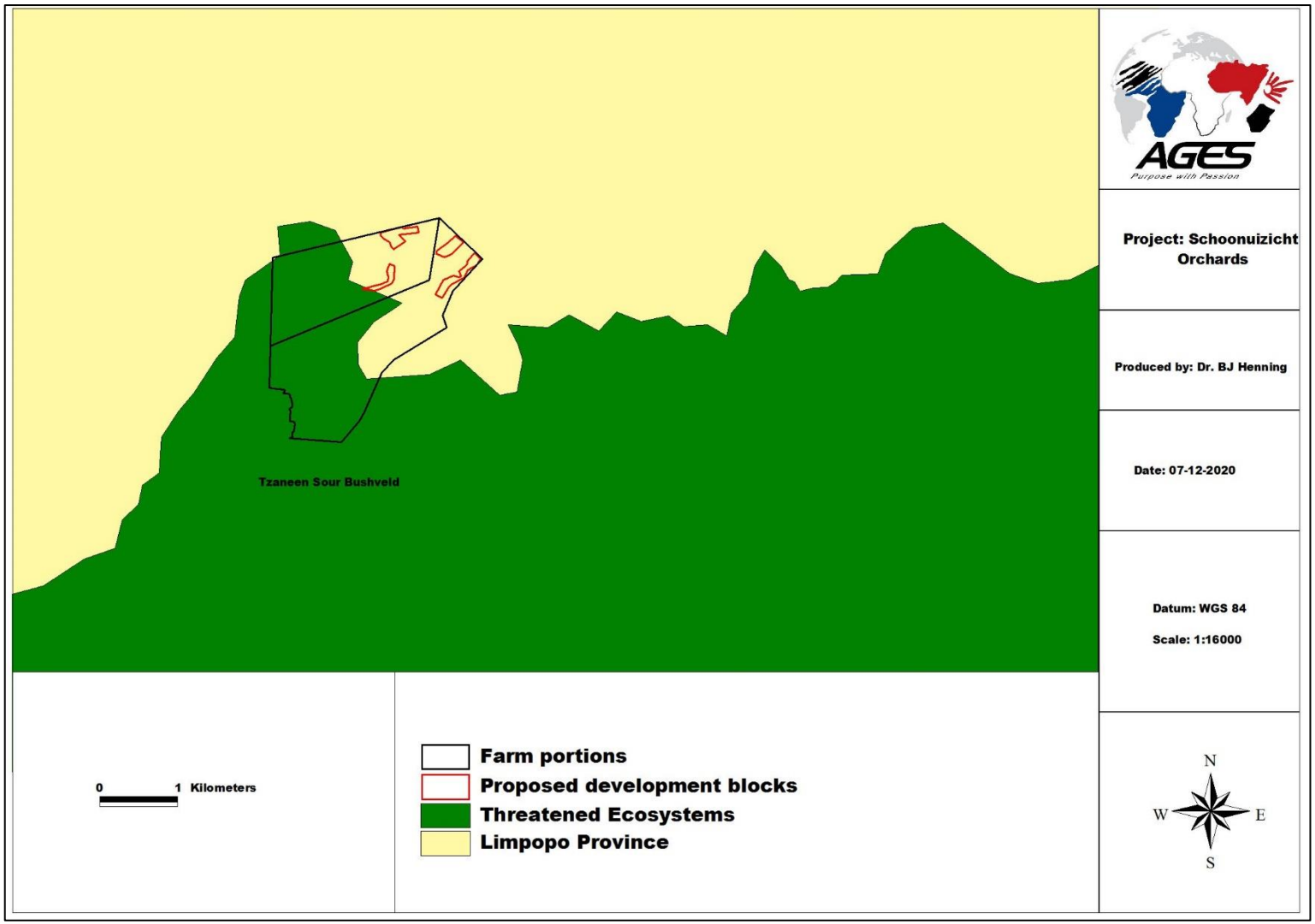

Figure 9. Map indicating location of listed threatened ecosystem in relation to the project area

6.5 ECOLOGICAL SENSITIVITY CLASSES

Following the ecological surveys, the classification of the study area into different sensitivity classes and development zones was based on information collected at various levels on different environmental characteristics. Factors which determined sensitivity classes were as follows:

- Presence, density and potential impact of development on rare, endemic and protected plant species;
- Conservation status of vegetation units;
- Soil types, soil depth and soil clay content;
- Previous land-use;
- State of the vegetation in general as indicated by indicator species.

Below included is the sensitivity map for the proposed orchards development, (Figure 10). Only criteria applicable to the specific vegetation units were used to determine the sensitivity of the specific unit.

Based on the analysis the following can be concluded:

- The firebreak block and a section of Block 13 needs to be preserved to prevent impacts on nieghbouring wetlands and conserve important corridors;
- The degraded forest patches can be developed with mitigation.

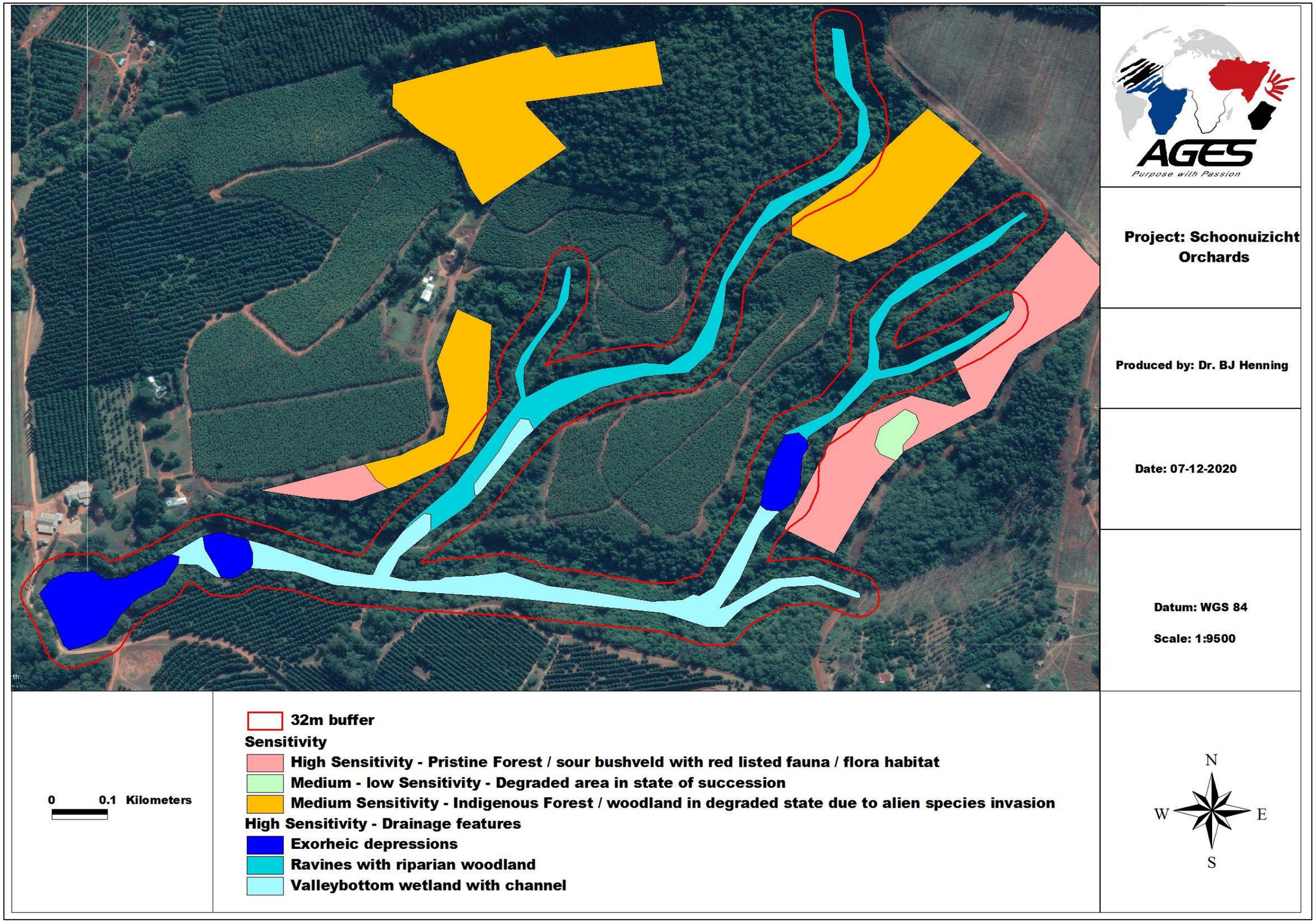

Figure 10. Sensitivity Map of the project area

7 DISCUSSION

Following the investigation and potential ecological impact of the proposed orchards on different portions of the farm Schoonuitzicht on the fauna and flora vegetation of the area, some conclusions can be made:

All aspects of the environment, especially living organisms, are vulnerable to disturbance of their habitat. The proposed development activities will modify the vegetation and faunal habitats of the development site to a certain extent varying according to the habitats on the site, although in general the vegetation on site where the development footprint is planned are classified as pristine to slightly degraded.

Most sensitive sections: It is evident from the distribution of biodiversity, presence of threatened species and sites of scientific interest, that the proposed development has the potential for negative impact on the flora and faunal of the study area. This is particularly true of the sensitive vegetation associated with the pristine forests, wetlands and riverine ecosystems in the project area.

Most sensitive habitats: Many threatened species are forests and wetland specialists (e.g. Samango monkeys, marsh and musk shrews, avifauna), linked to these habitats either for breeding, feeding or shelter. Major impacts on wetland, riverine and pristine forests areas (firebreak block) should be avoided wherever possible during construction. Where unavoidable impacts will occur, strict mitigation measures and legislation should be implemented (IWUL application etc.).

Monitoring of threatened species: Many endemic and protected species have been recorded in the Soutpansberg region. The EMP for the development should highlight the conservation status of these species and note that steps must be undertaken in conjunction with conservation authorities to protect or translocate any populations encountered during project actions. Ecological monitoring is recommended for the construction phase of the development considering the presence of potential red listed fauna on areas surrounding the site.

