APPENDIX F: BIODIVERSITY STUDY

Updated aquatics and impact sections of the biodiversity study and additional specialist study completed as part of the RMDEC process is included in Appendix R.

Scientific Aquatic Services

Applying science to the real world

91 Geldenhuis Road, Malvern East Ext. 1, 2007
Tel 011 616 7893
Fax 011 615 4106
www.sasenvironmental.co.za
admin@sasenvironmental.co.za

Name: Stephen van Staden
Date: Friday, 19 August 2016
Ref: SAS/SLR 180316

SPECIALIST REPORTING REQUIREMENTS AS PER SECTION 32 OF THE EIA REGULATIONS, 2010

This letter has been prepared to report on the compliance of –S. van Staden, E. van der Westhuizen, C. Hooton, N. Cloete and A. Mileson from Scientific Aquatic Services CC- as part of the specialist reporting requirements under Section 32 of the Environmental Impact Assessment Regulations, 2010 from the National Environmental Management Act, 1998 (Act no. 107 of 1999) for the (Floral, Faunal, Wetland and Aquatic Assessment as part of the Environmental Authorisation Process for the Proposed Commissieskraal Colliery, Kwazulu-Natal Province) prepared for the environmental impact assessment and the environmental management programme for the proposed Commissiekraal Coal Mine.

33. (1) An applicant or the EAP managing an application may appoint a person who is independent to carry out a specialist study or specialised process

33. (2)(a)(i) the person who prepared the report

Stephen van Staden, Emile van der Westhuizen, Nelanie Cloete, Chris Hooton and Amanda Mileson.

33. (2)(a)(ii) the expertise of that person to carry out the specialist study or specialised process;

Stephen van Staden

SACNASP REG.NO: 400134/05

Stephen van Staden completed an undergraduate degree in Zoology, Geography and Environmental Management at RAU. On completion of this degree, he undertook an honours course in Aquatic health through the Zoology department at RAU. In 2002 he began a Masters degree in environmental management, where he did his mini dissertation in the field of aquatic resource management, also undertaken at RAU. At the same time, Stephen began building a career by first working at an environmental consultancy specialising in town planning developments, after which he moved to a larger firm in late 2002.

From 2002 to the end of 2003, he managed the monitoring division and acted as a specialist consultant on water resource management issues and other environmental processes and applications. In late 2003, Stephen started consulting as an independent environmental scientist, specialising in water resource management under the banner of Scientific Aquatic Services. In addition to aquatic ecological assessments, clients started enquiring about terrestrial ecological assessments and biodiversity assessments. Stephen, in conjunction with other qualified ecologists, began facilitating these studies as well as highly specialised studies on specific endangered species, including grass owls, arachnids, invertebrates and

various vegetation species. Scientific Aquatic Services soon became recognised as a company capable of producing high quality terrestrial ecological assessments. Stephen soon began diversifying into other fields, including the development of EIA process, EMPR activities and mine closure studies.
Stephen has experience on well over 1000 environmental assessment projects with specific mention of aquatic and wetland ecological studies, as well as terrestrial ecological assessments and project management of environmental studies. Stephen has a professional career spanning more than 10 years, of which almost the entire period has been as the owner and Managing member of Scientific Aquatic Services and the project manager on most projects undertaken by the company. Stephen has also obtained extensive experience in wetland and aquatic assessments in the Limpopo Plains aquatic ecoregion.
Stephen is registered by the SA RHP as an accredited aquatic biomonitoring specialist and is also registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) in the field of ecology. Stephen is also a member of the Gauteng Wetland Forum and South African Soil Surveyors Association (SASSO).

Emile van der Westhuizen
SACNASP REG.NO: 100008/15
Emile van der Westhuizen is currently employed by Scientific Aquatic Services and focuses in the facilitation of Ecological Assessments, EIA, EMPR, Basic Assessment and Biodiversity Action Plan processes. Emile is a passionate field biologist with more than 8 years' experience in ecological assessments throughout Southern, Eastern, Central and West Africa. Further skills include GIS and Wetland Delineation processes. He started to build his career in 2007 with a firm specialising in EIA's, BA's, Water Use Licensing and the development of Rehabilitation Plans, Landscape plans and Visual Assessments. He has extensive experience in all the above mentioned fields of practice, and decided to diversify his fields of expertise and focus on his passion for botany and ecology by joining Scientific Aquatic Services early in 2008.
He has since been involved in various projects throughout Africa (including South Africa, Ghana, the DRC and Mozambique) focusing on terrestrial ecological assessments which involve phytosociological community assessments, RDL faunal and floral species assessments, alien and invasive species control methods and rehabilitation plans. Further to this, he also performs wetland delineation and function assessments, along with rehabilitation plans for disturbed wetland areas. Such projects include several large scale urban developments, gold and copper mines in the Democratic Republic of the Congo (southern and central areas), gold mines and airports in Mozambique and large scale urban developments in Ghana. He holds a BSc Botany and Environmental Management degree from UNISA and holds a BSc (Hons) Plant science degree with specialisation in terrestrial plant ecology from the University of Pretoria (UP). He is also registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) in the field of botany.

Nelanie Bezuidenhout
SACNASP REG.NO: **400503/14**

Nelanie Bezuidenhout completed an undergraduate degree in Zoology and Botany at Rand Afrikaans University. On completion of this degree, she undertook an honours course in Plant physiology through the Botany and Biotechnology department at the University of Johannesburg. In 2006 she started a Masters degree in Botany and Biotechnology, where she did her mini dissertation in the field of plant pathogens (Biotechnology), also undertaken at the University of Johannesburg. In 2009 she did a short course in Enforcements and Compliance to Environmental Management at UNISA. Nelanie has completed a second Masters degree in Environmental Management, where she did a number of short modules.

Currently she is in the process of doing her mini dissertation in the field of *water quality and factors influencing the quality*; through Rand Water and the University of Johannesburg.

Nelanie began building a career by working at an environmental consultancy specialising in Ecological studies, Basic Assessments and Environmental Impact Assessments. Since September 2008 to February 2011 she acted as a specialist consultant on Floral assessments and other environmental processes and applications. Other specialist studies she undertook with associate specialist were Golden Mole assessments (Juliana's Golden mole and Rough-haired Golden mole) and *Mitisella meninx (*Marsh sylph*)* assessments. Nelanie expanded her abilities within the environmental management field by conducting processes such as Basic Assessments, Scoping reports as part of the Environmental Management Assessment (EIA) process, Public participation and Environmental Management Programs for developments.

Nelanie is registered at the South African Association of Botanists (SAAB) and is also registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP).

Christopher Hooton

Chris obtained his National Diploma in Nature Conservation (2006-2008) and then proceeded to complete his BTech Nature Conservation degree (2011-2013), both at Tshwane University of Technology. Chris's BTech research thesis looked at successfully calculating Spotted Hyaena population size using infrared camera traps and the capture-recapture model for population calculation.

Chris's working career spans various departments, organizations and fields. He spent a year working for the Special Investigations Unit of the then Gauteng Department of Agriculture, Conservation and Environment (GDACE), focusing on the enforcement of the Nature Conservation Ordinance of Gauteng, CITES and TOPS in the Gauteng and North West province. Here he focussed primarily on the control of illegal trade in endangered species, with special focus on Red Data List and CITES species and products thereof. Whilst working for GDACE Chris actively involved himself in the provincial game reserves, assisting with floral and faunal assessments.

As part of his BTech studies, Chris went to work for the Lowveld Wild Dog Project, based in Savé Valley Conservancy, Zimbabwe. Here he gained invaluable field experience in large carnivore work. Whilst in Zimbabwe, Chris assisted with the collaring, tracking and population management of the Wild Dogs, and also helped with a lion and leopard collaring project with his supervisor and the reserve ecologist. After leaving Zimbabwe, Chris moved to Phinda Private Game Reserve to start his research for his thesis. This research spanned the period of a year, using whole species counts and call-up methods to gain benchmark population numbers in order to confer population numbers calculated from the camera trap method, in order to show that hyaena populations can be calculated through the use of camera traps and a capture recapture methodology. Following his work on Spotted Hyaenas, Chris joined Scientific Terrestrial Services in November 2013 as an ecologist, specialising in faunal studies.

Amanda Mileson

Amanda Mileson was born and raised in Zimbabwe. Her interest in, and love for the natural world was ignited at an early age, with a particular interest in zoology. Whilst fortunate enough to grow up surrounded by veils and bushveld, resources were scarce and after choosing an exchange year in Australia over university, Amanda returned to Zimbabwe to begin her working career in retail photography. From there she joined a well-known advertising agency as Secretary to the Creative Department, quickly progressing through

the ranks to become an Account Executive, responsible for client liaison with six of the agency's clients – two of whom were amongst the company's top ten clients.

The ever deteriorating situation in Zimbabwe led Amanda to seek opportunities overseas, and she spent two years in Birmingham, England, during which time Amanda made the decision to return to Africa and to study further in order to fulfil her life-long dream of a career in conservation.

Upon her relocation to South Africa in 2007, Amanda started volunteering part-time at FreeMe Wildlife Rehabilitation Centre in Johannesburg, gaining experience in the general husbandry, nutrition and basic veterinary treatment of avian and mammal species. The hands-on experience and desire to learn more about the animals she was working to rehabilitate pushed her to enrol with UNISA to study a National Diploma in Nature Conservation. In order to align her career with her studies, in October 2011 Amanda took up the position of PA to the CEO of the Johannesburg Zoo, rapidly learning the ins and outs of one of the most unique businesses in the world. Driven to gain as much relevant experience as possible, Amanda job shadowed curatorial staff and veterinarians in her spare time, organised a volunteer programme for other Nature Conservation students to gain practical experience, and participated in the Wattled Crane Recovery Programme, hand-rearing Wattled Crane chicks.

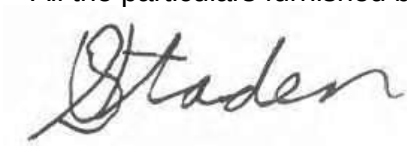
Additionally, Amanda has participated in field work on projects which seek to ascertain the effect of wind farms on bats in South Africa, and provided administrative support to the Jane Goodall Institute South Africa and the African Association of Zoos and Aquaria on a volunteer basis.

Amanda joined Scientific Aquatic Services in September 2013 as a Junior Field Ecologist focusing on wetland ecology and zoology, and is a member of the Gauteng Wetland Forum and the South African Wetland Society

33. (2)(b) declaration that the person is independent in a form as may be specified by the competent authority;
I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant 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 application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

- All the particulars furnished by me in this form are true and correct

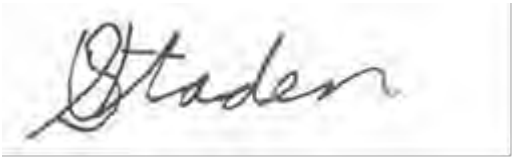


Signature of the Specialist

33. (2) (c) an indication of the scope of, and the purpose for which, the report was prepared;
See Section A – Chapter 1.2 Project Scope
33. (2) (d) a description of the methodology adopted in preparing the report or carrying out the specialised process;
See Section A – Chapter 3.1 General Approach to Biodiversity Projects, Section B – Chapter 3, Section C – Chapter 2, Section D - Chapter 2, Section E – Chapter 3.
33. (2) (e) a description of any assumptions made and any uncertainties or gaps in knowledge;
See Section A – Chapter 1.3 Assumptions and Limitations
33. (2) (f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;
See Sections B, C, D, E, F for results of assessments
33. (2) (g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;
See Section F – Impact Mitigations
33. (2) (h) a description of any consultation process that was undertaken during the course of carrying out the study;
Consultation with interested and affected parties was undertaken as part of the environmental impact assessment and environmental management programme process conducted by SLR Consulting (Africa) (Pty) Ltd. Relevant issues were considered as part of the study.
33. (2) (i) a summary and copies if any comments that were received during any consultation process,
Comments and responses that were raised by interested and affected parties are included in the issues table, an Appendix D of the EIA and EMP report.
OR
If responses to issues was provided and included in the specialist report please refer to relevant section in the report
33. (2) (j) any other information requested by the competent authority.
Not applicable

If you have any queries regarding the above, please do not hesitate to contact me.

Yours Sincerely



Specialist Name
Date:

FLORAL, FAUNAL, WETLAND AND AQUATIC ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED COMMISSIESKRAAL COLLIERY, KWAZULU-NATAL PROVINCE

Prepared for

SLR Consulting (Africa) (Pty) Ltd.

October 2015

Section A: Executive Summary and Background Information

Prepared by:	**Scientific Aquatic Services**
Report author	**E. van der Westhuizen**
	S. van Staden (Pr. Sci. Nat)
Report Reference:	**SAS 213081**
Date:	**October 2015**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
91 Geldenhuis Rd
Malvern East, Ext 1

Tel: 011 616 7893
Fax: 011 615 4106
E-mail: admin@sasenvironmental.co.za

EXECTIVE SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct a faunal and floral ecological investigation as well as an investigation of the wetland and aquatic resources associated with a proposed new underground coal mine and related surface infrastructure to support a mining operation on the farm Commissiekraal 90HT, hereafter referred to as “subject property”. The subject property is located approximately 28 km north of Utrecht in the eMadlangeni Local Municipality and the Amajuba District Municipality, KwaZulu-Natal. The main land uses at the time of assessment include agriculture, primarily livestock grazing with minor dryland crops, forestry, conservation and tourism.

The Commissiekraal project is located within an area of increased ecological importance and sensitivity when compared to most potential and current mining localities in South Africa. The terrestrial and wetland features within the majority of the subject property are in a largely natural to natural condition. Therefore, on this basis, should the project proceed it will have an ecological impact of high significance both within and potentially beyond the boundaries of the project. The potential for dewatering of the Pandana River during the later operational phase and beyond closure as well as post-closure impacts on water quality are of concern, along with the permanent alteration a surface area which is currently in a reasonably intact state. Therefore, unless ddewatering of the Pandana River can be avoided and it is considered economically feasible to treat and/or contain all potential sources of contaminated water which may affect the receiving environment post-closure indefinitely to pre-mining water quality standards in such a way as to support the post closure land use and land capability which supports the adjacent land uses and to ensure rehabilitation back to natural or largely natural land capability, the project is regarded as posing a very high long term impact on the region.

It is highly recommended that should it nonetheless be deemed appropriate to mine the resource from a cumulative sustainable development point of view, as much infrastructure as possible be moved to the areas where historical disturbance as a result of anthropogenic activity has occurred. In addition the infrastructure required to access the resource must be kept to the absolute minimum. Furthermore, extensive mitigation must be applied during the construction and operational phases of the project to ensure that no impact takes place beyond the surface infrastructure footprint. In this regard particular mention is made of the management of surface water quality and quantity and the dirty water management system of ther mine and the impact of mining related activities on surrounding sensitive terrestrial and wetland habitat. Exceptionally strict monitoring throughout the life of the mine and post-closure is required in order to ensure the health and functioning of the terrestrial, wetland and aquatic

ecosystems is retained, and monitoring data must be utilised to proactively manage any identified emerging issues in a well-managed and overseen Biodiversity Action Plan (BAP), which must be implemented through an automated Environmental Management System (EMS). The rehabilitation of the infrastructure during closure of the mine must take place in such a way as to ensure that the post closure land use objectives are met and that adjacent land uses and land potential is supported. The water resources will need to be rehabilitated in such a way as to support the larger drainage and wetland systems at the same level as those evident in the pre-mining condition and with particular mention of ensuring that no significant impact takes place on the downstream instream flow and water quality. In order to meet this objective, rehabilitation will need to be well planned and a suitably qualified ecologist must form part of the management team through the entire life cycle of the project and to guide the rehabilitation including concurrent rehabilitation) and closure objectives of the mine.

Of secondary concern is the potential for this project to create a precedent for further mining in this ecologically sensitive area. Mining within this area is contradictory to the Mining and Biodiversity Guidelines, as well as the NFEPA Guidelines, KZN C-Plan and the NPAES. This precedent could lead to future cumulative impacts in the region which could affect local and regional conservation initiatives significantly.

The objective of this study was to provide sufficient information on the ecology of the area, together with other studies on the physical and socio-cultural environment, in order for the Environmental Assessment Practitioner (EAP) and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. The needs for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to compared and considered along with the need to ensure economic development of the country.

It is the opinion of the ecologists that this study provides the relevant information required in order to implement IEM and to ensure that the best long term use of the resources on the subject property will be made in support of the principle of sustainable development.

FLORAL, FAUNAL, WETLAND AND AQUATIC ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED COMMISSIESKRAAL COLLIERY, KWAZULU-NATAL PROVINCE

Prepared for

SLR Consulting (Africa) (Pty) Ltd.

October 2015

Section A: Executive Summary and Background Information

Prepared by: **Scientific Aquatic Services**
Report author **E. van der Westhuizen**
S. van Staden (Pr. Sci. Nat)
Report Reference: **SAS 213081**
Date: **October 2015**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
91 Geldenhuis Rd
Malvern East, Ext 1

Tel: 011 616 7893
Fax: 011 615 4106
E-mail: admin@sasenvironmental.co.za

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GLOSSARY OF TERMS & ACRONYMS

Alien vegetation	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally.
Biome	A broad ecological unit representing major life zones of large natural areas defined mainly by vegetation structure and climate.
Bush encroachment	A state where undesirable woody elements gain dominance within grassland, leading to depletion of the grass component. Typically due to disturbances and transformations as a consequence of veldt mismanagement (overgrazing, incorrect burning, etc.).
Decreaser grass	Grass abundant in veldt in good condition, which decreases when veldt is under- or over-utilized.
°C	Degrees Celsius.
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
Exotic vegetation	Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Ex situ conservation	Where a plant (or community) cannot be allowed to remain in its original habitat and is removed and cultivated to allow for its ongoing survival.
Extrinsic	Factors that have their origin outside of the system.
ha	Hectares.
Indigenous vegetation	Vegetation occurring naturally within a defined area.
Increaser 1 grass	Grass species that increase in density when veld is under-utilized.
Increaser 2 grass	Grass species that increase in density in over-utilized, trampled or disturbed veld.
Increaser 3 grass	Grass species that increase in density in over and under-utilized veld.

In situ conservation	Where a plant (or community) is allowed to remain in its natural habitat with an allocated buffer zone to allow for its ongoing survival.
Karoid vegetation	A shrub-type vegetation that dominates in grasslands that have seen historical disturbances. Mainly due to over-grazing and mismanaged burning regimes. The shrubby vegetation eventually becomes dominant and out-competes the grassy layer.
m	Metres.
mm	Millimetres.
MAMSL	Metres above mean sea level.
MAP	Mean annual precipitation.
MAPE	Mean annual potential for evaporation.
MASMS	Mean annual soil moisture stress.
MAT	Mean annual temperature.
Orange Listed	Species that are not Red Data Listed, but are under threat and at risk of becoming RDL in the near future. Usually allocated to species with conservation status of *Near Threatened (NT), Least Concern (LC), Rare* and *Data Deficient (DD)*.
PES	Present Ecological State.
POC	Probability of occurrence.
PRECIS	Pretoria Computer Information Systems.
Pioneer species	A plant species that is stimulated to grow after a disturbance has taken place. This is the first step in natural veld succession after a disturbance has taken place.
QDS	Quarter degree square (1:50,000 topographical mapping references).
Rare	Organisms with small populations at present.
RDL (Red Data listed) species	Organisms that fall into the *Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU)* categories of ecological status.
RDSIS	Red Data Sensitivity Index Score.
SANBI	South African National Biodiversity Institute.
Veld retrogression	The ongoing and worsening ecological integrity state of a veld.

1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a faunal and floral ecological investigation as well as an investigation of the wetland and aquatic resources associated with a proposed new underground coal mine and related surface infrastructure to support a mining operation on the farm Commissiekraal 90HT, hereafter referred to as "subject property". The subject property is located approximately 28 km north of Utrecht in the eMadlangeni Local Municipality and the Amajuba District Municipality, KwaZulu-Natal. The main land uses at the time of assessment include agriculture, primarily livestock grazing with minor dryland crops, forestry, conservation and tourism.

This report, after consideration and description of the ecological integrity of the subject property, must guide the Environmental Assessment Practitioner (EAP), authorities and potential developers, by means of recommendations, as to viability of the proposed mining development from an ecological point of view.

1.2 Project Scope

Specific outcomes in terms of this report are outlined below:

Terrestrial Ecological Assessment:

- To conduct a Red Data Listed (RDL) species assessment, including potential for species to occur on the subject property and the implementation of a Red Data Sensitivity Index Score (RDSIS) for the subject property;
- To provide faunal and floral inventories of species as encountered on site;
- To determine and describe habitats, communities and the ecological state of the subject property;
- To describe the spatial significance of the subject property with regards to surrounding natural areas;
- To identify and consider all sensitive landscapes including rocky ridges, wetlands and/or any other special features;
- To determine the environmental impacts of the proposed development activities on the terrestrial ecology within the subject property; and

- To present management and mitigation measures which should be implemented during the various development phases to assist in minimising the impact on the receiving terrestrial environment.

Wetland Assessment:

- To define the Present Ecological State (PES) of the Hydrogeomorphic (HGM) Units within the subject property;
- To characterise the identified HGM Units according to the Classification System for Wetlands (Ollis *et al*., 2013);
- To determine the functioning and the environmental and socio-cultural services that each HGM Unit provide;
- To advocate a Recommended Ecological Class (REC) for each HGM Unit;
- To delineate all wetlands or riparian zones occurring within the subject property;
- To determine the environmental impacts of the proposed development activity on the wetland areas within the subject property; and
- To present management and mitigation measures which should be implemented during the various development phases to assist in minimising the impact on the receiving aquatic environment.

Aquatic Assessment:

- To define the Present Ecological State (PES) of the aquatic resources on the subject property through the assessment of:
    - Historical database searches
    - Biota Specific Water Quality
    - Habitat analyses
        - General habitat integrity (IHIA)
        - Habitat suitability for aquatic macro-invertebrates (IHAS)
        - Habitat suitability for fish (HCR)
    - Riparian vegetation assessments (VEGRAI)
    - Aquatic macro-invertebrate community assessments (SASS5 and MIRAI)
    - Fish community assessments (FRAI)
- Based on the findings of the assessment define the Ecological Importance and Sensitivity (EIS) of the system;
- To determine the environmental impacts of the proposed development activity on the wetland areas within the subject property as well as areas downstream of the proposed activity; and

- To present management and mitigation measures which should be implemented during the various development phases to assist in minimising the impact on the receiving aquatic environment, should the mining project proceed.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The ecological assessment is confined to the subject property and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment.
- Due to the nature and habits of most faunal taxa it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations are compared with extensive literature studies where necessary.
- Sampling by its nature, means that not all individuals are assessed and identified. With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked due to seasonal and temporal variances. It is, however, expected that most faunal and floral communities have been accurately assessed and considered.
- The wetland assessment is confined to the subject property, as well as areas of relevance immediately adjacent to the subject property and does not include the neighbouring and adjacent properties. The general surroundings were however considered in the desktop assessment of the subject property.
- The wetland delineation as presented in this report is regarded as a best estimate of the wetland boundary based on the site condition present at the time of the assessment and limitations in the accuracy of the delineation due to disturbances created by grazing, existing development and anthropogenic disturbances are deemed possible.
- Wetland and terrestrial areas form transitional areas where an ecotone is formed as vegetation species change from terrestrial species to facultative and obligate wetland species. Within the transition zone some variation of opinion on the wetland boundary may occur, however if the Department of Water Affairs (DWA), 2005 method is followed, all assessors should get largely similar results.
- Weather conditions during two rounds of assessment wer enot ideal. The rivers were in spate and made aquatic assessments of some sites impossible and futile. The rainy weather led to field assessments being abandoned. In addition faunal assessment and observation was severely hampered.

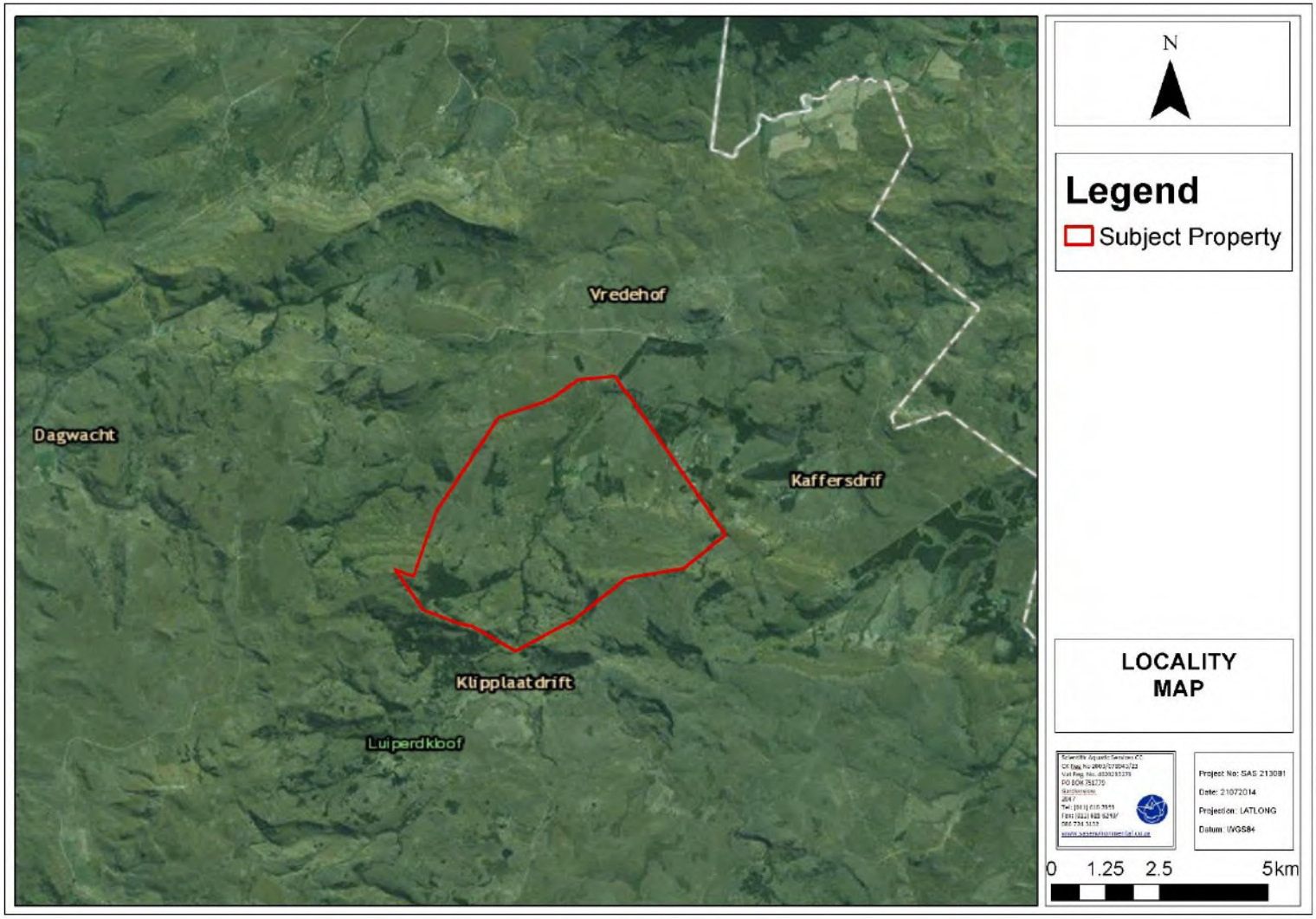

Figure 1: Digital Satellite image depicting the location of the subject property in relation to surrounding areas.

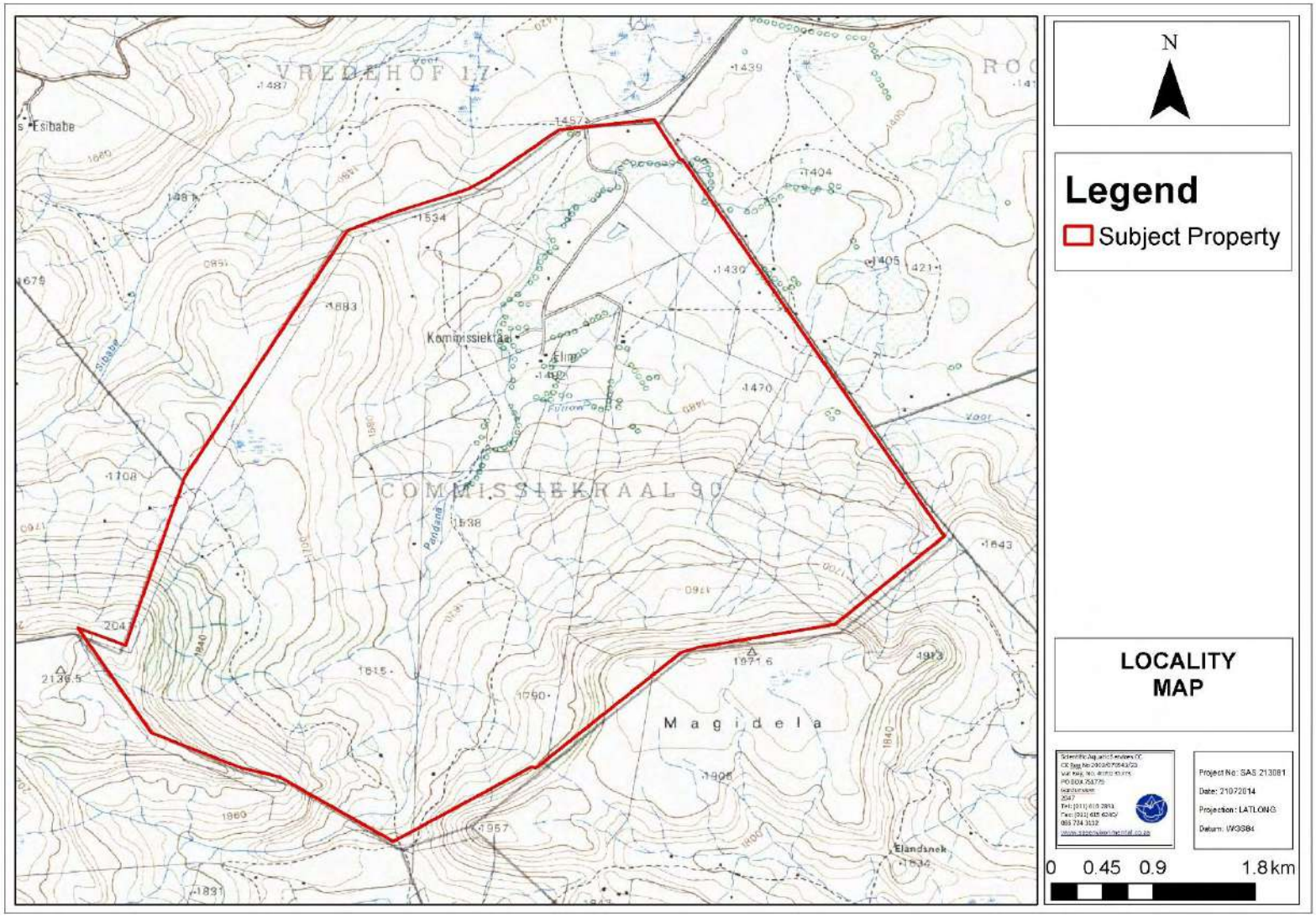

Figure 2: Subject property depicted on a 1:50 000 topographical map in relation to its surrounding area.

2 SCIENTIFIC AQUATIC SERVICES AND THE PROJECT TEAM

2.1 History

Scientific Aquatic Services (SAS) was initiated in March 2003 as a specialist consulting business focusing on aquatic resource management. Over time the frequency of requests by clients for related studies and procedures has increased and the company has expanded through the employment of professional consultants with the relevant expertise to facilitate studies on terrestrial ecological assessments and biodiversity assessments as well as highly specialised studies on specific endangered species, including grass owls, arachnids, invertebrates and various vegetation species. Professional consultants presently employed by SAS include:

- 3 Aquatic ecologists
- 4 Wetland ecologists
- 2 Zoologists
- 4 Botanists
- 1 GIS technician

2.2 Track Record and Geographical Areas of Expertise

SAS has a track record spanning 11 years with an ever increasing project volume:

- 2010 184 projects
- 2011 217 projects
- 2012 255 projects
- 2013 318 projects
- 2014 to date 225 projects

SAS has experience in the following geographical areas:

- South Africa (all provinces)
- Mozambique
- Lesotho
- Southern Africa
    - Botswana
    - Lesotho
    - Zambia
- Central Africa
    - DRC

- Western Africa
  - Angola
  - Guinea-Bissau
  - Liberia
  - Ghana

2.3 Specific Project Related Experience

The following selected large coal projects, among several others, have been conducted by SAS:

- Faunal, floral, wetland and aquatic ecological assessment of the proposed Ibutho Fuleni Anthracite mine;
- Wetland assessment and delineation of wetlands on the Exxaro Strathrae Colliery covering approximately 15000ha;
- Weltevreden coal project (25 000 ha current full terrestrial and aquatic assessment);
- Emarenthia Colliery (400 ha current full terrestrial and aquatic assessment);
- Wonderfontein Colliery (400 ha full terrestrial and aquatic assessment);
- Vlakfontein coal project (2000 ha current full terrestrial and aquatic assessment);
- Polmaise Colliery (200 ha full terrestrial and aquatic assessment);
- Langkloof Colliery (300 ha full terrestrial and aquatic assessment);
- Goedehoop Colliery (270 ha full terrestrial and aquatic assessment);
- Zonnebloem Colliery (400 ha full terrestrial and aquatic assessment);
- Jikama colliery (700 ha full terrestrial and aquatic assessment);
- Yzermyn coal Project, Dirkiesdorp (wetland assessment);
- Generaal and Chapudi coal projects, Limpopo (wetland and aquatic assessments).

2.4 Project Team

Stephen van Staden

SACNASP REG.NO: 400134/05

Stephen van Staden completed an undergraduate degree in Zoology, Geography and Environmental Management at RAU. On completion of this degree, he undertook an honours course in Aquatic health through the Zoology department at RAU. In 2002 he began a Masters degree in environmental management, where he did his mini dissertation in the field of aquatic resource management, also undertaken at RAU. At the same time, Stephen began building a career by first working at an environmental consultancy specialising in town planning developments, after which he moved to a larger firm in late 2002.

From 2002 to the end of 2003, he managed the monitoring division and acted as a specialist consultant on water resource management issues and other environmental processes and applications. In late 2003, Stephen started consulting as an independent environmental scientist, specialising in water resource management under the banner of Scientific Aquatic Services. In addition to aquatic ecological assessments, clients started enquiring about terrestrial ecological assessments and biodiversity assessments. Stephen, in conjunction with other qualified ecologists, began facilitating these studies as well as highly specialised studies on specific endangered species, including grass owls, arachnids, invertebrates and various vegetation species. Scientific Aquatic Services soon became recognised as a company capable of producing high quality terrestrial ecological assessments. Stephen soon began diversifying into other fields, including the development of EIA process, EMPR activities and mine closure studies.

Stephen has experience on well over 1000 environmental assessment projects with specific mention of aquatic and wetland ecological studies, as well as terrestrial ecological assessments and project management of environmental studies. Stephen has a professional career spanning more than 10 years, of which almost the entire period has been as the owner and Managing member of Scientific Aquatic Services and the project manager on most projects undertaken by the company. Stephen has also obtained extensive experience in wetland and aquatic assessments in the Limpopo Plains aquatic ecoregion.

Stephen is registered by the SA RHP as an accredited aquatic biomonitoring specialist and is also registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) in the field of ecology. Stephen is also a member of the Gauteng Wetland Forum and South African Soil Surveyors Association (SASSO).

Emile van der Westhuizen
SACNASP REG.NO: 100008/15

Emile van der Westhuizen is currently employed by Scientific Aquatic Services and focuses in the facilitation of Ecological Assessments, EIA, EMPR, Basic Assessment and Biodiversity Action Plan processes. Emile is a passionate field biologist with more than 8 years' experience in ecological assessments throughout Southern, Eastern, Central and West Africa. Further skills include GIS and Wetland Delineation processes. He started to build his career in 2007 with a firm specialising in EIA's, BA's, Water Use Licensing and the development of Rehabilitation Plans, Landscape plans and Visual Assessments. He has extensive experience in all the above mentioned fields of practice, and decided to diversify his fields of expertise

and focus on his passion for botany and ecology by joining Scientific Aquatic Services early in 2008.

He has since been involved in various projects throughout Africa (including South Africa, Ghana, the DRC and Mozambique) focusing on terrestrial ecological assessments which involve phytosociological community assessments, RDL faunal and floral species assessments, alien and invasive species control methods and rehabilitation plans. Further to this, he also performs wetland delineation and function assessments, along with rehabilitation plans for disturbed wetland areas. Such projects include several large scale urban developments, gold and copper mines in the Democratic Republic of the Congo (southern and central areas), gold mines and airports in Mozambique and large scale urban developments in Ghana. He holds a BSc Botany and Environmental Management degree from UNISA and holds a BSc (Hons) Plant science degree with specialisation in terrestrial plant ecology from the University of Pretoria (UP). He is also registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) in the field of botany.

Nelanie Cloete
SACNASP REG.NO: 400503/14

Nelanie completed an undergraduate degree in Zoology and Botany at Rand Afrikaans University. On completion of this degree, she undertook an honours course in Plant physiology through the Botany and Biotechnology department at the University of Johannesburg. In 2006 she started a Master's degree in Botany and Biotechnology, where she completed her mini dissertation in the field of plant pathogens (Biotechnology), also undertaken at the University of Johannesburg. In 2009 she attended a short course in Legal Enforcement and Compliance for Environmental Management at UNISA. In 2010 she began another Master's degree in Environmental Management, where she completed a number of short modules such as Environmental law, Environmental Impact Assessments, general biodiversity studies and concepts and Auditing (ISO standards). In 2013 she finished her mini dissertation in the field of water quality and factors influencing the quality; through Rand Water and the University of Johannesburg.

Nelanie began building a career by working for an environmental consultancy specialising in Ecological studies, Basic assessments and Environmental Impact Assessments. Since 2008 to the current date she acted as a specialist consultant on floral and wetland assessments and other environmental processes and applications such as permit applications for Red Data Listed (RDL) floral and protected tree species, Water Use Licence Applications (WULA) and performance appraisals for environmental and waste processes. Nelanie expanded her abilities within the environmental management field by conducting processed such as Basic

Assessments, Scoping reports as part of the Environmental Management Assessment (EIA) process, Public participation and Environmental Management Programs for developments. She underwent a Water Use Licence (WUL) course at the Department of Water Affairs in October 2012, where Section 21 and the WUL process formed part of the training. Nelanie has conducted several Biodiversity Action Plans (BAP) for numerous mines within the Mpumalanga and Limpopo Province.

Currently Nelanie is also involved as a junior project manager for numerous projects within the company, managing specialist within and outside of the company, arranging and managing site assessments, project administration, guidance and interpretation of field data and liaising with clients.

Nelanie is registered at the South African Association of Botanists (SAAB) and is also registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP), currently in the process of registering as a Professional Natural Scientist with SACNASP. Nelanie is also a professional member of the Grassland Society of South Africa (GSSA) and member of the International Affiliation for Impact Assessments (IAIAsa) group.

Christopher Hooton

Chris's working career spans various departments, organizations and fields. A year was spent working for the Special Investigations Unit of the then Gauteng Department of Agriculture, Conservation and Environment (GDACE), focusing on the enforcement of the Nature Conservation Ordinance of Gauteng, CITES and TOPS in the Gauteng and North West province. Here he focussed primarily on the control of illegal trade in endangered species, with special focus on Red Data List and CITES species and products thereof. Whilst working for GDACE Chris actively involved himself in the provincial game reserves, assisting with floral and faunal assessments.

As part of his BTech studies, Chris went to work for the Lowveld Wild Dog Project, based in Savé Valley Conservancy, Zimbabwe. Here he gained invaluable field experience in large carnivore work. Whilst in Zimbabwe, Chris assisted with the collaring, tracking and population management of the Wild Dogs, and also helped with a lion and leopard collaring project with his supervisor and the reserve ecologist. After leaving Zimbabwe, Chris moved to Phinda Private Game Reserve to start his research for his thesis project. This research involved using total species counts and call-up methods to gain benchmark population numbers in order to confirm population numbers calculated from the camera trap method, in order to show that hyaena populations can be successfully calculated through the use of camera traps and a

capture recapture methodology. Following his work on Spotted Hyaenas, Chris joined Scientific Aquatic Services in November 2013 as a junior ecologist, specialising in faunal studies.

Marc Hanekom

Marc has worked overseas in England compiling and expanding on field work and data analysis techniques, where he became involved in the conducting and managing various data analysis processes. In addition, he has managed to bring expertise to the faunal field work assessments.

Over the course of his career, Marc has completed several reports on aquatic and faunal impact studies, and has had the opportunity to apply his knowledge through rehabilitation design, planning, specification and implementation.

He is registered at the Zoological Society of Southern African (ZSSA), the Entomological Society of South Africa (ESSA), is an active beekeeper and is a member of the South Africa Bee Industry Organization (SABIO, TA number 1175) and is registered as an accredited aquatic biomonitoring specialist by the SA RHP standards of South Africa.

Dionne Crafford

SACNASP REG.NO: 400146/14

Dionne Crafford matriculated in 1993 and obtained a BSc Ecology degree from the University of Pretoria in 1996. He obtained his BSc (Hons) Zoology degree with distinction at the same university in 1997, where he was awarded the Zoological Society of Southern Africa (ZSSA) award for the best honours student in Zoology. His honours project focused on behavioural ecology (grass owl acoustics).

He spent 1998 in the United States of America exploring various warm water fly fishing opportunities, before returning to enrol for an MSc in Zoology at the Rand Afrikaans University in 1999. He obtained the degree with distinction in 2000 and was awarded the Neitz Medallion for the best MSc in Zoology by the Parasitological Society of Southern Africa (PARSA). His MSc project was on aquatic environmental management/biological monitoring using catfish and their parasites as indicators of water quality.

From 2001 to 2006 he was first employed as "Veterinary Researcher" and later "Specialist Veterinary Researcher" by former Intervet at their Malelane research facility. From 2003 to 2006 he also performed part-time fly fishing guiding services for the former Fly Fishing Outfitters (Nelspruit). He moved to Bloemfontein in 2007 where he was employed as "Assistant

Manager: Endoparasitology" at ClinVet International (Pty) Ltd from 2007 to 2012. In 2009 he enrolled for a part-time PhD in Zoology (monogenean parasites of freshwater fish) at the University of Johannesburg and received his degree in 2013. As from 2013 he is employed as Associate Scientific Writing Manager at ClinVet and also performs scientific writing services for Scientific Aquatic Services. In the latter capacity he has participated in a number of studies relating to aquatic baseline studies, biomonitoring and toxicity testing.

3 DESKTOP ASSESSMENT METHODOLOGY

3.1 General Approach to Biodiversity Projects

Scientific Aquatic Services strives to ensure the highest quality of documentation and to utilise best practice procedures in order to ensure that products are concise, yet informative and that they are written in such a way that will allow for easy interpretation by readers and that the needs of stakeholders requiring the information are met. The general approach followed for biodiversity projects are illustrated in the diagram below.

In order to accurately determine the Present Ecological State (PES) of subject property and capture comprehensive data with respect to faunal and floral taxa and their associated habitats the following methodology was used:

- The Ezemvelo KZN Guidelines for Biodiversity Impact Assessments in KZN (2013) were consulted and followed.
- Maps, aerial photographs and digital satellite images were consulted prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on-site assessment of the subject property was made in order to confirm the assumptions made during consultation of the maps.
- Literature review with respect to habitats, vegetation types and species distribution was conducted.
- Relevant data bases considered during the assessment of the subject property included SANBI [Threatened species programme (TSP) and PRECIS], the SANBI Biodiversity GIS database (BGIS) and the relevant conservation databases and species lists applicable to the Kwa-Zulu Natal Province.
- Field visits were conducted to determine the baseline ecological conditions of the subject property;
- Field data was analysed and species collected were identified;
- Draft reports were developed to present the findings of the initial site assessment;

- Gaps in knowledge were identified and additional field assessments were undertaken to address these gaps;
- The baseline reports were finalised and sensitivity maps were developed, after which the proposed mine plan was overlaid;
- Based on the data in consideration with the proposed mining plan, the anticipated impacts of the proposed mine on the receiving ecological environment was assessed;
- The results of the baseline ecological assessments were presented during an internal peer review and specialist workshop process;
- The baseline ecological assessment reports were made available to the EAP and relevant stakeholders for review and comment;
- The EAP and stakeholder comments were addressed and incorporated into the baseline ecological assessments, whereafter the reports were finalised and submitted as part of the finalised EIA document.

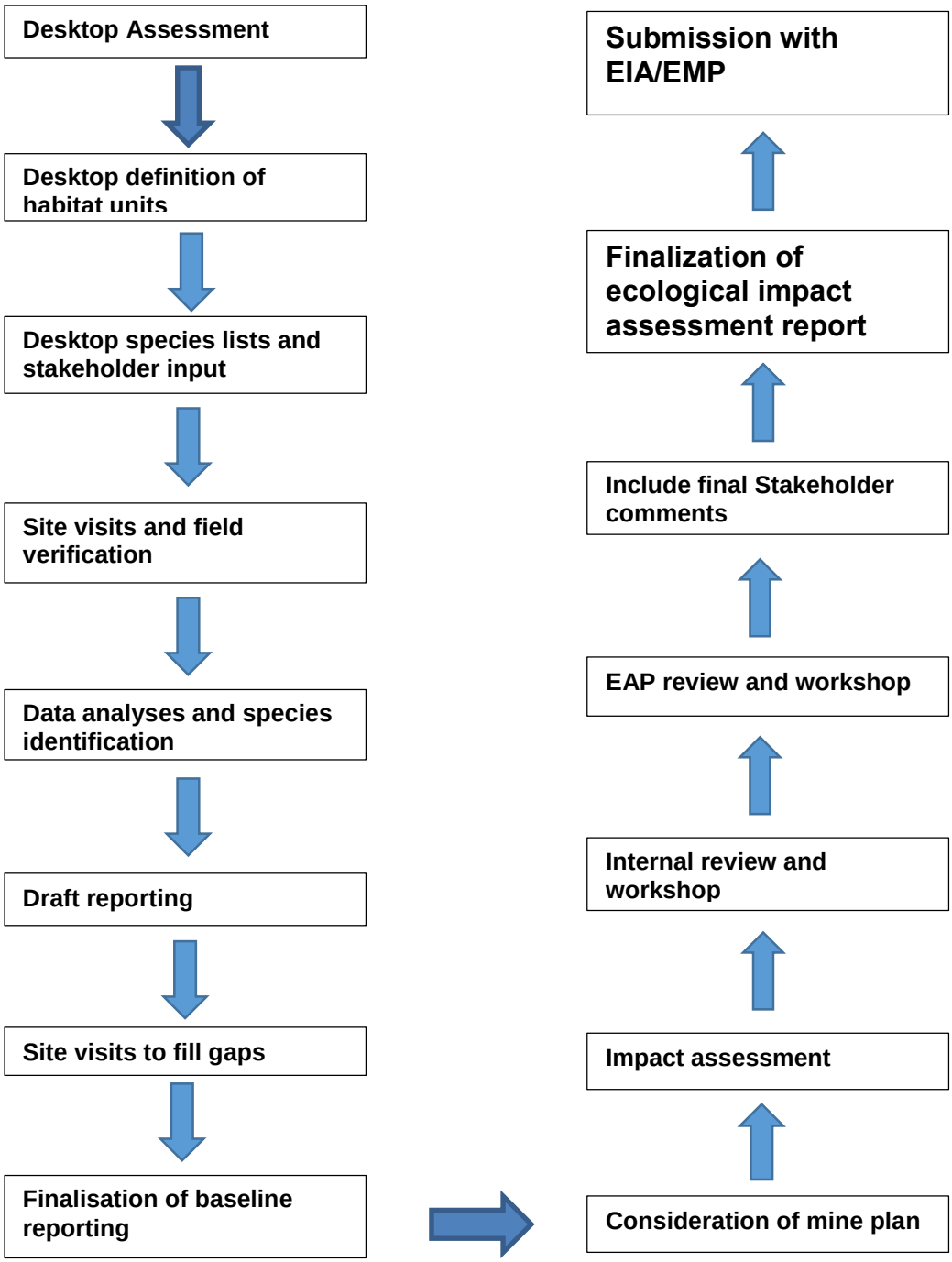

Figure 3: General Approach to Biodiversity Projects

4 CONSERVATION CHARACTERISTICS OF THE SUBJECT PROPERTY

4.1 National List of Threatened Terrestrial Ecosystems for South Africa (2011)

The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected. Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value (SANBI, BGIS).

According to the National List of Threatened Terrestrial Ecosystems (2011) the subject property contains sections of the remaining extent of the vulnerable *Paulpietersburg Moist Grassland* and *Northern Afrotemperate Forest* vegetation types. These vegetation type have undergone ecosystem degradation and a loss of integrity (Figure 4).

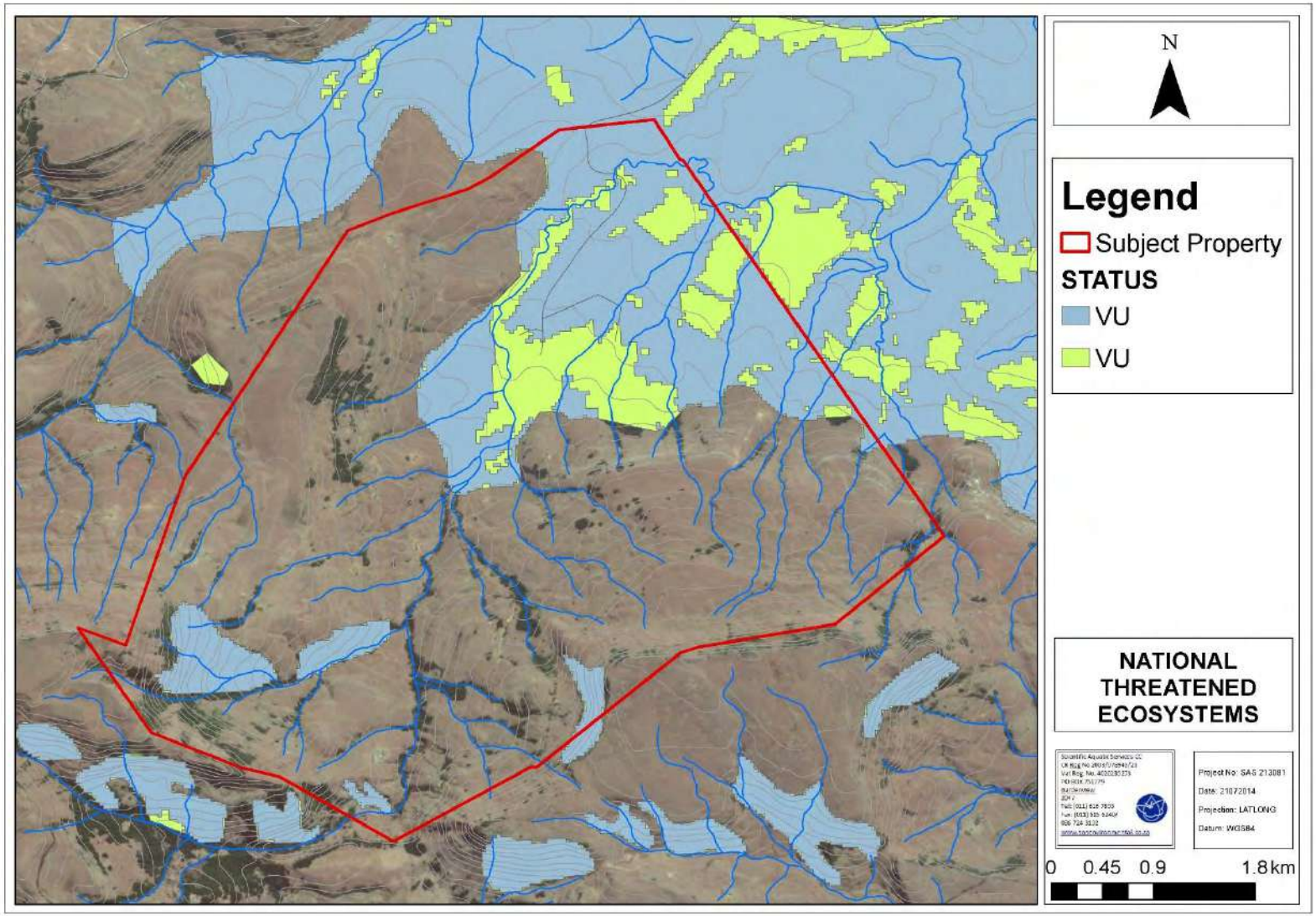

Figure 4: Threatened terrestrial ecosystems associated with the subject property

4.2 The National Protected Areas Expansion Strategy, 2010 (NPAES)

The goal of the National Protected Area Expansion Strategy (NPAES) is to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. It deals with land-based and marine protected areas across all of South Africa's territory (SANBI BGIS).

According to the NPAES, the subject property is not located within a NPAES protected area (formal or informal). However, a NPAES focus area is located within the southeastern portion of the subject property (Figure 5). NPAES Focus Areas are focus areas for land-based protected area expansion. Focus areas are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas.

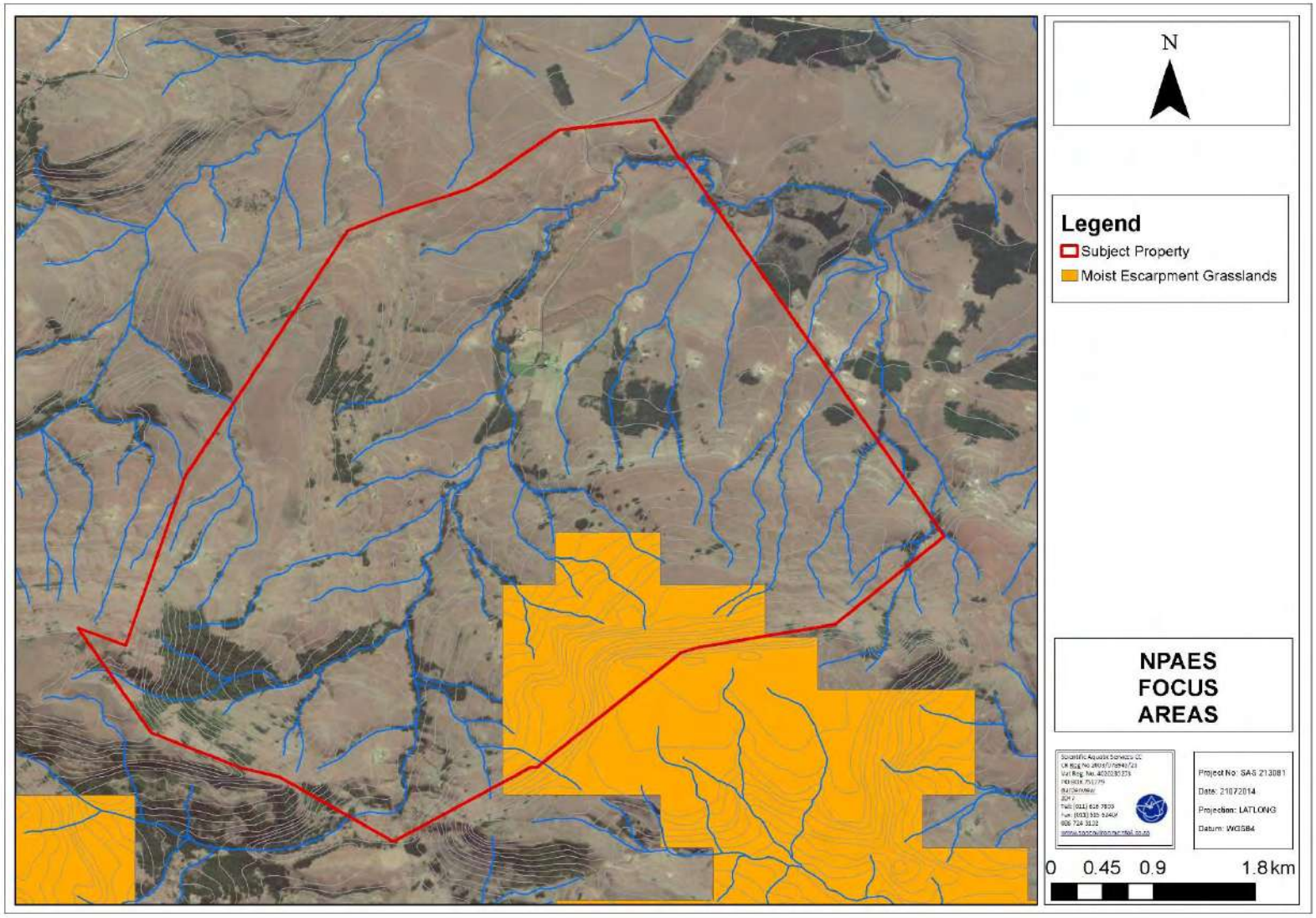

Figure 5: NPAES Focus Area associated with the subject property.

4.3 Formally or Informally Protected Areas, 2011 (NBA)

The recently completed NBA (2011) provides an assessment of South Africa's biodiversity and ecosystems, including headline indicators and national maps for the terrestrial, freshwater, estuarine and marine environments. The NBA 2011 was led by the South African National Biodiversity Institute (SANBI) in partnership with a range of organisations, including the DEA, CSIR and SanParks. It follows on from the National Spatial Biodiversity Assessment 2004, broadening the scope of the assessment to include key thematic issues as well as a spatial assessment. The NBA 2011 includes a summary of spatial biodiversity priority areas that have been identified through systematic biodiversity plans at national, provincial and local levels (SANBI BGIS).

According to the South African Protected Area Database (SAPAD) completed in 2014, the subject property is not located within either a formal or informal protected area or within a national park. However, the Pongola Bush Protected Environment is located approximately 10km north of the subject property, along with several other formally and informally protected areas on a wider scale (Figure 6).

Additonally, the proposed Elandsberg Protected Environment is situated adjacent to the subject property, on its southwestern, northwestern and northeastern boundaries (Figure 7). This protected environment forms part of phase 3 of the South African Biodiversity Institute (SANBI) upper Pongola biodiversity stewardship initiative. WWF-SA is the implementing agency for SANBI (WWF-SA, 2012).

4.4 Importance According to the Mining and Biodiversity Guideline (2012)

The Mining Biodiversity Guideline (2012) provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining. The Guideline distinguishes between four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining. These categories include: Legally Protected Areas, Highest Biodiversity Importance, High Biodiversity Importance and Moderate Biodiversity Importance.

According to the Mining Biodiversity Guidelines the majority of the subject property falls within an area considered to be of Highest Biodiversity Importance. Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g.

water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive necessary authorisations.

Areas within the remainder of the subject property fall within isolated areas considered to be of Moderate Biodiversity Importance (Figure 8). Moderate Biodiversity Importance areas are typically associated with ecological support areas and vulnerable ecosystems. These areas pose a moderate risk to mining. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.

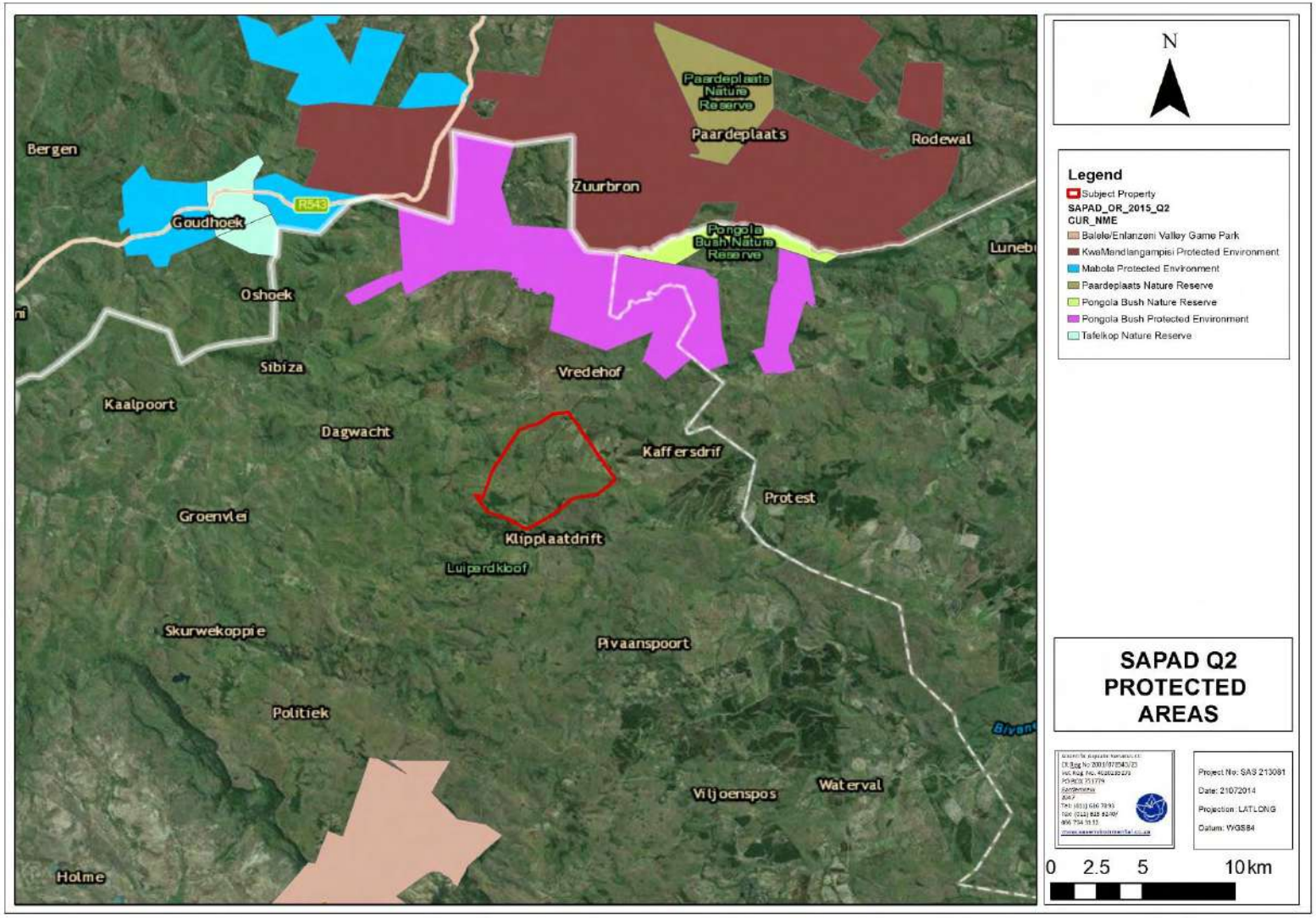

Figure 6: Formally protected areas associated with the subject property (SAPAD 2014).

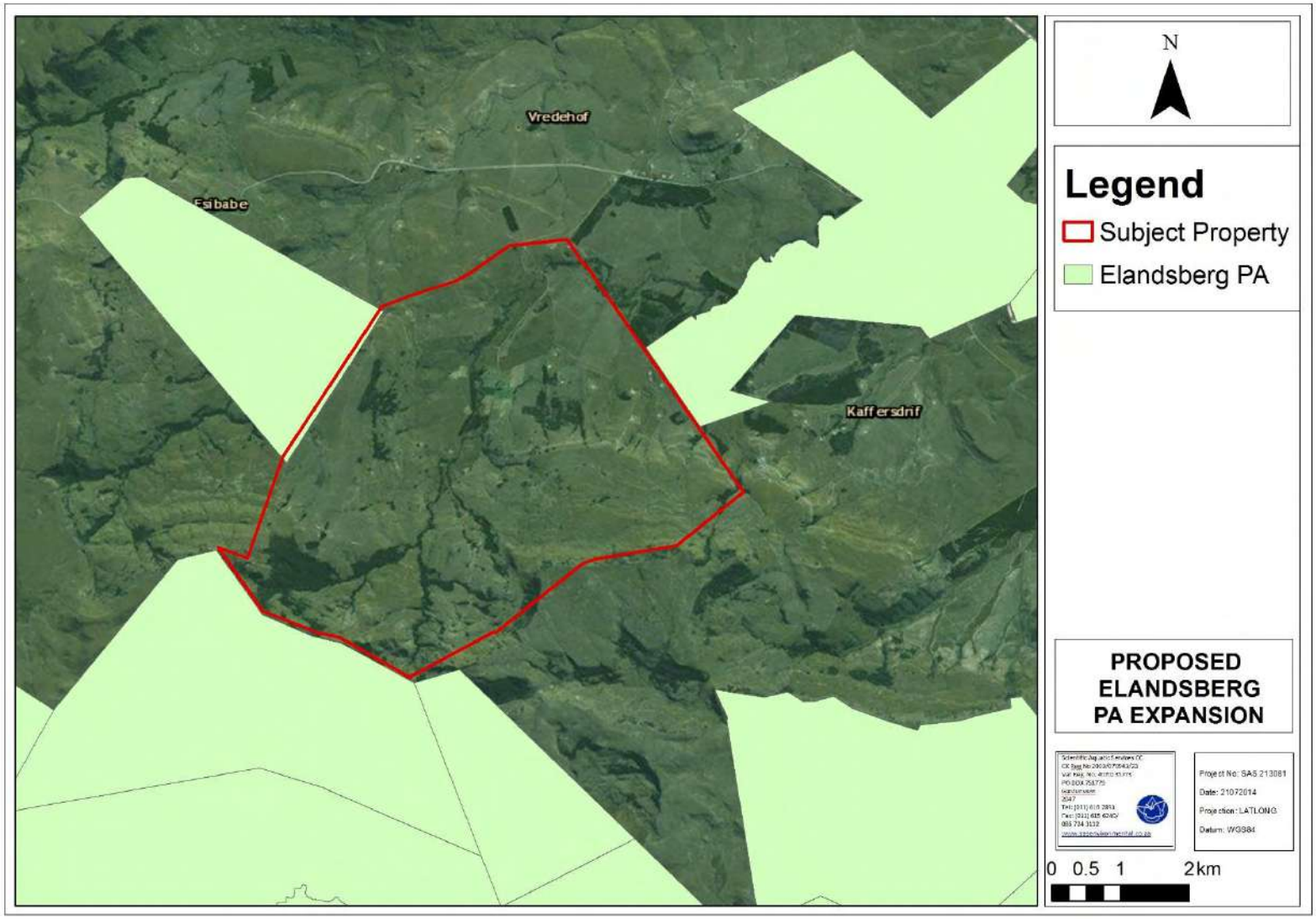

Figure 7: The proposed Elandsberg Protected Environment in relation to the subject property.

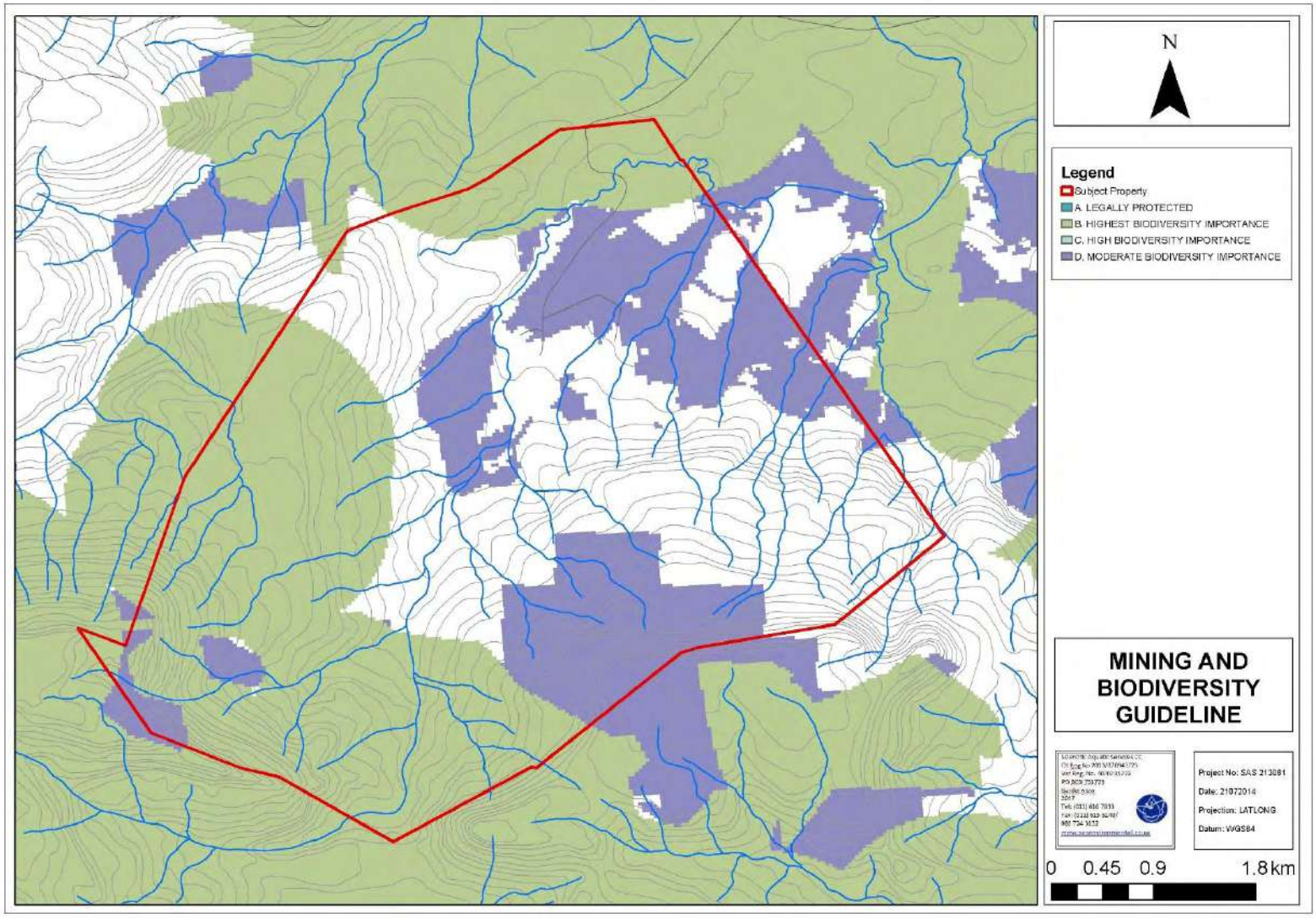

Figure 8: Importance of the subject property in terms of the Mining and Biodiversity Guidelines (2012).

4.5 KwaZulu-Natal Land-Use Categories, 2008

In order to appropriately monitor development and derive useful conservation plans, we need appropriate measures of the state of the landscape and extent of transformation. The KwaZulu-Natal (KZN) Land Cover Dataset is a single, contiguous land-cover dataset covering the entire KZN Province that has been generated from multi-date SPOT2/4 imagery acquired primarily in 2005, and represents the final 2005 KZN Province Land-Cover product. Following the successful completion of the 2005 KZN Provincial land cover dataset, a request was made to generate an updated version in order to better understand the ongoing land cover and land-use changes that are occurring within KZN (2008).

According to the KZN Land Cover Dataset the land cover of the subject property is a combination of irrigated and dryland cropfields, plantations, grassland, dense bush, bushland, grassland/bushclump mix, degraded grassland, wetlands, dams and freshwater systems (SANBI BGIS).

4.6 KwaZulu Natal Terrestrial Biodiversity Priority Areas

According to the KwaZulu-Natal Terrestrial Conservation Plan (Figure 9) the subject property contains areas specified as Biodiversity Priority Areas 1 (Critical Biodiversity Areas (CBAs) 1 Mandatory) and Biodiversity Priority Areas 3 (CBA 3 Optimal).

The CBA 1 Mandatory areas are based on the C-Plan Irreplaceability analyses. Identified as having an Irreplaceability value of 1, these planning units represent the only localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved i.e. there are no alternative sites available.

CBA 3 Optimal areas reflect the negotiable sites with an Irreplaceability score of less than 0.8. Even though these areas may display a lower Irreplaceability value it must be noted that these areas, together with CBA 1s and CBA 2s, collectively reflect the minimal reserve design required to meet the Systematic Conservation Plans targets and as such, they are also regarded as CBA areas.

Biodiversity areas not highlighted in MINSET are not open for wholesale development. Important species are still located within them and should be accounted for in the EIA process. They are not highlighted as the MINSET highlights the 'choice' areas from a biodiversity point of view only. Should one or more of the CBA2 and CBA3 sites be utilised for development, it is obvious that the target for whatever feature(s) where located within that PU will no longer be met.

4.7 Important Bird Areas (IBA)

The subject property falls within the Grasslands IBA (IBA SA125) (Figure 10) which extends across three provinces, namely KwaZulu-Natal, Mpumalanga and the Freestate. This large IBA covers several catchments, containing many perennial rivers and wetlands. These habitat units combined with the grasslands within the IBA provide suitable habitat to many Crane and grassland specialist species. Grasslands throughout southern Africa are under severe pressure as a result of habitat transformation from agriculture and mining. As a result, many habitat specialist species are currently being displaced and as a result are being compressed into increasingly diminishing suitable habitat. The result of this is an increase in competition for resources and breeding habitat, leading to intra-specific species competition, with a net loss of overall species numbers. As such, mining developments and placement of mining infrastructure needs to be increasingly scrutinized, ensuring that sensitive habitats are being conserved whilst suitably managing the increasing demand for natural resources.