The importance of rehabilitation and implementation of mitigation processes to prevent negative impacts on the environment during and after the construction phase of the orchards should be considered a high priority. The proposed site for the development varies from being in a slightly degraded to pristine state.

A sensitivity analyses was conducted to identify the most suitable site for the development. From this investigation and ecological surveys, the following main observations was made:

- The degraded forest represents indigenous forest where the lower shrub stratum has become invaded by alien invasive species. These areas have a Medium

Sensitivity and development can be supported in the area provided certain mitigation measures are implemented. Where the clearance of the vegetation would cause protected trees or other fauna to be removed, permits should be obtained from the relevant authorities;

- The wetlands and riparian woodland associated with the rivers (including instream dams) have a high sensitivity and should be preserved as important fauna and flora habitats;
- The pristine forests in the area have a High Sensitivity and represent important corridors that link mistbelt forests at higher altitudes with these lower-lying forests / sour bushveld.

No red data plant species were found on the site due to the state of the vegetation and physical environment of the larger area mostly not being suitable for any of the red data plant species that may be found in the area, although potential habitat types in the riparian woodland and perennial water sources (dams) was still preserved.

Some potential rare fauna may also occur in the area, and specific mitigation measures need to be implemented to ensure that the impact of the development on the species' habitat will be low. Specific mitigation relating to red data fauna includes the following:

- Disturbances in close vicinity of the development (periphery) should be limited to the smallest possible area in order to protect species habitat;
- Corridors are important to allow fauna to move freely between the areas of disturbance;
- Monitoring should be implemented during the construction phase of the orchards.

Several potential impacts were identified and assessed. A few of these were assessed as having potentially medium or high significance, including the following:

- Destruction or disturbance to sensitive ecosystems leading to reduction in the overall extent of a particular habitat;
- Increased soil erosion;
- Impairment of the movement and/or migration of animal species resulting in genetic and/or ecological impacts;
- Destruction/permanent loss of individuals of rare, endangered, endemic and/or protected species;
- Soil and water pollution through spillages;
- Establishment and spread of declared weeds and alien invader plants;
- Impacts of human activities on fauna and flora of the area during construction;

- Air pollution through dusts and fumes from construction vehicles (construction phase)

Mitigation measures are provided that would reduce these impacts from a higher to a lower significance. Furthermore, the proposed layout plan of the development should be consistent with the sensitivity map and recommendations stipulated in this report, and the impact on the sensitive habitats on site should be kept to a minimum.

8 CONCLUSION

All aspects of the environment, especially living organisms, are vulnerable to disturbance of their habitat. If we can bring about a more integrated approach to living within our ecosystems, we are much more likely to save the fundamental structure of biodiversity. Positive contributions can be made even on a small scale such as within the proposed orchards development. All stakeholders, such as business, government and environmental groups need to be involved to the impacts associated with the development from causing a significant loss.

The proposed development should avoid sensitive areas such as forests, wetlands and riverine areas. Where sensitive areas of natural vegetation cannot be avoided, a few mitigation measures have been recommended to minimise and/or offset impacts (licence application for eradication of protected species.). Negative impacts can be minimised by strict enforcement and compliance with an Environmental Management Plan which considers the recommendations for managing impacts detailed above.

Provided that the proposed development and layout plans is consistent with the sensitivity map and take all the mitigation measures into consideration stipulated in this report, the planned development on 13 ha can be supported.

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APPENDIX A. PLANT SPECIES LIST FOR SITE

Plant species list
Woody species
Albizia adianthifolia
Albiziaversicolor
Anonna senegalensis
Anthocleista grandiflora
Antidesma venosum
Bauhinia galpinni
Brachylaena discolour
Breonadia salicina
Bridelia micrantha
Buddleja salvifolia
Caesalpinnia decapetalaVachellia gerrardi
Celtis africana
Curtisia dentata
Cussonia spicata
Diospyros whyteana
Diospyros whyteana
Ekebergia capensis
Ficus thonningii
Grewia hexamita
Jacaranda mimosifolia
Jasminum multipartitum
Kirkia acuminata
Maesia lanceolata
Melia azedarach
Nuxia floribunda
Olea europaea
Parinari curateifolia
Pavetta schumanniana
Peltophorum africanum
Psiadia guava
Pterocarpus angolensi
Rhamnus prinoides
Rubus cuneifolius
Searsia pyroides
Senegalia ataxacantha
Solanum mauritianum
Syzigium cordatum
Tecoma stans
Trema orientalis
Vachellia polyacantha

Plant species list
Zanthoxylum capense
Grass species
Cymbopogon caesius
Hyparrhenia cymbaria
Oplismenus hirtellus
Panicum maximum
Paspalum scobiculatum
Setaria megaphylla
Setaria sphacelata
Sporobolus africanus
Themeda triandra
Forbs & Succulents
Agathisanthemum bojeri
Barleria elegans
Bidens pilosa
Bidens pilosa
Chromolaena odorata
Coccinia spp.
Commelina benghalensis
Cyanotis speciosa
Cyanotis speciose
Cyperus spp.
Datura stramonium
Dicliptera clinopodia
Dipcadi glaucum
Impatiens spp.
Justicia flava
Lantana camara
Malva parvifolia
Nidorella spp.
Pavonia burchelli
Pellaea viridis
Piper capense
Plantago lanceolata
Polygala producta
Pterolobium stellatum
Ricinus communis
Sida cordifolia
Tagetes minuta
Tithonia rotundifolia
Verbena bonariensis
Waltheria indica

Plant species list
Xanthium strumarium

APPENDIX B. PLANT SPECIES LIST FOR QDS

Family	Genus	Sp1	IUCN
Lamiaceae	*Syncolostemon*	*obermeyerae*	LC
Bryaceae	*Brachymenium*	*pulchrum*	
Crassulaceae	*Kalanchoe*	*lanceolata*	LC
Asteraceae	*Gerbera*	*jamesonii*	LC
Lamiaceae	*Pycnostachys*	*urticifolia*	LC
Combretaceae	*Combretum*	*hereroense*	
Poaceae	*Trichoneura*	*grandiglumis*	LC
Vitaceae	*Rhoicissus*	*rhomboidea*	LC
Passifloraceae	*Adenia*	*gummifera*	LC
Rutaceae	*Zanthoxylum*	*capense*	LC
Combretaceae	*Combretum*	*erythrophyllum*	LC
Crassulaceae	*Crassula*	*lanceolata*	LC
Asteraceae	*Senecio*	*sp.*	
Burseraceae	*Commiphora*	*africana*	LC
Fabaceae	*Dichrostachys*	*cinerea*	NE
Rubiaceae	*Psychotria*	*capensis*	NE
Solanaceae	*Solanum*	*campylacanthum*	
Aphloiaceae	*Aphloia*	*theiformis*	LC
Amaranthaceae	*Dysphania*	*carinata*	
Poaceae	*Hyparrhenia*	*hirta*	LC
Convolvulaceae	*Convolvulus*	*sagittatus*	LC
Alliaceae	*Tulbaghia*	*ludwigiana*	LC
Poaceae	*Bothriochloa*	*bladhii*	LC
Fabaceae	*Crotalaria*	*lanceolata*	LC
Cannabaceae	*Trema*	*orientalis*	LC
Hypnaceae	*Hypnum*	*cupressiforme*	
Fabaceae	*Albizia*	*adianthifolia*	LC
Cyperaceae	*Pycreus*	*nitidus*	LC
Malvaceae	*Hibiscus*	*calyphyllus*	LC
Cyperaceae	*Cyperus*	*latifolius*	LC
Rubiaceae	*Cephalanthus*	*natalensis*	LC
Anacardiaceae	*Mangifera*	*indica*	NE
Asteraceae	*Senecio*	*polyanthemoides*	LC
Fabaceae	*Neonotonia*	*wightii*	LC
Asteraceae	*Pseudognaphalium*	*oligandrum*	LC
Orobanchaceae	*Striga*	*forbesii*	LC
Fabaceae	*Pterolobium*	*stellatum*	LC
Fabaceae	*Senna*	*occidentalis*	NE
Rhamnaceae	*Berchemia*	*discolor*	LC

Family	Genus	Sp1	IUCN
Convolvulaceae	*Convolvulus*	*farinosus*	LC
Acanthaceae	*Dicliptera*	*minor*	LC
Bignoniaceae	*Tecomaria*	*capensis*	LC
Verbenaceae	*Lantana*	*rugosa*	LC
Fabaceae	*Vigna*	*sp.*	
Burseraceae	*Commiphora*	*mollis*	LC
Araliaceae	*Schefflera*	*umbellifera*	LC
Myrtaceae	*Eugenia*	*woodii*	LC
Poaceae	*Hemarthria*	*altissima*	LC
Thymelaeaceae	*Lasiosiphon*	*caffer*	LC
Poaceae	*Bothriochloa*	*insculpta*	LC
Meliaceae	*Turraea*	*nilotica*	LC
Anacardiaceae	*Ozoroa*	*albicans*	LC
Salicaceae	*Homalium*	*dentatum*	LC
Asteraceae	*Sonchus*	*oleraceus*	
Pottiaceae	*Trichostomum*	*brachydontium*	
Fabaceae	*Crotalaria*	*natalitia*	LC
Euphorbiaceae	*Croton*	*sylvaticus*	LC
Asteraceae	*Senecio*	*madagascariensis*	LC
Celastraceae	*Maytenus*	*peduncularis*	LC
Rubiaceae	*Richardia*	*scabra*	NE
Malvaceae	*Pavonia*	*burchellii*	LC
Agavaceae	*Chlorophytum*	*bowkeri*	LC
Verbenaceae	*Lippia*	*javanica*	LC
Orobanchaceae	*Striga*	*asiatica*	LC
Apocynaceae	*Secamone*	*filiformis*	LC
Apiaceae	*Heteromorpha*	*arborescens*	LC
Malvaceae	*Grewia*	*caffra*	LC
Poaceae	*Stereochlaena*	*cameronii*	LC
Meteoriaceae	*Papillaria*	*africana*	
Fabaceae	*Pterocarpus*	*rotundifolius*	LC
Fabaceae	*Zornia*	*capensis*	LC
Urticaceae	*Pouzolzia*	*mixta*	LC
Rhamnaceae	*Ziziphus*	*mucronata*	LC
Chrysobalanaceae	*Parinari*	*curatellifolia*	LC
Poaceae	*Setaria*	*sphacelata*	LC
Poaceae	*Eragrostis*	*gummiflua*	LC
Putranjivaceae	*Drypetes*	*gerrardii*	LC
Poaceae	*Tristachya*	*leucothrix*	LC
Ebenaceae	*Diospyros*	*lycioides*	LC
Lejeuneaceae	*Brachiolejeunea*	*phyllorhiza*	
Sapindaceae	*Allophylus*	*africanus*	LC
Poaceae	*Hyparrhenia*	*rudis*	LC

Family	Genus	Sp1	IUCN
Asphodelaceae	*Aloe*	*vogtsii*	NT
Anacardiaceae	*Lannea*	*edulis*	LC
Asteraceae	*Acmella*	*caulirhiza*	LC
Asteraceae	*Hilliardiella*	*aristata*	LC
Malvaceae	*Melhania*	*prostrata*	LC
Malvaceae	*Hermannia*	*glanduligera*	LC
Solanaceae	*Solanum*	*aculeatissimum*	
Cyperaceae	*Cyperus*	*dives*	LC
Scrophulariaceae	*Limosella*	*maior*	LC
Poaceae	*Brachiaria*	*deflexa*	LC
Verbenaceae	*Verbena*	*officinalis*	
Poaceae	*Perotis*	*sp.*	
Poaceae	*Sporobolus*	*pyramidalis*	LC
Amaranthaceae	*Alternanthera*	*pungens*	
Anacardiaceae	*Searsia*	*rehmanniana*	LC
Maesaceae	*Maesa*	*lanceolata*	LC
Poaceae	*Echinochloa*	*sp.*	
Convolvulaceae	*Ipomoea*	*involucrata*	LC
Olacaceae	*Ximenia*	*caffra*	LC
Loganiaceae	*Strychnos*	*spinosa*	LC
Fabaceae	*Senna*	*italica*	LC
Hyacinthaceae	*Dipcadi*	*sp.*	
Anacardiaceae	*Searsia*	*pyroides*	LC
Caryophyllaceae	*Pollichia*	*campestris*	LC
Stereophyllaceae	*Stereophyllum*	*radiculosum*	
Lejeuneaceae	*Frullanoides*	*tristis*	
Poaceae	*Panicum*	*deustum*	LC
Sapindaceae	*Allophylus*	*decipiens*	LC
Asteraceae	*Pulicaria*	*scabra*	LC
Asteraceae	*Gymnanthemum*	*amygdalinum*	LC
Asteraceae	*Berkheya*	*zeyheri*	NE
Bartramiaceae	*Philonotis*	*dregeana*	
Phyllanthaceae	*Antidesma*	*venosum*	LC
Fabaceae	*Bauhinia*	*galpinii*	LC
Ebenaceae	*Diospyros*	*mespiliformis*	LC
Proteaceae	*Faurea*	*saligna*	LC
Combretaceae	*Combretum*	*collinum*	LC
Malvaceae	*Triumfetta*	*pilosa*	NE
Fabaceae	*Ormocarpum*	*trichocarpum*	LC
Orchidaceae	*Eulophia*	*streptopetala*	LC
Apocynaceae	*Landolphia*	*kirkii*	LC
Fabaceae	*Abrus*	*laevigatus*	LC
Fabaceae	*Vachellia*	*tortilis*	LC

Family	Genus	Sp1	IUCN
Poaceae	*Aristida*	*congesta*	LC
Moraceae	*Ficus*	*sycomorus*	LC
Rubiaceae	*Tricalysia*	*capensis*	
Malvaceae	*Triumfetta*	*welwitschii*	LC
Annonaceae	*Xylopia*	*parviflora*	LC
Lobeliaceae	*Lobelia*	*flaccida*	LC
Santalaceae	*Osyridicarpos*	*schimperianus*	LC
Rubiaceae	*Cordylostigma*	*virgata*	
Oleaceae	*Olea*	*europaea*	
Malvaceae	*Grewia*	*occidentalis*	LC
Phyllanthaceae	*Bridelia*	*mollis*	LC
Fabaceae	*Alysicarpus*	*zeyheri*	LC
Orchidaceae	*Calanthe*	*sylvatica*	LC
Fabaceae	*Teramnus*	*labialis*	LC
Asteraceae	*Laggera*	*crispata*	LC
Fabaceae	*Eriosema*	*psoraleoides*	LC
Fabaceae	*Vachellia*	*sieberiana*	LC
Celastraceae	*Catha*	*edulis*	LC
Leucobryaceae	*Campylopus*	*robillardei*	
Orobanchaceae	*Cycnium*	*adonense*	LC
Fabaceae	*Albizia*	*versicolor*	LC
Lamiaceae	*Mesosphaerum*	*pectinatum*	
Euphorbiaceae	*Acalypha*	*villicaulis*	LC
Lamiaceae	*Volkameria*	*glabra*	LC
Asteraceae	*Gerbera*	*ambigua*	LC
Fabaceae	*Listia*	*heterophylla*	LC
Boraginaceae	*Trichodesma*	*zeylanicum*	LC
Amaranthaceae	*Achyropsis*	*avicularis*	LC
Fabaceae	*Senna*	*petersiana*	LC
Vitaceae	*Cissus*	*cornifolia*	LC
Fabaceae	*Psoralea*	*arborea*	LC
Malvaceae	*Dombeya*	*burgessiae*	LC
Poaceae	*Leersia*	*hexandra*	LC
Thelypteridaceae	*Pneumatopteris*	*unita*	LC
Achariaceae	*Rawsonia*	*lucida*	LC
Polygonaceae	*Persicaria*	*lapathifolia*	
Celastraceae	*Pterocelastrus*	*echinatus*	LC
Scrophulariaceae	*Jamesbrittenia*	*micrantha*	LC
Polygonaceae	*Rumex*	*rhodesius*	LC
Boraginaceae	*Cynoglossum*	*lanceolatum*	LC
Poaceae	*Digitaria*	*milanjiana*	LC
Fabaceae	*Pterocarpus*	*angolensis*	LC
Fabaceae	*Mundulea*	*sericea*	LC

Family	Genus	Sp1	IUCN
Cyperaceae	*Isolepis*	*sepulcralis*	LC
Fabaceae	*Vachellia*	*davyi*	LC
Celastraceae	*Maytenus*	*undata*	LC
Poaceae	*Paspalum*	*scrobiculatum*	LC
Acanthaceae	*Crossandra*	*greenstockii*	LC
Rhamnaceae	*Scutia*	*myrtina*	LC
Asparagaceae	*Asparagus*	*racemosus*	LC
Asteraceae	*Tithonia*	*diversifolia*	
Fabaceae	*Senegalia*	*caffra*	LC
Lamiaceae	*Plectranthus*	*verticillatus*	LC
Asteraceae	*Nidorella*	*resedifolia*	LC
Rubiaceae	*Canthium*	*ciliatum*	LC
Poaceae	*Phragmites*	*mauritianus*	LC
Asteraceae	*Brachylaena*	*transvaalensis*	LC
Asteraceae	*Helichrysum*	*setosum*	LC
Myrtaceae	*Syzygium*	*cordatum*	LC
Asteraceae	*Helichrysum*	*odoratissimum*	
Fabaceae	*Vigna*	*vexillata*	LC
Boraginaceae	*Ehretia*	*amoena*	LC
Lamiaceae	*Ocimum*	*obovatum*	NE
Acanthaceae	*Justicia*	*campylostemon*	LC
Rubiaceae	*Pavetta*	*trichardtensis*	LC
Fabaceae	*Chamaecrista*	*absus*	LC
Poaceae	*Digitaria*	*sp.*	
Asteraceae	*Senecio*	*inaequidens*	LC
Fabaceae	*Chamaecrista*	*plumosa*	LC
Lauraceae	*Cassytha*	*filiformis*	NE
Rubiaceae	*Vangueria*	*infausta*	LC
Asparagaceae	*Asparagus*	*buchananii*	LC
Poaceae	*Sporobolus*	*sp.*	
Hedwigiaceae	*Hedwigidium*	*integrifolium*	
Sematophyllaceae	*Sematophyllum*	*sphaeropyxis*	
Pteridaceae	*Cheilanthes*	*viridis*	LC
Fabaceae	*Rhynchosia*	*minima*	NE
Rubiaceae	*Pavetta*	*gardeniifolia*	LC
Scrophulariaceae	*Melanospermum*	*sp.*	
Celastraceae	*Gymnosporia*	*senegalensis*	LC
Colchicaceae	*Gloriosa*	*superba*	LC
Asteraceae	*Hilliardiella*	*elaeagnoides*	
Fabaceae	*Argyrolobium*	*tomentosum*	LC
Euphorbiaceae	*Euphorbia*	*cupularis*	LC
Poaceae	*Hyparrhenia*	*dichroa*	LC
Malvaceae	*Grewia*	*subspathulata*	LC