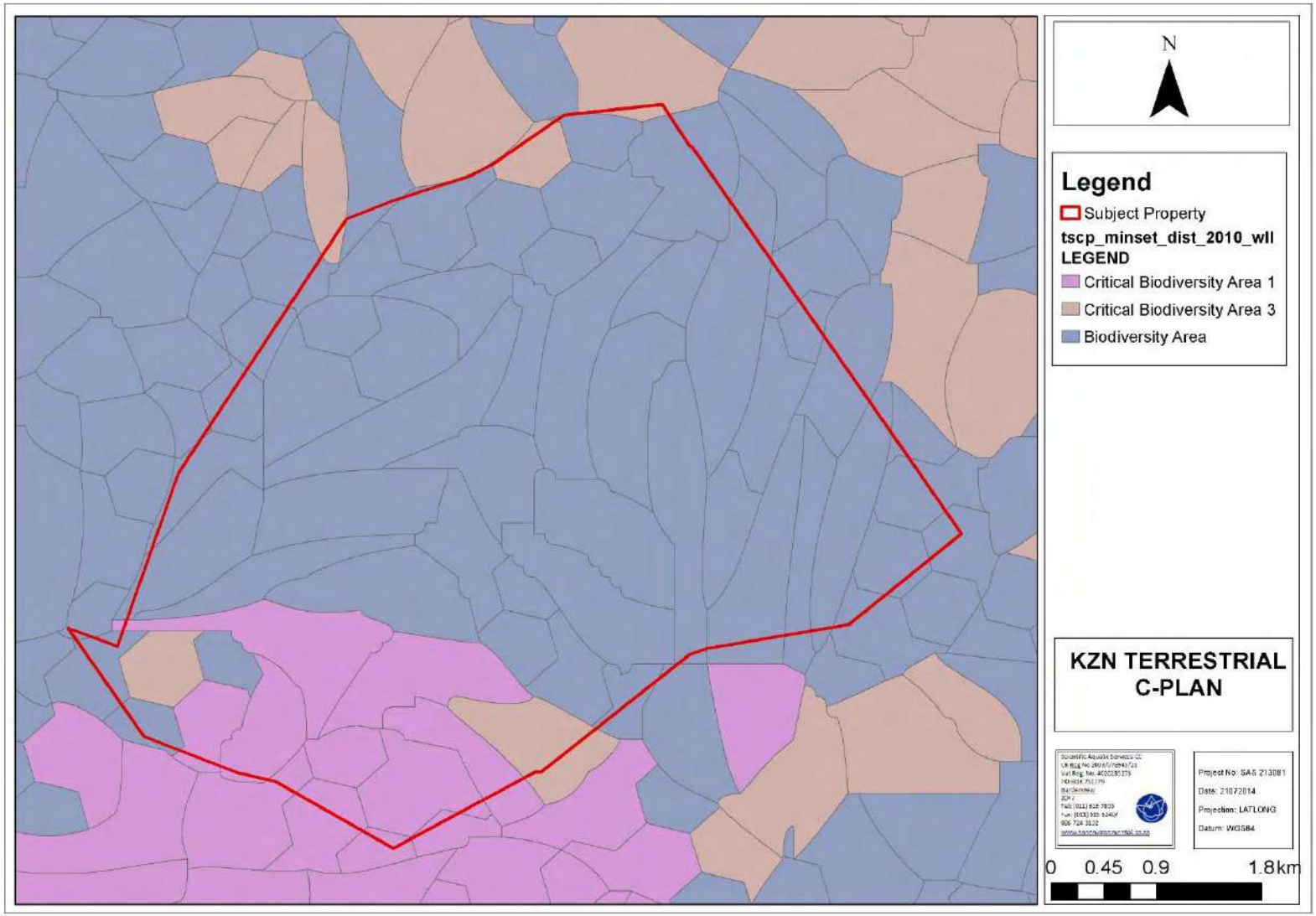

Figure 9: KZN Terrestrial Biodiversity Priority Areas associated with the subject property.

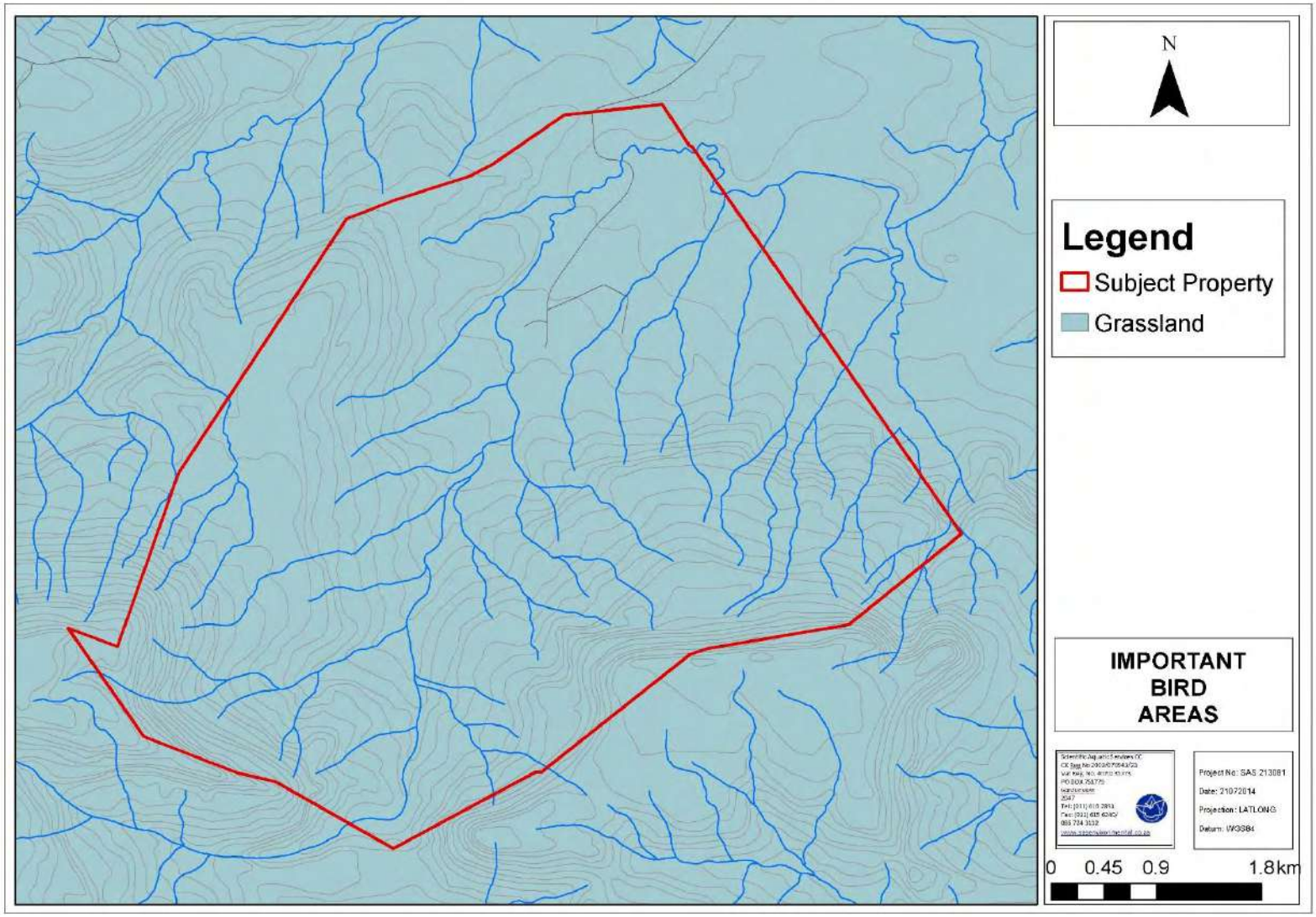

Figure 10: Important Bird Areas associated with the subject property.

5 STRUCTURE OF THE REPORT

Section A of this report served to provide an introduction to the subject property, the general approach to the study as well as the method of impact assessment. Section A also presents the results of general desktop information reviewed as part of the study including the information generated by the relevant authorities as well as the context of the site in relation to the surrounding anthropogenic activities and ecological character.

Section B addresses all the aspects pertaining to the assessment of the floral ecology of the subject property.

Section C addresses all the aspects pertaining to the assessment of the faunal ecology of the subject property.

Section D addresses all the aspects pertaining to the assessment of the wetland ecology of the subject property.

Section E addresses all the aspects pertaining to the assessment of the aquatic ecology of the subject property with focus on the Pandana and Sibabe Rivers.

Section F presents the results of the impact assessment and the mitigation measure development as well as the impact statement for the project.

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FLORAL, FAUNAL, WETLAND AND AQUATIC ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED COMMISSIEKRAAL COLLIERY, KWAZULU-NATAL PROVINCE

Prepared for

SLR Consulting (Africa) (Pty) Ltd.

July 2015

Section B: Floral Assessment

Prepared by: **Scientific Aquatic Services**
Report author **E. van der Westhuizen (Pr. Sci. Nat)**
S. van Staden (Pr. Sci. Nat)
Report Reference: **SAS 213081**
Date: **July 2015**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
E-mail: admin@sasenvironmental.co.za

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1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a faunal and floral ecological investigation as well as an investigation of the wetland and aquatic resources associated with a proposed new underground coal mine and related surface infrastructure to support a mining operation on the farm Commissiekraal 90HT, hereafter referred to as “subject property”. The subject property is located approximately 28 km north of Utrecht in the eMadlangeni Local Municipality and the Amajuba District Municipality, KwaZulu-Natal. The main land uses at the time of assessment include agriculture, primarily livestock grazing with minor dryland crops, forestry, conservation and tourism.

This report, after consideration and description of the ecological integrity of the subject property, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the most appropriate way forward for further assessment of botanical impacts associated with the proposed development as well as to define the suitability of the subject property for the intended land use, which in this case is the proposed mining development, from a floral ecological point of view.

2 GENERAL SITE SURVEY

Field assessments were undertaken during April 2013, December 2013 and February 2014, in order to determine the ecological status of the subject property. A reconnaissance ‘walkabout’ was initially undertaken to determine the general habitat types found throughout the subject property and, following this, specific study sites were selected that were considered to be representative of the habitats found within the area, with special emphasis being placed on areas that may potentially support floral Species of Conservation Concern (SCC). Sites were investigated on foot in order identify the occurrence of the dominant plant species and habitat diversities.

3 FLORAL ASSESSMENT METHODOLOGY

3.1 Floral Species of Conservational Concern Assessment

Prior to the field visit, a record of floral SCC and their habitat requirements was acquired from the South African National Biodiversity Institute (SANBI) for the Quarter Degree Square (QDS) 2730AD (Appendix A). Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as identification of suitable habitat that could potentially sustain these species.

The Probability of Occurrence (POC) for each floral SCC was determined using the following calculations wherein the habitat requirements and habitat disturbance were considered. The accuracy of the calculation is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research. Therefore, it is important that the literature available is also considered during the calculation.

Each factor contributes an equal value to the calculation.

Literature availability						
	No literature available					**Literature available**
Site score						
EVC 1 score	0	1	2	3	4	5
Habitat availability						
	No habitat available					**Habitat available**
Site score						
EVC 1 score	0	1	2	3	4	5
Habitat disturbance						
	0	**Very low**	**Low**	**Moderate**	**High**	**Very high**
Site score						
EVC 1 score	5	4	3	2	1	0

[Literature availability + Habitat availability + Habitat disturbance] / 15 x 100 = POC%

3.2 Vegetation Surveys

Vegetation surveys were undertaken by first identifying different habitat units and then analysing the floral species composition that was recorded during detailed floral assessments using the step point vegetation assessment methodology. Different transect lines were chosen throughout the entire subject property within areas that were perceived to best represent the various plant communities. Floral species were recorded and a species list was compiled for each habitat unit. These species lists were also compared with the vegetation expected to be found within the relevant vegetation types as described in Section 4, which serves to provide an accurate indication of the ecological integrity and conservation value of each habitat unit (Evans & Love, 1957; Owensby, 1973).

3.3 Vegetation Index Score

The Vegetation Index Score (VIS) was designed to determine the ecological state of each habitat unit defined within an assessment site. This enables an accurate and consistent description of the Present Ecological State (PES) concerning the subject property in question. The information gathered during the assessment also contributes towards the sensitivity mapping, leading to a more truthful representation of ecological value and sensitive habitats.

Each defined habitat unit is assessed using separate data sheets (Appendix B) and all the information gathered then contributes to the final VIS score. The VIS is derived using the following formulas:

VIS = [(EVC) + (SI x PVC) + (RIS)]

Where:

1. **EVC** is extent of vegetation cover;
2. **SI** is structural intactness;
3. **PVC** is percentage cover of indigenous species and
4. **RIS** is recruitment of indigenous species.

Each of these contributing factors is individually calculated as discussed below. All scores and tables indicated in blue are used in the final score calculation for each contributing factor.

1. EVC=[(EVC1+EVC2)/2]

EVC 1 - Percentage natural vegetation cover						
Vegetation cover %	**0%**	**1-5%**	**6-25%**	**26-50%**	**51-75%**	**76-100%**
Site score						
EVC 1 score	0	1	2	3	4	5
EVC 2 – Total site disturbance						
Disturbance score	**0**	**Very low**	**Low**	**Moderate**	**High**	**Very high**
Site score						
EVC 2 score	5	4	3	2	1	0

2. SI=(SI1+SI2+SI3+SI4)/4)

	Trees (S1)		Shrubs (S2)		Forbs (S3)		Grasses (S4)	
Score	*Present state	**Perceived reference state	Present state	Perceived reference state	Present state	Perceived reference state	Present state	Perceived reference state
Continuous								
Clumped								
Scattered								
Sparse								

*Present State (P/S) = currently applicable for each habitat unit

*Perceived Reference State (PRS) = if in pristine condition

Each SI score is determined with reference to the following scoring table of vegetation distribution for present state versus perceived reference state.

	Present state (P/S)			
Perceived reference state (PRS)	**Continuous**	**Clumped**	**Scattered**	**Sparse**
Continuous	3	2	1	0
Clumped	2	3	2	1
Scattered	1	2	3	2
Sparse	0	1	2	3

3. ***PVC=[(EVC)-(exotic x 0.7) + (bare ground x 0.3)]***

Percentage vegetation cover (exotic)						
	0%	**1-5%**	**6-25%**	**26-50%**	**51-75%**	**76-100%**
Vegetation cover %						
PVC score	0	1	2	3	4	5
Percentage vegetation cover (bare ground)						
	0%	**1-5%**	**6-25%**	**26-50%**	**51-75%**	**76-100%**
Vegetation cover %						
PVC score	0	1	2	3	4	5

4. ***RIS***

Extent of indigenous species recruitment	**0**	**Very low**	**Low**	**Moderate**	**High**	**Very high**
RIS						
RIS Score	0	1	2	3	4	5

The final VIS scores for each habitat unit are then categorised as follows:

Vegetation Index Score	Assessment Class	Description
22 to 25	**A**	Unmodified, natural
18 to 22	**B**	Largely natural with few modifications
14 to 18	**C**	Moderately modified
10 to 14	**D**	Largely modified
5 to 10	**E**	The loss of natural habitat extensive
<5	**F**	Modified completely

4 ECOLOGICAL DESCRIPTION OF THE PROPERTY

4.1 Biome and bioregion

Biomes are broad ecological units that represent major life zones extending over large natural areas (Rutherford 1997). This subject property falls within the *Grassland Biome* (Figure 1) (Rutherford & Westfall, 1994). Biomes are further divided into bioregions, which are spatial terrestrial units possessing similar biotic and physical features, and processes at a regional scale. This assessment site is situated within the *Mesic Highveld Grassland Bioregion* (Figure 2) (Mucina & Rutherford, 2006).

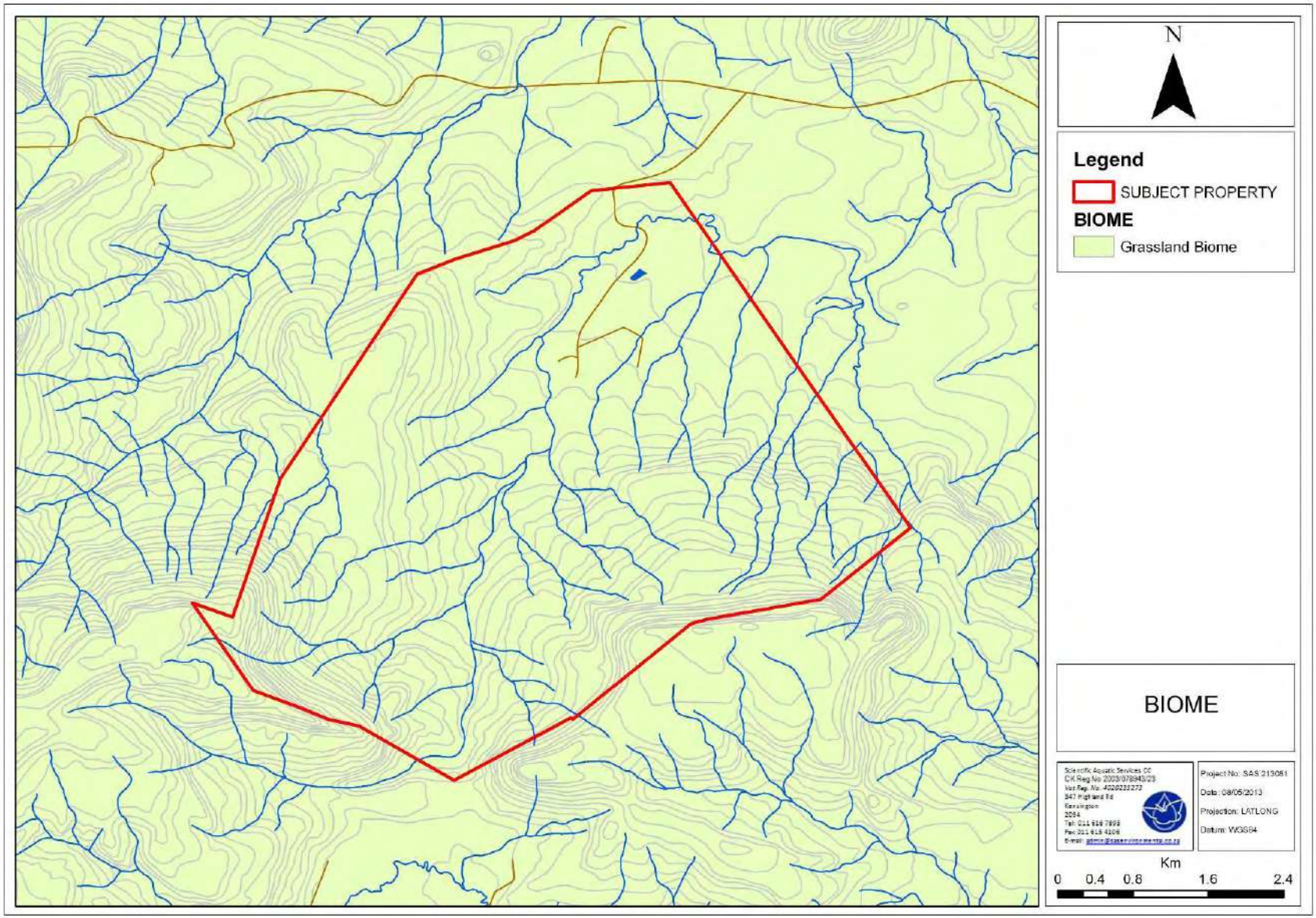


Figure 1: Biomes associated with the subject property (Mucina & Rutherford, 2006).

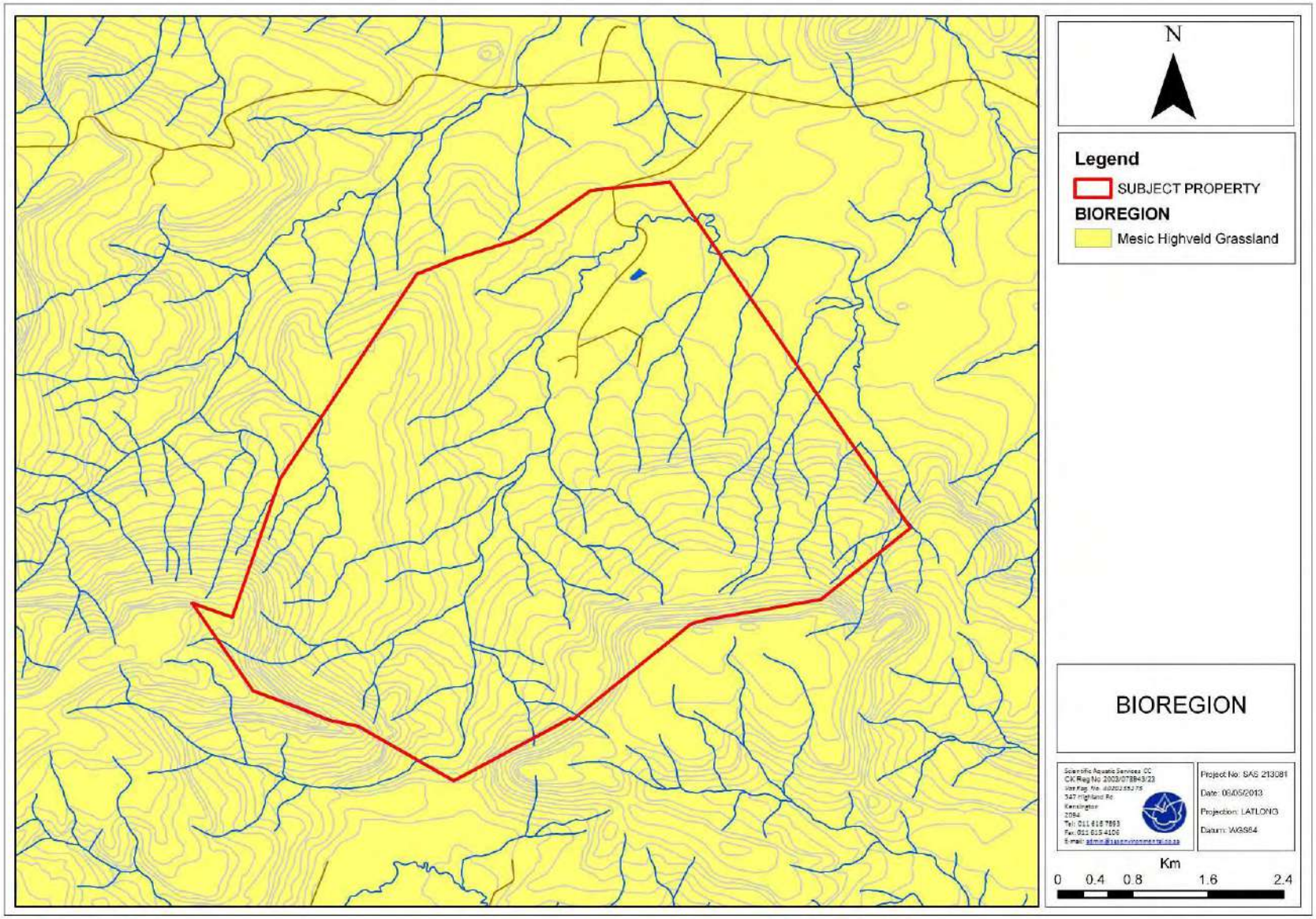


Figure 2: Bioregions associated with the subject property (Mucina & Rutherford, 2006).

4.2 Vegetation Type and Landscape Characteristics

While biomes and bioregions are valuable as they describe broad ecological patterns, they provide limited information on the actual species that are expected to be found in an area. Knowing which vegetation type an area belongs to provides an indication of the floral composition that would be found if the assessment site was in a pristine condition, which can then be compared to the observed floral list and so give an accurate and timely description of the ecological integrity of the assessment site. When the boundary of the subject property is superimposed on the vegetation types of the surrounding area it can be seen that it falls within the *Wakkerstroom Montane Grassland, Paulpietersburg Moist Grassland* and the *Northern Afrotemperate Forest Vegetation Types* (Figure 3).

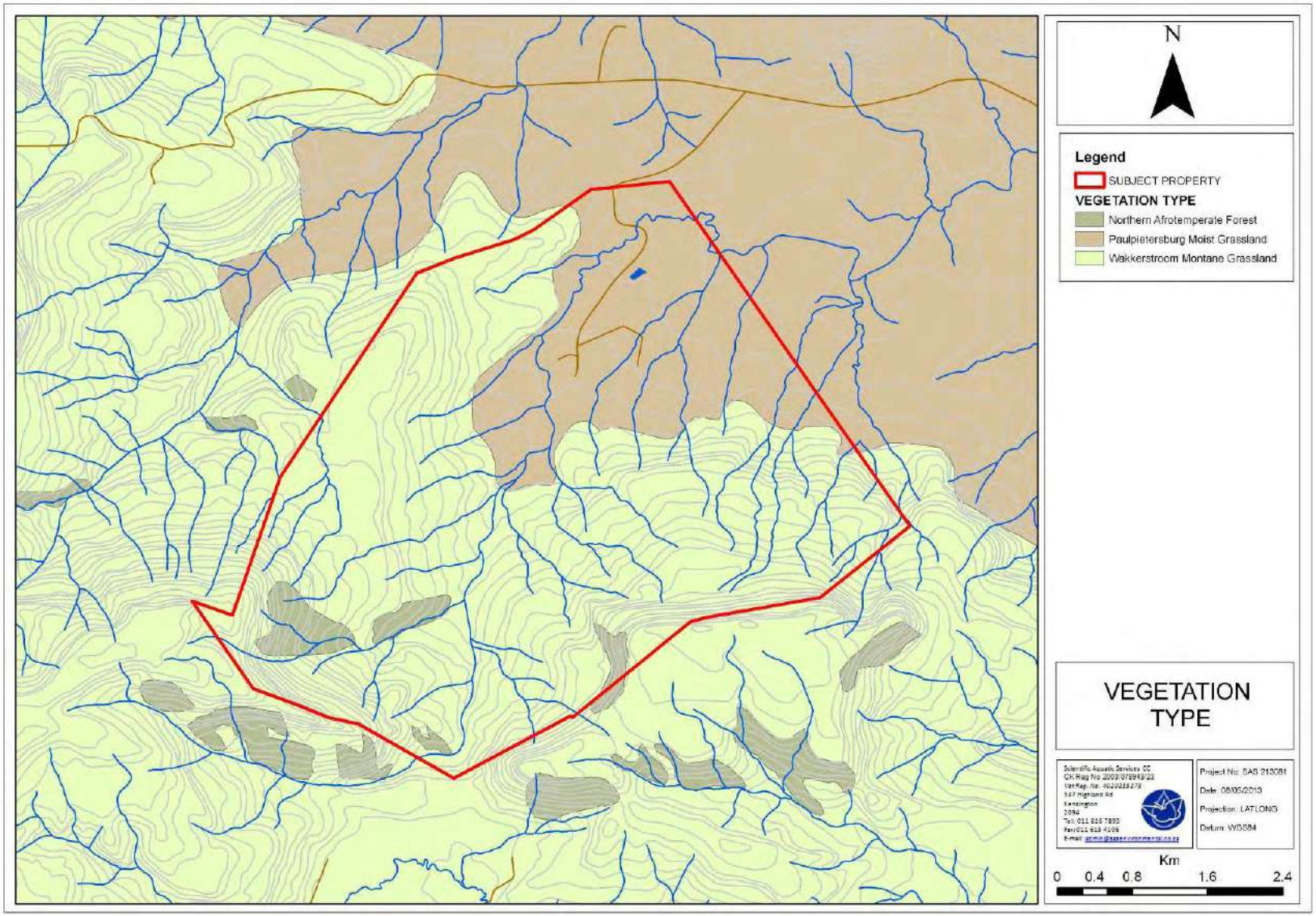


Figure 3: Vegetation type associated with the subject property (Mucina & Rutherford, 2006).

4.3 Wakkerstroom Montane Grassland

4.3.1 Distribution

Wakkerstroom Montane Grassland occurs in the KwaZulu-Natal and Mpumalanga Provinces. It occurs from the escarpment just north of Sheepmoor to south east of Utrecht, and then from the vicinity of Volksrust in the west to Mandhlangampisi Mountain near Luneberg in the east. Altitude is from 1140 – 2200 m (Mucina & Rutherford, 2006).

4.3.2 Climate

Rainfall in the *Wakkerstroom Montane Grassland* peaks in midsummer and varies from 800-11250mm per year. This unit experiences an orographic effect which results in a locally higher precipitation than the adjacent areas. Winters are very cold and summers are mild (Man annual temperature is 14°C) (Mucina & Rutherford, 2006).

4.3.3 Geology and soils

The mudstones, sandstones and shale of the Madzaringwe and Volksrust Formations were intruded by voluminous Jurassic dolerite dykes and sills. (Mucina & Rutherford, 2006).

4.3.4 Conservation

Wakkerstroom Montane Grassland is considered Least Threatened. The conservation target for the area is 27%. However, only 1% is statutorily protected in the Paardeplaats Nature Reserve. There are some 10 South African heritage sites in this unit, although very little of it is formally protected. Land use pressure from agriculture is low (5% cultivated) probably owing to colder climates and shallower soils. The area is also suited to afforestation, with more than 1% under *Acacia mearnsii* and *Eucalyptus* plantations. The black wattle (*A. mearnsii* is an aggressive invader of riparian areas. Erosion id very low and low (Mucina & Rutherford, 2006).

4.3.5 Taxa of the Wakkerstroom Montane Grassland

The *Wakkerstroom Montane Grassland* vegetation type is a less obvious continuation of the escarpment that links the southern and northern Drakensberg escarpments. It straddles this divide and is comprised of low mountains and undulating plains. The vegetation comprises predominantly short montane grasslands on the plateaus and the relatively flat areas, with short forest and *Leucosidea* thickets occurring along steep, mainly east facing slopes and drainage areas. *L.*

sericea is the dominant woody pioneer species that invades areas as a result of grazing mismanagement (Mucina and Rutherford, 2006).

Key indicator species of this vegetation type include:
Small trees: *Canthium ciliatum, Protea subvestita;*
Tall shrubs: *Buddleja salvifolia* (d), *Leucosidea sericea* (d), *Buddleja auriculata, Diospyros lycioides* subsp. *guerki. Euclea crispa* subsp. *crispa, Rhus Montana, R. rehmanniana, R. transvaalensis;*
Low shrubs: *Asparagus devinishii* (d), *Cliffortia linearifolia* (d), *Helichrysum melanacme* (d), *H. splendidum* (d), *Anthospermum rigidum* subsp. *pumilum, Clutia natalensis, Erica oatesii, Felicia filifolia* subsp. *filifolia, Gymnosporia heterophylla, Helichrysum hypoleucum, Hermannia geniculata, Inulanthera dregeana, Metalasia densa, Printzia pyrifolia, Rhus discolour, Rubus ludwigii* subsp. *ludwigii;*
Graminoids: - *Andropogon schirensis* (d), *Ctenium concinnum* (d), *Cymbopogon caesius* (d), *Digitaria tricholaenoides* (d), *Diheteropogon amplectens* (d), *Eragrostis chloromelas* (d), *E. plana* (d), *E. racemosa* (d), *Harpochloa falx* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Microchloa caffra* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *Alloteropsis semialata* subsp. *eckloniana, Aristida junciformis* subsp. *galpinii, Brachiaria serrata, Diheteropogon filifolius, Elionurus muticus, Eragrostis capensis, Eulalia villosa, Festuca scabra, Loudetia simplex, Rendlia altera, Setaria nigrirostis;*
Herbs: *Berkheya onopordifolia* var. *glabra* (d), *Acalypha depressinerva, A. penduncularis, A. wilmsii, Aster bakerianus, Berkheya setifera, Euryops transvaalensis* subsp. *setilobus, Galium thunbergianum* var *thunbergianum, Geranium ornithopodiodes, Helichrysum cephaloidium, H. cooperi, H. monticola, H. nudifolium* var *nudifolium, H. oreophyllum, H. similimum, Pentanisia prunelloides* subsp. *latifolia, Plectranthus laxiflorus, Sebaea leiostyla, S. sedoides* var *sedoides, Selago densiflora, Vernonia hirsute, V. natalensis, Wahlenbergia cuspidate;*
Geophytic herbs: *Hypoxis costata* (d), *Agapanthus inaperatus* subsp. *intermedius, Asclepias aurea, Cheilanthes hirta, Corycium dracomontanum, C. nigrescens, Cyrtanthus tuckii* var. *transvaalensis, Disa versicolor, Eriospermum cooperi* var *cooperi, Eucomis bicolor, Geum capense, Gladiolus ecklonii, G. sericeovillosus* subsp. *sericeovillosus, Hesperantha coccinea, Hypoxis rigidula* var. *pilosissima, Moraea brevistyla, Rhodohypoxis baurii* var *confecta;*
Semiparasitic herb: *Striga bilabiata* subsp. *bilabiata.*
(d) = dominant species

4.4 Paulpietersburg Moist Grassland

4.4.1 Distribution

Paulpietersburg Moist Grassland occurs in the KwaZulu-Natal and Mpumalanga Provinces in the broad surrounds of Piet Retief, Paulpietersburg and Vryheid, extending westwards to east of Wakkerstroom. It occurs in the upper most catchments of the Phongolo River at altitudes between 920-1500 m (Mucina & Rutherford, 2006).

4.4.2 Climate

Paulpietersburg Moist Grassland is characterised by summer rainfalls with a MAP of 900mm. The vegetation type is characterised by a warm-temperate climate with a mean annual temperature close to 17°C with fairly frequent frosts (Mucina & Rutherford, 2006).

4.4.3 Geology and soils

This area is underlain by Archaean granite and gneiss partly covered by Karoo Supergroup sediments and intruded by Karoo Dolerite Suite dykes and sills. Dominant soils on the sedimentary parent material are yellow apedal, well drained, with a depth of >800mm and a clay content of >35%, representing the soils series Hutton, Clovelly and Griffin. Shortland soils are dominant on dolerite (Mucina & Rutherford, 2006).

4.4.4 Conservation

Paulpietersburg Moist Grassland is considered Vulnerable. The conservation target for the area is 24%. However, only a very small portion is statutorily conserved in the Witband, Vryheid Mountain, Paardeplaats and Phongola Bush Nature Reserves. Some private reserves protect small patches (Rooikraal, Mhlongamvula, Kombewaria). About one third is already transformed by plantations or cultivated land. Heavy livestock grazing and altered fire regimes have greatly reduced the area of grasslands of high conservation value. Aliens such as *Acacia*, *Eucalyptus* and *Pinus* are a major concern in places. Erosion is very low or low (Mucina & Rutherford, 2006).

4.4.5 Taxa of the Paulpietersburg Moist Grassland

The *Paulpietersburg Moist Grassland* vegetation type is mainly undulating with moderate steep slopes but valley basins are wide and flat and mountainous areas occur mostly along the northern and eastern boundary. Characterised by tall closed grassland rich in forbs and dominated by *Tristachya leucothrix*, *Themeda triandra* and *Hyparrhenia hirta*. Evergreen woody vegetation is characteristic on rocky outcrops.

Key indicator species of this vegetation type include:

Small trees: *Canthium cilliatum* (d), *Dombeya rotundifolia, Vangueria infausta;*

Succulent tree: *Aloe marlothii* subsp. *marlothii;*

Tall shrubs: *Calpurnia sericea* (d), *Rhus rehmannii* (d), *Diospyros lycioides* subsp. *guerkei, Euclea crispa* subsp. *crispa;*

Low shrubs*: Rhus discolour* (d), *Anthospermum rigidum* subsp. *pumilum, A. rigidum* subsp. *rigidum, Clutia monticola, Diospyros galpinii, Erica oatesii, E. woodii, Hermannia geniculata, Indigofera arrecta, Otholobium wilmsii, Polygala uncinata, Pseudarthria hookeri, Rubus rigidus;*

Succulent shrub*: Euphorbia pulvinata;*

Graminoids*: Alloteropsis semialata* subsp. *ecklonia* (d), *Andropogon schirensis (d), Brachiaria serrate* (d), *Ctenium concinnum* (d), *Cymbopogon caesius* (d), *Digitaria tricholaenoides* (d) *Eragrostis racemosa* (d), *Harpochloa falx* (d) *heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), *Rendlia altera* (d), *Setaria nigrirostis* (d), *Themeda triandra* (d), *Tristachya leucothrix* (d), *Andropogon appendiculatus, Cynodon hirsutus, Diheteropogon amplectens, D. filifolius, Elionurus muticus, Eragrostis chloromelas, E. curvula, E. plana, Festuca scabra, Melinis nerviglumis, Panicum ecklonii, P. natalense, Trachypogon spicatus, Urelytrum agropyroides;*

Herbs: *Argyrolobium speciosum* (d), *Cissus diversilobata* (d), *Dicoma zeyheri* (d), *Eriosema kraussianum* (d) *Geranium wakkerstroomianum* (d), *Helichrysum nudifolium* var. *nudifolium* (d), *Ipomoea oblongata* (d), *Pelargonium luridum* (d), *Acalypha grandulifolia, A. peduncularis, Acanthospermum austral, Aster barkerianus, Becium filamentosum, Berkheya setifera, Dicoma anomala, Euryops laxus, E. transvaalensis* subsp. *setilobus, E. transvaalensis* subsp. *transvaalensis, Helichrysum rugulosum, H. similimum, Indigofera hilaris, I. velutina, Kohautia amatymbica, Pearsonia grandifolia, Pentanisia prunelloides* subsp. *latifolia, Senecio bupleuroides, S. coronatus, S. inornatus, S. isatideus, S. latifolius, Sonchus nanus, Thunbergia atriplicifolia, Vernonia capensis, V. natalensis, Xerophyta retinervis;*

Herbaceous climber*: Rhynchosia totta;*

Geophytic herbs: *Chlorophytum haygarthii* (d), *Gladiolus aurantiacus* (d), *Agapanthus inapertus* subsp. *intermedius, Asclepias aurea, Cheilanthes hirta, Cyrtanthus tuckii* var *transvaalensis, Hypoxis colchicifolia, H. costata, H. rigidula* var. *pilosissima, Moraea brevistyla, Pteridium aquilinum, Watsonia latifolia, Zantedeschia rehmannii;*

Succulent herbs: *Aloe ecklonis, A. maculata, Lopholaena segmentata.*

**(d = dominant species)*

4.5 Northern Afrotemperate Forest

4.5.1 Distribution

Northern Afrotemperate Forest occurs in the Free State, KwaZulu-Natal, Mpumalanga, North West, Gauteng and Limpopo Provinces. It is restricted to mountain kloofs and low ridges interrupting the relatively flat northern Highveld. This group also comprises forests found in kloofs along the northern and eastern flanks of the Drakensberg and those found on the slopes and scarps of the Low Escarpment between Van Reenens Pass and Pongola Bush near Piet Retief. The westernmost localities of these forests are found in the Koranaberg (Close to Thaba 'Nchu). Most patches occur at altitudes between 1450 and 1900m, with outliers as low as 1100m and around 2000m (Mucina & Rutherford, 2006).