Family	Genus	Sp1	IUCN
Malvaceae	*Sida*	*serratifolia*	LC
Lamiaceae	*Hoslundia*	*opposita*	LC
Erpodiaceae	*Aulacopilum*	*trichophyllum*	
Poaceae	*Cymbopogon*	*nardus*	LC
Cyperaceae	*Pycreus*	*polystachyos*	LC
Hypoxidaceae	*Rhodohypoxis*	*baurii*	LC
Rubiaceae	*Rubia*	*cordifolia*	LC
Poaceae	*Setaria*	*sp.*	
Asteraceae	*Felicia*	*mossamedensis*	LC
Apiaceae	*Alepidea*	*peduncularis*	DD
Poaceae	*Setaria*	*incrassata*	LC
Poaceae	*Sporobolus*	*nitens*	LC
Solanaceae	*Solanum*	*tomentosum*	
Poaceae	*Trachypogon*	*spicatus*	LC
Verbenaceae	*Lantana*	*camara*	
Fabaceae	*Dichrostachys*	*cinerea*	LC
Asteraceae	*Helichrysum*	*kraussii*	LC
Fabaceae	*Vachellia*	*permixta*	LC
Cupressaceae	*Widdringtonia*	*nodiflora*	LC
Myrtaceae	*Syzygium*	*legatii*	LC
Melianthaceae	*Bersama*	*tysoniana*	LC
Fabaceae	*Peltophorum*	*africanum*	LC
Apocynaceae	*Raphionacme*	*procumbens*	LC
Cyperaceae	*Lipocarpha*	*chinensis*	LC
Asteraceae	*Gamochaeta*	*coarctata*	
Malvaceae	*Hibiscus*	*praeteritus*	LC
Cyperaceae	*Schoenoplectus*	*brachyceras*	LC
Poaceae	*Hyparrhenia*	*filipendula*	LC
Fabaceae	*Cajanus*	*cajan*	NE
Myrtaceae	*Syzygium*	*gerrardii*	LC
Solanaceae	*Withania*	*somnifera*	LC
Asteraceae	*Schistostephium*	*crataegifolium*	LC
Sapotaceae	*Mimusops*	*zeyheri*	LC
Ebenaceae	*Euclea*	*divinorum*	LC
Cyperaceae	*Cyperus*	*sexangularis*	LC
Fabaceae	*Vachellia*	*gerrardii*	
Agavaceae	*Chlorophytum*	*recurvifolium*	LC
Poaceae	*Panicum*	*maximum*	LC
Asparagaceae	*Asparagus*	*virgatus*	LC
Polygonaceae	*Rumex*	*sagittatus*	LC
Rhamnaceae	*Berchemia*	*zeyheri*	LC
Commelinaceae	*Cyanotis*	*speciosa*	LC
Lamiaceae	*Ocimum*	*gratissimum*	NE

Family	Genus	Sp1	IUCN
Asteraceae	*Gymnanthemum*	*triflorum*	
Asteraceae	*Gymnanthemum*	*coloratum*	LC
Rubiaceae	*Spermacoce*	*natalensis*	LC
Fabaceae	*Indigofera*	*heterotricha*	LC
Fabaceae	*Biancaea*	*decapetala*	
Convolvulaceae	*Xenostegia*	*tridentata*	LC
Iridaceae	*Dietes*	*iridioides*	LC
Gentianaceae	*Sebaea*	*leiostyla*	LC
Poaceae	*Eragrostis*	*viscosa*	LC
Pteridaceae	*Adiantum*	*capillus-veneris*	LC
Asteraceae	*Gymnanthemum*	*crataegifolium*	LC
Combretaceae	*Combretum*	*molle*	LC
Apocynaceae	*Rauvolfia*	*caffra*	LC
Apiaceae	*Centella*	*asiatica*	LC
Fabaceae	*Senegalia*	*polyacantha*	LC
Asteraceae	*Inula*	*glomerata*	LC
Ochnaceae	*Ochna*	*natalitia*	LC
Asteraceae	*Gymnanthemum*	*myrianthum*	LC
Poaceae	*Themeda*	*triandra*	LC
Oleaceae	*Jasminum*	*fluminense*	LC
Sapindaceae	*Dodonaea*	*viscosa*	LC
Rubiaceae	*Agathisanthemum*	*bojeri*	LC
Cyperaceae	*Cyperus*	*keniensis*	LC
Orchidaceae	*Bonatea*	*porrecta*	LC
Cyperaceae	*Pycreus*	*mundii*	LC
Annonaceae	*Annona*	*senegalensis*	LC
Fabaceae	*Eriosema*	*nutans*	LC
Proteaceae	*Faurea*	*rochetiana*	LC
Amaranthaceae	*Gomphrena*	*celosioides*	
Capparaceae	*Capparis*	*tomentosa*	LC
Pedaliaceae	*Sesamum*	*indicum*	
Salicaceae	*Oncoba*	*spinosa*	LC
Malvaceae	*Pavonia*	*columella*	LC
Poaceae	*Hyparrhenia*	*variabilis*	LC
Tectariaceae	*Tectaria*	*gemmifera*	LC
Araceae	*Stylochaeton*	*natalensis*	LC
Asteraceae	*Berkheya*	*bipinnatifida*	LC
Asparagaceae	*Asparagus*	*angusticladus*	LC
Poaceae	*Urochloa*	*oligotricha*	LC
Thelypteridaceae	*Thelypteris*	*confluens*	LC
Phyllanthaceae	*Phyllanthus*	*incurvus*	LC
Anacardiaceae	*Ozoroa*	*paniculosa*	LC
Asphodelaceae	*Aloe*	*davyana*	

Family	Genus	Sp1	IUCN
Salicaceae	*Dovyalis*	*caffra*	LC
Aizoaceae	*Delosperma*	*sp.*	
Cucurbitaceae	*Coccinia*	*adoensis*	LC
Asteraceae	*Osteospermum*	*auriculatum*	LC
Asteraceae	*Sigesbeckia*	*orientalis*	
Acanthaceae	*Thunbergia*	*neglecta*	LC
Poaceae	*Sporobolus*	*ioclados*	LC
Malvaceae	*Hibiscus*	*altissimus*	LC
Fabaceae	*Rhynchosia*	*caribaea*	LC
Asteraceae	*Parapolydora*	*fastigiata*	
Stilbaceae	*Halleria*	*lucida*	LC
Loranthaceae	*Tapinanthus*	*quequensis*	LC
Poaceae	*Hyparrhenia*	*cymbaria*	LC
Fabaceae	*Senegalia*	*ataxacantha*	LC
Euphorbiaceae	*Ricinus*	*communis*	NE
Fabaceae	*Acacia*	*sp.*	
Fabaceae	*Alysicarpus*	*rugosus*	LC
Melastomataceae	*Dissotis*	*canescens*	LC
Poaceae	*Brachiaria*	*brizantha*	LC
Asteraceae	*Ageratum*	*conyzoides*	
Haloragaceae	*Laurembergia*	*repens*	LC
Rubiaceae	*Gardenia*	*ternifolia*	NE
Hypnaceae	*Vesicularia*	*galerulata*	
Entodontaceae	*Entodon*	*macropodus*	
Apocynaceae	*Carissa*	*bispinosa*	LC
Lamiaceae	*Ocimum*	*labiatum*	LC
Asphodelaceae	*Aloe*	*verecunda*	LC
Celastraceae	*Gymnosporia*	*harveyana*	LC
Cyperaceae	*Pycreus*	*pelophilus*	LC
Orobanchaceae	*Cycnium*	*tubulosum*	LC
Vitaceae	*Cyphostemma*	*simulans*	LC
Malpighiaceae	*Sphedamnocarpus*	*pruriens*	LC
Solanaceae	*Lycium*	*shawii*	LC
Rutaceae	*Toddalia*	*asiatica*	LC
Thymelaeaceae	*Gnidia*	*sp.*	
Asteraceae	*Berkheya*	*sp.*	
Anacardiaceae	*Searsia*	*transvaalensis*	LC
Rubiaceae	*Coddia*	*rudis*	LC
Bryaceae	*Bryum*	*argenteum*	
Ebenaceae	*Diospyros*	*lycioides*	LC
Acanthaceae	*Dyschoriste*	*burchellii*	LC
Rhamnaceae	*Helinus*	*integrifolius*	LC
Pedaliaceae	*Dicerocaryum*	*senecioides*	LC

Family	Genus	Sp1	IUCN
Brassicaceae	*Lepidium*	*schinzii*	LC
Asteraceae	*Macledium*	*zeyheri*	LC
Fabaceae	*Lablab*	*purpureus*	LC
Phyllanthaceae	*Flueggea*	*virosa*	LC
Anacardiaceae	*Lannea*	*discolor*	LC
Vitaceae	*Rhoicissus*	*tridentata*	NE
Rhamnaceae	*Ziziphus*	*rivularis*	LC
Malvaceae	*Hibiscus*	*trionum*	
Poaceae	*Melinis*	*nerviglumis*	LC
Asparagaceae	*Asparagus*	*asparagoides*	LC
Lamiaceae	*Tinnea*	*rhodesiana*	LC
Boraginaceae	*Cordia*	*caffra*	LC
Solanaceae	*Datura*	*ferox*	
Cannabaceae	*Chaetachme*	*aristata*	LC
Oleaceae	*Schrebera*	*alata*	LC
Fabaceae	*Albizia*	*harveyi*	LC
Frullaniaceae	*Frullania*	*ericoides*	
Pittosporaceae	*Pittosporum*	*viridiflorum*	LC
Meliaceae	*Turraea*	*sp.*	
Fabaceae	*Pseudarthria*	*hookeri*	LC
Poaceae	*Eragrostis*	*lappula*	LC
Aizoaceae	*Zaleya*	*pentandra*	LC
Poaceae	*Sporobolus*	*festivus*	LC
Vitaceae	*Rhoicissus*	*tomentosa*	LC
Santalaceae	*Viscum*	*verrucosum*	LC
Fabaceae	*Indigofera*	*arrecta*	LC
Ebenaceae	*Euclea*	*crispa*	LC
Poaceae	*Heteropogon*	*contortus*	LC
Combretaceae	*Combretum*	*zeyheri*	LC
Fabaceae	*Sesbania*	*bispinosa*	NE
Smilacaceae	*Smilax*	*anceps*	LC
Asteraceae	*Cotula*	*nigellifolia*	LC
Poaceae	*Sorghum*	*sp.*	
Capparaceae	*Capparis*	*fascicularis*	LC
Fabaceae	*Otholobium*	*polyphyllum*	LC
Fabaceae	*Philenoptera*	*violacea*	LC
Fabaceae	*Sesbania*	*sesban*	NE
Malvaceae	*Abutilon*	*austro-africanum*	LC
Poaceae	*Hyparrhenia*	*dregeana*	LC
Acanthaceae	*Ruellia*	*cordata*	LC
Polygalaceae	*Polygala*	*virgata*	LC
Araceae	*Zantedeschia*	*albomaculata*	LC
Cleomaceae	*Cleome*	*gynandra*	LC