4.5.2 Geology and soils

Occurs on Shallow acidic soils over sandstones of the Karoo Supergroup, quartzites and rarely also volcanic rock of the Ventersdorp Supergroup and intrusive diabases of the Pretoria Igneous Complex (Mucina & Rutherford, 2006).

4.5.3 Conservation

Northern Afrotemperate Forest is considered Least Threatened. The conservation target for the area is 31%. About 30% of the vegetation type is statutorily conserved in uKhahlamba Drakensberg Park, Phongola Bush, Vryheid Mountain, Cloccolan/Robinsons Bush, Ngome and Ncandu Nature Reserves, Magaliesberg Nature Area, Merville Ridge, Paardeplaats, Rustenburg, Suikerbosrand Nature Reserves, Marekele National Park and Pilanesberg Game Reserve. Some private Nature Reserves (Mooibron, Mhlongamvula, Tafelkop, Oudehoutdraai, Oshoek and Ossewakop) protect some patches too. Occasional hot fires encroaching from the surrounding savannah woodlands, uncontrolled timber extraction, medicinal plant harvesting and grazing in the forests can be viewed as the current major threats (Mucina & Rutherford, 2006).

4.5.4 Taxa of Northern Afrotemperate Forest

Low, relatively species poor forests of afromontane origin and some of them still showing clear afromontane character. Found as small patches in kloofs and on sub-ridge scarps at high altitudes (1500-1900m). Canopy dominated usually by *Podocarpus latifolius, Olinia emarginata, Halleria lucida, Scolopia mundii* and rarely also by *Widdringtonia nodiflora*, in drier faces also by *Pittosporum viridiflorum, Celtis africana, Mimusops zeyheri, Nuxia congesta* and *Combretum*

erythrophyllum. Xymalos monospora sometimes dominates patches of species poor mistbelt forest of northern KwaZulu-Natal.

Key indicator species of this vegetation type include:
Tall Trees: *Celtis africana* (d), *Halleria lucida* (d), *Olinia emarginata* (d), *Pittosporum viridiflorum* (d), *Podocarpus latifolius* (d), *Rothmannia capensis* (d), *Scolopia mundii* (d), *Afrocarpus falcatus, Buddleja saligna, Dais cotinifolia, Ilex mitis;*
Small trees: *Acalypha glabrata* (d), *Buddleja salviifolia* (d), *Calpurnia aurea* (d), *Combretum erythrophyllum* (d), *Diospyros lycioides* subsp*. guerkei* (d), *D. whyteana* (d), *Euclea crispa* subsp. *crispa* (d), *Widdringtonia nodiflora* (d), *Bowkeria verticilata, Canthium ciliatum, Leucosidea sericea, Scolopia flanaganii;*
Woody climber*: Cassinopsis ilicifolia* (d);
Tall shrubs: *Myrsine africana* (d), *Cliffortia nitidula;*
Soft shrubs*: Isoglossa grantii* (d), *Hypoestes aristata, Plectranthus fruticosus;*
Herbs*: Plectranthus grallatus* (d), *P. hereroensis* (d), *Peperomia retusa, Streptocarpus haygarthii, S. pusillus;*
Geophytic herbs: *Blechnum attenuatum* (d), *Asplenium aethiopicum, Polystichum luctuosum;*
Graminoids*: Carex spicato-paniculata* (d), *Oplismenus hirtellus* (d), *Cyperus albostriatus, Schoenoxiphium lehmannii, Thamnocalamus tessellatus.*
**(d = dominant species)*

5 RESULTS OF FLORAL ASSESSMENT

During the field assessment, a number of habitat units were identified. These habitat units are:

- Wetland and riparian habitat associated with various streams, drainage lines, seepage areas and dams;
- Montane grassland, associated with the mountainous areas in the southern section of the subject property;
- Northern Afrotemperate forest, associated with ravines, kloofs and forest patches within the higher elevation grasslands; and
- Transformed grassland which has suffered impacts from current and historic cultivation, rural settlements and homesteads and severe overgrazing which is associated with the lower altitude areas on the subject property.

These habitat units are described in the sections below.

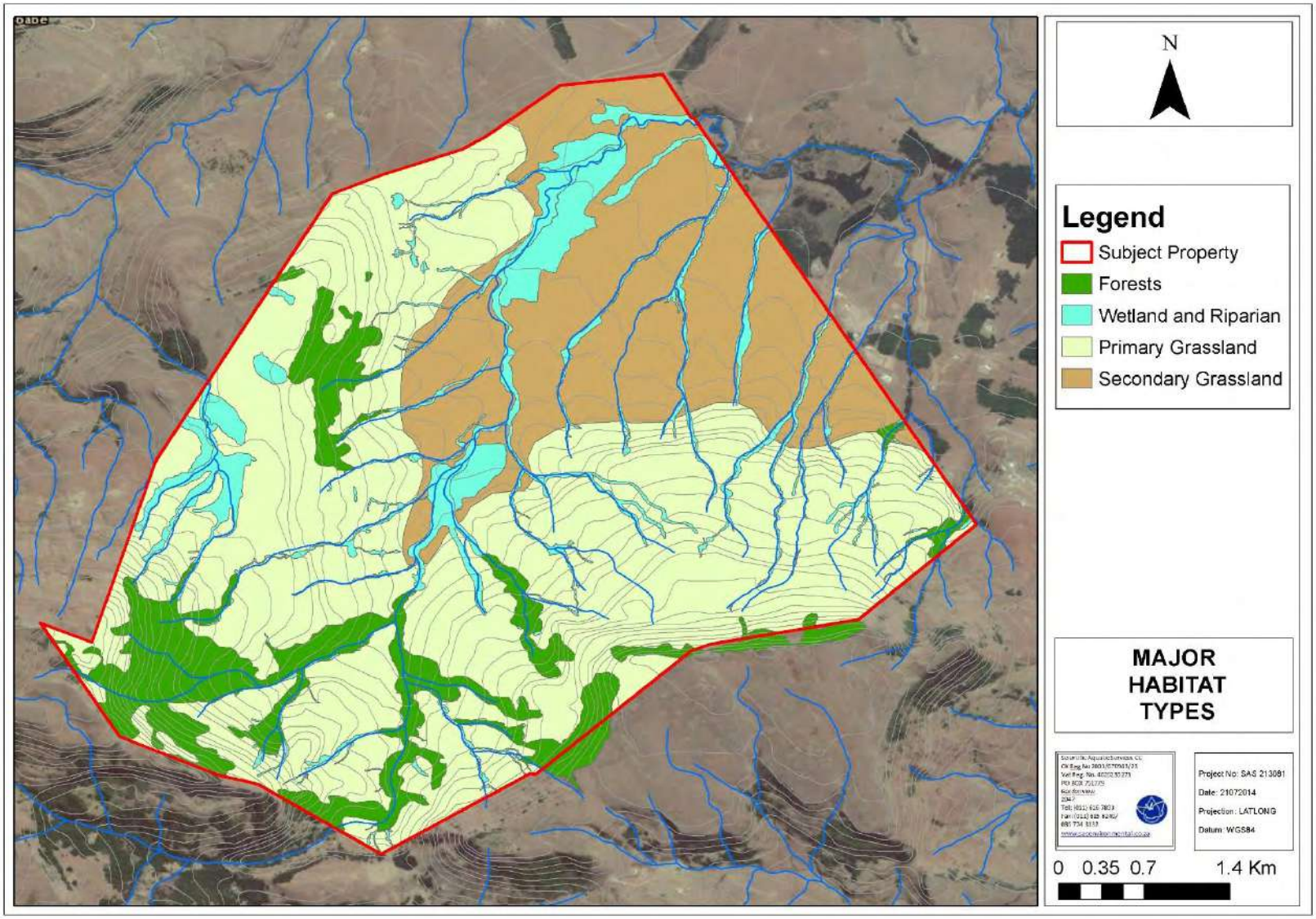


Figure 4: Conceptual illustration of the habitat units within the subject property.

5.1 Habitat Unit 1: Wetland and Riparian Habitat Unit

Figure 5: Wetland and riparian habitat present in the subject property.

Various wetland and riparian features (Pandana River) were encountered within the subject property that comprised of wetland types such as valley bottom wetlands, riparian zones and seepage wetlands. The ecological condition of these wetlands varies from excellent in the high altitude grasslands and Afrotemperate forests, to moderately transformed in the lower altitude areas where crop cultivation, dam and weir construction and alien floral invasion have transformed the hydrological and geomorphological aspects of the wetlands. Alien floral invasion levels were generally low, except for the lower sections of the Pandana River, where *Acacia mearnsii* has, in some instances, completely replaced the indigenous riparian vegetation.

Various floral SCC in the genera *Gladiolus., Habenaria, Eulophia, Satyrium* and *Disa* (refer to table below for complete floral SCC list), which are protected under the Kwazulu-Natal Nature Conservation Management Amendment Act, 1999 No. 5 of 1999, were encountered in the wetland areas during the field surveys.

In addition, the protected tree species *Podocarpus falcatus, P. latifolius* and *Ilex mitis* occur within the Afrotemperate forest riparian zones along the high altitude streams and ravines. These tree species are protected under the National Forests Act of 1998 (Act 84 of 1998). In terms of this act, protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the Department of Water Affairs or a delegated authority.

During the assessment, the various wetland vegetation components were investigated. Dominant species were characterised as either wetland or terrestrial species. The wetland

species were then further categorised as temporary, seasonal and permanent zone species. This characterisation is presented in the table below.

Table 1: Dominant species encountered in the wetland and riparian habitat unit. Alien species are indicated with an asterisk (*) and protected species are in bold font.

Terrestrial species	Seasonal species	Temporary species	Permanent species
Eragrostis curvula	*Berkheya radula*	*Sporobolus africanus*	*Cyperus esculentis*
Eragrostis chloromelas	***Cyathea dregei***	*Miscanthus junceus*	*Cyperus rotundus*
Cynodon dactylon	*Schoenoplectus paludicola*	*Cyperus esculentis*	*Persicaria lapathifolia*
Hyparrhenia hirta	*Cyperus rupestris*	*Helichrysum krausii*	*Typha capensis*
*Acacia mearnsii	*Panicum maximum*	*Cyperus marginatus*	*Nymphaea capensis*
Ilex mitis	*Verbena bonariensis**	*Eragrostis plana*	*Leersia hexandra*
Podocarpus latifolius	***Panicum tricholaenoides***	*Schoenoplectus paludicola*	*Cyperus rupestris*
Podocarpus falcatus	*Imperata cylindrica*	*Stiburus alopecuroides*	*Schoenoplectus paludicola*
	Miscanthus junceus		
	Setaria sphacelata var. torta		
	Gladiolus dalenii		
	Gladiolus ecklonii		
	Corycium nigrescens		
	Stiburus alopecuroides		
	Disa versicolor		
	Gladiolus crassifolius		
	Gladiolus appendiculatus		

The riparian and wetland areas are generally characterised by high ecological functionality and overall high levels of habitat integrity. In terms of floral SCC, several such species are present in this habitat unit.

The wetland and riparian habitat unit provides niche habitat for a high diversity of floral and faunal species and acts as a very important network of migratory corridors for faunal species. Thus, this habitat unit is considered to be sensitive. As such, any impacts on the wetland and riparian systems associated with the subject property are likely to be significant on a local and potentially regional scale depending on how well impacts are managed and mitigated.

5.2 Habitat Unit 2: Montane grassland

Figure 6: Representative depictions of montane grassland present on the subject property.

This habitat unit comprises high-altitude grassland associated with Paulpietersburg Moist Grassland and Wakkerstroom Montane Grassland, and was encountered in high-altitude areas on the subject property (1600 mamsl and higher). Forb diversity was high, and species recorded within this habitat unit included *Gnidia kraussiana, Senecio coronatus, Kohautia amatymbica, Helichrysum kraussii, Acalypha angustata, Eriospermum abyssinicum, Castalis respectabilis* and *Hypoxis acuminata.* The graminoid layer was characterised by mostly climax species and included *Andropogon schirensis, Diheteropogon amplectens, Setaria sphacelata* var. *sphacelata, Harpochloa falx, Tristachya leucothrix, Themeda triandra* and *Elionurus muticus.* In the high altitude areas, woody clumps comprised of *Leucosidea sericea, Widdringtonia nodiflora.* Very few alien and/or invasive species were encountered within this habitat unit, which further indicates that floral habitat and community structure is intact.

Table 2: Dominant species encountered in montane grassland habitat unit. Alien species are indicated with an asterisk (*) and protected species are in bold font.

Grass/sedge/reed species	Forb species	Tree/Shrub Species
Aristida bipartata	*Acalypha angustata*	**Acacia mearnsii*
Aristida congesta subsp. congesta	*Agapanthus inaperatus subsp. intermedius*	***Cyathea dregei***
Aristida junciformis subsp. galpinii	*Albuca setosa*	*Indigofera hilaris*
Brachiaria serrata	*Castalis respectabilis*	*Leucosidea sericea*
Cynodon dactylon	*Cleome maculata*	***Protea subvestita***
Digitaria tricholaenoides	***Corycium nigrescens***	*Searsia pondoensis*
Diheteropogon amplectens	*Crassula alba*	*Widdringtonia nodiflora*
Elionurus muticus	*Crocosmia pottsii*	
Enneapogon scoparius	*Delosperma sutherlandii*	
Eragrostis chloromelas	*Dierama dracomontanum*	
Eragrostis curvula	*Dierama dracomontanum*	
Eragrostis gummiflua	*Dimorphotheca jucunda*	
Eragrostis superba	***Disa brevicornis***	
Harpochloa falx	***Disa versicolor***	
Imperata cylindrica	***Disperis concinna***	
Monocymbium ceresiiforme	***Disperis tysonii***	
Rendlia altera	*Eriosema burkei*	
Schizachyrium sanguineum	*Eriospermum abyssinica*	
Setaria sphacelata var. sphacelata	***Eucomis autumnalis***	
Themeda triandra	***Eulophia sp***	
Tristachya leucothrix	*Euphorbia clavaroides*	
	Galtonia candicans	
	Gladiolus appendiculatus	
	Gladiolus crassifolius	
	Gladiolus dalenii	
	Gladiolus ecklonii	
	Habenaria filicornis	
	Helichrysum kraussii	
	Hypoxis acuminata	
	Hypoxis angustifolia	
	Indigofera cuneifolia	
	Ledebouria cooperii	

Grass/sedge/reed species	Forb species	Tree/Shrub Species
	Ledebouria ovatifolia	
	Monopsis decipiens	
	Monsonia attenuata	
	Pelargonium luridum	
	Satyrium cristatum	
	Satyrium longicauda	
	Schizoglossum hilliardiae	
	Scilla nervosa	
	Senecio coronatus	
	Tritonia nelsonii	
	Tulbaghia acutilobia	
	**Verbena tenuisecta*	
	Watsonia confusa	
	Watsonia gladioloides	

The Montane Grassland habitat unit has general high ecological functionality and overall high levels of habitat integrity, especially in the high altitude areas and is in a mostly undisturbed condition, apart from isolated areas where existing homesteads and kraals are situated. Furthermore, several species protected under the Kwazulu-Natal Nature Conservation Management Amendment Act (No. 5 of 1999) (refer to table above) are present in this habitat unit. The above-mentioned botanical aspects of the Montane Grassland habitat indicate that this habitat type is of increased ecological sensitivity and conservation value. This habitat unit provides intact habitat for a high diversity of floral and faunal species and contributes towards faunal migratory connectivity within the area.

Thus, the Montane Grassland habitat unit is considered to be of high ecological sensitivity, and any impacts from the proposed mining activities and associated infrastructure are anticipated to be significant.

5.3 Habitat Unit 3: Northern Afrotemperate Forest

Figure 7: Forested ravines (left) and stream within Northern Afrotemperate Forest ravine (right).

The Northern Afrotemperate forests were encountered in ravines, kloofs and forest patches at higher altitude areas associated with the subject property. The floral species diversity is generally relatively low and dominated by *Podocarpus falcatus*, P *latifolius, Nuxia congesta, Olinia emarginata* and *Dais cotinifolia,* which is typical for this vegetation type. Very little disturbance was encountered, and was generally limited to isolated patches of deforestation and alien floral invasion by *Acacia mearnsii.* Thus, the species composition is representative of this vegetation type. Furthermore, several species, such as *Podocarpus falcatus, P. latifolius, Ilex mitis* and *Pittosporum viridiflorum,* are present in this habitat unit and are protected under the Kwazulu-Natal Nature Conservation Management Amendment Act (No. 5 of 1999) and the National Forests Act of 1998 (Act 84 of 1998). In terms of this act, protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the Department of Water Affairs or a delegated authority. The dominant species recorded during the surveys are listed below.

Table 3: Dominant species encountered in Northern Afrotemperate Forest habitat unit. Alien species are indicated with an asterisk (*) and protected species are in bold font.

Grass/sedge/reed species	Forb species	Tree/Shrub Species
Carex spicato-paniculata	*Hypoestes aristata*	**Acacia mearnsii*
Cyperus albostriatus	*Isoglossa grantii*	*Acalypha glabrata*
Panicum maximum	*Peperomia retusa*	*Bowkeria verticilata*
	Plectranthus fruticosus;	*Buddleja saligna*
	Plectranthus grallatus	*Buddleja salviifolia*
	Streptocarpus haygarthii	*Calpurnia aurea*
	Streptocarpus pusillus	*Canthium ciliatum*
		Celtis africana
		Clausena anisata
		Cliffortia nitidula
		Combretum erythrophyllum
		Dais cotinifolia
		Diospyros lycioides subsp. guerkei
		Diospyros whyteana
		Euclea crispa subsp. crispa
		Halleria lucida,
		Ilex mitis
		Leucosidea sericea
		Myrsine africana
		Nuxia congesta
		Olinia emarginata
		Pittosporum viridiflorum
		Podocarpus falcatus
		Podocarpus latifolius
		Rapanea melanophloeos
		Rothmannia capensis
		Scolopia flanaganii
		Scolopia mundii
		Widdringtonia nodiflora

The Northern Afrotemperate habitat unit is representative of the vegetation type, has high ecological functionality and overall high levels of habitat integrity, especially in the more remote areas and is in a mostly undisturbed condition. Furthermore, several species protected under the Kwazulu-Natal Nature Conservation Management Amendment Act (No. 5 of 1999) and the Forests Act of 1998 (Act 84 of 1998) (refer to table above) are present in this habitat unit. The above-mentioned botanical aspects of the Northern Afrotemperate Forest indicate that this habitat type is of increased ecological sensitivity and conservation value. This habitat unit provides intact habitat for a high diversity of floral and faunal species and contributes towards faunal migratory connectivity and cover within the area.

Thus, the Northern Afrotemperate Forest habitat unit is considered to be of high ecological sensitivity, and any impacts from the proposed mining activities and associated infrastructure are anticipated to be significant.

5.4 Habitat Unit 4: Secondary Grassland

Figure 8: Transformed grassland associated with the subject property.

This habitat unit comprises of lower-altitude grassland which would most likely have been historically associated with Paulpietersburg Moist Grassland, and was encountered in low-

altitude areas on the subject property (lower than 1600 mamsl). Secondary grassland areas have been transformed by current and historic agricultural activities such as grazing and pastures, alien floral invasion and edge effects from farm homesteads, rural settlements, roads, vegetation clearing and woody encroachment by *Seriphium plumosum*. This has led to the alteration of the floral community structure and the establishment of a sub-climax grass community. Ecological functioning was found to be moderately low in most areas. Dominant grass species included *Hyparrhenia hirta, Eragrostis curvula* and *E. chloromelas*. These species are associated with transformation and usually grow in disturbed places such as old cultivated lands and along roadsides. Additionally, these areas have a significant build-up of moribund material due to the natural burning regime being altered, which significantly reduces forb diversity.

However, various floral SCC in the genera *Gladiolus., Habenaria, Eulophia, Satyrium* and *Disa,* among others, which are protected under the Kwazulu-Natal Nature Conservation Management Amendment Act, 1999 No. 5 of 1999, were encountered scattered throughout this habitat unit during the field surveys.

Table 4: Dominant species encountered in the secondary grassland habitat unit. Alien species are indicated with an asterisk.

Grass/sedge/reed species	Forb species	Tree/Shrub Species
Aristida bipartata	**Bidens formosa*	**Acacia mearnsii*
Aristida congesta subsp. barbicollis	**Bidens pilosa*	**Populus x canescens*
Aristida congesta subsp. congesta	**Plantago lanceolata*	*Indigofera cuneifolia*
Cynodon dactylon	**Tagetes minuta*	*Seriphium plumosum*
Digitaria tricholaenoides	**Taraxacum officinale*	
Eragrostis curvula	*Acalypha angustata*	
Eragrostis chloromelas	*Berkheya macrocephala*	
Hyparrhenia hirta	*Berkheya radula*	
Themeda triandra	***Corycium nigrescens***	
Tristachya leucothrix	***Disa brevicornis***	
Pogonarthria squarrosa	***Disa versicolor***	
Imperata cylindrica	***Gladiolus appendiculatus***	
	Gladiolus crassifolius	
	Gladiolus dalenii	
	Gladiolus ecklonii	
	Helichrysum kraussii	
	Helichrysum tenax	
	Hypoxis acuminata	

Grass/sedge/reed species	Forb species	Tree/Shrub Species
	Hypoxis angustifolia	
	Hypoxis iridifolia	
	Indigofera cuneifolia	
	Ledebouria cooperii	
	Ledebouria ovatifolia	
	Lotononis eriantha	
	Monopsis decipiens	
	Pelargonium luridum	
	Satyrium cristatum	
	Satyrium longicauda	
	Senecio coronatus	

The species composition of this habitat unit is still moderately representative of the vegetation type in which it occurs and the vegetation type is considered *Vulnerable* (Mucina & Rutherford, 2006). Furthermore, several species protected by the Kwazulu-Natal Nature Conservation Management Amendment Act (No. 5 of 1999) (refer to table above), are present in this habitat unit.

Thus, the Secondary Grassland habitat unit is considered to be of moderate ecological sensitivity, and impacts from the proposed mining activities and associated infrastructure are likely to be moderately significant.

5.5 Floral community assessment

Grass communities can provide information regarding the ecological status of specific areas within a subject property. If the species composition is quantitatively determined and characteristics of all components of the grass communities are taken into consideration, it is possible to determine the PES of the portion of land represented by the assessment point. Any given grass species is specifically adapted to specific growth conditions. This sensitivity to specific conditions make grasses good indicators of veld conditions.

The sections below summarise the dominant grass species identified within the transects with their associated habitats and optimal growth conditions with reference to the table and figure below. Please note that the percentage contribution of each species was rounded to the nearest 5% for presentation purposes. It should be noted that transect locations were chosen within all areas moderately representative of vegetation in a good condition, therefore areas with a complete loss of indigenous grass community were not assessed using this method. These areas were however assessed using the VIS (see section below).

Table 5: Grouping of gasses (Van Oudtshoorn, 2006).

Category	Decription
Pioneer	Hardened, annual plants that can grow in very unfavourable conditions. In time improves growth conditions for perennial grasses.
Subclimax	Weak perennials denser than pioneer grasses. Protects soils leading to more moisture, which leads to a denser stand, which deposits more organic material on the surface. As growth conditions improve climax grasses are replaced by subclimax grasses.
Climax	Strong perennial plants adapted to optimal growth conditions.
Decreaser	Grasses abundant in good veld.
Increaser I	Grasses abundant in underutilized veld.
Increaser II	Grasses abundant in overgrazed veld.
Increaser III	Grasses commonly found in overgrazed veld.

The results below indicate that the graminoid layer of the Montane Grassland habitat unit is in a largely climax state of ecological succession and representative of the vegetation type in which it occurs. Thus is considered to be a primary grassland and of high sensitivity. The graminoid layer of the Secondary Grassland habitat unit is moderately representative of the vegetation types associated with the location of the transects. However, the transect analysis indicates that secondary, sub-climax grassland conditions are present and the secondary grassland is of moderate sensitivity. The transects performed in the wetland areas indicate that the graminoid layer is representative of wetland conditions.

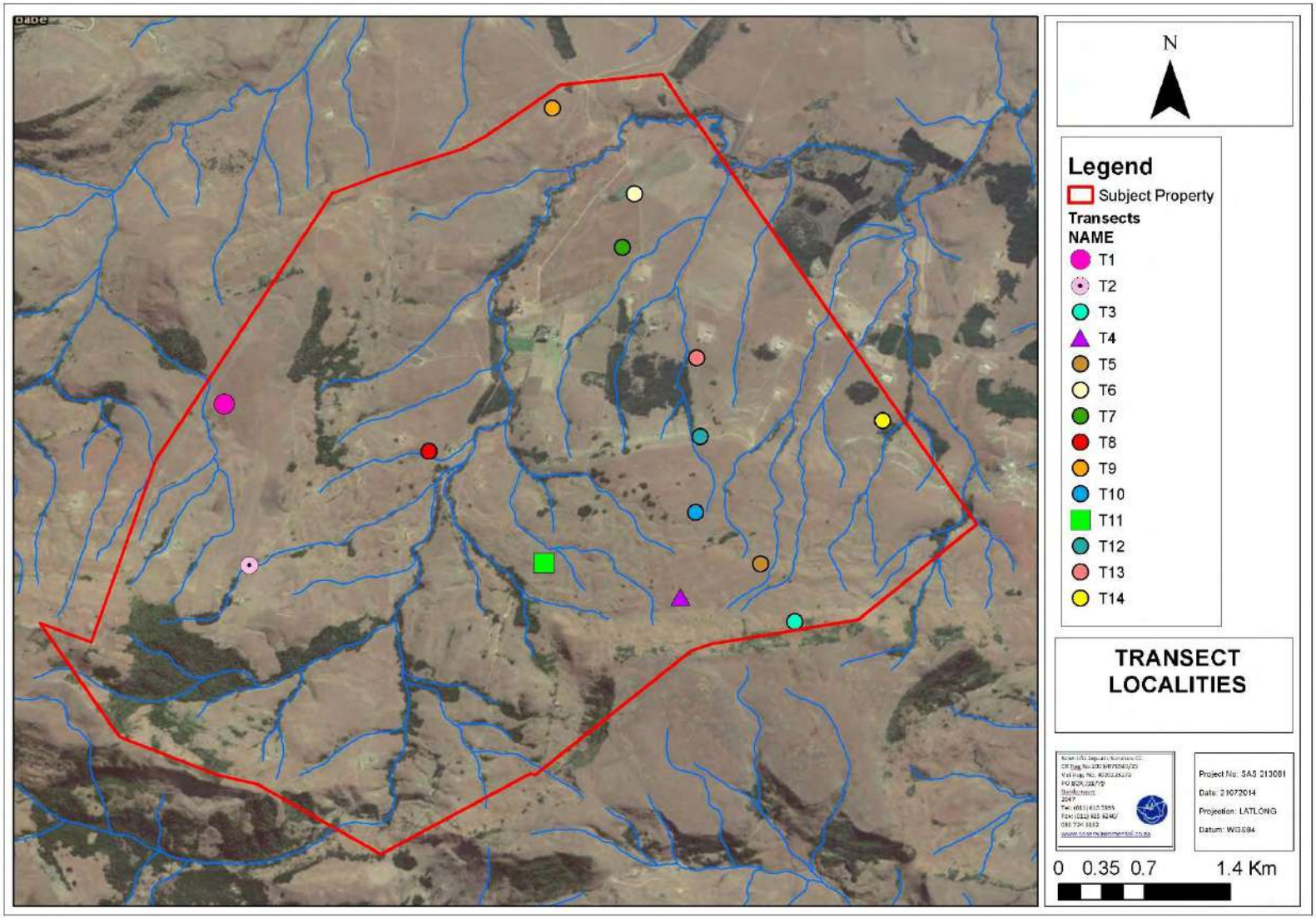
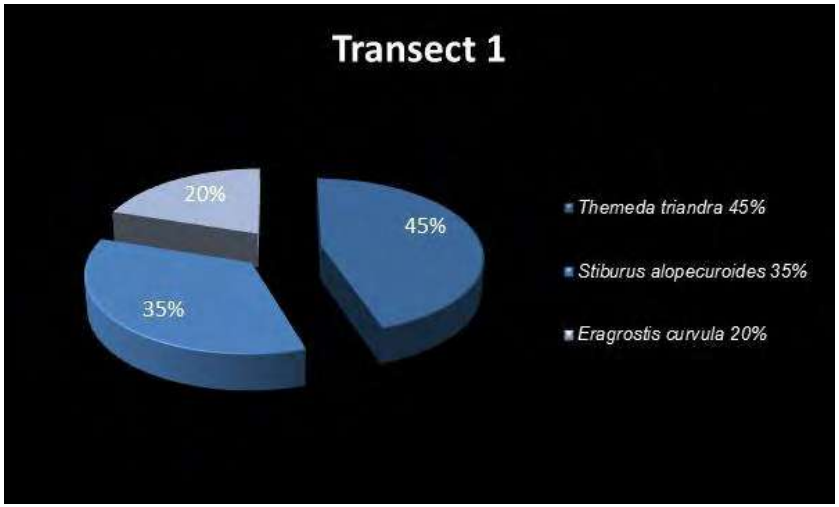


Figure 9: Digital satellite image depicting location of the transects.

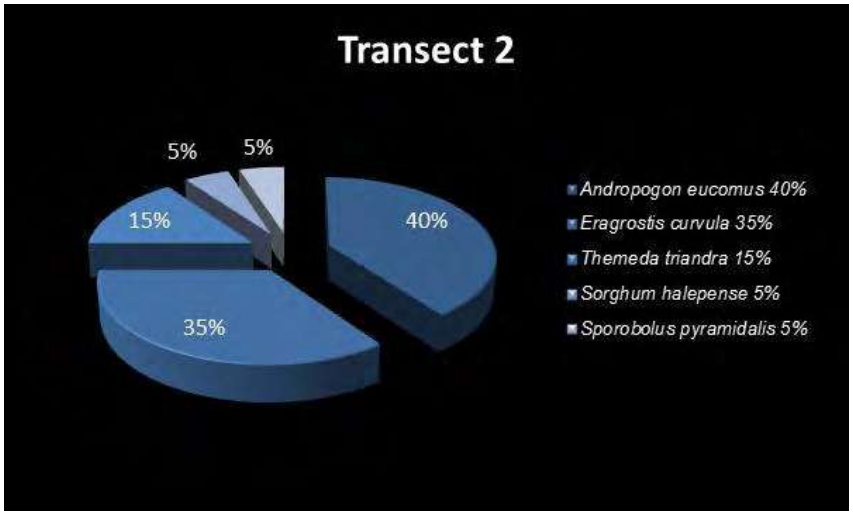


Transect 1 –Wetland habitat unit

- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Stiburus alopecuroides* (Stiburus) [Climax Grass, Low grazing value]. Stiburus grows in high altitude open grassland in shallow, damp soil such as vlei areas and on poorly drained rock plates. It mostly growls in soil with high nutritional status.
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.

Conclusion: *Themeda triandra* and *Stiburus alopecuroides* dominated this transect undertaken within the wetland habitat unit. These species are known to grow in in open grassland within undisturbed veld or areas with damp soil, such as the area where this transect was undertaken. The area in the vicinity of Transect 1 can therefore be considered in a natural state representative of the vegetation type.

Figure 10: Transect 1



Transect 2 –Secondary Grassland habitat unit

- *Andropogon eucomus* (Snowflake grass) [Subclimax grass, Increaser II]. Snowflake grass grows in wet areas such as vleis, riverbanks, road reserves and seepage areas, especially in disturbed sandy soil
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.
- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Sorghum halepense* (Johnson grass) [Subclimax grass, Climax grass, exotic grass]. Johnson grass grows in disturbed places, usually in damp clay or sandy soil. It seldom occurs in natural grazing.
- *Sporobolus pyramidalis* (Catstail Dropseed) [Subclimax grass, Increaser II]. Catstail dropseed grows in disturbed places such as trampled veld and old cultivated lands in areas with a high rainfall or in damp places. It is often found near kraals or other places where animals pass by. It grows in all soil types, especially in fertile soil.

Conclusion: The two dominant species occurring within the transformed grassland area are *Andropogon eucomus* and *Eragrostis curvula*. These species usually grow in moist grassland areas with some disturbance. *Sorghum halepense and Sporobolus pyramidalis* grow in more disturbed places and overgrazed veld, as was the case in areas closer to the alien proliferation due to overgrazing and alien tree communities.

Figure 11: Transect 2.

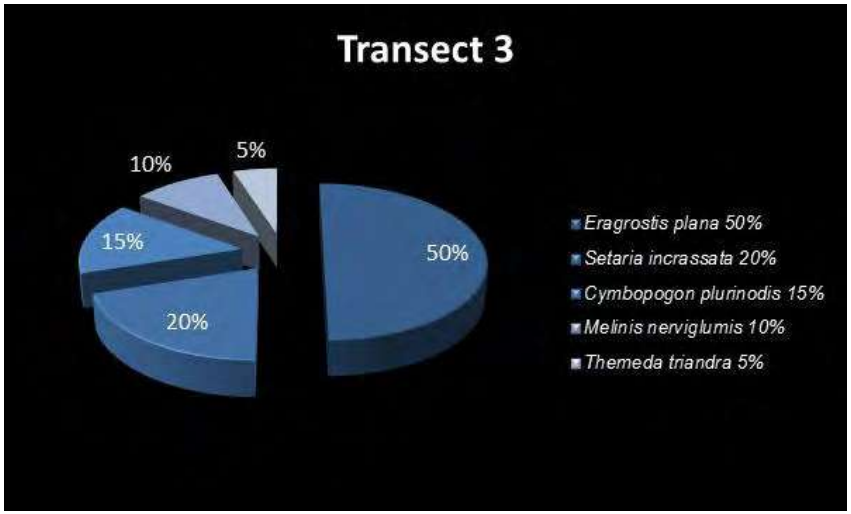
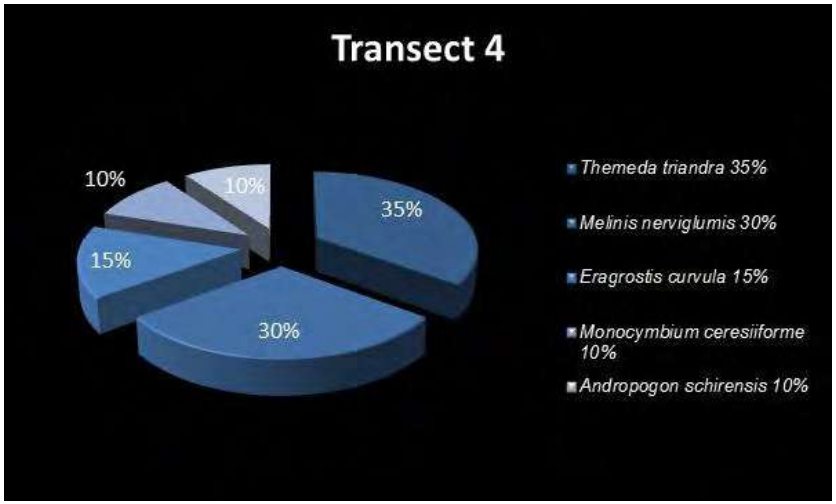


Figure 12: Transect 3.