Family	Genus	Sp1	IUCN
Cyperaceae	*Cyperus*	*dichrostachyus*	LC
Hyacinthaceae	*Eucomis*	*autumnalis*	NE
Salicaceae	*Scolopia*	*zeyheri*	LC
Iridaceae	*Freesia*	*grandiflora*	LC
Asteraceae	*Coreopsis*	*sp.*	
Rubiaceae	*Anthospermum*	*welwitschii*	LC
Convolvulaceae	*Ipomoea*	*papilio*	LC
Anacardiaceae	*Searsia*	*pentheri*	LC
Fabaceae	*Tephrosia*	*purpurea*	NE
Monimiaceae	*Xymalos*	*monospora*	LC
Polygonaceae	*Persicaria*	*decipiens*	LC
Rubiaceae	*Sericanthe*	*andongensis*	LC
Poaceae	*Hyparrhenia*	*gazensis*	LC
Rutaceae	*Calodendrum*	*capense*	LC
Asteraceae	*Senecio*	*gerrardii*	LC
Fabaceae	*Tylosema*	*fassoglense*	LC
Asteraceae	*Gazania*	*krebsiana*	LC
Poaceae	*Tragus*	*berteronianus*	LC
Fabaceae	*Sesbania*	*macrantha*	LC
Ranunculaceae	*Clematis*	*brachiata*	LC
Menispermaceae	*Cissampelos*	*torulosa*	LC
Icacinaceae	*Pyrenacantha*	*grandiflora*	LC
Combretaceae	*Combretum*	*collinum*	LC
Fabaceae	*Piliostigma*	*thonningii*	LC
Amaranthaceae	*Kyphocarpa*	*angustifolia*	LC
Combretaceae	*Combretum*	*imberbe*	LC
Fabaceae	*Mucuna*	*coriacea*	LC
Lobeliaceae	*Monopsis*	*stellarioides*	LC
Fabaceae	*Vachellia*	*karroo*	LC
Apocynaceae	*Orbea*	*melanantha*	LC
Convolvulaceae	*Ipomoea*	*crassipes*	LC
Fabaceae	*Argyrolobium*	*transvaalense*	LC
Orthotrichaceae	*Schlotheimia*	*ferruginea*	
Thelypteridaceae	*Christella*	*dentata*	LC
Thelypteridaceae	*Cyclosorus*	*interruptus*	LC
Cleomaceae	*Cleome*	*monophylla*	LC
Poaceae	*Eragrostis*	*superba*	LC
Commelinaceae	*Commelina*	*erecta*	LC
Asteraceae	*Senecio*	*pterophorus*	LC
Apocynaceae	*Carissa*	*spinarum*	
Malvaceae	*Grewia*	*flavescens*	LC
Rubiaceae	*Pavetta*	*schumanniana*	LC
Salicaceae	*Salix*	*mucronata*	LC

Family	Genus	Sp1	IUCN
Poaceae	*Sporobolus*	*natalensis*	LC
Heteropyxidaceae	*Heteropyxis*	*natalensis*	LC
Lamiaceae	*Plectranthus*	*hereroensis*	LC
Asteraceae	*Senecio*	*pleistocephalus*	LC
Malvaceae	*Grewia*	*monticola*	LC
Theophrastaceae	*Samolus*	*valerandi*	LC
Fabaceae	*Tephrosia*	*burchellii*	LC
Amaranthaceae	*Amaranthus*	*thunbergii*	LC
Funariaceae	*Funaria*	*hygrometrica*	
Commelinaceae	*Commelina*	*benghalensis*	LC
Asteraceae	*Cineraria*	*sp.*	
Cyperaceae	*Isolepis*	*costata*	LC
Cyperaceae	*Cyperus*	*distans*	LC
Asteraceae	*Helichrysum*	*adenocarpum*	LC
Moraceae	*Ficus*	*thonningii*	
Salicaceae	*Dovyalis*	*zeyheri*	LC
Euphorbiaceae	*Acalypha*	*glabrata*	LC
Proteaceae	*Serruria*	*nervosa*	NT
Poaceae	*Melinis*	*repens*	LC
Moraceae	*Ficus*	*ingens*	
Fabaceae	*Rhynchosia*	*hirta*	LC
Dioscoreaceae	*Dioscorea*	*cotinifolia*	LC
Cyperaceae	*Cyperus*	*fastigiatus*	LC
Fabaceae	*Indigofera*	*sanguinea*	LC
Fabaceae	*Vachellia*	*rehmanniana*	LC
Polygonaceae	*Persicaria*	*madagascariensis*	
Poaceae	*Hyperthelia*	*dissoluta*	LC
Fabaceae	*Crotalaria*	*laburnifolia*	LC
Malvaceae	*Sida*	*dregei*	LC
Fabaceae	*Crotalaria*	*distans*	LC
Fabaceae	*Erythrina*	*humeana*	LC
Amaranthaceae	*Alternanthera*	*sessilis*	
Fabaceae	*Lessertia*	*prostata*	LC
Orthotrichaceae	*Macrocoma*	*lycopodioides*	
Fabaceae	*Senna*	*septemtrionalis*	NE
Asteraceae	*Cotula*	*anthemoides*	LC
Bryaceae	*Bryum*	*pycnophyllum*	
Cyperaceae	*Fimbristylis*	*dichotoma*	LC
Poaceae	*Echinochloa*	*colona*	LC
Pteridaceae	*Cheilanthes*	*viridis*	LC
Thymelaeaceae	*Lasiosiphon*	*capitatus*	LC
Verbenaceae	*Priva*	*meyeri*	LC
Myrtaceae	*Eugenia*	*sp.*	

Family	Genus	Sp1	IUCN
Combretaceae	*Terminalia*	*sericea*	LC
Solanaceae	*Physalis*	*peruviana*	
Orthotrichaceae	*Macrocoma*	*tenuis*	
Salicaceae	*Flacourtia*	*indica*	LC
Cannabaceae	*Celtis*	*africana*	LC
Fabaceae	*Sphenostylis*	*angustifolia*	LC
Oleaceae	*Jasminum*	*streptopus*	LC
Malvaceae	*Hermannia*	*grandifolia*	LC
Rubiaceae	*Canthium*	*armatum*	LC
Malvaceae	*Dombeya*	*rotundifolia*	LC
Poaceae	*Eragrostis*	*curvula*	LC
Poaceae	*Eragrostis*	*heteromera*	LC
Apocynaceae	*Pachycarpus*	*asperifolius*	LC
Amaranthaceae	*Dysphania*	*cristata*	
Nyctaginaceae	*Boerhavia*	*diffusa*	
Sapindaceae	*Cardiospermum*	*halicacabum*	LC
Cyperaceae	*Bulbostylis*	*contexta*	LC
Iridaceae	*Crocosmia*	*aurea*	
Turneraceae	*Tricliceras*	*longepedunculatum*	LC
Poaceae	*Setaria*	*sphacelata*	LC
Amaranthaceae	*Aerva*	*leucura*	LC
Asteraceae	*Senecio*	*latifolius*	LC
Convolvulaceae	*Evolvulus*	*alsinoides*	LC
Euphorbiaceae	*Jatropha*	*zeyheri*	LC
Turneraceae	*Afroqueta*	*capensis*	LC
Euphorbiaceae	*Euphorbia*	*natalensis*	LC
Strelitziaceae	*Strelitzia*	*caudata*	LC
Poaceae	*Paspalum*	*distichum*	LC
Rubiaceae	*Anthospermum*	*herbaceum*	LC
Asteraceae	*Helichrysum*	*nudifolium*	LC
Aspleniaceae	*Asplenium*	*phillipsianum*	LC
Vitaceae	*Cyphostemma*	*woodii*	LC
Rubiaceae	*Vangueria*	*madagascariensis*	LC
Cyperaceae	*Cyperus*	*sphaerospermus*	LC
Fabaceae	*Listia*	*bainesii*	LC
Asteraceae	*Launaea*	*nana*	LC
Phyllanthaceae	*Bridelia*	*micrantha*	LC
Rubiaceae	*Pentodon*	*pentandrus*	LC
Lamiaceae	*Satureja*	*biflora*	LC
Capparaceae	*Cadaba*	*termitaria*	LC
Lamiaceae	*Endostemon*	*obtusifolius*	LC
Moraceae	*Ficus*	*sur*	LC
Lejeuneaceae	*Lejeunea*	*eckloniana*	

Family	Genus	Sp1	IUCN
Apiaceae	*Apium*	*graveolens*	
Cucurbitaceae	*Cucumis*	*zeyheri*	LC
Asphodelaceae	*Trachyandra*	*saltii*	LC
Acanthaceae	*Thunbergia*	*atriplicifolia*	LC
Passifloraceae	*Adenia*	*digitata*	LC
Acanthaceae	*Dyschoriste*	*depressa*	
Celastraceae	*Gymnosporia*	*buxifolia*	LC
Boraginaceae	*Ehretia*	*rigida*	LC
Poaceae	*Urochloa*	*sp.*	
Poaceae	*Panicum*	*novemnerve*	LC
Cucurbitaceae	*Momordica*	*cardiospermoides*	LC
Pteridaceae	*Cheilanthes*	*inaequalis*	LC
Convolvulaceae	*Ipomoea*	*albivenia*	LC
Fabaceae	*Stylosanthes*	*fruticosa*	LC
Meliaceae	*Ekebergia*	*capensis*	LC
Malvaceae	*Sida*	*pseudocordifolia*	LC
Asteraceae	*Helichrysum*	*harveyanum*	LC
Ebenaceae	*Diospyros*	*villosa*	LC
Ranunculaceae	*Ranunculus*	*multifidus*	LC
Fabaceae	*Tephrosia*	*rhodesica*	LC
Ricciaceae	*Riccia*	*stricta*	
Ebenaceae	*Euclea*	*sp.*	
Rubiaceae	*Psychotria*	*zombamontana*	LC
Lamiaceae	*Orthosiphon*	*rubicundus*	LC

APPENDIX C. AVIFAUNA LIST FOR QDS ACCORDING TO SABAP2 DATABASE

Common_name	Taxon_name	Status
Apalis, Bar-throated	*Apalis thoracica*	Least Concern
Apalis, Yellow-breasted	*Apalis flavida*	Least Concern
Babbler, Arrow-marked	*Turdoides jardineii*	Least Concern
Barbet, Acacia Pied	*Tricholaema leucomelas*	Least Concern
Barbet, Black-collared	*Lybius torquatus*	Least Concern
Barbet, Crested	*Trachyphonus vaillantii*	Least Concern
Bateleur	*Terathopius ecaudatus*	Endangered
Batis, Cape	*Batis capensis*	Least Concern
Batis, Chinspot	*Batis molitor*	Least Concern
Bee-eater, European	*Merops apiaster*	Least Concern
Bee-eater, Little	*Merops pusillus*	Least Concern
Bee-eater, Swallow-tailed	*Merops hirundineus*	Least Concern
Bee-eater, White-fronted	*Merops bullockoides*	Least Concern
Bishop, Southern Red	*Euplectes orix*	Least Concern
Bishop, Yellow	*Euplectes capensis*	Least Concern
Bishop, Yellow-crowned	*Euplectes afer*	Least Concern
Bittern, Dwarf	*Ixobrychus sturmii*	Least Concern
Bittern, Little	*Ixobrychus minutus*	Least Concern
Boubou, Southern	*Laniarius ferrugineus*	Least Concern
Broadbill, African	*Smithornis capensis*	Vulnerable
Brownbul, Terrestrial	*Phyllastrephus terrestris*	Least Concern
Brubru, Brubru	*Nilaus afer*	Least Concern
Bulbul, Dark-capped	*Pycnonotus tricolor*	Least Concern
Bunting, Cinnamon-breasted	*Emberiza tahapisi*	Least Concern
Bunting, Golden-breasted	*Emberiza flaviventris*	Least Concern
Bush-shrike, Gorgeous	*Telophorus quadricolor*	Least Concern
Bush-shrike, Grey-headed	*Malaconotus blanchoti*	Least Concern
Bush-shrike, Olive	*Telophorus olivaceus*	Least Concern
Bush-shrike, Orange-breasted	*Telophorus sulfureopectus*	Least Concern
Bustard, Black-bellied	*Lissotis melanogaster*	Near threatened
Buttonquail, Kurrichane	*Turnix sylvaticus*	Least Concern
Buzzard, Forest	*Buteo trizonatus*	Least Concern
Buzzard, Jackal	*Buteo rufofuscus*	Least Concern
Buzzard, Lizard	*Kaupifalco monogrammicus*	Least Concern
Buzzard, Steppe	*Buteo vulpinus*	Least Concern
Camaroptera, Green-backed	*Camaroptera brachyura*	Least Concern
Camaroptera, Grey-backed	*Camaroptera brevicaudata*	Least Concern
Canary, Brimstone	*Crithagra sulphuratus*	Least Concern

Common_name	Taxon_name	Status
Canary, Yellow-fronted	*Crithagra mozambicus*	Least Concern
Chat, Familiar	*Cercomela familiaris*	Least Concern
Cisticola, Croaking	*Cisticola natalensis*	Least Concern
Cisticola, Desert	*Cisticola aridulus*	Least Concern
Cisticola, Lazy	*Cisticola aberrans*	Least Concern
Cisticola, Levaillant's	*Cisticola tinniens*	Least Concern
Cisticola, Rattling	*Cisticola chiniana*	Least Concern
Cisticola, Red-faced	*Cisticola erythrops*	Least Concern
Cisticola, Zitting	*Cisticola juncidis*	Least Concern
Coot, Red-knobbed	*Fulica cristata*	Least Concern
Cormorant, Reed	*Phalacrocorax africanus*	Least Concern
Cormorant, White-breasted	*Phalacrocorax carbo*	Least Concern
Coucal, Burchell's	*Centropus burchellii*	Least Concern
Crake, Black	*Amaurornis flavirostris*	Least Concern
Crested-flycatcher, Blue-mantled	*Trochocercus cyanomelas*	Least Concern
Crombec, Long-billed	*Sylvietta rufescens*	Least Concern
Crow, Pied	*Corvus albus*	Least Concern
Cuckoo, African Emerald	*Chrysococcyx cupreus*	Least Concern
Cuckoo, Black	*Cuculus clamosus*	Least Concern
Cuckoo, Common	*Cuculus canorus*	Least Concern
Cuckoo, Diderick	*Chrysococcyx caprius*	Least Concern
Cuckoo, Jacobin	*Clamator jacobinus*	Least Concern
Cuckoo, Klaas's	*Chrysococcyx klaas*	Least Concern
Cuckoo, Levaillant's	*Clamator levaillantii*	Least Concern
Cuckoo, Red-chested	*Cuculus solitarius*	Least Concern
Cuckoo-shrike, Black	*Campephaga flava*	Least Concern
Cuckoo-shrike, Grey	*Coracina caesia*	Least Concern
Darter, African	*Anhinga rufa*	Least Concern
Dove, Laughing	*Streptopelia senegalensis*	Least Concern
Dove, Lemon	*Aplopelia larvata*	Least Concern
Dove, Namaqua	*Oena capensis*	Least Concern
Dove, Red-eyed	*Streptopelia semitorquata*	Least Concern
Dove, Rock	*Columba livia*	Least Concern
Dove, Tambourine	*Turtur tympanistria*	Least Concern
Drongo, Fork-tailed	*Dicrurus adsimilis*	Least Concern
Duck, African Black	*Anas sparsa*	Least Concern
Duck, Comb	*Sarkidiornis melanotos*	Least Concern
Duck, White-backed	*Thalassornis leuconotus*	Least Concern
Duck, White-faced	*Dendrocygna viduata*	Least Concern
Duck, Yellow-billed	*Anas undulata*	Least Concern
Eagle, Crowned	*Stephanoaetus coronatus*	Vulnerable
Eagle, Long-crested	*Lophaetus occipitalis*	Least Concern
Eagle, Tawny	*Aquila rapax*	Endangered

Common_name	Taxon_name	Status
Eagle, Wahlberg's	*Aquila wahlbergi*	Least Concern
Eagle-owl, Spotted	*Bubo africanus*	Least Concern
Egret, Cattle	*Bubulcus ibis*	Least Concern
Egret, Great	*Egretta alba*	Least Concern
Egret, Little	*Egretta garzetta*	Least Concern
Egret, Yellow-billed	*Egretta intermedia*	Least Concern
Eremomela, Burnt-necked	*Eremomela usticollis*	Least Concern
Eremomela, Yellow-bellied	*Eremomela icteropygialis*	Least Concern
Falcon, Amur	*Falco amurensis*	Least Concern
Falcon, Lanner	*Falco biarmicus*	Vulnerable
Falcon, Peregrine	*Falco peregrinus*	Least Concern
Finfoot, African	*Podica senegalensis*	Vulnerable
Firefinch, African	*Lagonosticta rubricata*	Least Concern
Firefinch, Jameson's	*Lagonosticta rhodopareia*	Least Concern
Firefinch, Red-billed	*Lagonosticta senegala*	Least Concern
Fiscal, Common (Southern)	*Lanius collaris*	Least Concern
Fish-eagle, African	*Haliaeetus vocifer*	Least Concern
Flufftail, Buff-spotted	*Sarothrura elegans*	Least Concern
Flufftail, Red-chested	*Sarothrura rufa*	Least Concern
Flycatcher, African Dusky	*Muscicapa adusta*	Least Concern
Flycatcher, Ashy	*Muscicapa caerulescens*	Least Concern
Flycatcher, Fiscal	*Sigelus silens*	Least Concern
Flycatcher, Marico	*Bradornis mariquensis*	Least Concern
Flycatcher, Pale	*Bradornis pallidus*	Least Concern
Flycatcher, Southern Black	*Melaenornis pammelaina*	Least Concern
Flycatcher, Spotted	*Muscicapa striata*	Least Concern
Francolin, Coqui	*Peliperdix coqui*	Least Concern
Francolin, Crested	*Dendroperdix sephaena*	Least Concern
Goose, African Pygmy	*Nettapus auritus*	Vulnerable
Goose, Domestic	*Anser anser*	Least Concern
Goose, Egyptian	*Alopochen aegyptiacus*	Least Concern
Goose, Spur-winged	*Plectropterus gambensis*	Least Concern
Goshawk, African	*Accipiter tachiro*	Least Concern
Goshawk, Gabar	*Melierax gabar*	Least Concern
Grassbird, Cape	*Sphenoeacus afer*	Least Concern
Grebe, Little	*Tachybaptus ruficollis*	Least Concern
Greenbul, Sombre	*Andropadus importunus*	Least Concern
Greenbul, Yellow-bellied	*Chlorocichla flaviventris*	Least Concern
Greenbul, Yellow-streaked	*Phyllastrephus flavostriatus*	Least Concern
Green-pigeon, African	*Treron calvus*	Least Concern
Greenshank, Common	*Tringa nebularia*	Least Concern
Ground-thrush, Orange	*Zoothera gurneyi*	Least Concern
Guineafowl, Crested	*Guttera edouardi*	Least Concern