Transect 3 – Montane Grassland habitat unit

- *Eragrostis plana* (Tough love grass) [Increaser II; Subclimax grass]. Tough love grass grows in disturbed places such as old cultivated lands, road reserves and also tramples places such as feedlots and water points; it grows in all types of soil; mostly in damp patches, especially in the more arid western parts of its area of distribution.
- *Setaria incrassata (*Vlei Bristle grass) [Climax grass, Decreaser]. Vlei bristle grass usually grows in damp places such as vleis or riverbanks, on black clay soil. It is also found at the edges or forests and sometimes on stony slopes, usually in fertile soil.
- *Cymbopogon plurinodis* (Narrow-leaved Turpentine Grass) [Climax grass, Increaser I/ Increaser III]: Narrow-leafed turpentine grass grows in open grassland or on bare patches in bushveld. Occurs in most soils types where it can form dominant stands.
- *Melinis nerviglumis* (Bristle-leaved Rep Top) [Climax grass, Increaser I]. Bristle-leaved red top grows in undisturbed veld shallow, gravelly soil. It usually grows on slopes.
- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.

Conclusion: The majority of grass species occurring within this transect are classified as climax grasses which are representative of the vegetation type in which the transect was undertaken. *Eragrostis plana* is a subclimax gras, however it is naturally dominant in Wakkerstroom Montane Grassland. Thus, the Montane Grassland is considered to be in a climax state of ecological succession.

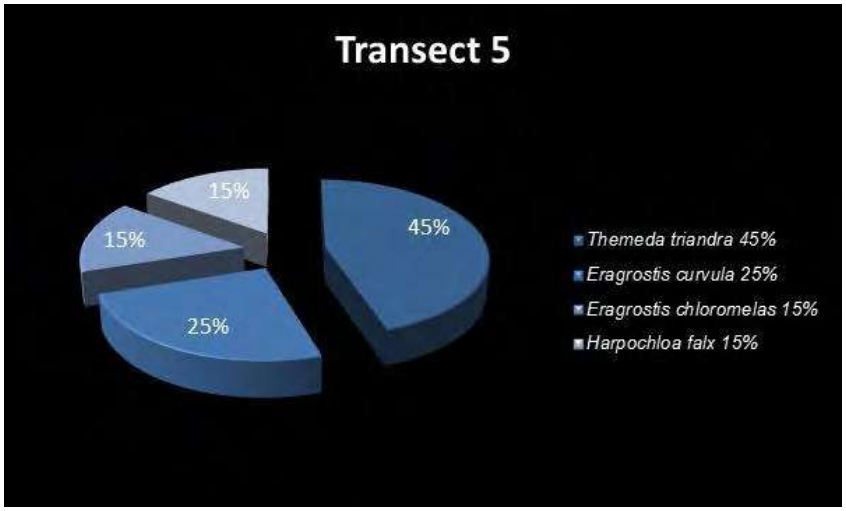


Transect 4 – Grassland habitat unit (rocky slopes)

- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Melinis nerviglumis* (Bristle-leaved Rep Top) [Climax grass, Increaser I]. Bristle-leaved red top grows in undisturbed veld shallow, gravelly soil. It usually grows on slopes.
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.
- *Monocymbium ceresiiforme* (Boat grass) [Decreaser, Climax grass]. Boat grass usually grows on slopes in high altitude grassland with a high rainfall. It is associated with leached acidic soil. In areas with a lower rainfall the grass mostly grows in sandy soil in places where water accumulates. In the central parts of Africa it often grows around vleis in low-lying regions.
- *Andropogon schirensis* (Stab grass) [Climax grass; Increaser I]. Stab grass occurs in grassland with a relatively high rainfall and in open bushveld areas. It is often found on rocky slopes in well drained soil. But sometimes also in damp places.

Conclusion: The majority of grass species occurring within this transect are classified as climax grasses which are representative of the vegetation type in which the transect was undertaken. Thus, the Montane Grassland is considered to be in a climax state of ecological succession.

Figure 13: Transect 4.

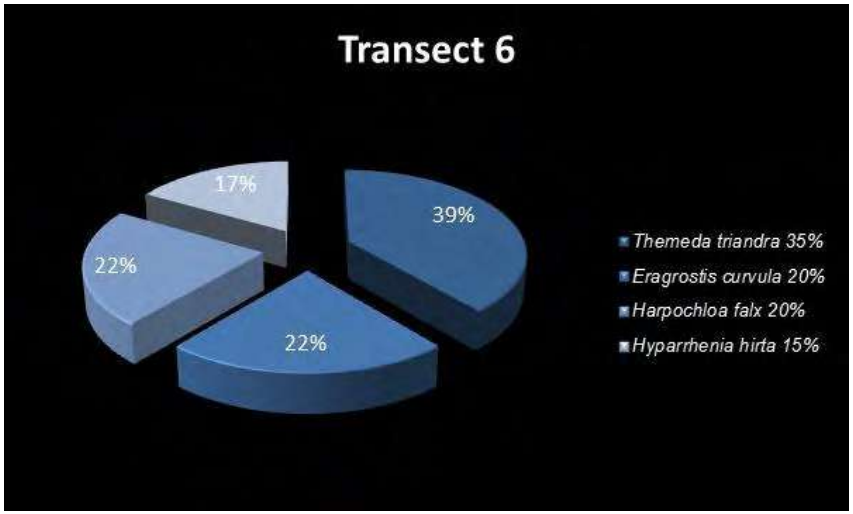


Transect 5 –Montane Grassland habitat unit

- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.
- *Eragrostis chloromelas* (Narrow curly leaf) [Increaser II, subclimax and climax grass]. Curly leaf grows on stony slopes in sandy and loam soil. It is more common in open grassland than in the bushveld.
- *Harpochloa falx* (Caterpillar Grass)[Climax grass, Increaser I]: This grass species usually grows against rocky slopes in well-drained soil, usually in high-rainfall areas. Mostly in undisturbed grassland.

Conclusion: *Themeda triandra* dominated this transect undertaken within the Montane Grassland habitat unit. This species is known to grow in in open grassland within undisturbed veld or areas with mostly clay soil, such as the area where this transect was undertaken. Thus, the Montane Grassland is considered to be in a climax state of ecological succession.

Figure 14: Transect 5.

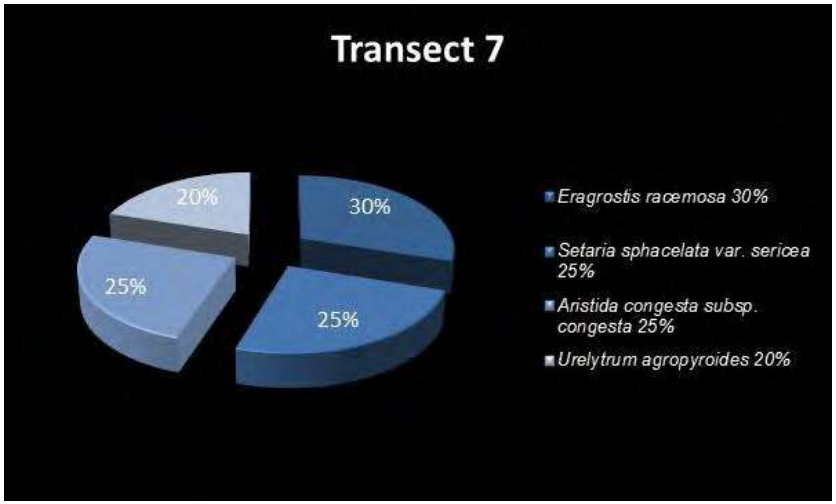


Transect 6 –Secondary grassland

- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.
- *Harpochloa falx* (Caterpillar Grass) [Climax grass, Increaser I]: This grass species usually grows against rocky slopes in well-drained soil, usually in high-rainfall areas. Mostly in undisturbed grassland.
- *Hyparrhenia hirta* (Common thatching grass) [Increaser I, Climax grass]. Grows well in drained soil, especially gravelly soil, in open grassland, as well as in bushveld. It is often found in disturbed places such as old cultivated lands and road reserves. It is also sometimes found along riversides on heavier soil.
- *Panicum maximum* (Guinea Grass) [Subclimax/ climax grass, Decreaser]. Guinea grass grows in shade under trees and shrubs. Grows well under moist conditions in fertile soils, often adjacent to streams. Also utilises other growing conditions.

Conclusion: The three dominant species occurring within the secondary grassland area are *Themeda triandra, Harpochloa falx* and *Eragrostis curvula*. These species usually grow in moist grassland areas, as was the case with this transect being undertaken next to a wetland. *Hyparrhenia hirta* grows in more disturbed areas and overgrazed veld, as was the case in areas closer to the alien proliferation due to overgrazing and historic agricultural activities. Although several climax species are present, the abundance of *Panicum maximum* and *Hyparrhenia hirta* are indicative of secondary grassland conditions.

Figure 15: Transect 6.

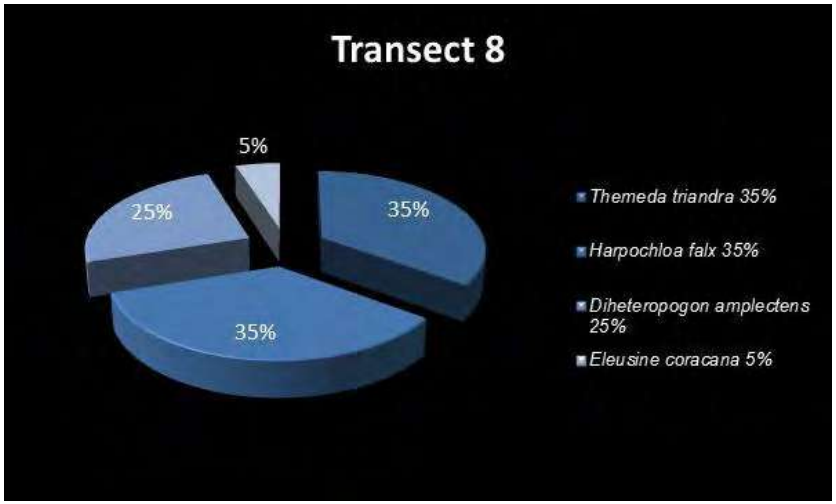


Transect 7 – Secondary grassland

- *Eragrostis racemosa* (Narrow heart love grass) [Subclimax grass, Increaser II]. Narrow heart love grass grows in a large variety of habitat types, mostly in shallow sandy or gravelly soil in damp places. It is more often found in disturbed places.
- *Setaria sphacelata var. sericea* (Golden bristle grass) [Climax grass, Decreaser grass]. Golden bristle grass grows in mountainous grassland in parts with a high rainfall; damp places such as in vleis and marshes; mostly in clay soil. It is often also found in damp places in old cultivated lands, roads reserves and other disturbed places.
- *Aristida congesta* subsp*. congesta* (Tassel Three-awn) [Pioneer grass, Increaser II]: this grass occurs mostly in disturbed places such as old fields, road reserves and bare patches in overutilised veld. It grows in most soil types, but mostly loam soil.
- *Urelytrum agropyroides* (Quinine grass) [Climax grass; Increaser I]. Quinine grass grows in open as well as open parts in bushveld areas. It usually grows on stony slopes in sandy (often damp) soil.

Conclusion: The grass species associated with this transect are mostly associated with disturbance such as old cultivated lands. This area has undergone historic cultivation activities and is currently used for grazing of livestock.

Figure 16: Transect 7.

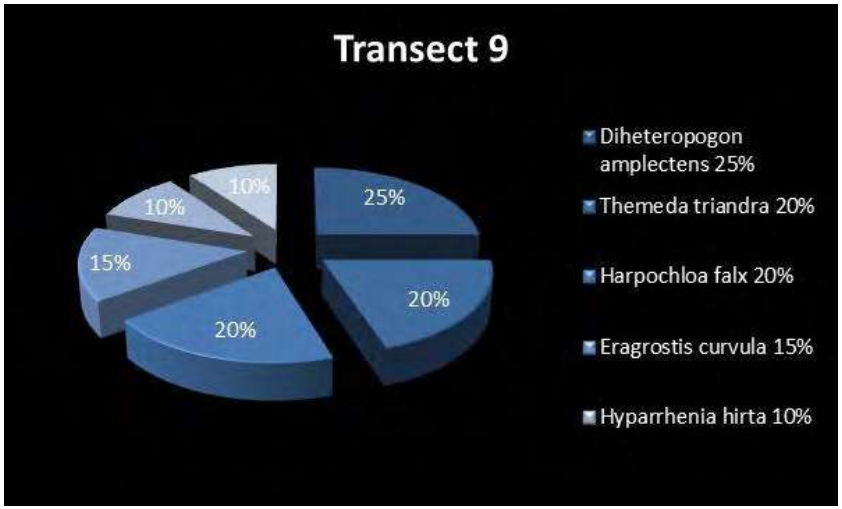


Transect 8 – Montane Grassland habitat unit

- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Harpochloa falx* (Caterpillar Grass) [Climax grass, Increaser I]: This grass species usually grows against rocky slopes in well-drained soil, usually in high-rainfall areas. Mostly in undisturbed grassland.
- *Diheteropogon amplectens* (Broad-leaved Bluestem) [Climax grass, decreaser]. Broad-leaved bluestem grows in open grassland, as well as in open patches in bushveld parts (especially in mixed bushveld). It grows mostly in poor gravelly soil on slopes, but also in other soil types.
- *Eleusine coracana* (Goose grass) [Pioneer, Increaser II grass]. Goose grass grows in disturbed places such as cultivated lands and gardens, in all soil types. Grows in compacted ground (for example roads) where few other grasses can survive.

Conclusion: The majority of grass species occurring within this transect are classified as climax grasses which are representative of the vegetation type in which the transect was undertaken. Thus, the Montane Grassland is considered to be in a climax state of ecological succession.

Figure 17: Transect 8.

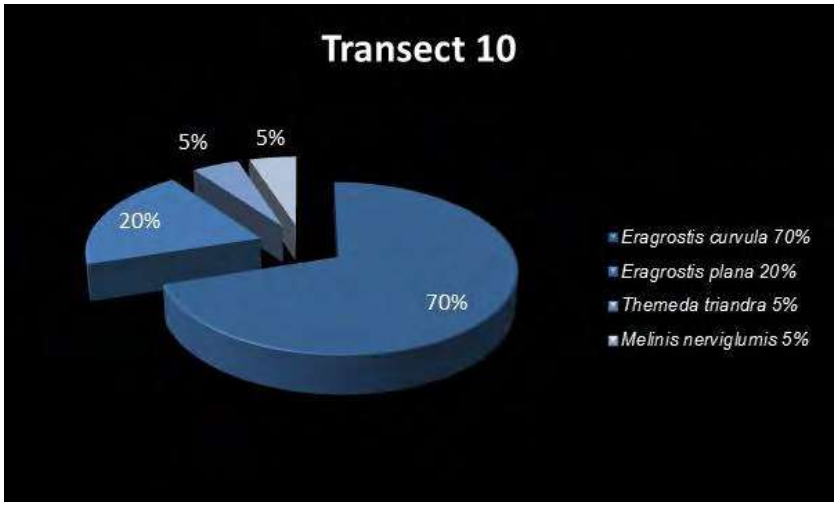


Transect 9 – Montane Grassland habitat unit

- *Diheteropogon amplectens* (Broad-leaved Bluestem) [Climax grass, decreaser]. Broad-leaved bluestem grows in open grassland, as well as in open patches in bushveld parts (especially in mixed bushveld). It grows mostly in poor gravelly soil on slopes, but also in other soil types.
- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Harpochloa falx* (Caterpillar Grass) [Climax grass, Increaser I]: This grass species usually grows against rocky slopes in well-drained soil, usually in high-rainfall areas. Mostly in undisturbed grassland.
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.
- *Hyparrhenia hirta* (Common thatching grass) [Increaser I, Climax grass]. Grows well in drained soil, especially gravelly soil, in open grassland, as well as in bushveld. It is often found in disturbed places such as old cultivated lands and road reserves. It is also sometimes found along riversides on heavier soil.
- *Trachypogon spicatus* (Giant spear grass) [Climax grass; Increaser I]. Giant spear grass mostly grows in open undisturbed grassland, but it also occurs in bushveld areas with a relatively high rainfall. It is often encountered near vleis. It grows mostly in sandy and gravelly soil types.

Conclusion: *Themeda triandra, Diheteropogon amplectens and Harpochloa falx* dominated this transect unit undertaken within the grassland habitat unit. These species are known to grow in in open grassland within undisturbed veld or areas with mostly clay soil, such as the area where this transect was undertaken. Thus, the Montane Grassland is considered to be in a climax state of ecological succession.

Figure 18: Transect 9.

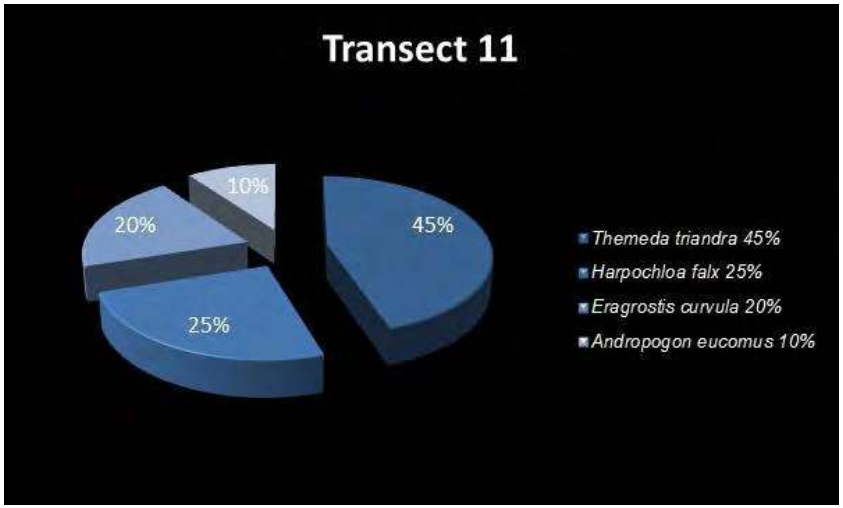


Transect 10 –Montane Grassland habitat unit

- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.
- *Eragrostis plana* (Tough love grass) [Increaser II; Subclimax grass]. Tough love grass grows in disturbed places such as old cultivated lands, road reserves and also tramples places such as feedlots and water points; it grows in all types of soil; mostly in damp patches, especially in the more arid western parts of its area of distribution.
- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Melinis nerviglumis* (Bristle-leaved Rep Top) [Climax grass, Increaser I]. Bristle-leaved red top grows in undisturbed veld shallow, gravelly soil. It usually grows on slopes.

Conclusion: The dominant species is *Eragrostis curvula,* which usually grows in disturbed places such as overgrazed areas, as was the case where this .transect was performed.

Figure 19: Transect 10.

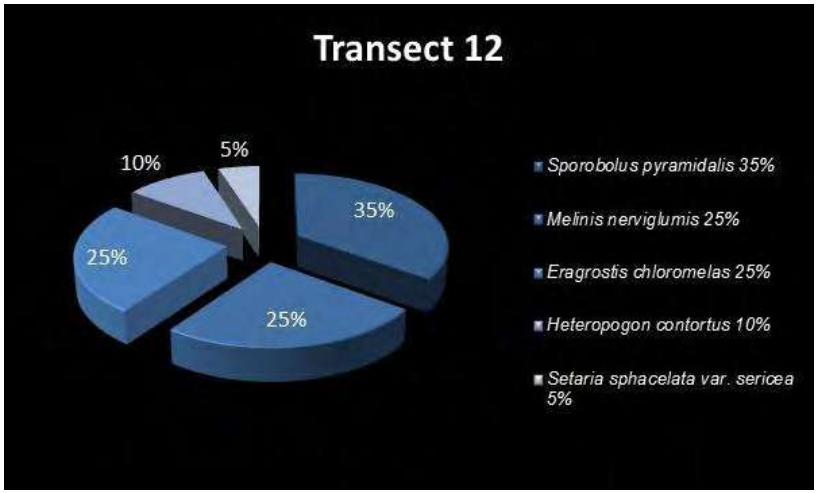


Transect 11 – Montane Grassland habitat unit

- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Harpochloa falx* (Caterpillar Grass) [Climax grass, Increaser I]: This grass species usually grows against rocky slopes in well-drained soil, usually in high-rainfall areas. Mostly in undisturbed grassland.
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.
- *Andropogon eucomus* (Snowflake grass) [Subclimax grass, Increaser II]. Snowflake grass grows in wet areas such as vleis, riverbanks, road reserves and seepage areas, especially in disturbed sandy soil.

Conclusion: The grass species associated with this transect are mostly associated with open grasslands and rocky slopes. Some disturbance has occurred due to livestock transforming natural grasslands and decreasing indigenous floral diversity.

Figure 20: Transect 11.

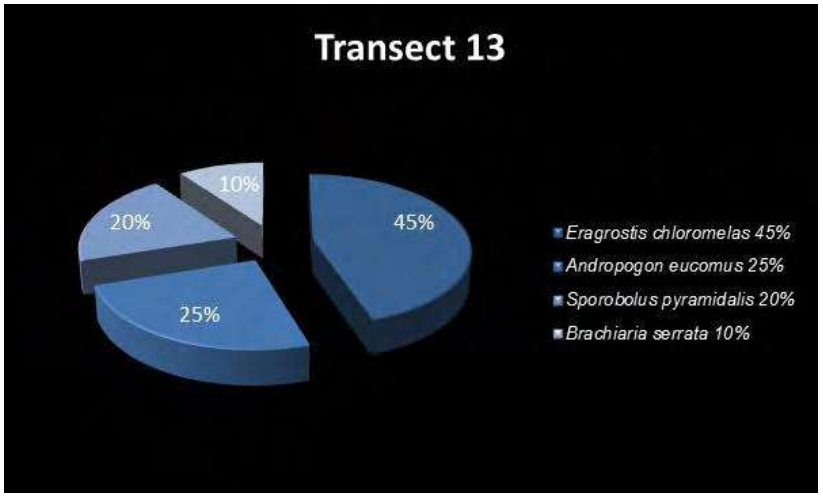


Transect 12 – Montane Grassland habitat unit

- *Sporobolus pyramidalis* (Catstail Dropseed) [Subclimax grass, Increaser II]. Catstail dropseed grows in disturbed places such as trampled veld and old cultivated lands in areas with a high rainfall or in damp places. It is often found near kraals or other places where animals pass by. It grows in all soil types, especially in fertile soil.
- *Melinis nerviglumis* (Bristle-leaved Rep Top) [Climax grass, Increaser I]. Bristle-leaved red top grows in undisturbed veld shallow, gravelly soil. It usually grows on slopes.
- *Eragrostis chloromelas* (Narrow curly leaf) [Increaser II, subclimax and climax grass]. Curly leaf grows on stony slopes in sandy and loam soil. It is more common in open grassland than in the bushveld.
- *Heteropogon contortus* (Spear grass) [Increaser II]. Grows especially in gravelly and other well drained soil. It often grows on slopes and disturbed places such as road reserves where it forms dense stands.
- *Setaria sphacelata var. sericea* (Golden bristle grass) [Climax grass, Decreaser grass]. Golden bristle grass grows in mountainous grassland in parts with a high rainfall; damp places such as in vleis and marshes; mostly in clay soil. It is often also found in damp places in old cultivated lands, roads reserves and other disturbed places.

Conclusion: The three dominant grass species found within this transect unit are mostly associated with open grasslands and some degree of disturbance and trampled veld. These species are increaser, climax and subclimax grasses indicating that these species would increase in favourable conditions.

Figure 21: Transect 12.

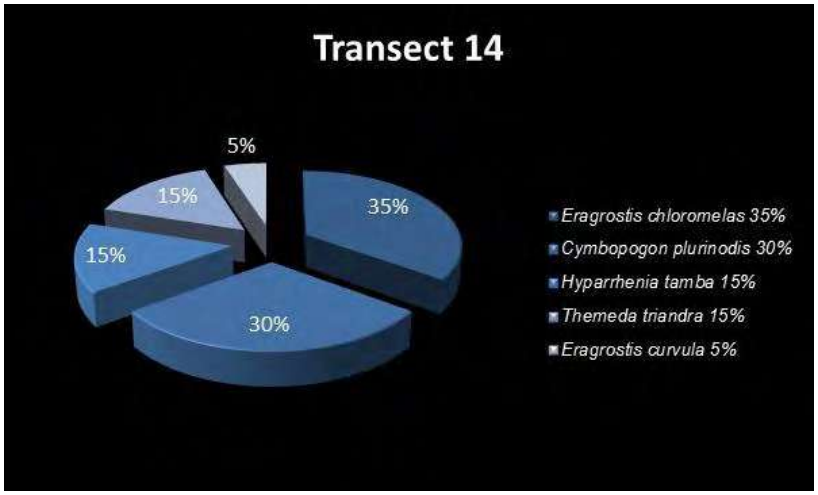


Transect 13 – Wetland habitat unit

- *Eragrostis chloromelas* (Narrow curly leaf) [Increaser II, subclimax and climax grass]. Curly leaf grows on stony slopes in sandy and loam soil. It is more common in open grassland than in the bushveld.
- *Andropogon eucomus* (Snowflake grass) [Subclimax grass, Increaser II]. Snowflake grass grows in wet areas such as vleis, riverbanks, road reserves and seepage areas, especially in disturbed sandy soil.
- *Sporobolus pyramidalis* (Catstail Dropseed) [Subclimax grass, Increaser II]. Catstail dropseed grows in disturbed places such as trampled veld and old cultivated lands in areas with a high rainfall or in damp places. It is often found near kraals or other places where animals pass by. It grows in all soil types, especially in fertile soil.
- *Brachiaria serrata*. (Velvet signal grass) [Climax grass, Decreaser]. Velvet signal grass occurs mainly in rocky places in undisturbed veld. It also utilises a wide range of other habitat types such as sand veld and marshes. It often grows in sandy and loamy soils.

Conclusion: *Eragrostis chloromelas* and *Andropogon eucomus* dominated this transect within the wetland habitat unit. These species are known to grow in in open grassland within undisturbed veld or areas with damp soil, such as the area where this transect was undertaken.

Figure 22: Transect 13.



Transect 14 – Montane Grassland habitat unit

- *Eragrostis chloromelas* (Narrow curly leaf) [Increaser II, subclimax and climax grass]. Curly leaf grows on stony slopes in sandy and loam soil. It is more common in open grassland than in the bushveld.
- *Cymbopogon plurinodis* (Narrow-leaved Turpentine Grass) [Climax grass, Increaser I/ Increaser III]: Narrow-leafed turpentine grass grows in open grassland or on bare patches in bushveld. Occurs in most soils types where it can form dominant stands.
- *Hyparrhenia tamba* (Blue thatching grass) [Climax grass; Increaser I]. Blue thatching grass usually grows in road reserves, especially where water collects; otherwise in damp soil next to rivers and vleis.
- *Themeda triandra* (Red Grass) [Decreaser; Climax grass]. Red grass is abundant in undisturbed open grassland and bushveld in parts with an average to high rainfall. It grows in any type of soil, but mostly clay soil.
- *Eragrostis curvula* (Weeping love grass) [Climax grass; Increaser II]. Weeping love grass usually grows in disturbed places such as old cultivated lands and roadsides; mostly in well drained fertile soil. It is associated with regions with a high rainfall with overgrazed and trampled veld.

Conclusion: The two dominant grass species found within this transect unit are mostly associated with open grasslands. These species are increaser, climax grasses indicating that these species would increase in favourable conditions. Some disturbance of floral diversity has occurred due to alien encroachment along the wetland features and grazing of livestock in the area.

Figure 23: Transect 14.

The dominant grass species are all indicative of nutrient-poor, sandy soils, which is the dominant soil type associated with the subject property. Furthermore, the fact that the majority of grass species are sub-climax species does not necessarily indicate disturbance, but is a function of the sandy nature of the soil and typical of the vegetation types in which the subject property is situated. Thus, the grass layer is considered to be in a largely natural condition.

5.6 Vegetation Index Score

The information gathered during the assessment of the subject property was used to determine the Vegetation Index Score (VIS) - see Appendix B for calculations. Due to variation between the different habitat units within the site, all habitat units were assessed separately. The tables below list the scoring system as well as the results of each habitat unit.

Table 6: Scoring for the Vegetation Index Score

Vegetation Index Score	Assessment Class	Description
22 to 25	**A**	Unmodified, natural
18 to 22	**B**	Largely natural with few modifications.
14 to 18	**C**	Moderately modified
10 to 14	**D**	Largely modified
5 to 10	**E**	The loss of natural habitat extensive
<5	**F**	Modified completely

Table 7: Vegetation Index Score

Habitat unit	Score	Class	Motivation
Montane Grassland	21	**B - Largely natural with few modifications**	Montane Grassland mostly undisturbed and representative of vegetation type, intact, high ecological functionality, low levels of alien floral invasion.
Northern Afrotemperate Forest	21	**B - Largely natural with few modifications**	Northern Afrotemperate Forest mostly undisturbed and representative of vegetation type, intact, high ecological functionality, low levels of alien floral invasion and isolated transformed areas.
Wetlands and Riparian habitat	18	**B/C – Largely natural/Moderately modified**	Upper reaches mostly intact, lower levels moderate to high levels of alien floral invasion. Overall, it still consists of an intact interconnected system providing valuable ecological and socio-cultural services.
Secondary Grassland	15	**C – Moderately modified**	Evidence of overgrazing and alien plant species invasion was noted, although overall functioning is still largely intact, placing the secondary grasslands within a Class C VIS.

5.7 Floral Species of Conservation Concern Assessment

An assessment considering the presence of any plant species of concern, as well as suitable habitat to support any such species will be undertaken. The complete PRECIS Red Data

Listed plants for the grid reference 2730AD was acquired from SANBI. The following red data species were listed for the area.

Table 8: IUCN Red Data List Categories – Version 3.1 as supplied by SANBI

Category	Definition
EX	Extinct
EW	Extinct in the wild
CR	Critically endangered
EN	Endangered
VU	Vulnerable
NT	Near threatened
LC	Least concern
DD	Data deficient
NE	Not evaluated

Threatened species are species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered, Endangered or Vulnerable is a threatened species.

SCC 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 and Declining.

Table 9: PRECIS RDL plant list for the QDS 2730AD (Raimondo *et al*., 2009; SANBI, www.sanbi.org).

Family	Species	Threat status	Habitat
AMARYLLIDACEAE	*Nerine platypetala McNeil*	VU	Montane grassland, margins of permanently moist vleis and levees of river banks.
ANACARDIACEAE	*Searsia dracomontana (Moffett) Moffett*	NT	Lower Drakensberg Escarpment around Charlestown and Wakkerstroom in southern Mpumalanga and at Van Reenen on the Free State-KwaZulu-Natal border.
APOCYNACEAE	*Aspidoglossum xanthosphaerum Hilliard*	VU	Montane grassland, marshy sites, 1800 m.
APOCYNACEAE	*Brachystelma remotum R.A.Dyer*	Rare	Montane grasslands, grows in shallow soils on shale outcrops, 1600-2200 m.
APOCYNACEAE	*Brachystelma villosum (Schltr.) N.E.Br.*	Rare	Scattered in grassland at an altitude of 500-1500 m.
AQUIFOLIACEAE	*Ilex mitis (L.) Radlk. var. mitis*	Declining	Along rivers and streams in forest and thickets, sometimes in the open. Found from sea level to inland mountain slopes.

Family	Species	Threat status	Habitat
ASPARAGACEAE	*Asparagus fractiflexus (Oberm.) Fellingham & N.L.Mey.*	EN	High altitude, open grasslands, on rocky outcrops or among boulders.
ASPHODELACEAE	*Aloe kniphofioides Baker*	VU	High altitude grasslands of Mpumalanga, KwaZulu-Natal and north-eastern Eastern Cape.
ASTERACEAE	*Helichrysum aureum (Houtt.) Merr. var. argenteum Hilliard*	VU	Montane grassland, 1800-2000 m.
CELASTRACEAE	*Gymnosporia devenishii Jordaan*	Rare	Montane and mistbelt forest understorey.
COLCHICACEAE	*Sandersonia aurantiaca Hook.*	Declining	Cool, moist slopes with minimal herbivory and fire, 200-1800 m.
DIOSCOREACEAE	*Dioscorea mundii Baker*	NT	Eastern Cape, Western Cape
FABACEAE	*Lotononis amajubica (Burtt Davy) B.-E.van Wyk*	Rare	Well-drained, high altitude grassland, 1600-1800 m.
FABACEAE	*Lotononis dichiloides Sond.*	CR	Indian Ocean Coastal Belt
GUNNERACEAE	*Gunnera perpensa L.*	Declining	Damp marshy area and vleis from coast to 2400 m.
HYACINTHACEAE	*Eucomis bicolor Baker*	NT	Well-drained, grassy mountain slopes, sometimes in forests, along watercourses and on rocky cliffs, generally at higher altitudes up to 2800 m.
HYACINTHACEAE	*Eucomis montana Compton*	Declining	Rocky montane grassland.
HYACINTHACEAE	*Merwilla plumbea (Lindl.) Speta*	NT	Widespread in eastern half of South Africa. Also in Swaziland and Lesotho.
MESEMBRYANTHEMACEAE	*Khadia alticola Chess. & H.E.K.Hartmann*	Rare	Montane grassland in shallow, sandy, humus-rich soil pockets and crevices between rock plates above 2000 m.
MESEMBRYANTHEMACEAE	*Khadia beswickii (L.Bolus) N.E.Br.*	VU	Gauteng
MYRSINACEAE	*Rapanea melanophloeos (L.) Mez*	Declining	Coastal, swamp and mountain forest, on forest margins and bush clumps, often in damp areas from coast to mountains.
ORCHIDACEAE	*Disa galpinii Rolfe*	Rare	Between Ramatsiliso's Gate and Naude's Nek Pass.
ORCHIDACEAE	*Satyrium microrrhynchum Schltr.*	Rare	Montane and subalpine grassland 1 600-3 000 m, on grassy and sometimes stony or moist slopes.
PROTEACEAE	*Protea parvula Beard*	NT	Most prominent in Lydenburg montane grassland.
PROTEACEAE	*Protea subvestita N.E.Br.*	VU	Confined to infrequently burned habitats, often associated with gullies, scarps and forest margins. Occasional fires are required for successful recruitment.
SCROPHULARIACEAE	*Bowkeria citrina Thode*	Rare	Between Groenvlei, Wakkerstroom and Luneburg. Forest margins and cliff edges on cool slopes, 1400-1800 m.

The POC of each of the species listed above was calculated (table below) with reference to habitat suitability within the subject property.

Table 10: POC for floral species of concern.

Species	POC	Motivation
Nerine platypetala McNeil	80%	High probability of occurring, especially in montane grassland and wetlands. Not recorded during assessment.
Searsia dracomontana (Moffett) Moffett	70%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Aspidoglossum xanthosphaerum Hilliard	76%	High probability of occurring, especially in montane grassland and wetlands. Not recorded during assessment.
Brachystelma remotum R.A.Dyer	80%	High probability of occurring, especially in montane grassland and wetlands. Not recorded during assessment.
Brachystelma villosum (Schltr.) N.E.Br.	80%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Ilex mitis (L.) Radlk. var. mitis	100%	Recorded during assessment in Northern Afrotemperate Forest
Asparagus fractiflexus (Oberm.) Fellingham & N.L.Mey.	80%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Aloe kniphofioides Baker	80%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Helichrysum aureum (Houtt.) Merr. var. argenteum Hilliard	80%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Gymnosporia devenishii Jordaan	80%	High probability of occurring, especially in Northern Afrotemperate Forest. Not recorded during assessment.
Sandersonia aurantiaca Hook.	75%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Dioscorea mundii Baker	0%	Outside distribution range.
Lotononis amajubica (Burtt Davy) B.-E.van Wyk	70%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Lotononis dichiloides Sond.	0%	Outside distribution range
Gunnera perpensa L.	0%	High probability of occurring, especially in wetlands. Not recorded during assessment.
Eucomis bicolor Baker	80%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Eucomis montana Compton	78%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Merwilla plumbea (Lindl.) Speta	85%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Khadia alticola Chess. & H.E.K.Hartmann	80%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Khadia beswickii (L.Bolus) N.E.Br.	0%	Outside distribution range
Rapanea melanophloeos (L.) Mez	100%	Recorded during assessment
Disa galpinii Rolfe	15%	On verge of distribution range. Suitable habitat present
Satyrium microrrhynchum Schltr.	80%	High probability of occurring, especially in montane grassland. Not recorded during assessment.
Protea parvula Beard	0%	Outside distribution range
Protea subvestita N.E.Br.	100%	Recorded during assessment
Bowkeria citrina Thode	90%	High probability of occurring, especially in montane grassland. Not recorded during assessment.

From the above assessment, it is clear that the majority of the floral SCC listed for the QDS 2730AD have a high probability of occurring within the subject property, especially within the

Montane Grassland, Northern Afrotemperate Forest and Wetland and Riparian habitat units. Three of the listed species, namely *Ilex mitis, Rapanea melanophloeos* and *Protea subvestita* were positively identified during the field assessments.

Furthermore, four tree species protected by the National Forest Act (1998), namely *Podocarpus latifolius, P. falcatus, Ilex mitis* and *Pittosporum viridiflorum* are present in the Northern Afrotemperate Forest habitat unit. In terms of this act, protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the Department of Water Affairs (DWA) (or a delegated authority). Various species in the genera *Gladiolus., Habenaria, Eulophia, Satyrium* and *Disa* (refer to tables for complete floral SCC list), were also recorded and are protected under the Kwazulu-Natal Nature Conservation Management Amendment Act, 1999 No. 5 of 1999. Thus, the subject property is considered to be of high sensitivity in terms of floral SCC conservation. Impacts from the proposed mining activities and associated infrastructure are deemed highly likely to have a significant impact on floral SCC and habitat.

5.8 Alien and Invasive Plant Species

Alien invaders are plants that are of exotic origin and are invading previously pristine areas or ecological niches (Bromilow, 2001). Not all weeds are exotic in origin but, as these exotic plant species have very limited natural “check” mechanisms within the natural environment, they are often the most opportunistic and aggressively growing species within the ecosystem. Therefore, they are often the most dominant and noticeable within an area. Disturbances of the ground through trampling, excavations or landscaping often leads to the dominance of exotic pioneer species that rapidly dominate the area. Under natural conditions, these pioneer species are overtaken by sub-climax and climax species through natural veld succession. This process however takes many years to occur, with the natural vegetation never reaching the balanced, pristine species composition prior to the disturbance. There are many species of indigenous pioneer plants, but very few indigenous species can out-compete their more aggressively growing exotic counterparts.

Alien vegetation invasion causes degradation of the ecological integrity of an area, causing (Bromilow, 2001):

- A decline in species diversity;
- Local extinction of indigenous species;
- Ecological imbalance;
- Decreased productivity of grazing pastures and

- Increased agricultural input costs.

Grasslands are particularly prone to bush encroachment and alien vegetation invasion, as this vegetation type is the most utilised for agricultural purposes. This is mainly for livestock grazing, or complete transformation for agronomy (crops). These areas suffer the highest degree of degrading factors that include overgrazing, trampling, incorrect fire management and removal, and grassland areas are traditionally sought after for agronomy, as they often occur on rich, fertile soils. These factors lead to an imbalance in the species composition and make the grasslands prone to alien vegetation invasion. Exotic trees and shrubs often invade grasslands, with the grass species not being able to compete with the deeper-rooted and taller trees for moisture and light and are therefore quickly displaced. A loss of floral and faunal species diversity then occurs that was once dependent on the grassland.

Table 11: Exotic or invasive species within the subject property.

Species	English name	Country of Origin	Category*
Trees/ shrubs			
Acacia mearnsii	Black wattle	Australia	2
Populus x canescens	Grey Poplar	Europe and Asia	2
Forbs			
Bidens pilosa	Common blackjack	S America	NA
Bidens formosa	Cosmos	Central America	NA
Tagetes minuta	Tall khakiweed	S America	NA
Verbena tenuisecta	Purple top	S America	NA
Asclepias fruticosa	Shrubby milkweed	Indigenous weed	Na

Category 1a – Invasive species that require compulsory control.
Category 1b – Invasive species that require control by means of an invasive species management programme.
Category 2 – Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread.
Category 3 – Ornamentally used plants that may no longer be planted. Existing plants may remain, except within the flood line of watercourses and wetlands, as long as all reasonable steps are taken to prevent their spread (Bromilow, 2001).

From the table above it is clear that a low diversity of alien species occurs within the subject property. Of particular concern are the dense stands of *Acacia mearnsii* in the lower sections of the subject property, especially associated with the Pandana River, which have transformed the indigenous vegetation. Alien species located in the subject property need to be removed on a regular basis as part of maintenance activities according to the National Environmental Management: Biodiversity Act (Act 10 of 2004): Alien and Invasive Species Regulations, GN R598 of 2014.

5.9 Medicinal Plant Species

Medicinal floral species are not necessarily indigenous species, with many of them regarded as alien invasive weeds.

The table below presents a list of dominant floral species with traditional medicinal value, floral parts traditionally used and their main applications, which were identified during the field assessment.

Table 12: Traditional medicinal floral species identified during the field assessment. Medicinal applications and application methods are also presented (van Wyk, Oudtshoorn, Gericke, 2009).

Species	Name	Plant parts used	Medicinal uses
Rapanea melanophloeos	Cape Beech	Bark and roots	The grey bark or sometimes roots are used medicinally for respiratory problems, stomach, muscular and heart complaints.
Eucomis autumnalis	Pineapple flower	Bulb	Decoctions of the bulb in water or milk are usually administered as enemas for the treatment of low backache, to assist in post-operative recovery, and to aid in healing fractures. Decoctions are also used for a variety of ailments, including urinary diseases, stomach ache, fevers, colic, flatulence, hangovers and syphilis, and to facilitate childbirth.
Scilla nervosa	Squill	Various parts	Warmed fresh bulb scales, slightly burned bulb scales and decoctions of the bulb are used externally as ointments for wound-healing, to treat sprains, fractures, boils and sores and to draw abscesses. Decoctions are taken as enemas for female infertility and to enhance male potency and libido. It is also known to be used as a purgative, a laxative and for internal tumours, and is used in conjunction with other ingredients in infusions taken during pregnancy to facilitate delivery and in treatments for chest pain and kidney troubles.
Podocarpus falcatus	Outeniqua yellowwood	Sap	The sap is used as a remedy for chest complaints.
Pittosporum viridiflorum	Cheesewood	Various parts	Decoctions or infusions are widely used to treat stomach complaints, abdominal pain and fever. Dried, powdered root or bark is sometimes added to beer as an aphrodisiac.
Rothmannia capensis	Wild gardenia	Roots	The powdered roots are used for treating leprosy and rheumatism.
Tagetes minuta	Tall khaki bush	Leaves	Highly aromatic leaves have repellent properties of essential oils used by gardeners to keep plants disease free. Oil used in perfumery and as flavouring in foods, beverages and tobacco.
Helichrysum kraussii	Everlasting	Leaves, twigs and sometimes the roots	Many ailments are treated, including coughs, colds, fever, infections, headache and menstrual pains. It is a popular ingredient in wound dressing.

Species	Name	Plant parts used	Medicinal uses
Asclepias fruticosa	Milkweed	Mainly leaves, sometimes roots.	Snuff is prepared from ground leaves and used for treatment of headaches, tuberculosis and a general emetic to strengthen body.

A moderate to high diversity of medicinal species is present, and it is highly likely that the local communities rely on these medicinal species as relatively few medical facilities are present in the local area. In addition, two medicinal tree species, namely *Podocarpus falcatus* and *Pittosporum viridiflorum* are protected under the NFA (1998). Other medicinal species, namely *Scilla nervosa* and *Eucomis autumnalis,* are protected under the Kwazulu-Natal Nature Conservation Management Amendment Act, 1999 No. 5 of 1999. Furthermore, *Rapanea melanophloeos* is listed as *Rare* by SANBI for the QDS 2730AD.

Thus, any detrimental impact on the medicinal species associated with the subject property is likely to have a significant impact on surrounding communities relying on such species for medicinal use.

6 SENSITIVITY MAPPING

The figure below conceptually illustrates the areas considered to be of increased ecological sensitivity in relation to the proposed project. The areas are depicted according to their sensitivity in terms of faunal and floral habitat integrity and their suitability to provide habitat to faunal and floral communities.

The Wetland and Riparian habitat unit (blue) provides niche habitat for a high diversity of floral and faunal species and acts as a very important network of migratory corridors for faunal species. Thus, this habitat unit is considered to be highly sensitive. As such, any impacts on the wetland and riparian systems associated with the mining footprint area are likely to be significant on a local and regional scale.

The Northern Afrotemperate Forest habitat unit (dark green) provides niche habitat for a high diversity of floral and faunal species and contributes towards faunal migratory connectivity within the area. The species composition of this habitat unit is also representative of the vegetation type in which it occurs. Furthermore, this habitat unit contains several floral SCC. Thus, this habitat unit is considered to be highly sensitive.

The Montane Grassland habitat unit (light red) has general high ecological functionality and overall high levels of habitat integrity and is in a mostly undisturbed condition. The species

composition of this habitat unit is also representative of the vegetation type in which it occurs. Furthermore, this habitat unit contains several floral SCC. Thus, this habitat unit is considered to be highly sensitive.

The Secondary Grassland habitat unit (light green) has general moderate levels of ecological functionality and moderate levels of habitat integrity as a moderate degree of transformation has occurred. Furthermore, this habitat unit contains several floral SCC. Thus, this habitat unit is considered to be moderately sensitive, although edge effects from mining activities are deemed likely to have a detrimental impact on the surrounding more sensitive habitat units.

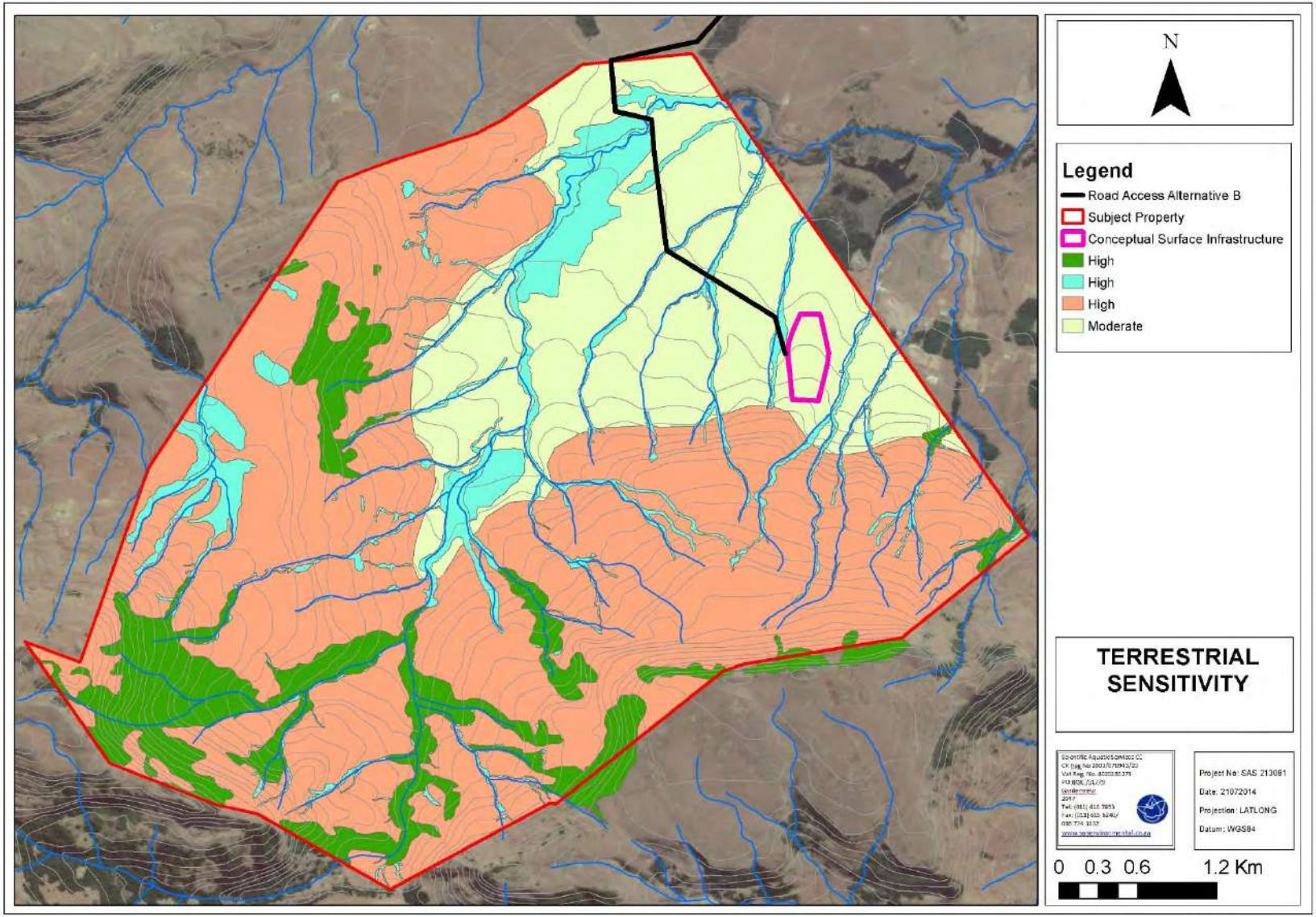


Figure 24: Sensitivity map for the subject property

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APPENDIX A

List of floral species in QDS

Table 13: Expected floral species list for the QDS *2730AD* (SANBI, 2015)

Family	Species	Threat status	Growth forms
ACANTHACEAE	*Chaetacanthus setiger (Pers.) Lindl.*	LC	Dwarf shrub, herb, shrub
ACANTHACEAE	*Crabbea hirsuta Harv.*	LC	Herb
ACANTHACEAE	*Hypoestes aristata (Vahl) Sol. ex Roem. & Schult. var. aristata*	LC	Suffrutex
ACANTHACEAE	*Hypoestes triflora (Forssk.) Roem. & Schult.*	LC	Dwarf shrub, herb
ACANTHACEAE	*Ruellia stenophylla C.B.Clarke*	LC	Herb
ACANTHACEAE	*Thunbergia atriplicifolia E.Mey. ex Nees*	LC	Dwarf shrub, herb
ACHARIACEAE	*Kiggelaria africana L.*	LC	Shrub, tree
AGAPANTHACEAE	*Agapanthus caulescens Spreng. subsp. gracilis (F.M.Leight.) F.M.Leight.*	LC	Herb
AGAPANTHACEAE	*Agapanthus inapertus P.Beauv. subsp. inapertus*	LC	Herb
AGAPANTHACEAE	*Agapanthus inapertus P.Beauv. subsp. intermedius F.M.Leight.*	LC	Herb
ALLIACEAE	*Tulbaghia acutiloba Harv.*	LC	Herb
ALLIACEAE	*Tulbaghia cernua Avé-Lall.*	LC	Herb
ALLIACEAE	*Tulbaghia leucantha Baker*	LC	Herb
AMARANTHACEAE	*Achyranthes aspera L. var. pubescens (Moq.) C.C.Towns.*	Not Evaluated	Herb
AMARANTHACEAE	*Achyranthes aspera L. var. sicula L.*	Not Evaluated	Herb
AMARANTHACEAE	*Cyathula cylindrica Moq. var. cylindrica*	LC	Herb
AMARYLLIDACEAE	*Apodolirion buchananii Baker*	LC	Geophyte
AMARYLLIDACEAE	*Brunsvigia grandiflora Lindl.*	LC	Geophyte
AMARYLLIDACEAE	*Brunsvigia radulosa Herb.*	LC	Geophyte
AMARYLLIDACEAE	*Cyrtanthus breviflorus Harv.*	LC	Geophyte
AMARYLLIDACEAE	*Cyrtanthus epiphyticus J.M.Wood*	LC	Epiphyte, geophyte
AMARYLLIDACEAE	*Cyrtanthus obrienii Baker*	LC	Geophyte
AMARYLLIDACEAE	*Cyrtanthus stenanthus Baker var. stenanthus*	LC	Geophyte
AMARYLLIDACEAE	*Cyrtanthus tuckii Baker var. transvaalensis I.Verd.*	LC	Geophyte
AMARYLLIDACEAE	*Cyrtanthus tuckii Baker var. tuckii*	LC	Geophyte
AMARYLLIDACEAE	*Haemanthus humilis Jacq. subsp. hirsutus (Baker) Snijman*	LC	Geophyte
AMARYLLIDACEAE	*Haemanthus humilis Jacq. subsp. humilis*	LC	Geophyte
AMARYLLIDACEAE	*Nerine angustifolia (Baker) Baker*	LC	Geophyte
AMARYLLIDACEAE	*Nerine filifolia Baker*	LC	Geophyte
AMARYLLIDACEAE	*Nerine platypetala McNeil*	VU	Geophyte
AMARYLLIDACEAE	*Scadoxus puniceus (L.) Friis & Nordal*	LC	Geophyte, herb
ANACARDIACEAE	*Searsia chirindensis (Baker f.) Moffett*	LC	Shrub, tree
ANACARDIACEAE	*Searsia dentata (Thunb.) F.A.Barkley*	LC	Shrub, tree
ANACARDIACEAE	*Searsia discolor (E.Mey. ex Sond.) Moffett*	LC	Dwarf shrub, shrub
ANACARDIACEAE	*Searsia dracomontana (Moffett) Moffett*	NT	Dwarf shrub, shrub
ANACARDIACEAE	*Searsia lucida (L.) F.A.Barkley forma lucida*	Not Evaluated	Shrub, tree
ANACARDIACEAE	*Searsia montana (Diels) Moffett*	LC	Shrub, tree
ANACARDIACEAE	*Searsia pentheri (Zahlbr.) Moffett*	LC	Shrub, tree
ANACARDIACEAE	*Searsia pyroides (Burch.) Moffett var. gracilis (Engl.) Moffett*	LC	Shrub, tree
ANACARDIACEAE	*Searsia pyroides (Burch.) Moffett var. integrifolia (Engl.) Moffett*	LC	Shrub, tree

Family	Species	Threat status	Growth forms
ANACARDIACEAE	*Searsia pyroides (Burch.) Moffett var. pyroides*	LC	[No lifeform defined]
ANACARDIACEAE	*Searsia rigida (Mill.) F.A.Barkley var. dentata (Engl.) Moffett*	LC	Shrub, tree
ANACARDIACEAE	*Searsia rigida (Mill.) F.A.Barkley var. margaretae (Burtt Davy ex Moffett) Moffett*	LC	Shrub
ANACARDIACEAE	*Searsia tomentosa (L.) F.A.Barkley*	LC	Shrub, tree
ANACARDIACEAE	*Searsia transvaalensis (Engl.) Moffett*	LC	Shrub, tree
ANEMIACEAE	*Mohria nudiuscula J.P.Roux*	LC	Geophyte, herb, lithophyte
ANEMIACEAE	*Mohria vestita Baker*	LC	Geophyte, herb, lithophyte
ANTHERICACEAE	*Chlorophytum cooperi (Baker) Nordal*	LC	Herb
ANTHERICACEAE	*Chlorophytum fasciculatum (Baker) Kativu*	LC	Herb
ANTHERICACEAE	*Chlorophytum haygarthii J.M.Wood & M.S.Evans*	LC	Herb
APIACEAE	*Afroligusticum thodei (T.H.Arnold) P.J.D.Winter*	LC	Herb
APIACEAE	*Afrosciadium caffrum (Meisn.) P.J.D.Winter*	LC	Herb
APIACEAE	*Afrosciadium platycarpum (Sond.) P.J.D.Winter*	LC	Herb
APIACEAE	*Alepidea cordifolia B.-E.van Wyk*		Herb
APIACEAE	*Alepidea peduncularis A.Rich.*	DDT	Herb
APIACEAE	*Alepidea setifera N.E.Br.*	LC	Herb
APIACEAE	*Berula thunbergii (DC.) H.Wolff*	LC	Herb, hydrophyte
APIACEAE	*Bupleurum mundii Cham. & Schltdl.*	LC	Herb
APIACEAE	*Conium fontanum Hilliard & B.L.Burtt var. fontanum*	LC	Herb
APIACEAE	*Heteromorpha arborescens (Spreng.) Cham. & Schltdl. var. abyssinica (Hochst. ex A.Rich.) H.Wolff*	LC	Shrub, tree
APIACEAE	*Pimpinella caffra (Eckl. & Zeyh.) D.Dietr.*	LC	Herb
APIACEAE	*Pimpinella transvaalensis H.Wolff*	LC	Herb
APIACEAE	*Polemannia montana Schltr. & H.Wolff*	LC	Shrub, tree
APIACEAE	*Sanicula elata Buch.-Ham. ex D.Don*	LC	Herb
APOCYNACEAE	*Asclepias albens (E.Mey.) Schltr.*	LC	Herb
APOCYNACEAE	*Asclepias aurea (Schltr.) Schltr.*	LC	Herb
APOCYNACEAE	*Asclepias cucullata (Schltr.) Schltr. subsp. cucullata*	LC	Herb
APOCYNACEAE	*Asclepias cultriformis (Harv. ex Schltr.) Schltr.*	LC	Herb
APOCYNACEAE	*Asclepias gibba (E.Mey.) Schltr. var. gibba*	LC	Herb
APOCYNACEAE	*Asclepias stellifera Schltr.*	LC	Herb
APOCYNACEAE	*Asclepias vicaria N.E.Br.*	LC	Herb
APOCYNACEAE	*Aspidoglossum demissum Kupicha*	DDD	Herb, succulent
APOCYNACEAE	*Aspidoglossum dissimile (N.E.Br.) Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Aspidoglossum glabrescens (Schltr.) Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Aspidoglossum glanduliferum (Schltr.) Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Aspidoglossum ovalifolium (Schltr.) Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Aspidoglossum xanthosphaerum Hilliard*	VU	Herb, succulent
APOCYNACEAE	*Aspidonepsis diploglossa (Turcz.) Nicholas & Goyder*	LC	Herb, succulent
APOCYNACEAE	*Brachystelma remotum R.A.Dyer*	Rare	Geophyte, succulent
APOCYNACEAE	*Brachystelma villosum (Schltr.) N.E.Br.*	Rare	Geophyte, succulent

Family	Species	Threat status	Growth forms
APOCYNACEAE	*Carissa bispinosa (L.) Desf. ex Brenan*	LC	Shrub
APOCYNACEAE	*Cordylogyne globosa E.Mey.*	LC	Geophyte, succulent
APOCYNACEAE	*Cynanchum ellipticum (Harv.) R.A.Dyer*	LC	Climber
APOCYNACEAE	*Miraglossum pulchellum (Schltr.) Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Pachycarpus campanulatus (Harv.) N.E.Br. var. sutherlandii N.E.Br.*	LC	Herb, succulent
APOCYNACEAE	*Pachycarpus grandiflorus (L.f.) E.Mey. subsp. tomentosus (Schltr.) Goyder*	LC	Geophyte, herb, succulent
APOCYNACEAE	*Raphionacme galpinii Schltr.*	LC	Geophyte, herb, succulent
APOCYNACEAE	*Raphionacme hirsuta (E.Mey.) R.A.Dyer*	LC	Geophyte, herb, succulent
APOCYNACEAE	*Schizoglossum atropurpureum E.Mey. subsp. atropurpureum*	LC	Herb, succulent
APOCYNACEAE	*Schizoglossum bidens E.Mey. subsp. atrorubens (Schltr.) Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Schizoglossum bidens E.Mey. subsp. bidens*	LC	Herb, succulent
APOCYNACEAE	*Schizoglossum bidens E.Mey. subsp. pachyglossum (Schltr.) Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Schizoglossum cordifolium E.Mey.*	LC	Herb
APOCYNACEAE	*Schizoglossum nitidum Schltr.*	LC	Herb, succulent
APOCYNACEAE	*Schizoglossum stenoglossum Schltr. subsp. latifolium Kupicha*	LC	Herb, succulent
APOCYNACEAE	*Secamone alpini Schult.*	LC	Climber
APOCYNACEAE	*Secamone gerrardii Harv. ex Benth.*	LC	Climber
APOCYNACEAE	*Sisyranthus huttoniae (S.Moore) S.Moore*	LC	Herb
APOCYNACEAE	*Sisyranthus imberbis Harv.*	LC	Herb
APOCYNACEAE	*Strophanthus speciosus (Ward & Harv.) Reber*	LC	Climber, shrub
APOCYNACEAE	*Xysmalobium involucratum (E.Mey.) Decne.*	LC	Herb, succulent
APOCYNACEAE	*Xysmalobium parviflorum Harv. ex Scott-Elliot*	LC	Herb, succulent
APOCYNACEAE	*Xysmalobium stockenstromense Scott-Elliot*	LC	Herb, succulent
APOCYNACEAE	*Xysmalobium undulatum (L.) Aiton f. var. undulatum*	LC	Herb, succulent
APONOGETONACEAE	*Aponogeton junceus Lehm.*	LC	Geophyte, herb, hydrophyte, tenagophyte
AQUIFOLIACEAE	*Ilex mitis (L.) Radlk. var. mitis*	Declining	Shrub, tree
ARACEAE	*Zantedeschia aethiopica (L.) Spreng.*	LC	Geophyte, herb
ARACEAE	*Zantedeschia albomaculata (Hook.) Baill. subsp. albomaculata*	LC	Geophyte, herb
ARACEAE	*Zantedeschia albomaculata (Hook.) Baill. subsp. macrocarpa (Engl.) Letty*	LC	Geophyte, herb
ARACEAE	*Zantedeschia rehmannii Engl.*	LC	Geophyte, herb
ARALIACEAE	*Cussonia paniculata Eckl. & Zeyh. subsp. sinuata (Reyneke & Kok) De Winter*	LC	Succulent, tree
ASPARAGACEAE	*Asparagus angusticladus (Jessop) J.-P.Lebrun & Stork*	LC	Climber
ASPARAGACEAE	*Asparagus asparagoides (L.) Druce*	LC	Climber, succulent
ASPARAGACEAE	*Asparagus concinnus (Baker) Kies*	LC	Shrub
ASPARAGACEAE	*Asparagus cooperi Baker*	LC	Dwarf shrub, shrub
ASPARAGACEAE	*Asparagus devenishii (Oberm.) Fellingham & N.L.Mey.*	LC	Dwarf shrub
ASPARAGACEAE	*Asparagus edulis (Oberm.) J.-P.Lebrun & Stork*	LC	Dwarf shrub

Family	Species	Threat status	Growth forms
ASPARAGACEAE	*Asparagus fractiflexus (Oberm.) Fellingham & N.L.Mey.*	EN	Scrambler
ASPARAGACEAE	*Asparagus laricinus Burch.*	LC	Shrub
ASPARAGACEAE	*Asparagus microraphis (Kunth) Baker*	LC	Shrub
ASPARAGACEAE	*Asparagus ramosissimus Baker*	LC	Climber
ASPARAGACEAE	*Asparagus virgatus Baker*	LC	Shrub
ASPHODELACEAE	*Aloe ecklonis Salm-Dyck*	LC	Herb, succulent
ASPHODELACEAE	*Aloe kniphofioides Baker*	VU	Geophyte, herb, succulent
ASPHODELACEAE	*Aloe maculata All.*	LC	Herb, succulent
ASPHODELACEAE	*Aloe mudenensis Reynolds*	LC	Herb, succulent
ASPHODELACEAE	*Bulbine coetzeei Oberm.*	LC	Geophyte, succulent
ASPHODELACEAE	*Bulbine frutescens (L.) Willd.*	LC	Dwarf shrub, succulent
ASPHODELACEAE	*Kniphofia albescens Codd*	LC	Herb
ASPHODELACEAE	*Kniphofia fluviatilis Codd*	LC	Herb
ASPHODELACEAE	*Kniphofia linearifolia Baker*	LC	Herb
ASPHODELACEAE	*Kniphofia multiflora J.M.Wood & M.S.Evans*	LC	Herb
ASPHODELACEAE	*Kniphofia porphyrantha Baker*	LC	Herb
ASPHODELACEAE	*Trachyandra asperata Kunth var. asperata*	LC	Geophyte, succulent
ASPHODELACEAE	*Trachyandra asperata Kunth var. nataglencoensis (Kuntze) Oberm.*	LC	Geophyte, succulent
ASPHODELACEAE	*Trachyandra gerrardii (Baker) Oberm.*	LC	Geophyte, succulent
ASPHODELACEAE	*Trachyandra margaretae Oberm.*	LC	Geophyte, succulent
ASPHODELACEAE	*Trachyandra saltii (Baker) Oberm. var. saltii*	LC	Geophyte, succulent
ASPLENIACEAE	*Asplenium aethiopicum (Burm.f.) Bech.*	LC	Epiphyte, geophyte, herb, lithophyte
ASPLENIACEAE	*Asplenium monanthes L.*	LC	Geophyte, herb, lithophyte
ASPLENIACEAE	*Asplenium varians Wall. ex Hook. & Grev. subsp. fimbriatum (Kunze) Schelpe*	LC	Geophyte, herb, lithophyte
ASTERACEAE	*Adenanthellum osmitoides (Harv.) B.Nord.*	LC	Herb
ASTERACEAE	*Arctotis arctotoides (L.f.) O.Hoffm.*	LC	Herb
ASTERACEAE	*Artemisia afra Jacq. ex Willd. var. afra*	LC	Herb, shrub
ASTERACEAE	*Aster bakerianus Burtt Davy ex C.A.Sm.*	LC	Herb
ASTERACEAE	*Aster harveyanus Kuntze*	LC	Herb
ASTERACEAE	*Athrixia arachnoidea J.M.Wood & M.S.Evans ex J.M.Wood*	LC	Dwarf shrub
ASTERACEAE	*Athrixia fontana MacOwan*	LC	Herb
ASTERACEAE	*Athrixia gerrardii Harv.*	LC	Dwarf shrub
ASTERACEAE	*Athrixia phylicoides DC.*	LC	Shrub
ASTERACEAE	*Berkheya echinacea (Harv.) O.Hoffm. ex Burtt Davy subsp. echinacea*	LC	Herb
ASTERACEAE	*Berkheya rhapontica (DC.) Hutch. & Burtt Davy subsp. rhapontica*	LC	Herb
ASTERACEAE	*Berkheya setifera DC.*	LC	Herb
ASTERACEAE	*Berkheya speciosa (DC.) O.Hoffm. subsp. lanceolata Roessler*	LC	Herb
ASTERACEAE	*Callilepis laureola DC.*	LC	Herb
ASTERACEAE	*Chrysocoma ciliata L.*	LC	Shrub
ASTERACEAE	*Cineraria geifolia (L.) L.*	LC	Herb, suffrutex

Family	Species	Threat status	Growth forms
ASTERACEAE	*Conyza chilensis Spreng.*	Not Evaluated	Herb
ASTERACEAE	*Conyza gouanii (L.) Willd.*	LC	Herb
ASTERACEAE	*Conyza pinnata (L.f.) Kuntze*	LC	Herb
ASTERACEAE	*Cotula hispida (DC.) Harv.*	LC	Herb
ASTERACEAE	*Crassocephalum x picridifolium (DC.) S.Moore*	Not Evaluated	Herb
ASTERACEAE	*Crepis hypochaeridea (DC.) Thell.*	Not Evaluated	Herb
ASTERACEAE	*Denekia capensis Thunb.*	LC	Herb
ASTERACEAE	*Dimorphotheca jucunda E.Phillips*	LC	Herb
ASTERACEAE	*Euryops gilfillanii Bolus*	LC	Herb
ASTERACEAE	*Euryops laxus (Harv.) Burtt Davy*	LC	Herb
ASTERACEAE	*Euryops transvaalensis Klatt subsp. setilobus (N.E.Br.) B.Nord.*	LC	Herb
ASTERACEAE	*Felicia muricata (Thunb.) Nees subsp. muricata*	LC	Shrub
ASTERACEAE	*Felicia quinquenervia (Klatt) Grau*	LC	Herb
ASTERACEAE	*Felicia rosulata Yeo*	LC	Herb
ASTERACEAE	*Galinsoga parviflora Cav.*	Not Evaluated	Herb
ASTERACEAE	*Garuleum woodii Schinz*	LC	Shrub, suffrutex
ASTERACEAE	*Gazania krebsiana Less. subsp. krebsiana*	LC	Herb
ASTERACEAE	*Gazania krebsiana Less. subsp. serrulata (DC.) Roessler*	LC	Herb
ASTERACEAE	*Gerbera ambigua (Cass.) Sch.Bip.*	LC	Herb
ASTERACEAE	*Gerbera galpinii Klatt*	LC	Herb
ASTERACEAE	*Gerbera natalensis Sch.Bip.*	LC	Herb
ASTERACEAE	*Gerbera piloselloides (L.) Cass.*	LC	Herb
ASTERACEAE	*Haplocarpha nervosa (Thunb.) Beauverd*	LC	Herb
ASTERACEAE	*Haplocarpha scaposa Harv.*	LC	Herb
ASTERACEAE	*Helichrysum adenocarpum DC. subsp. adenocarpum*	LC	Herb
ASTERACEAE	*Helichrysum allioides Less.*	LC	Herb
ASTERACEAE	*Helichrysum appendiculatum (L.f.) Less.*	LC	Herb
ASTERACEAE	*Helichrysum argyrolepis MacOwan*	LC	Dwarf shrub
ASTERACEAE	*Helichrysum aureonitens Sch.Bip.*	LC	Herb
ASTERACEAE	*Helichrysum aureum (Houtt.) Merr. var. argenteum Hilliard*	VU	Herb
ASTERACEAE	*Helichrysum aureum (Houtt.) Merr. var. candidum Hilliard*	LC	Herb
ASTERACEAE	*Helichrysum aureum (Houtt.) Merr. var. monocephalum (DC.) Hilliard*	LC	Herb
ASTERACEAE	*Helichrysum caespititium (DC.) Harv.*	LC	Herb
ASTERACEAE	*Helichrysum cephaloideum DC.*	LC	Herb
ASTERACEAE	*Helichrysum chionosphaerum DC.*	LC	Herb
ASTERACEAE	*Helichrysum confertifolium Klatt*	LC	Herb
ASTERACEAE	*Helichrysum cooperi Harv.*	LC	Herb
ASTERACEAE	*Helichrysum cymosum (L.) D.Don subsp. calvum Hilliard*	LC	Dwarf shrub, shrub
ASTERACEAE	*Helichrysum ecklonis Sond.*	LC	Herb
ASTERACEAE	*Helichrysum epapposum Bolus*	LC	Herb
ASTERACEAE	*Helichrysum glomeratum Klatt*	LC	Herb

Family	Species	Threat status	Growth forms
ASTERACEAE	*Helichrysum hypoleucum Harv.*	LC	Herb, shrub
ASTERACEAE	*Helichrysum infaustum J.M.Wood & M.S.Evans*	LC	Dwarf shrub
ASTERACEAE	*Helichrysum interjacens Hilliard*	LC	Dwarf shrub, herb
ASTERACEAE	*Helichrysum krookii Moeser*	LC	Herb
ASTERACEAE	*Helichrysum melanacme DC.*	LC	Dwarf shrub, herb
ASTERACEAE	*Helichrysum miconiifolium DC.*	LC	Herb
ASTERACEAE	*Helichrysum monticola Hilliard*	LC	Herb
ASTERACEAE	*Helichrysum mundtii Harv.*	LC	Herb
ASTERACEAE	*Helichrysum nudifolium (L.) Less. var. nudifolium*	LC	Herb
ASTERACEAE	*Helichrysum nudifolium (L.) Less. var. pilosellum (L.f.) Beentje*	LC	Herb
ASTERACEAE	*Helichrysum opacum Klatt*	LC	Herb
ASTERACEAE	*Helichrysum oreophilum Klatt*	LC	Herb
ASTERACEAE	*Helichrysum pallidum DC.*	LC	Herb
ASTERACEAE	*Helichrysum platypterum DC.*	LC	Herb
ASTERACEAE	*Helichrysum polycladum Klatt*	LC	Herb
ASTERACEAE	*Helichrysum rugulosum Less.*	LC	Herb
ASTERACEAE	*Helichrysum spiralepis Hilliard & B.L.Burtt*	LC	Herb
ASTERACEAE	*Helichrysum splendidum (Thunb.) Less.*	LC	Herb, shrub
ASTERACEAE	*Helichrysum spodiophyllum Hilliard & B.L.Burtt*	LC	Dwarf shrub, herb
ASTERACEAE	*Helichrysum sutherlandii Harv.*	LC	Dwarf shrub, herb, shrub
ASTERACEAE	*Hilliardiella aristata (DC.) H.Rob.*	LC	Herb
ASTERACEAE	*Hilliardiella hirsuta (DC.) H.Rob.*	LC	Herb
ASTERACEAE	*Hirpicium armerioides (DC.) Roessler*	LC	Herb
ASTERACEAE	*Hirpicium linearifolium (Bolus) Roessler*	LC	Herb
ASTERACEAE	*Hypochaeris radicata L.*	Not Evaluated	Herb
ASTERACEAE	*Inulanthera calva (Hutch.) Källersjö*	LC	Shrub
ASTERACEAE	*Lactuca inermis Forssk.*	LC	Herb
ASTERACEAE	*Leucanthemum vulgare Lam.*	Not Evaluated	Herb
ASTERACEAE	*Lopholaena segmentata (Oliv.) S.Moore*	LC	Herb, succulent
ASTERACEAE	*Macledium zeyheri (Sond.) S.Ortíz subsp. argyrophyllum (Oliv.) S.Ortíz*	LC	Herb
ASTERACEAE	*Macowania pinifolia (N.E.Br.) Kroner*	LC	Shrub
ASTERACEAE	*Macowania tenuifolia M.D.Hend.*	LC	Shrub
ASTERACEAE	*Nidorella anomala Steetz*	LC	Herb
ASTERACEAE	*Nidorella auriculata DC.*	LC	Herb
ASTERACEAE	*Nidorella undulata (Thunb.) Sond. ex Harv.*	LC	Herb
ASTERACEAE	*Othonna gymnodiscus (DC.) Sch.Bip.*	LC	Geophyte, herb, succulent
ASTERACEAE	*Othonna natalensis Sch.Bip.*	LC	Herb, succulent
ASTERACEAE	*Phymaspermum acerosum (DC.) Källersjö*	LC	Shrub
ASTERACEAE	*Phymaspermum woodii (Thell.) Källersjö*	LC	Herb
ASTERACEAE	*Printzia auriculata Harv.*	LC	Shrub
ASTERACEAE	*Pseudognaphalium luteo-album (L.) Hilliard & B.L.Burtt*		Herb
ASTERACEAE	*Pseudognaphalium oligandrum (DC.) Hilliard & B.L.Burtt*	LC	Herb