Common_name	Taxon_name	Status
Guineafowl, Helmeted	*Numida meleagris*	Least Concern
Hamerkop, Hamerkop	*Scopus umbretta*	Least Concern
Harrier-Hawk, African	*Polyboroides typus*	Least Concern
Hawk, African Cuckoo	*Aviceda cuculoides*	Least Concern
Hawk, Bat	*Macheiramphus alcinus*	Least Concern
Hawk, Bat	*Macheiramphus alcinus*	Endangered
Hawk-eagle, African	*Aquila spilogaster*	Least Concern
Helmet-shrike, White-crested	*Prionops plumatus*	Least Concern
Heron, Black-headed	*Ardea melanocephala*	Least Concern
Heron, Goliath	*Ardea goliath*	Least Concern
Heron, Green-backed	*Butorides striata*	Least Concern
Heron, Grey	*Ardea cinerea*	Least Concern
Heron, Purple	*Ardea purpurea*	Least Concern
Heron, Squacco	*Ardeola ralloides*	Least Concern
Hobby, Eurasian	*Falco subbuteo*	Least Concern
Honeybird, Brown-backed	*Prodotiscus regulus*	Least Concern
Honeyguide, Greater	*Indicator indicator*	Least Concern
Honeyguide, Lesser	*Indicator minor*	Least Concern
Honeyguide, Scaly-throated	*Indicator variegatus*	Least Concern
Hoopoe, African	*Upupa africana*	Least Concern
Hornbill, African Grey	*Tockus nasutus*	Least Concern
Hornbill, Crowned	*Tockus alboterminatus*	Least Concern
Hornbill, Southern Yellow-billed	*Tockus leucomelas*	Least Concern
House-martin, Common	*Delichon urbicum*	Least Concern
Ibis, African Sacred	*Threskiornis aethiopicus*	Least Concern
Ibis, Hadeda	*Bostrychia hagedash*	Least Concern
Indigobird, Dusky	*Vidua funerea*	Least Concern
Indigobird, Purple	*Vidua purpurascens*	Least Concern
Indigobird, Village	*Vidua chalybeata*	Least Concern
Jacana, African	*Actophilornis africanus*	Least Concern
Kingfisher, Brown-hooded	*Halcyon albiventris*	Least Concern
Kingfisher, Giant	*Megaceryle maximus*	Least Concern
Kingfisher, Half-collared	*Alcedo semitorquata*	Least Concern
Kingfisher, Half-collared	*Alcedo semitorquata*	Near threatened
Kingfisher, Malachite	*Alcedo cristata*	Least Concern
Kingfisher, Pied	*Ceryle rudis*	Least Concern
Kingfisher, Striped	*Halcyon chelicuti*	Least Concern
Kingfisher, Woodland	*Halcyon senegalensis*	Least Concern
Kite, Black-shouldered	*Elanus caeruleus*	Least Concern
Kite, Yellow-billed	*Milvus aegyptius*	Least Concern
Lapwing, African Wattled	*Vanellus senegallus*	Least Concern
Lapwing, Blacksmith	*Vanellus armatus*	Least Concern
Lapwing, Crowned	*Vanellus coronatus*	Least Concern

Common_name	Taxon_name	Status
Lark, Rufous-naped	*Mirafra africana*	Least Concern
Lark, Sabota	*Calendulauda sabota*	Least Concern
Longclaw, Yellow-throated	*Macronyx croceus*	Least Concern
Mannikin, Bronze	*Spermestes cucullatus*	Least Concern
Mannikin, Red-backed	*Spermestes bicolor*	Least Concern
Martin, Banded	*Riparia cincta*	Least Concern
Martin, Brown-throated	*Riparia paludicola*	Least Concern
Martin, Rock	*Hirundo fuligula*	Least Concern
Masked-weaver, Lesser	*Ploceus intermedius*	Least Concern
Masked-weaver, Southern	*Ploceus velatus*	Least Concern
Moorhen, Common	*Gallinula chloropus*	Least Concern
Mousebird, Red-faced	*Urocolius indicus*	Least Concern
Mousebird, Speckled	*Colius striatus*	Least Concern
Myna, Common	*Acridotheres tristis*	Least Concern
Neddicky, Neddicky	*Cisticola fulvicapilla*	Least Concern
Nicator, Eastern	*Nicator gularis*	Least Concern
Night-Heron, Black-crowned	*Nycticorax nycticorax*	Least Concern
Night-Heron, White-backed	*Gorsachius leuconotus*	Least Concern
Nightjar, Fiery-necked	*Caprimulgus pectoralis*	Least Concern
Olive-pigeon, African	*Columba arquatrix*	Least Concern
Openbill, African	*Anastomus lamelligerus*	Least Concern
Oriole, Black-headed	*Oriolus larvatus*	Least Concern
Oriole, Eurasian Golden	*Oriolus oriolus*	Least Concern
Osprey, Osprey	*Pandion haliaetus*	Least Concern
Ostrich, Common	*Struthio camelus*	Least Concern
Owl, Barn	*Tyto alba*	Least Concern
Owlet, Pearl-spotted	*Glaucidium perlatum*	Least Concern
Palm-swift, African	*Cypsiurus parvus*	Least Concern
Paradise-flycatcher, African	*Terpsiphone viridis*	Least Concern
Paradise-whydah, Long-tailed	*Vidua paradisaea*	Least Concern
Parrot, Grey-headed Parrot	*Poicephalus fuscicollis*	Least Concern
Petronia, Yellow-throated	*Petronia superciliaris*	Least Concern
Pipit, African	*Anthus cinnamomeus*	Least Concern
Pipit, Striped	*Anthus lineiventris*	Least Concern
Plover, Kittlitz's	*Charadrius pecuarius*	Least Concern
Plover, Three-banded	*Charadrius tricollaris*	Least Concern
Pochard, Southern	*Netta erythrophthalma*	Least Concern
Prinia, Tawny-flanked	*Prinia subflava*	Least Concern
Puffback, Black-backed	*Dryoscopus cubla*	Least Concern
Pygmy-Goose, African	*Nettapus auritus*	Least Concern
Pygmy-Kingfisher, African	*Ispidina picta*	Least Concern
Pytilia, Green-winged	*Pytilia melba*	Least Concern
Quail, Common	*Coturnix coturnix*	Least Concern

Common_name	Taxon_name	Status
Quelea, Red-billed	*Quelea quelea*	Least Concern
Raven, White-necked	*Corvus albicollis*	Least Concern
Reed-warbler, African	*Acrocephalus baeticatus*	Least Concern
Reed-warbler, Great	*Acrocephalus arundinaceus*	Least Concern
Robin, White-starred	*Pogonocichla stellata*	Least Concern
Robin-chat, Cape	*Cossypha caffra*	Least Concern
Robin-chat, Chorister	*Cossypha dichroa*	Least Concern
Robin-chat, Red-capped	*Cossypha natalensis*	Least Concern
Robin-chat, White-browed	*Cossypha heuglini*	Least Concern
Robin-chat, White-throated	*Cossypha humeralis*	Least Concern
Roller, Broad-billed	*Eurystomus glaucurus*	Least Concern
Roller, European	*Coracias garrulus*	Near threatened
Roller, Purple	*Coracias naevius*	Least Concern
Rush-warbler, Little	*Bradypterus baboecala*	Least Concern
Sandpiper, Common	*Actitis hypoleucos*	Least Concern
Sandpiper, Wood	*Tringa glareola*	Least Concern
Saw-wing, Black (Southern race)	*Psalidoprocne holomelaena*	Least Concern
Scimitarbill, Common	*Rhinopomastus cyanomelas*	Least Concern
Scops-owl, Southern White-faced	*Ptilopsus granti*	Least Concern
Scrub-robin, Bearded	*Cercotrichas quadrivirgata*	Least Concern
Scrub-robin, Brown	*Cercotrichas signata*	Least Concern
Scrub-robin, White-browed	*Cercotrichas leucophrys*	Least Concern
Seedeater, Streaky-headed	*Crithagra gularis*	Least Concern
Shrike, Lesser Grey	*Lanius minor*	Least Concern
Shrike, Red-backed	*Lanius collurio*	Least Concern
Snake-eagle, Black-chested	*Circaetus pectoralis*	Least Concern
Snake-eagle, Brown	*Circaetus cinereus*	Least Concern
Sparrow, House	*Passer domesticus*	Least Concern
Sparrow, Southern Grey-headed	*Passer diffusus*	Least Concern
Sparrowhawk, Black	*Accipiter melanoleucus*	Least Concern
Sparrowhawk, Little	*Accipiter minullus*	Least Concern
Spoonbill, African	*Platalea alba*	Least Concern
Spurfowl, Natal	*Pternistis natalensis*	Least Concern
Spurfowl, Swainson's	*Pternistis swainsonii*	Least Concern
Starling, Cape Glossy	*Lamprotornis nitens*	Least Concern
Starling, Red-winged	*Onychognathus morio*	Least Concern
Starling, Violet-backed	*Cinnyricinclus leucogaster*	Least Concern
Starling, Wattled	*Creatophora cinerea*	Least Concern
Stilt, Black-winged	*Himantopus himantopus*	Least Concern
Stint, Little	*Calidris minuta*	Least Concern
Stonechat, African	*Saxicola torquatus*	Least Concern
Stork, Abdim's	*Ciconia abdimii*	Near threatened
Stork, Black	*Ciconia nigra*	Vulnerable

Common_name	Taxon_name	Status
Stork, White	*Ciconia ciconia*	Least Concern
Stork, Woolly-necked	*Ciconia episcopus*	Least Concern
Sunbird, Amethyst	*Chalcomitra amethystina*	Least Concern
Sunbird, Collared	*Hedydipna collaris*	Least Concern
Sunbird, Greater Double-collared	*Cinnyris afer*	Least Concern
Sunbird, Scarlet-chested	*Chalcomitra senegalensis*	Least Concern
Sunbird, Southern Double-collared	*Cinnyris chalybeus*	Least Concern
Sunbird, White-bellied	*Cinnyris talatala*	Least Concern
Swallow, Barn	*Hirundo rustica*	Least Concern
Swallow, Greater Striped	*Hirundo cucullata*	Least Concern
Swallow, Lesser Striped	*Hirundo abyssinica*	Least Concern
Swallow, White-throated	*Hirundo albigularis*	Least Concern
Swallow, Wire-tailed	*Hirundo smithii*	Least Concern
Swamp-warbler, Lesser	*Acrocephalus gracilirostris*	Least Concern
Swift, African Black	*Apus barbatus*	Least Concern
Swift, Alpine	*Tachymarptis melba*	Least Concern
Swift, Horus	*Apus horus*	Least Concern
Swift, Little	*Apus affinis*	Least Concern
Swift, White-rumped	*Apus caffer*	Least Concern
Tchagra, Black-crowned	*Tchagra senegalus*	Least Concern
Tchagra, Brown-crowned	*Tchagra australis*	Least Concern
Teal, Red-billed	*Anas erythrorhyncha*	Least Concern
Thick-knee, Spotted	*Burhinus capensis*	Least Concern
Thick-knee, Water	*Burhinus vermiculatus*	Least Concern
Thrush, Kurrichane	*Turdus libonyanus*	Least Concern
Thrush, Olive	*Turdus olivaceus*	Least Concern
Thrush, Orange Ground	*Zoothera gurneyi*	Near threatened
Tinkerbird, Yellow-fronted	*Pogoniulus chrysoconus*	Least Concern
Tit, Southern Black	*Parus niger*	Least Concern
Tit-flycatcher, Grey	*Myioparus plumbeus*	Least Concern
Trogon, Narina	*Apaloderma narina*	Least Concern
Turaco, Knysna	*Tauraco corythaix*	Least Concern
Turaco, Purple-crested	*Gallirex porphyreolophus*	Least Concern
Turtle-dove, Cape	*Streptopelia capicola*	Least Concern
Twinspot, Green	*Mandingoa nitidula*	Least Concern
Wagtail, African Pied	*Motacilla aguimp*	Least Concern
Wagtail, Cape	*Motacilla capensis*	Least Concern
Wagtail, Mountain	*Motacilla clara*	Least Concern
Warbler, Dark-capped Yellow	*Chloropeta natalensis*	Least Concern
Warbler, Garden	*Sylvia borin*	Least Concern
Warbler, Icterine	*Hippolais icterina*	Least Concern
Warbler, Marsh	*Acrocephalus palustris*	Least Concern
Warbler, Sedge	*Acrocephalus schoenobaenus*	Least Concern