Family	Species	Threat status	Growth forms
ASTERACEAE	*Schistostephium crataegifolium (DC.) Fenzl ex Harv.*	LC	Herb, suffrutex
ASTERACEAE	*Schkuhria pinnata (Lam.) Kuntze ex Thell.*	Not Evaluated	Herb
ASTERACEAE	*Senecio adnatus DC.*	LC	Herb
ASTERACEAE	*Senecio albanensis DC. var. albanensis*	LC	Herb
ASTERACEAE	*Senecio albanensis DC. var. doroniciflorus (DC.) Harv.*	LC	Herb
ASTERACEAE	*Senecio barbatus DC.*	LC	Herb
ASTERACEAE	*Senecio burchellii DC.*	LC	Dwarf shrub, shrub
ASTERACEAE	*Senecio caudatus DC.*	LC	Herb
ASTERACEAE	*Senecio deltoideus Less.*	LC	Herb, scrambler
ASTERACEAE	*Senecio discodregeanus Hilliard & B.L.Burtt*	LC	Herb
ASTERACEAE	*Senecio erubescens Aiton var. erubescens*	LC	Herb
ASTERACEAE	*Senecio glaberrimus DC.*	LC	Herb
ASTERACEAE	*Senecio harveianus MacOwan*	LC	Dwarf shrub, herb
ASTERACEAE	*Senecio hieracioides DC.*	LC	Herb
ASTERACEAE	*Senecio inaequidens DC.*	LC	Herb
ASTERACEAE	*Senecio inornatus DC.*	LC	Herb
ASTERACEAE	*Senecio othonniflorus DC.*	LC	Herb
ASTERACEAE	*Senecio oxyriifolius DC. subsp. oxyriifolius*	LC	Herb, succulent
ASTERACEAE	*Senecio panduriformis Hilliard*	LC	Herb
ASTERACEAE	*Senecio polyodon DC. var. polyodon*	LC	Herb
ASTERACEAE	*Senecio purpureus L.*	LC	Herb
ASTERACEAE	*Senecio scitus Hutch. & Burtt Davy*	LC	Herb
ASTERACEAE	*Senecio serratuloides DC.*	LC	Herb
ASTERACEAE	*Senecio striatifolius DC.*	LC	Herb
ASTERACEAE	*Senecio subcoriaceus Schltr.*	LC	Herb
ASTERACEAE	*Senecio subrubriflorus O.Hoffm.*	LC	Herb
ASTERACEAE	*Senecio tanacetopsis Hilliard*	LC	Dwarf shrub, shrub
ASTERACEAE	*Senecio ulopterus Thell.*	LC	Herb
ASTERACEAE	*Sonchus integrifolius Harv. var. schlechteri R.E.Fr.*	LC	Herb
ASTERACEAE	*Tolpis capensis (L.) Sch.Bip.*	LC	Herb
ASTERACEAE	*Ursinia montana DC. subsp. montana*	LC	Herb
ASTERACEAE	*Ursinia tenuiloba DC.*	LC	Herb
ASTERACEAE	*Vernonia galpinii Klatt*	LC	Herb
ASTERACEAE	*Vernonia sutherlandii Harv.*	LC	Herb
ASTERACEAE	*Vernonia thodei E.Phillips*	LC	Herb
AYTONIACEAE	*Asterella bachmannii (Steph.) S.W.Arnell*		Bryophyte
AYTONIACEAE	*Asterella wilmsii (Steph.) S.W.Arnell*		Bryophyte
BALSAMINACEAE	*Impatiens hochstetteri Warb. subsp. hochstetteri*	LC	Herb
BARTRAMIACEAE	*Philonotis hastata (Duby) Wijk & Margad.*		Bryophyte
BEHNIACEAE	*Behnia reticulata (Thunb.) Didr.*	LC	Climber
BORAGINACEAE	*Cynoglossum austroafricanum Hilliard & B.L.Burtt*	LC	Herb
BORAGINACEAE	*Cynoglossum hispidum Thunb.*	LC	Herb
BORAGINACEAE	*Lithospermum papillosum Thunb.*	LC	Herb
BORAGINACEAE	*Myosotis afropalustris C.H.Wright*	LC	Herb

Family	Species	Threat status	Growth forms
BORAGINACEAE	*Myosotis sylvatica Hoffm.*	Not Evaluated	Herb
BRASSICACEAE	*Cardamine flexuosa With.*	Not Evaluated	Herb
BRASSICACEAE	*Cardamine impatiens L.*	Not Evaluated	Herb
BRASSICACEAE	*Heliophila carnosa (Thunb.) Steud.*	LC	Dwarf shrub, succulent
BRASSICACEAE	*Heliophila rigidiuscula Sond.*	LC	Herb
BRASSICACEAE	*Raphanus raphanistrum L.*	Not Evaluated	Herb
BRASSICACEAE	*Rorippa nudiuscula Thell.*	LC	Herb
BRASSICACEAE	*Turritis glabra L.*	Not Evaluated	Herb
BRYACEAE	*Anomobryum julaceum (Schrad. ex P.Gaertn., B.Mey. & Schreb.) Schimp.*		Bryophyte
BRYACEAE	*Brachymenium acuminatum Harv.*		Bryophyte
BRYACEAE	*Brachymenium pulchrum Hook.*		Bryophyte, epiphyte
BRYACEAE	*Bryum argenteum Hedw.*		Bryophyte
BRYACEAE	*Bryum pseudotriquetrum (Hedw.) P.Gaertn., B.Mey. & Scherb.*		Bryophyte
BUDDLEJACEAE	*Buddleja auriculata Benth.*	LC	Shrub
BUDDLEJACEAE	*Buddleja dysophylla (Benth.) Radlk.*	LC	Climber, shrub
BUDDLEJACEAE	*Buddleja loricata Leeuwenb.*	LC	Shrub
BUDDLEJACEAE	*Buddleja salviifolia (L.) Lam.*	LC	Shrub, tree
CAMPANULACEAE	*Wahlenbergia androsacea A.DC.*	LC	Herb
CAMPANULACEAE	*Wahlenbergia cuspidata Brehmer*	LC	Herb
CAMPANULACEAE	*Wahlenbergia epacridea Sond.*	LC	Herb
CAMPANULACEAE	*Wahlenbergia grandiflora Brehmer*	LC	Herb
CAMPANULACEAE	*Wahlenbergia huttonii (Sond.) Thulin*	LC	Herb
CAMPANULACEAE	*Wahlenbergia krebsii Cham. subsp. krebsii*	LC	Herb
CAMPANULACEAE	*Wahlenbergia squamifolia Brehmer*	LC	Herb
CAMPANULACEAE	*Wahlenbergia undulata (L.f.) A.DC.*	LC	Herb
CAMPANULACEAE	*Wahlenbergia virgata Engl.*	LC	Herb
CANNACEAE	*Canna indica L.*	Not Evaluated	Herb
CAPPARACEAE	*Maerua cafra (DC.) Pax*	LC	Shrub, tree
CARYOPHYLLACEAE	*Cerastium arabidis E.Mey. ex Fenzl*	LC	Herb
CARYOPHYLLACEAE	*Cerastium indicum Wight & Arn.*	LC	Herb
CARYOPHYLLACEAE	*Dianthus basuticus Burtt Davy subsp. basuticus var. basuticus*	LC	Herb
CARYOPHYLLACEAE	*Dianthus basuticus Burtt Davy subsp. basuticus var. grandiflorus S.S.Hooper*	LC	Herb
CARYOPHYLLACEAE	*Herniaria erckertii Herm. subsp. erckertii*	LC	Herb
CARYOPHYLLACEAE	*Paronychia brasiliana DC. var. pubescens Chaudhri*	Not Evaluated	Herb
CARYOPHYLLACEAE	*Silene burchellii Otth var. angustifolia Sond.*	Not Evaluated	Herb
CARYOPHYLLACEAE	*Silene undulata Aiton*	LC	Herb
CARYOPHYLLACEAE	*Spergula arvensis L.*	Not Evaluated	Herb
CELASTRACEAE	*Gymnosporia buxifolia (L.) Szyszyl.*	LC	Shrub, tree
CELASTRACEAE	*Gymnosporia devenishii Jordaan*	Rare	Shrub, tree
CELASTRACEAE	*Gymnosporia harveyana Loes. subsp. harveyana*	LC	Shrub, tree
CELASTRACEAE	*Gymnosporia mossambicensis (Klotzsch) Loes.*	LC	Shrub, tree
CELASTRACEAE	*Gymnosporia nemorosa (Eckl. & Zeyh.) Szyszyl.*	LC	Shrub, tree
CELASTRACEAE	*Maytenus acuminata (L.f.) Loes. var. acuminata*	LC	Shrub, tree

Family	Species	Threat status	Growth forms
CELASTRACEAE	*Maytenus undata (Thunb.) Blakelock*	LC	Shrub, tree
CELASTRACEAE	*Mystroxylon aethiopicum (Thunb.) Loes. subsp. aethiopicum*	LC	Shrub, tree
CELASTRACEAE	*Pterocelastrus echinatus N.E.Br.*	LC	Shrub, tree
CELASTRACEAE	*Robsonodendron eucleiforme (Eckl. & Zeyh.) R.H.Archer*	LC	Tree
CELTIDACEAE	*Celtis africana Burm.f.*	LC	Shrub, tree
CHENOPODIACEAE	*Chenopodium schraderianum Roem. & Schult.*	Not Evaluated	Herb
CHRYSOBALANACEAE	*Parinari capensis Harv. subsp. capensis*	LC	Dwarf shrub
CLADONIACEAE	*Cladonia subulata (L.) Weber ex F.H.Wigg.*		Lichen
COLCHICACEAE	*Colchicum longipes (Baker) J.C.Manning & Vinn.*	LC	Geophyte
COLCHICACEAE	*Colchicum striatum (Hochst. ex A.Rich.) J.C.Manning & Vinn.*	LC	Geophyte
COLCHICACEAE	*Gloriosa modesta (Hook.) J.C.Manning & Vinn.*	LC	Climber, geophyte
COLCHICACEAE	*Sandersonia aurantiaca Hook.*	Declining	Climber, geophyte, herb
COMMELINACEAE	*Commelina africana L. var. africana*	LC	Herb
COMMELINACEAE	*Cyanotis speciosa (L.f.) Hassk.*	LC	Herb, succulent
CONVOLVULACEAE	*Convolvulus farinosus L.*	LC	Climber, herb
CONVOLVULACEAE	*Convolvulus natalensis Bernh. ex Krauss*	LC	Herb
CONVOLVULACEAE	*Cuscuta campestris Yunck.*	Not Evaluated	Herb, parasite
CONVOLVULACEAE	*Ipomoea crassipes Hook. var. crassipes*	LC	Herb, succulent
CONVOLVULACEAE	*Ipomoea oblongata E.Mey. ex Choisy*	LC	Herb, succulent
CRASSULACEAE	*Crassula arborescens (Mill.) Willd. subsp. arborescens*	LC	Shrub, succulent
CRASSULACEAE	*Crassula compacta Schönland*	LC	Herb, succulent
CRASSULACEAE	*Crassula inanis Thunb.*	LC	Herb, hydrophyte, succulent
CRASSULACEAE	*Crassula lanceolata (Eckl. & Zeyh.) Endl. ex Walp. subsp. lanceolata*	LC	Herb, succulent
CRASSULACEAE	*Crassula lanceolata (Eckl. & Zeyh.) Endl. ex Walp. subsp. transvaalensis (Kuntze) Toelken*	LC	Herb, succulent
CRASSULACEAE	*Crassula natalensis Schönland*	LC	Herb, lithophyte, succulent
CRASSULACEAE	*Crassula pellucida L. subsp. brachypetala (Drège ex Harv.) Toelken*	LC	Herb, scrambler, succulent
CRASSULACEAE	*Crassula setulosa Harv. var. rubra (N.E.Br.) G.D.Rowley*	LC	Herb, succulent
CRASSULACEAE	*Crassula setulosa Harv. var. setulosa forma setulosa*	Not Evaluated	Herb, succulent
CRASSULACEAE	*Crassula tuberella Toelken*	LC	Herb, succulent
CRASSULACEAE	*Crassula vaginata Eckl. & Zeyh. subsp. vaginata*	LC	Herb, succulent
CUCURBITACEAE	*Cucumis myriocarpus Naudin subsp. myriocarpus*	LC	Herb
CUCURBITACEAE	*Kedrostis capensis (Sond.) A.Meeuse*	LC	Climber, succulent
CUCURBITACEAE	*Momordica boivinii Baill.*	LC	Climber, herb, succulent
CUCURBITACEAE	*Momordica foetida Schumach.*	LC	Climber, herb
CYATHEACEAE	*Alsophila dregei (Kunze) R.M.Tryon*	LC	Tree
CYPERACEAE	*Ascolepis capensis (Kunth) Ridl.*	LC	Cyperoid, herb
CYPERACEAE	*Bulbostylis densa (Wall.) Hand.-Mazz. subsp. afromontana (Lye) R.W.Haines*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Bulbostylis humilis (Kunth) C.B.Clarke*	LC	Cyperoid, herb, mesophyte

Family	Species	Threat status	Growth forms
CYPERACEAE	*Bulbostylis oritrephes (Ridl.) C.B.Clarke*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Bulbostylis schoenoides (Kunth) C.B.Clarke*	LC	Cyperoid, helophyte, herb, mesophyte
CYPERACEAE	*Carex acutiformis Ehrh.*	Not Evaluated	Cyperoid, emergent hydrophyte, helophyte, herb
CYPERACEAE	*Carex cognata Kunth*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Carex rhodesiaca Nelmes*		[No lifeform defined]
CYPERACEAE	*Carex spicatopaniculata Boeckeler ex C.B.Clarke x C. zuluensis C.B.Clarke*	Not Evaluated	Cyperoid, herb, mesophyte
CYPERACEAE	*Carex spicatopaniculata Boeckeler ex C.B.Clarke*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Carpha filifolia C.Reid & T.H.Arnold*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Cyperus albostriatus Schrad.*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Cyperus congestus Vahl*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Cyperus keniensis Kük.*	LC	Cyperoid, helophyte, herb, mesophyte
CYPERACEAE	*Cyperus obtusiflorus Vahl var. flavissimus (Schrad.) Boeck.*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Cyperus obtusiflorus Vahl var. obtusiflorus*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Cyperus rupestris Kunth var. rupestris*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Cyperus schlechteri C.B.Clarke*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Cyperus semitrifidus Schrad.*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Cyperus uitenhagensis (Steud.) C.Archer & Goetgh.*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Dracoscirpoides falsa (C.B.Clarke) Muasya*	LC	[No lifeform defined]
CYPERACEAE	*Eleocharis dregeana Steud.*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Ficinia gracilis Schrad.*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Ficinia stolonifera Boeckeler*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Fuirena pubescens (Poir.) Kunth var. pubescens*	LC	Cyperoid, helophyte, herb, mesophyte
CYPERACEAE	*Isolepis cernua (Vahl) Roem. & Schult. var. cernua*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Isolepis costata Hochst. ex A.Rich.*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Isolepis fluitans (L.) R.Br. var. fluitans*	LC	Cyperoid, emergent hydrophyte, helophyte, herb
CYPERACEAE	*Isolepis inyangensis Muasya & Goetgh.*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Isolepis natans (Thunb.) A.Dietr.*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Kyllinga alata Nees*	LC	Cyperoid, helophyte, herb, mesophyte
CYPERACEAE	*Kyllinga erecta Schumach. var. erecta*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Kyllinga pauciflora Ridl.*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Pycreus cooperi C.B.Clarke*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Pycreus macranthus (Boeckeler) C.B.Clarke*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Pycreus nigricans (Steud.) C.B.Clarke*	LC	Cyperoid, helophyte, herb

Family	Species	Threat status	Growth forms
CYPERACEAE	*Pycreus nitidus (Lam.) J.Raynal*	LC	Cyperoid, helophyte, herb, sudd hydrophyte
CYPERACEAE	*Pycreus rehmannianus C.B.Clarke*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Pycreus unioloides (R.Br.) Urb.*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Rhynchospora brownii Roem. & Schult.*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Schoenoplectus brachyceras (Hochst. ex A.Rich.) Lye*	LC	Cyperoid, emergent hydrophyte, helophyte, herb
CYPERACEAE	*Schoenoxiphium lehmannii (Nees) Steud.*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Schoenoxiphium rufum Nees var. rufum*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Schoenoxiphium sparteum (Wahlenb.) C.B.Clarke*	LC	Cyperoid, herb, mesophyte
CYPERACEAE	*Scleria dieterlenii Turrill*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Scleria dregeana Kunth*	LC	Cyperoid, helophyte, herb
CYPERACEAE	*Scleria woodii C.B.Clarke*	LC	Cyperoid, helophyte, herb
DICRANACEAE	*Campylopus pilifer Brid. var. pilifer*		Bryophyte
DIOSCOREACEAE	*Dioscorea cotinifolia Kunth*	LC	Climber, geophyte, succulent
DIOSCOREACEAE	*Dioscorea mundii Baker*	NT	Climber, geophyte, succulent
DIOSCOREACEAE	*Dioscorea retusa Mast.*	LC	Climber, geophyte, succulent
DIOSCOREACEAE	*Dioscorea sylvatica Eckl. var. brevipes (Burtt Davy) Burkill*	Not Evaluated	Climber, geophyte, succulent
DIOSCOREACEAE	*Dioscorea sylvatica Eckl. var. sylvatica*	Not Evaluated	Climber, geophyte, succulent
DIPSACACEAE	*Cephalaria petiolata Compton*		Herb
DIPSACACEAE	*Cephalaria pungens Szabó*	LC	Herb
DIPSACACEAE	*Scabiosa columbaria L.*	LC	Herb
DITRICHACEAE	*Ceratodon purpureus (Hedw.) Brid. subsp. stenocarpus (Bruch & Schimp. ex Müll.Hal.) Dixon*		Bryophyte
DROSERACEAE	*Drosera collinsiae N.E.Br. ex Burtt Davy*	LC	Carnivore, herb
DROSERACEAE	*Drosera dielsiana Exell & J.R.Laundon*	LC	Carnivore, herb
DRYOPTERIDACEAE	*Dryopteris inaequalis (Schltdl.) Kuntze*	LC	Geophyte, herb
DRYOPTERIDACEAE	*Dryopteris lewalleana Pic.Serm.*	LC	Geophyte, herb, lithophyte
DRYOPTERIDACEAE	*Polystichum luctuosum (Kunze) T.Moore*	LC	Geophyte, herb, lithophyte
DRYOPTERIDACEAE	*Polystichum transvaalense N.C.Anthony*	LC	Geophyte, herb, lithophyte
EBENACEAE	*Diospyros austro-africana De Winter var. microphylla (Burch.) De Winter*	LC	Shrub
EBENACEAE	*Diospyros lycioides Desf. subsp. guerkei (Kuntze) De Winter*	LC	Shrub, tree
EBENACEAE	*Diospyros lycioides Desf. subsp. sericea (Bernh.) De Winter*	LC	Shrub, tree
EBENACEAE	*Diospyros whyteana (Hiern) F.White*	LC	Shrub, tree
EBENACEAE	*Euclea crispa (Thunb.) Gürke subsp. crispa*	LC	Shrub, tree
ELAPHOGLOSSACEAE	*Elaphoglossum acrostichoides (Hook. & Grev.) Schelpe*	LC	Epiphyte, geophyte, herb, lithophyte
ERICACEAE	*Erica alopecurus Harv. var. alopecurus*	LC	Shrub
ERICACEAE	*Erica caffrorum Bolus var. caffrorum*	LC	Shrub

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ERICACEAE	*Erica cerinthoides L. var. cerinthoides*	LC	Shrub
ERICACEAE	*Erica drakensbergensis Guthrie & Bolus*	LC	Shrub
ERICACEAE	*Erica oatesii Rolfe var. oatesii*	LC	Shrub
ERICACEAE	*Erica revoluta (Bolus) L.E.Davidson*	LC	Shrub
ERICACEAE	*Erica woodii Bolus var. woodii*	LC	Dwarf shrub
ERIOCAULACEAE	*Eriocaulon hydrophilum Markötter*	LC	Herb, hydrophyte, tenagophyte
ERIOCAULACEAE	*Eriocaulon sonderianum Körn.*	LC	Herb, hydrophyte, tenagophyte
ERIOSPERMACEAE	*Eriospermum cooperi Baker var. cooperi*	LC	Geophyte
ERIOSPERMACEAE	*Eriospermum flagelliforme (Baker) J.C.Manning*	LC	Geophyte
ERIOSPERMACEAE	*Eriospermum porphyrovalve Baker*	LC	Geophyte
ESCALLONIACEAE	*Choristylis rhamnoides Harv.*	LC	Climber, shrub, tree
EUPHORBIACEAE	*Acalypha wilmsii Pax ex Prain & Hutch.*	LC	Dwarf shrub, herb, shrub
EUPHORBIACEAE	*Adenocline acuta (Thunb.) Baill.*	LC	Herb
EUPHORBIACEAE	*Adenocline pauciflora Turcz.*	LC	Herb
EUPHORBIACEAE	*Clutia affinis Sond.*	LC	Shrub
EUPHORBIACEAE	*Clutia hirsuta (Sond.) Müll.Arg. var. hirsuta*	LC	Dwarf shrub, shrub
EUPHORBIACEAE	*Clutia laxa Eckl. ex Sond.*	LC	Shrub
EUPHORBIACEAE	*Clutia monticola S.Moore var. monticola*	LC	Dwarf shrub, herb
EUPHORBIACEAE	*Clutia natalensis Bernh.*	LC	Shrub
EUPHORBIACEAE	*Clutia pulchella L. var. pulchella*	LC	Dwarf shrub, herb, shrub
EUPHORBIACEAE	*Clutia virgata Pax & K.Hoffm.*	LC	Dwarf shrub, herb
EUPHORBIACEAE	*Euphorbia clavarioides Boiss. var. truncata (N.E.Br.) A.C.White, R.A.Dyer & B.Sloane*	LC	Dwarf shrub, shrub, succulent
EUPHORBIACEAE	*Euphorbia epicyparissias E.Mey. ex Boiss.*	LC	Dwarf shrub, herb
EUPHORBIACEAE	*Euphorbia kraussiana Bernh. var. kraussiana*	LC	Dwarf shrub, herb
EUPHORBIACEAE	*Euphorbia striata Thunb. var. striata*	LC	Dwarf shrub, herb
FABACEAE	*Argyrolobium lotoides Harv.*	LC	Herb
FABACEAE	*Argyrolobium pseudotuberosum T.J.Edwards*	LC	Herb
FABACEAE	*Argyrolobium rupestre (E.Mey.) Walp. subsp. rupestre*	LC	Herb
FABACEAE	*Argyrolobium speciosum Eckl. & Zeyh.*	LC	Herb
FABACEAE	*Argyrolobium tomentosum (Andrews) Druce*	LC	Dwarf shrub, shrub
FABACEAE	*Argyrolobium tuberosum Eckl. & Zeyh.*	LC	Herb
FABACEAE	*Calpurnia aurea (Aiton) Benth. subsp. aurea*	LC	Shrub, tree
FABACEAE	*Calpurnia sericea Harv.*	LC	Shrub
FABACEAE	*Desmodium repandum (Vahl) DC.*	LC	Herb, shrub
FABACEAE	*Dichilus strictus E.Mey.*	LC	Dwarf shrub, herb, shrub
FABACEAE	*Dolichos angustissimus E.Mey.*	LC	Herb
FABACEAE	*Elephantorrhiza elephantina (Burch.) Skeels*	LC	Dwarf shrub, shrub, suffrutex
FABACEAE	*Eriosema cordatum E.Mey.*	LC	Herb
FABACEAE	*Eriosema kraussianum Meisn.*	LC	Herb
FABACEAE	*Erythrina zeyheri Harv.*	LC	Dwarf shrub, shrub, succulent
FABACEAE	*Indigastrum fastigiatum (E.Mey.) Schrire*	LC	Herb
FABACEAE	*Indigofera dimidiata Vogel ex Walp.*	LC	Herb

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FABACEAE	*Indigofera frondosa N.E.Br.*	LC	Shrub
FABACEAE	*Indigofera hilaris Eckl. & Zeyh. var. hilaris*	LC	Herb
FABACEAE	*Indigofera longibarbata Engl.*	LC	Dwarf shrub
FABACEAE	*Indigofera rostrata Bolus*	LC	Dwarf shrub, herb
FABACEAE	*Indigofera sanguinea N.E.Br.*	LC	Herb
FABACEAE	*Leobordea eriantha (Benth.) B.-E.van Wyk & Boatwr.*	LC	[No lifeform defined]
FABACEAE	*Lotononis amajubica (Burtt Davy) B.-E.van Wyk*	Rare	Dwarf shrub
FABACEAE	*Lotononis dichiloides Sond.*	CR PE	Shrub
FABACEAE	*Lotus discolor E.Mey. subsp. discolor*	LC	Herb
FABACEAE	*Otholobium nigricans C.H.Stirt.*	LC	Shrub
FABACEAE	*Otholobium spicatum (L.) C.H.Stirt.*	LC	Shrub
FABACEAE	*Otholobium wilmsii (Harms) C.H.Stirt.*	LC	Shrub, tree
FABACEAE	*Pearsonia grandifolia (Bolus) Polhill subsp. grandifolia*	LC	Herb
FABACEAE	*Pearsonia sessilifolia (Harv.) Dummer subsp. filifolia (Bolus) Polhill*	LC	Herb
FABACEAE	*Pearsonia sessilifolia (Harv.) Dummer subsp. marginata (Schinz) Polhill*	LC	Dwarf shrub, herb
FABACEAE	*Rhynchosia caribaea (Jacq.) DC.*	LC	Climber, herb
FABACEAE	*Rhynchosia harmsiana Schltr. ex Zahlbr. var. harmsiana*	LC	Climber, herb
FABACEAE	*Rhynchosia pentheri Schltr. ex Zahlbr. var. pentheri*	LC	Herb
FABACEAE	*Rhynchosia totta (Thunb.) DC. var. totta*	LC	Climber, herb
FABACEAE	*Tephrosia capensis (Jacq.) Pers. var. capensis*	LC	Dwarf shrub, herb, shrub
FABACEAE	*Tephrosia elongata E.Mey. var. elongata*	LC	Dwarf shrub, herb, shrub
FABACEAE	*Tephrosia marginella H.M.L.Forbes*	LC	Herb
FABACEAE	*Tephrosia polystachya E.Mey. var. polystachya*	LC	Dwarf shrub, herb, shrub
FABACEAE	*Trifolium africanum Ser. var. africanum*	LC	Herb
FABACEAE	*Trifolium africanum Ser. var. lydenburgense J.B.Gillett*	LC	Herb
FABACEAE	*Zornia capensis Pers. subsp. capensis*	LC	Herb
FISSIDENTACEAE	*Fissidens bryoides Hedw.*		Bryophyte
FISSIDENTACEAE	*Fissidens ovatus Brid.*		Bryophyte, hydrophyte
FUMARIACEAE	*Cysticapnos pruinosa (Bernh.) Lidén*	LC	Herb
GENTIANACEAE	*Chironia krebsii Griseb.*	LC	Herb
GENTIANACEAE	*Sebaea bojeri Griseb.*	LC	Herb
GENTIANACEAE	*Sebaea erosa Schinz*	LC	Herb
GENTIANACEAE	*Sebaea leiostyla Gilg*	LC	Herb
GENTIANACEAE	*Sebaea longicaulis Schinz*	LC	Herb
GENTIANACEAE	*Sebaea natalensis Schinz*	LC	Herb
GENTIANACEAE	*Sebaea repens Schinz*	LC	Herb
GENTIANACEAE	*Sebaea sedoides Gilg var. confertiflora (Schinz) Marais*	LC	Herb
GENTIANACEAE	*Sebaea sedoides Gilg var. schoenlandii (Schinz) Marais*	LC	Herb
GENTIANACEAE	*Sebaea sedoides Gilg var. sedoides*	LC	Herb
GENTIANACEAE	*Sebaea thomasii (S.Moore) Schinz*	LC	Herb

Family	Species	Threat status	Growth forms
GENTIANACEAE	*Swertia welwitschii Engl.*	LC	Herb
GERANIACEAE	*Geranium robustum Kuntze*	LC	Dwarf shrub
GERANIACEAE	*Geranium wakkerstroomianum R.Knuth*	LC	Herb
GERANIACEAE	*Monsonia attenuata Harv.*	LC	Herb
GERANIACEAE	*Monsonia brevirostrata R.Knuth*	LC	Geophyte, scrambler
GERANIACEAE	*Pelargonium alchemilloides (L.) L'Hér.*	LC	Dwarf shrub
GERANIACEAE	*Pelargonium luridum (Andrews) Sweet*	LC	Geophyte, succulent
GERANIACEAE	*Pelargonium tabulare (Burm.f.) L'Hér.*	LC	Dwarf shrub
GESNERIACEAE	*Streptocarpus grandis N.E.Br. subsp. grandis*	LC	Epiphyte, herb, lithophyte
GESNERIACEAE	*Streptocarpus pentherianus Fritsch*	LC	Herb, lithophyte
GESNERIACEAE	*Streptocarpus pusillus Harv. ex C.B.Clarke*	LC	Herb, lithophyte
GREYIACEAE	*Greyia radlkoferi Szyszyl.*	LC	Shrub, tree
GREYIACEAE	*Greyia sutherlandii Hook. & Harv.*	LC	Shrub, tree
GUNNERACEAE	*Gunnera perpensa L.*	Declining	Herb, hydrophyte
HEDWIGIACEAE	*Braunia secunda (Hook.) Bruch & Schimp.*		Bryophyte, epiphyte
HYACINTHACEAE	*Albuca affinis Baker*	LC	Geophyte
HYACINTHACEAE	*Albuca baurii Baker*	LC	Geophyte
HYACINTHACEAE	*Albuca humilis Baker*	LC	Geophyte
HYACINTHACEAE	*Albuca shawii Baker*	LC	Geophyte
HYACINTHACEAE	*Albuca tortuosa Baker*	LC	Geophyte
HYACINTHACEAE	*Dipcadi brevifolium (Thunb.) Fourc.*	LC	Geophyte
HYACINTHACEAE	*Dipcadi gracillimum Baker*	LC	Geophyte
HYACINTHACEAE	*Dipcadi marlothii Engl.*	LC	Geophyte
HYACINTHACEAE	*Dipcadi viride (L.) Moench*	LC	Geophyte
HYACINTHACEAE	*Drimia calcarata (Baker) Stedje*	LC	Geophyte
HYACINTHACEAE	*Drimia depressa (Baker) Jessop*	LC	Geophyte
HYACINTHACEAE	*Drimia elata Jacq.*	DDT	Geophyte
HYACINTHACEAE	*Drimia kniphofioides (Baker) J.C.Manning & Goldblatt*	LC	Geophyte
HYACINTHACEAE	*Drimia multisetosa (Baker) Jessop*	LC	Geophyte
HYACINTHACEAE	*Drimia sphaerocephala Baker*	LC	Geophyte
HYACINTHACEAE	*Eucomis autumnalis (Mill.) Chitt. subsp. clavata (Baker) Reyneke*	Not Evaluated	Geophyte
HYACINTHACEAE	*Eucomis bicolor Baker*	NT	Geophyte
HYACINTHACEAE	*Eucomis montana Compton*	Declining	Geophyte
HYACINTHACEAE	*Eucomis pallidiflora Baker subsp. pallidiflora*	LC	Geophyte
HYACINTHACEAE	*Ledebouria cooperi (Hook.f.) Jessop*	LC	Geophyte
HYACINTHACEAE	*Ledebouria floribunda (Baker) Jessop*	LC	Geophyte
HYACINTHACEAE	*Ledebouria ovatifolia (Baker) Jessop*	LC	Geophyte
HYACINTHACEAE	*Ledebouria revoluta (L.f.) Jessop*	LC	Geophyte
HYACINTHACEAE	*Merwilla plumbea (Lindl.) Speta*	NT	Geophyte
HYACINTHACEAE	*Ornithogalum flexuosum (Thunb.) U.& D.Müll.-Doblies*	LC	Geophyte
HYACINTHACEAE	*Ornithogalum graminifolium Thunb.*	LC	Geophyte
HYACINTHACEAE	*Ornithogalum paludosum Baker*	LC	Geophyte
HYACINTHACEAE	*Ornithogalum tenuifolium F.Delaroche subsp. tenuifolium*	Not Evaluated	Geophyte

Family	Species	Threat status	Growth forms
HYACINTHACEAE	*Schizocarphus nervosus (Burch.) Van der Merwe*	LC	Geophyte
HYDROCHARITACEAE	*Lagarosiphon major (Ridl.) Moss ex Wager*	LC	Herb, hydrophyte
HYPERICACEAE	*Hypericum aethiopicum Thunb. subsp. sonderi (Bredell) N.Robson*	LC	Herb
HYPERICACEAE	*Hypericum lalandii Choisy*	LC	Herb
HYPOXIDACEAE	*Empodium elongatum (Nel) B.L.Burtt*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis acuminata Baker*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis argentea Harv. ex Baker var. argentea*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis colchicifolia Baker*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis costata Baker*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis filiformis Baker*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis gerrardii Baker*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis iridifolia Baker*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis kraussiana Buchinger*	LC	Geophyte
HYPOXIDACEAE	*Hypoxis rigidula Baker var. rigidula*	LC	Geophyte, herb
HYPOXIDACEAE	*Hypoxis tetramera Hilliard & B.L.Burtt*	LC	Geophyte
HYPOXIDACEAE	*Rhodohypoxis baurii (Baker) Nel var. confecta Hilliard & B.L.Burtt*	LC	Geophyte
HYPOXIDACEAE	*Rhodohypoxis milloides (Baker) Hilliard & B.L.Burtt*	LC	Geophyte
ICACINACEAE	*Cassinopsis ilicifolia (Hochst.) Kuntze*	LC	Shrub, tree
ICACINACEAE	*Pyrenacantha grandiflora Baill.*	LC	Climber, shrub
IRIDACEAE	*Aristea angolensis Baker subsp. angolensis*	LC	Herb
IRIDACEAE	*Aristea montana Baker*	LC	Herb
IRIDACEAE	*Aristea torulosa Klatt*	LC	Herb
IRIDACEAE	*Crocosmia aurea (Pappe ex Hook.) Planch. subsp. aurea*	LC	Geophyte, herb
IRIDACEAE	*Dierama insigne N.E.Br.*	LC	Geophyte, herb
IRIDACEAE	*Dierama medium N.E.Br.*	LC	Geophyte, herb
IRIDACEAE	*Dierama pauciflorum N.E.Br.*	LC	Geophyte, herb
IRIDACEAE	*Dierama tyrium Hilliard*	LC	Geophyte, herb
IRIDACEAE	*Dietes iridioides (L.) Sweet ex Klatt*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus appendiculatus G.J.Lewis*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus crassifolius Baker*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus dalenii Van Geel subsp. dalenii*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus densiflorus Baker*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus ecklonii Lehm.*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus longicollis Baker subsp. platypetalus (Baker) Goldblatt & J.C.Manning*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus papilio Hook.f.*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus sericeovillosus Hook.f. subsp. sericeovillosus*	LC	Geophyte, herb
IRIDACEAE	*Gladiolus woodii Baker*	LC	Geophyte, herb
IRIDACEAE	*Hesperantha baurii Baker subsp. baurii*	LC	Geophyte, herb
IRIDACEAE	*Hesperantha coccinea (Backh. & Harv.) Goldblatt & J.C.Manning*	LC	Geophyte, herb
IRIDACEAE	*Hesperantha leucantha Baker*	LC	Geophyte, herb
IRIDACEAE	*Hesperantha radiata (Jacq.) Ker Gawl.*	LC	Geophyte, herb

Family	Species	Threat status	Growth forms
IRIDACEAE	*Moraea ardesiaca Goldblatt*	LC	Geophyte, herb
IRIDACEAE	*Moraea brevistyla (Goldblatt) Goldblatt*	LC	Geophyte, herb
IRIDACEAE	*Moraea elliotii Baker*	LC	Geophyte, herb
IRIDACEAE	*Moraea huttonii (Baker) Oberm.*	LC	Geophyte, herb
IRIDACEAE	*Moraea modesta Killick*	LC	Geophyte, herb
IRIDACEAE	*Moraea moggii N.E.Br. subsp. albescens Goldblatt*	LC	Geophyte, herb
IRIDACEAE	*Moraea muddii N.E.Br.*	LC	Geophyte, herb
IRIDACEAE	*Moraea natalensis Baker*	LC	Geophyte, herb
IRIDACEAE	*Moraea pallida (Baker) Goldblatt*	LC	Geophyte, herb
IRIDACEAE	*Moraea pubiflora N.E.Br.*	LC	Geophyte, herb
IRIDACEAE	*Moraea robusta (Goldblatt) Goldblatt*	LC	Geophyte, herb
IRIDACEAE	*Moraea spathulata (L.f.) Klatt*	LC	Geophyte, herb
IRIDACEAE	*Moraea stricta Baker*	LC	Geophyte, herb
IRIDACEAE	*Moraea trifida R.C.Foster*	LC	Geophyte, herb
IRIDACEAE	*Romulea camerooniana Baker*	LC	Geophyte
IRIDACEAE	*Tritonia disticha (Klatt) Baker subsp. rubrolucens (R.C.Foster) M.P.de Vos*	LC	Geophyte, herb
IRIDACEAE	*Watsonia latifolia N.E.Br. ex Oberm.*	LC	Geophyte, herb
IRIDACEAE	*Watsonia pulchra N.E.Br. ex Goldblatt*	LC	Geophyte, herb
JUNCACEAE	*Juncus dregeanus Kunth subsp. dregeanus*	LC	Helophyte, herb
JUNCACEAE	*Juncus effusus L.*	LC	Helophyte, herb
LAMIACEAE	*Ajuga ophrydis Burch. ex Benth.*	LC	Herb
LAMIACEAE	*Mentha aquatica L.*	LC	Herb
LAMIACEAE	*Plectranthus dolichopodus Briq.*	LC	Herb
LAMIACEAE	*Plectranthus grallatus Briq.*	LC	Herb
LAMIACEAE	*Plectranthus laxiflorus Benth.*	LC	Herb
LAMIACEAE	*Plectranthus rubropunctatus Codd*	LC	Herb
LAMIACEAE	*Prunella vulgaris L.*	Not Evaluated	Herb
LAMIACEAE	*Pycnostachys reticulata (E.Mey.) Benth.*	LC	Herb
LAMIACEAE	*Rabdosiella calycina (Benth.) Codd*	LC	Herb
LAMIACEAE	*Rotheca hirsuta (Hochst.) R.Fern.*	LC	Herb
LAMIACEAE	*Salvia runcinata L.f.*	LC	Herb
LAMIACEAE	*Salvia triangularis Thunb.*	LC	Herb
LAMIACEAE	*Stachys albiflora N.E.Br.*	LC	Herb
LAMIACEAE	*Stachys caffra E.Mey. ex Benth.*	LC	Shrub
LAMIACEAE	*Stachys grandifolia E.Mey. ex Benth.*	LC	Herb
LAMIACEAE	*Stachys nigricans Benth.*	LC	Herb
LAMIACEAE	*Stachys sessilis Gürke*	LC	Herb
LAMIACEAE	*Syncolostemon concinnus N.E.Br.*	LC	Herb
LAMIACEAE	*Syncolostemon parviflorus E.Mey. ex Benth. var. parviflorus*	LC	Dwarf shrub, herb
LAMIACEAE	*Syncolostemon pretoriae (Gürke) D.F.Otieno*	LC	Herb
LAMIACEAE	*Syncolostemon punctatus (Codd) D.F.Otieno*	LC	Shrub
LENTIBULARIACEAE	*Utricularia livida E.Mey.*	LC	Carnivore, herb
LENTIBULARIACEAE	*Utricularia prehensilis E.Mey.*	LC	Carnivore, herb

Family	Species	Threat status	Growth forms
LESKEACEAE	*Pseudoleskeopsis claviramea (Müll.Hal.) Thér.*		Bryophyte, epiphyte
LINACEAE	*Linum thunbergii Eckl. & Zeyh.*	LC	Herb
LOBELIACEAE	*Cyphia elata Harv. var. elata*	LC	Herb
LOBELIACEAE	*Cyphia elata Harv. var. glabra Harv.*	LC	Herb
LOBELIACEAE	*Cyphia longifolia N.E.Br.*	LC	Herb
LOBELIACEAE	*Lobelia laxa MacOwan*	LC	Herb
LOBELIACEAE	*Lobelia vanreenensis (Kuntze) K.Schum.*	LC	Herb
LOBELIACEAE	*Monopsis decipiens (Sond.) Thulin*	LC	Herb
LOBELIACEAE	*Monopsis malvacea E.Wimm.*		Herb
LORANTHACEAE	*Tapinanthus rubromarginatus (Engl.) Danser*	LC	Parasite, shrub, succulent
LYCOPODIACEAE	*Lycopodiella cernua (L.) Pic.Serm.*	LC	Geophyte, herb
LYCOPODIACEAE	*Lycopodium clavatum L.*	LC	Geophyte, herb, lithophyte
LYTHRACEAE	*Rotala capensis (Harv.) A.Fern. & Diniz*	LC	Herb, hydrophyte
MALVACEAE	*Grewia occidentalis L. var. occidentalis*	LC	Shrub, tree
MALVACEAE	*Hermannia cristata Bolus*	LC	Dwarf shrub
MALVACEAE	*Hermannia grandistipula (Buchinger ex Hochst.) K.Schum.*	LC	Herb
MALVACEAE	*Hibiscus aethiopicus L. var. ovatus Harv.*	LC	Herb
MALVACEAE	*Hibiscus trionum L.*		Herb
MALVACEAE	*Pavonia columella Cav.*	LC	Herb, shrub
MALVACEAE	*Sparrmannia ricinocarpa (Eckl. & Zeyh.) Kuntze var. ricinocarpa*	LC	Shrub
MALVACEAE	*Triumfetta pilosa Roth var. tomentosa Szyszyl. ex Sprague & Hutch.*	LC	Shrub
MELIACEAE	*Ekebergia capensis Sparrm.*	LC	Tree
MELIACEAE	*Ekebergia pterophylla (C.DC.) Hofmeyr*	LC	Shrub, tree
MELIANTHACEAE	*Melianthus dregeanus Sond. subsp. insignis (Kuntze) S.A.Tansley*	LC	Shrub
MENISPERMACEAE	*Cissampelos torulosa E.Mey. ex Harv.*	LC	Climber
MENISPERMACEAE	*Stephania abyssinica (Quart.-Dill. & A.Rich.) Walp. var. tomentella (Oliv.) Diels*	LC	Climber
MENYANTHACEAE	*Nymphoides thunbergiana (Griseb.) Kuntze*	LC	Hydrophyte
MESEMBRYANTHEMACEAE	*Khadia acutipetala (N.E.Br.) N.E.Br.*	LC	Succulent
MESEMBRYANTHEMACEAE	*Khadia alticola Chess. & H.E.K.Hartmann*	Rare	Succulent
MESEMBRYANTHEMACEAE	*Khadia beswickii (L.Bolus) N.E.Br.*	VU	Succulent
MNIACEAE	*Plagiomnium rhynchophorum (Hook.) T.J.Kop. var. reidii (Dixon) T.J.Kop.*		Bryophyte
MOLLUGINACEAE	*Psammotropha myriantha Sond.*	LC	Herb
MORACEAE	*Ficus ingens (Miq.) Miq.*	LC	Tree
MYRICACEAE	*Morella pilulifera (Rendle) Killick*	LC	Shrub, tree
MYRSINACEAE	*Myrsine africana L.*	LC	Shrub
MYRSINACEAE	*Rapanea melanophloeos (L.) Mez*	Declining	Tree
NECKERACEAE	*Neckera valentiniana Besch.*		Bryophyte, epiphyte
NECKERACEAE	*Porotrichum madagassum Kiaer ex Besch.*		Bryophyte, epiphyte
OCHNACEAE	*Ochna serrulata (Hochst.) Walp.*	LC	Shrub, tree
OLINIACEAE	*Olinia emarginata Burtt Davy*	LC	Tree
ONAGRACEAE	*Epilobium capense Buchinger ex Hochst.*	LC	Herb

Family	Species	Threat status	Growth forms
ONAGRACEAE	*Oenothera tetraptera Cav.*	Not Evaluated	Herb
OPHIOGLOSSACEAE	*Ophioglossum reticulatum L.*	LC	Geophyte, herb
ORCHIDACEAE	*Brownleea galpinii Bolus subsp. galpinii*	LC	Geophyte, herb
ORCHIDACEAE	*Brownleea parviflora Harv. ex Lindl.*	LC	Geophyte, herb
ORCHIDACEAE	*Corycium dracomontanum Parkman & Schelpe*	LC	Geophyte, herb
ORCHIDACEAE	*Corycium nigrescens Sond.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa aconitoides Sond. subsp. aconitoides*	LC	Geophyte, herb
ORCHIDACEAE	*Disa baurii Bolus*	LC	Geophyte, herb
ORCHIDACEAE	*Disa brevicornis (Lindl.) Bolus*	LC	Geophyte, herb
ORCHIDACEAE	*Disa chrysostachya Sw.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa cooperi Rchb.f.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa cornuta (L.) Sw.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa galpinii Rolfe*	Rare	Geophyte, herb
ORCHIDACEAE	*Disa nervosa Lindl.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa oreophila Bolus subsp. oreophila*	LC	Geophyte, herb
ORCHIDACEAE	*Disa patula Sond. var. transvaalensis Summerh.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa rhodantha Schltr.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa stachyoides Rchb.f.*	LC	Geophyte, herb
ORCHIDACEAE	*Disa versicolor Rchb.f.*	LC	Geophyte, herb
ORCHIDACEAE	*Disperis cardiophora Harv.*	LC	Geophyte, herb
ORCHIDACEAE	*Disperis cooperi Harv.*	LC	Geophyte, herb
ORCHIDACEAE	*Disperis fanniniae Harv.*	LC	Geophyte, herb
ORCHIDACEAE	*Disperis tysonii Bolus*	LC	Geophyte, herb
ORCHIDACEAE	*Disperis wealei Rchb.f.*	LC	Geophyte, herb
ORCHIDACEAE	*Eulophia aculeata (L.f.) Spreng. subsp. huttonii (Rolfe) A.V.Hall*	LC	Geophyte, herb
ORCHIDACEAE	*Eulophia calanthoides Schltr.*	LC	Geophyte, herb
ORCHIDACEAE	*Eulophia foliosa (Lindl.) Bolus*	LC	Geophyte, herb
ORCHIDACEAE	*Eulophia hians Spreng. var. hians*	LC	Geophyte, herb
ORCHIDACEAE	*Eulophia hians Spreng. var. nutans (Sond.) S.Thomas*	LC	Geophyte, herb
ORCHIDACEAE	*Eulophia ovalis Lindl. var. ovalis*	LC	Geophyte, herb
ORCHIDACEAE	*Eulophia parviflora (Lindl.) A.V.Hall*	LC	Geophyte, herb
ORCHIDACEAE	*Habenaria clavata (Lindl.) Rchb.f.*	LC	Geophyte, herb
ORCHIDACEAE	*Habenaria dives Rchb.f.*	LC	Geophyte, herb
ORCHIDACEAE	*Habenaria dregeana Lindl.*	LC	Geophyte, herb
ORCHIDACEAE	*Habenaria epipactidea Rchb.f.*	LC	Geophyte, herb
ORCHIDACEAE	*Habenaria filicornis Lindl.*	LC	Geophyte, herb
ORCHIDACEAE	*Habenaria laevigata Lindl.*	LC	Geophyte, herb
ORCHIDACEAE	*Habenaria lithophila Schltr.*	LC	Geophyte, herb
ORCHIDACEAE	*Mystacidium flanaganii (Bolus) Bolus*	LC	Epiphyte, herb
ORCHIDACEAE	*Neobolusia tysonii (Bolus) Schltr.*	LC	Geophyte, herb
ORCHIDACEAE	*Polystachya ottoniana Rchb.f.*	LC	Epiphyte, herb, succulent
ORCHIDACEAE	*Pterygodium hastatum Bolus*	LC	Geophyte, herb
ORCHIDACEAE	*Pterygodium magnum Rchb.f.*	LC	Geophyte, herb

Family	Species	Threat status	Growth forms
ORCHIDACEAE	*Satyrium bracteatum (L.f.) Thunb.*	LC	Geophyte, herb, lithophyte
ORCHIDACEAE	*Satyrium cristatum Sond. var. cristatum*	LC	Geophyte, herb
ORCHIDACEAE	*Satyrium cristatum Sond. var. longilabiatum A.V.Hall*	LC	Geophyte, herb
ORCHIDACEAE	*Satyrium hallackii Bolus subsp. ocellatum (Bolus) A.V.Hall*	LC	Geophyte, herb
ORCHIDACEAE	*Satyrium longicauda Lindl. var. jacottetianum (Kraenzl.) A.V.Hall*	LC	Geophyte, herb
ORCHIDACEAE	*Satyrium longicauda Lindl. var. longicauda*	LC	Geophyte, herb
ORCHIDACEAE	*Satyrium microrrhynchum Schltr.*	Rare	Geophyte, herb
ORCHIDACEAE	*Satyrium neglectum Schltr. subsp. neglectum var. neglectum*	LC	Geophyte, herb
ORCHIDACEAE	*Satyrium parviflorum Sw.*	LC	Geophyte, herb
ORCHIDACEAE	*Satyrium trinerve Lindl.*	LC	Geophyte, herb
ORCHIDACEAE	*Schizochilus flexuosus Harv. ex Rolfe*	LC	Geophyte, herb
ORCHIDACEAE	*Schizochilus zeyheri Sond.*	LC	Geophyte, herb
OROBANCHACEAE	*Alectra capensis Thunb.*	LC	Herb, parasite
OROBANCHACEAE	*Alectra sessiliflora (Vahl) Kuntze var. sessiliflora*	LC	Herb, parasite
OROBANCHACEAE	*Buchnera simplex (Thunb.) Druce*	LC	Herb, parasite
OROBANCHACEAE	*Graderia scabra (L.f.) Benth.*	LC	Herb, parasite, suffrutex
OROBANCHACEAE	*Harveya pumila Schltr.*	LC	Herb, parasite
OROBANCHACEAE	*Harveya speciosa Bernh.*	LC	Herb, parasite
OROBANCHACEAE	*Melasma scabrum P.J.Bergius var. scabrum*	LC	Herb, parasite
OROBANCHACEAE	*Sopubia cana Harv. var. cana*	LC	Herb, parasite
OROBANCHACEAE	*Striga bilabiata (Thunb.) Kuntze subsp. bilabiata*	LC	Herb, parasite
ORTHOTRICHACEAE	*Macrocoma lycopodioides (Schwägr.) Vitt*		Bryophyte, epiphyte
ORTHOTRICHACEAE	*Macrocoma tenuis (Hook. & Grev.) Vitt subsp. tenuis*		Bryophyte, epiphyte
OXALIDACEAE	*Oxalis corniculata L.*	Not Evaluated	Herb
OXALIDACEAE	*Oxalis obliquifolia Steud. ex A.Rich.*	LC	Geophyte
PALLAVICINIACEAE	*Symphyogyna brasiliensis Nees & Mont.*		Bryophyte
PAPAVERACEAE	*Papaver aculeatum Thunb.*	LC	Herb
PARMELIACEAE	*Flavoparmelia baltimorensis (Gyeln. & Fóriss) Hale*		Lichen
PARMELIACEAE	*Usnea flaccida (Müll.Arg.) Motyka*		Lichen
PHYTOLACCACEAE	*Phytolacca heptandra Retz.*	LC	Herb
PIPERACEAE	*Peperomia tetraphylla (G.Forst.) Hook. & Arn.*	LC	Herb, succulent
PITTOSPORACEAE	*Pittosporum viridiflorum Sims*	LC	Shrub, tree
PLANTAGINACEAE	*Plantago virginica L.*	Not Evaluated	Herb
POACEAE	*Agrostis barbuligera Stapf var. barbuligera*	LC	Graminoid
POACEAE	*Agrostis barbuligera Stapf var. longipilosa Gooss. & Papendorf*	LC	Graminoid
POACEAE	*Agrostis eriantha Hack. var. eriantha*	LC	Graminoid
POACEAE	*Agrostis lachnantha Nees var. lachnantha*	LC	Graminoid
POACEAE	*Alloteropsis semialata (R.Br.) Hitchc. subsp. eckloniana (Nees) Gibbs Russ.*	LC	Graminoid
POACEAE	*Andropogon amethystinus Steud.*	LC	Graminoid
POACEAE	*Andropogon appendiculatus Nees*	LC	Graminoid
POACEAE	*Andropogon eucomus Nees*	LC	Graminoid

Family	Species	Threat status	Growth forms
POACEAE	*Andropogon lacunosus J.G.Anderson*	LC	Graminoid
POACEAE	*Andropogon mannii Hook.f.*	LC	Graminoid
POACEAE	*Anthoxanthum ecklonii (Nees ex Trin.) Stapf*	LC	Graminoid
POACEAE	*Aristida congesta Roem. & Schult. subsp. congesta*	LC	Graminoid
POACEAE	*Aristida junciformis Trin. & Rupr. subsp. junciformis*	LC	Graminoid
POACEAE	*Arundinella nepalensis Trin.*	LC	Graminoid
POACEAE	*Brachypodium bolusii Stapf*	LC	Graminoid
POACEAE	*Brachypodium flexum Nees*	LC	Graminoid
POACEAE	*Bromus catharticus Vahl*	Not Evaluated	Graminoid
POACEAE	*Bromus firmior (Nees) Stapf*	LC	Graminoid
POACEAE	*Bromus leptoclados Nees*	LC	Graminoid
POACEAE	*Ctenium concinnum Nees*	LC	Graminoid
POACEAE	*Cymbopogon dieterlenii Stapf ex E.Phillips*	LC	Graminoid
POACEAE	*Cynodon hirsutus Stent*	LC	Graminoid
POACEAE	*Cynodon transvaalensis Burtt Davy*	LC	Graminoid
POACEAE	*Digitaria argyrograpta (Nees) Stapf*	LC	Graminoid
POACEAE	*Digitaria eriantha Steud.*	LC	Graminoid
POACEAE	*Digitaria flaccida Stapf*	LC	Graminoid
POACEAE	*Digitaria monodactyla (Nees) Stapf*	LC	Graminoid
POACEAE	*Digitaria scalarum (Schweinf.) Chiov.*	LC	Graminoid
POACEAE	*Digitaria thouarsiana (Flüggé) A.Camus*	LC	Graminoid
POACEAE	*Diheteropogon filifolius (Nees) Clayton*	LC	Graminoid
POACEAE	*Echinochloa jubata Stapf*	LC	Graminoid
POACEAE	*Ehrharta erecta Lam. var. erecta*	LC	Graminoid
POACEAE	*Eleusine indica (L.) Gaertn.*	LC	Graminoid
POACEAE	*Elionurus muticus (Spreng.) Kunth*	LC	Graminoid
POACEAE	*Eragrostis caesia Stapf*	LC	Graminoid
POACEAE	*Eragrostis capensis (Thunb.) Trin.*	LC	Graminoid
POACEAE	*Eragrostis chloromelas Steud.*	LC	Graminoid
POACEAE	*Eragrostis curvula (Schrad.) Nees*	LC	Graminoid
POACEAE	*Eragrostis planiculmis Nees*	LC	Graminoid
POACEAE	*Eragrostis racemosa (Thunb.) Steud.*	LC	Graminoid
POACEAE	*Eulalia villosa (Thunb.) Nees*	LC	Graminoid
POACEAE	*Festuca costata Nees*	LC	Graminoid
POACEAE	*Festuca scabra Vahl*	LC	Graminoid
POACEAE	*Helictotrichon longifolium (Nees) Schweick.*	LC	Graminoid
POACEAE	*Helictotrichon turgidulum (Stapf) Schweick.*	LC	Graminoid
POACEAE	*Hyparrhenia dregeana (Nees) Stapf ex Stent*	LC	Graminoid
POACEAE	*Hyparrhenia hirta (L.) Stapf*	LC	Graminoid
POACEAE	*Imperata cylindrica (L.) Raeusch.*	LC	Graminoid
POACEAE	*Ischaemum fasciculatum Brongn.*	LC	Graminoid
POACEAE	*Koeleria capensis (Steud.) Nees*	LC	Graminoid
POACEAE	*Leersia hexandra Sw.*	LC	Graminoid
POACEAE	*Loudetia simplex (Nees) C.E.Hubb.*	LC	Graminoid

Family	Species	Threat status	Growth forms
POACEAE	*Melinis nerviglumis (Franch.) Zizka*	LC	Graminoid
POACEAE	*Merxmuellera macowanii (Stapf) Conert*	LC	Graminoid
POACEAE	*Microchloa caffra Nees*	LC	Graminoid
POACEAE	*Miscanthus junceus (Stapf) Pilg.*	LC	Graminoid
POACEAE	*Monocymbium ceresiiforme (Nees) Stapf*	LC	Graminoid
POACEAE	*Panicum ecklonii Nees*	LC	Graminoid
POACEAE	*Panicum natalense Hochst.*	LC	Graminoid
POACEAE	*Paspalum dilatatum Poir.*	Not Evaluated	Graminoid
POACEAE	*Pennisetum clandestinum Hochst. ex Chiov.*	Not Evaluated	Graminoid
POACEAE	*Pennisetum natalense Stapf*	LC	Graminoid
POACEAE	*Pennisetum sphacelatum (Nees) T.Durand & Schinz*	LC	Graminoid
POACEAE	*Pennisetum thunbergii Kunth*	LC	Graminoid
POACEAE	*Phalaris arundinacea L.*	Not Evaluated	Graminoid
POACEAE	*Phragmites australis (Cav.) Steud.*	LC	Graminoid
POACEAE	*Poa binata Nees*	LC	Graminoid
POACEAE	*Poa pratensis L.*	Not Evaluated	Graminoid
POACEAE	*Rendlia altera (Rendle) Chiov.*	LC	Graminoid
POACEAE	*Setaria nigrirostris (Nees) T.Durand & Schinz*	LC	Graminoid
POACEAE	*Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. sphacelata*	LC	Graminoid
POACEAE	*Sporobolus centrifugus (Trin.) Nees*	LC	Graminoid
POACEAE	*Stiburus alopecuroides (Hack.) Stapf*	LC	Graminoid
POACEAE	*Stiburus conrathii Hack.*	LC	Graminoid
POACEAE	*Stipa dregeana Steud. var. elongata (Nees) Stapf*	LC	Graminoid
POACEAE	*Styppeiochloa gynoglossa (Gooss.) De Winter*	LC	Graminoid
POACEAE	*Trachypogon spicatus (L.f.) Kuntze*	LC	Graminoid
POACEAE	*Tristachya leucothrix Trin. ex Nees*	LC	Graminoid
PODOCARPACEAE	*Podocarpus falcatus (Thunb.) R.Br. ex Mirb.*	LC	Tree
PODOCARPACEAE	*Podocarpus henkelii Stapf ex Dallim. & A.B.Jacks.*	LC	Tree
PODOCARPACEAE	*Podocarpus latifolius (Thunb.) R.Br. ex Mirb.*	LC	Tree
POLYGALACEAE	*Muraltia saxicola Chodat*	LC	Dwarf shrub
POLYGALACEAE	*Polygala amatymbica Eckl. & Zeyh.*	LC	Herb
POLYGALACEAE	*Polygala gerrardii Chodat*	LC	Herb
POLYGALACEAE	*Polygala gracilenta Burtt Davy*	LC	Herb
POLYGALACEAE	*Polygala hispida Burch. ex DC.*	LC	Dwarf shrub, herb
POLYGALACEAE	*Polygala houtboshiana Chodat*	LC	Herb
POLYGALACEAE	*Polygala leendertziae Burtt Davy*	LC	Dwarf shrub, herb
POLYGALACEAE	*Polygala ohlendorfiana Eckl. & Zeyh.*	LC	Herb
POLYGALACEAE	*Polygala virgata Thunb. var. decora (Sond.) Harv.*	LC	Dwarf shrub, shrub
POLYGALACEAE	*Polygala virgata Thunb. var. virgata*	LC	Dwarf shrub, shrub
POLYGALACEAE	*Polygala wilmsii Chodat*	LC	Herb
POLYGONACEAE	*Persicaria attenuata (R.Br.) Soják subsp. africana K.L.Wilson*	LC	Helophyte, herb, hydrophyte
POLYGONACEAE	*Persicaria meisneriana (Cham. & Schltdl.) M.Gómez*	LC	Helophyte, herb, hydrophyte
POLYGONACEAE	*Rumex acetosella L. subsp. angiocarpus (Murb.) Murb.*		Herb

Family	Species	Threat status	Growth forms
POLYGONACEAE	*Rumex crispus L.*	Not Evaluated	Herb
POLYGONACEAE	*Rumex dregeanus Meisn. subsp. montanus B.L.Burtt*	LC	Herb
POLYGONACEAE	*Rumex sagittatus Thunb.*	LC	Climber, herb
POLYPODIACEAE	*Pleopeltis macrocarpa (Bory ex Willd.) Kaulf.*	LC	Epiphyte, herb, lithophyte
POLYPODIACEAE	*Pleopeltis polypodioides (L.) E.G.Andrews & Windham subsp. ecklonii (Kunze) J.P.Roux*	LC	Epiphyte, herb, lithophyte
POTTIACEAE	*Bryoerythrophyllum campylocarpum (Müll.Hal.) H.A.Crum*		Bryophyte
POTTIACEAE	*Syntrichia fragilis (Taylor) Ochyra*		Bryophyte, epiphyte
POTTIACEAE	*Trichostomum brachydontium Bruch*		Bryophyte
PRIMULACEAE	*Anagallis huttonii Harv.*	LC	Herb
PROTEACEAE	*Protea parvula Beard*	NT	Dwarf shrub
PROTEACEAE	*Protea roupelliae Meisn. subsp. roupelliae*	LC	Tree
PROTEACEAE	*Protea subvestita N.E.Br.*	VU	Shrub
PTERIDACEAE	*Adiantum poiretii Wikstr.*	LC	Geophyte, herb, lithophyte
PTERIDACEAE	*Pteris cretica L.*	LC	Geophyte, herb, lithophyte
PTERIDACEAE	*Pteris dentata Forssk.*	LC	Geophyte, herb
PTYCHOMITRIACEAE	*Ptychomitrium subcrispatum Thér. & P.de la Varde*		Bryophyte, epiphyte
RACOPILACEAE	*Racopilum capense Müll.Hal. ex Broth.*		Bryophyte, epiphyte
RANUNCULACEAE	*Clematis brachiata Thunb.*	LC	Climber
RANUNCULACEAE	*Knowltonia transvaalensis Szyszyl. var. transvaalensis*	LC	Herb
RANUNCULACEAE	*Ranunculus meyeri Harv.*	LC	Helophyte
RANUNCULACEAE	*Ranunculus multifidus Forssk.*		Herb
RANUNCULACEAE	*Thalictrum rhynchocarpum Quart.-Dill. & A.Rich.*	LC	Herb
RHAMNACEAE	*Rhamnus prinoides L'Hér.*	LC	Shrub, tree
RHAMNACEAE	*Scutia myrtina (Burm.f.) Kurz*	LC	Shrub, tree
RHAMNACEAE	*Ziziphus mucronata Willd. subsp. mucronata*	LC	Shrub, tree
RICCIACEAE	*Riccia natalensis Sim*		Bryophyte
ROSACEAE	*Agrimonia procera Wallr.*	LC	Herb
ROSACEAE	*Alchemilla woodii Kuntze*	LC	Herb
ROSACEAE	*Cliffortia linearifolia Eckl. & Zeyh.*	LC	Shrub
ROSACEAE	*Geum capense Thunb.*	LC	Herb
ROSACEAE	*Leucosidea sericea Eckl. & Zeyh.*	LC	Shrub
ROSACEAE	*Rubus apetalus Poir. var. apetalus*	Not Evaluated	Scrambler, shrub
ROSACEAE	*Rubus ludwigii Eckl. & Zeyh. subsp. ludwigii*	LC	Shrub
RUBIACEAE	*Anthospermum herbaceum L.f.*	LC	Herb
RUBIACEAE	*Anthospermum welwitschii Hiern*	LC	Shrub
RUBIACEAE	*Canthium ciliatum (Klotzsch) Kuntze*	LC	Shrub, tree
RUBIACEAE	*Canthium kuntzeanum Bridson*	LC	Shrub
RUBIACEAE	*Cephalanthus natalensis Oliv.*	LC	Shrub
RUBIACEAE	*Galium capense Thunb. subsp. capense*	LC	Herb
RUBIACEAE	*Galium capense Thunb. subsp. garipense (Sond.) Puff var. garipense*	LC	Herb
RUBIACEAE	*Galium scabrelloides Puff*	LC	Herb
RUBIACEAE	*Galium spurium L. subsp. africanum Verdc.*	LC	Herb

Family	Species	Threat status	Growth forms
RUBIACEAE	*Galium spurium-aparine complex*	LC	Scrambler
RUBIACEAE	*Galium subvillosum Sond. var. subvillosum*	LC	Herb
RUBIACEAE	*Galium thunbergianum Eckl. & Zeyh. var. thunbergianum*	LC	Herb
RUBIACEAE	*Galopina circaeoides Thunb.*	LC	Herb
RUBIACEAE	*Kohautia amatymbica Eckl. & Zeyh.*	LC	Herb
RUBIACEAE	*Pachystigma thamnus Robyns*	LC	Dwarf shrub
RUBIACEAE	*Pavetta cooperi Harv. & Sond.*	LC	Shrub, tree
RUBIACEAE	*Pavetta kotzei Bremek.*	LC	Shrub
RUBIACEAE	*Pentanisia angustifolia (Hochst.) Hochst.*	LC	Herb
RUBIACEAE	*Pentanisia prunelloides (Klotzsch ex Eckl. & Zeyh.) Walp. subsp. latifolia (Hochst.) Verdc.*	LC	Herb
RUBIACEAE	*Pentanisia prunelloides (Klotzsch ex Eckl. & Zeyh.) Walp. subsp. prunelloides*	LC	Herb
RUBIACEAE	*Pygmaeothamnus chamaedendrum (Kuntze) Robyns var. chamaedendrum*	LC	Dwarf shrub
RUBIACEAE	*Spermacoce natalensis Hochst.*	LC	Herb
RUTACEAE	*Calodendrum capense (L.f.) Thunb.*	LC	Tree
RUTACEAE	*Clausena anisata (Willd.) Hook.f. ex Benth. var. anisata*	LC	Shrub, tree
RUTACEAE	*Zanthoxylum davyi (I.Verd.) P.G.Waterman*	LC	Tree
SALICACEAE	*Salix mucronata Thunb. subsp. woodii (Seemen) Immelman*	LC	Tree
SALICACEAE	*Scolopia mundii (Eckl. & Zeyh.) Warb.*	LC	Shrub, tree
SALICACEAE	*Scolopia oreophila (Sleumer) Killick*	LC	Tree
SALICACEAE	*Trimeria grandifolia (Hochst.) Warb. subsp. grandifolia*	LC	Shrub, tree
SANTALACEAE	*Osyris lanceolata Hochst. & Steud.*	LC	Shrub
SANTALACEAE	*Thesium costatum A.W.Hill var. costatum*	LC	Herb, parasite
SANTALACEAE	*Thesium imbricatum Thunb.*	LC	Dwarf shrub, parasite, shrub
SANTALACEAE	*Thesium nigrum A.W.Hill*	LC	Herb, parasite, shrub
SCROPHULARIACEAE	*Bowkeria citrina Thode*	Rare	Shrub
SCROPHULARIACEAE	*Chaenostoma floribundum Benth.*	LC	Herb
SCROPHULARIACEAE	*Chaenostoma neglectum J.M.Wood & M.S.Evans*	LC	Herb
SCROPHULARIACEAE	*Chaenostoma polelense (Hiern) Kornhall subsp. fraterna (Hilliard) Kornhall*	LC	Herb
SCROPHULARIACEAE	*Diclis reptans Benth.*	LC	Herb
SCROPHULARIACEAE	*Diclis rotundifolia (Hiern) Hilliard & B.L.Burtt*	LC	Herb
SCROPHULARIACEAE	*Hebenstretia comosa Hochst.*	LC	Herb
SCROPHULARIACEAE	*Hebenstretia dura Choisy*	LC	Dwarf shrub, shrub
SCROPHULARIACEAE	*Hebenstretia oatesii Rolfe subsp. oatesii*	LC	Herb
SCROPHULARIACEAE	*Hebenstretia rehmannii Rolfe*	LC	Herb
SCROPHULARIACEAE	*Jamesbrittenia pristisepala (Hiern) Hilliard*	LC	Dwarf shrub, lithophyte
SCROPHULARIACEAE	*Jamesbrittenia silenoides (Hilliard) Hilliard*	LC	Herb
SCROPHULARIACEAE	*Limosella longiflora Kuntze*	LC	Herb, hydrophyte
SCROPHULARIACEAE	*Limosella maior Diels*	LC	Herb, hydrophyte
SCROPHULARIACEAE	*Lindernia conferta (Hiern) Philcox*	LC	Epihydate, herb
SCROPHULARIACEAE	*Manulea buchneroides Hilliard & B.L.Burtt*	LC	Herb

Family	Species	Threat status	Growth forms
SCROPHULARIACEAE	*Manulea rhodantha Hilliard subsp. aurantiaca Hilliard*	LC	Herb
SCROPHULARIACEAE	*Mimulus gracilis R.Br.*	LC	Helophyte, herb, hydrophyte
SCROPHULARIACEAE	*Nemesia caerulea Hiern*	LC	Herb
SCROPHULARIACEAE	*Nemesia denticulata (Benth.) Grant ex Fourc.*	LC	Herb
SCROPHULARIACEAE	*Nemesia fruticans (Thunb.) Benth.*	LC	Dwarf shrub, suffrutex
SCROPHULARIACEAE	*Phygelius aequalis Harv. ex Hiern*	LC	Dwarf shrub, herb, shrub
SCROPHULARIACEAE	*Selago capitellata Schltr.*	LC	Herb
SCROPHULARIACEAE	*Selago compacta Rolfe*	LC	Herb
SCROPHULARIACEAE	*Selago cucullata Hilliard*	LC	Herb
SCROPHULARIACEAE	*Selago galpinii Schltr.*	LC	Herb
SCROPHULARIACEAE	*Selago longicalyx Hilliard*	LC	Herb
SCROPHULARIACEAE	*Veronica anagallis-aquatica L.*	LC	Herb, hydrophyte
SCROPHULARIACEAE	*Zaluzianskya distans Hiern*	LC	Herb
SCROPHULARIACEAE	*Zaluzianskya microsiphon (Kuntze) K.Schum.*	LC	Herb
SCROPHULARIACEAE	*Zaluzianskya pulvinata Killick*	LC	Herb
SCROPHULARIACEAE	*Zaluzianskya spathacea (Benth.) Walp.*	LC	Herb
SINOPTERIDACEAE	*Cheilanthes hirta Sw. var. hirta*	LC	Geophyte, herb, lithophyte
SINOPTERIDACEAE	*Cheilanthes quadripinnata (Forssk.) Kuhn*	LC	Geophyte, herb, lithophyte
SINOPTERIDACEAE	*Cheilanthes viridis (Forssk.) Sw. var. glauca (Sim) Schelpe & N.C.Anthony*	LC	Geophyte, herb, lithophyte
SOLANACEAE	*Physalis peruviana L.*	Not Evaluated	Herb, shrub
SOLANACEAE	*Solanum aculeatissimum Jacq.*	LC	Shrub
SOLANACEAE	*Solanum capense L.*	LC	Dwarf shrub, shrub
SOLANACEAE	*Solanum lichtensteinii Willd.*	LC	Dwarf shrub, shrub
SOLANACEAE	*Solanum retroflexum Dunal*	LC	Herb
SOLANACEAE	*Solanum rigescens Jacq.*	Not Evaluated	[No lifeform defined]
SOLANACEAE	*Withania somnifera (L.) Dunal*	LC	Dwarf shrub, herb, shrub
THYMELAEACEAE	*Dais cotinifolia L.*	LC	Tree
THYMELAEACEAE	*Gnidia albosericea Moss ex B.Peterson*	LC	Dwarf