Common_name	Taxon_name	Status
Warbler, Willow	*Phylloscopus trochilus*	Least Concern
Waxbill, Blue	*Uraeginthus angolensis*	Least Concern
Waxbill, Common	*Estrilda astrild*	Least Concern
Waxbill, Swee	*Coccopygia melanotis*	Least Concern
Weaver, Cape	*Ploceus capensis*	Least Concern
Weaver, Golden	*Ploceus xanthops*	Least Concern
Weaver, Spectacled	*Ploceus ocularis*	Least Concern
Weaver, Thick-billed	*Amblyospiza albifrons*	Least Concern
Weaver, Village	*Ploceus cucullatus*	Least Concern
White-eye, Cape	*Zosterops virens*	Least Concern
Whydah, Pin-tailed	*Vidua macroura*	Least Concern
Widowbird, Long-tailed	*Euplectes progne*	Least Concern
Widowbird, Red-collared	*Euplectes ardens*	Least Concern
Widowbird, White-winged	*Euplectes albonotatus*	Least Concern
Wood-dove, Blue-spotted	*Turtur afer*	Least Concern
Wood-dove, Emerald-spotted	*Turtur chalcospilos*	Least Concern
Wood-hoopoe, Green	*Phoeniculus purpureus*	Least Concern
Woodland-warbler, Yellow-throated	*Phylloscopus ruficapilla*	Least Concern
Wood-owl, African	*Strix woodfordii*	Least Concern
Woodpecker, Bearded	*Dendropicos namaquus*	Least Concern
Woodpecker, Cardinal	*Dendropicos fuscescens*	Least Concern
Woodpecker, Golden-tailed	*Campethera abingoni*	Least Concern
Woodpecker, Olive	*Dendropicos griseocephalus*	Least Concern

APPENDIX D. MAMMALS LIST FOR QDS ACCORDING TO SARCA DATABASE

Family	Scientific name	Common name	Red list
Bovidae	*Cephalophus natalensis*	Red Duiker	Near Threatened (2016)
Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (2016)
Bovidae	*Tragelaphus scriptus*	Bushbuck	Least Concern
Cercopithecidae	*Cercopithecus albogularis*	Samango Monkey	Least Concern (2008)
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern (2016)
Felidae	*Panthera pardus*	Leopard	Vulnerable (2016)
Galagidae	*Otolemur crassicaudatus*	Brown Greater Galago	Least Concern (2016)
Hipposideridae	*Hipposideros caffer*	Sundevall's Leaf-nosed Bat	Least Concern (2016)
Molossidae	*Chaerephon pumilus*	Little Free-tailed Bat	Least Concern (2016)
Molossidae	*Mops (Mops) condylurus*	Angolan Free-tailed Bat	Least Concern
Molossidae	*Tadarida aegyptiaca*	Egyptian Free-tailed Bat	Least Concern (2016)
Muridae	*Acomys sp.*	Spiny Mice	
Muridae	*Acomys (Acomys) spinosissimus*	Southern African Spiny Mouse	Least Concern
Muridae	*Aethomys ineptus*	Tete Veld Aethomys	Least Concern (2016)
Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern (2016)

Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	Least Concern (2016)
Soricidae	*Crocidura cyanea*	Reddish-gray Musk Shrew	Least Concern (2016)
Soricidae	*Crocidura hirta*	Lesser Red Musk Shrew	Least Concern (2016)
Soricidae	*Crocidura maquassiensis*	Makwassie Musk Shrew	Vulnerable (2016)
Soricidae	*Myosorex cafer*	Dark-footed Mouse Shrew	Vulnerable (2016)
Soricidae	*Suncus infinitesimus*	Least Dwarf Shrew	Least Concern (2016)
Suidae	*Potamochoerus larvatus*	Bush-pig	Least Concern (2016)
Vespertilionidae	*Laephotis botswanae*	Botswanan Long-eared Bat	Least Concern (2016)
Vespertilionidae	*Myotis tricolor*	Temminck's Myotis	Least Concern (2016)
Vespertilionidae	*Myotis welwitschii*	Welwitsch's Myotis	Least Concern (2016)
Vespertilionidae	*Neoromicia nana*	Banana Pipistrelle	Least Concern
Vespertilionidae	*Pipistrellus (Pipistrellus) hesperidus*	Dusky Pipistrelle	Least Concern
Vespertilionidae	*Pipistrellus (Pipistrellus) rusticus*	Rusty Pipistrelle	Near Threatened

APPENDIX E HERPETOFAUNA LIST FOR QDS ACCORDING TO SARCA DATABASE

REPTILES

Family	Scientific name	Common name	Red list
Agamidae	*Acanthocercus atricollis*	Southern Tree Agama	Least Concern (SARCA 2014)
Chamaeleonidae	*Bradypodion transvaalense*	Wolkberg Dwarf Chameleon	Least Concern (SARCA 2014)
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	Least Concern (SARCA 2014)
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern (SARCA 2014)
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern (SARCA 2014)
Colubridae	*Dispholidus typus viridis*	Northern Boomslang	Not evaluated
Colubridae	*Philothamnus natalensis*	Eastern Natal Green Snake	Least Concern (SARCA 2014)
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern (SARCA 2014)
Cordylidae	*Platysaurus intermedius intermedius*	Common Flat Lizard	Least Concern (SARCA 2014)
Cordylidae	*Platysaurus relictus*	Soutpansberg Flat Lizard	Least Concern (SARCA 2014)
Cordylidae	*Smaug depressus*	Flat Girdled Lizard	Least Concern (SARCA 2014)
Crocodylidae	*Crocodylus niloticus*	Nile Crocodile	VU (SARCA 2014); LC (global, IUCN 2019)
Elapidae	*Naja annulifera*	Snouted Cobra	Least Concern (SARCA 2014)
Gekkonidae	*Hemidactylus mabouia*	Common Tropical House Gecko	Least Concern (SARCA 2014)
Gekkonidae	*Lygodactylus capensis*	Common Dwarf Gecko	Least Concern (SARCA 2014)
Gekkonidae	*Lygodactylus soutpansbergensis*	Soutpansberg Dwarf Gecko	Near Threatened (SARCA 2014)
Gekkonidae	*Pachydactylus vansoni*	Van Son's Gecko	Least Concern (SARCA 2014)
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)
Lacertidae	*Nucras holubi*	Holub's Sandveld Lizard	Least Concern (SARCA 2014)
Lamprophiidae	*Amblyodipsas microphthalma nigra*	Soutpansberg Purple-glossed snake	Least Concern (SARCA 2014)
Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Duberria lutrix lutrix*	South African Slug-eater	Least Concern (SARCA 2014)
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Prosymna stuhlmannii*	East African Shovel-snout	Least Concern (SARCA 2014)
Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern (SARCA 2014)

Family	Scientific name	Common name	Red list
Pythonidae	*Python natalensis*	Southern African Python	Least Concern (SARCA 2014)
Scincidae	*Acontias cregoi*	Cregoi's Blind Legless Skink	Least Concern (SARCA 2014)
Scincidae	*Acontias plumbeus*	Giant Legless Skink	Least Concern (SARCA 2014)
Scincidae	*Panaspis wahlbergi*	Wahlberg's Snake-eyed Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis margaritifera*	Rainbow Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis varia sensu stricto*	Common Variable Skink	
Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern (SARCA 2014)
Testudinidae	*Kinixys spekii*	Speke's Hinged Tortoise	Least Concern (SARCA 2014)
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	Least Concern (SARCA 2014)
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern (SARCA 2014)
Varanidae	*Varanus niloticus*	Water Monitor	Least Concern (SARCA 2014)
Viperidae	*Causus rhombeatus*	Rhombic Night Adder	Least Concern (SARCA 2014)

AMPHIBIANS

Family	Scientific name	Common name	Red list
Arthroleptidae	*Leptopelis mossambicus*	Brownbacked Tree Frog	Least Concern
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	Least Concern
Brevicepitidae	*Breviceps sylvestris*	Transvaal Rain Frog	Near Threatened (IUCN ver 3.1, 2016)
Brevicepitidae	*Breviceps sylvestris taeniatus*	Transvaal Rain Frog (subsp. taeniatus)	Near Threatened (IUCN ver 3.1, 2016)
Bufonidae	*Schismaderma carens*	Red Toad	Least Concern
Bufonidae	*Sclerophrys garmani*	Olive Toad	Least Concern (IUCN, 2016)
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern (IUCN, 2016)
Bufonidae	*Sclerophrys pusilla*	Flatbacked Toad	Least Concern (IUCN, 2016)
Hemisotidae	*Hemisus marmoratus*	Mottled Shovel-nosed Frog	Least Concern
Hyperoliidae	*Hyperolius marmoratus*	Painted Reed Frog	Least Concern (IUCN ver 3.1, 2013)
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
Microhylidae	*Phrynomantis bifasciatus*	Banded Rubber Frog	Least Concern
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern (IUCN, 2013)
Ptychadenidae	*Ptychadena anchietae*	Plain Grass Frog	Least Concern
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern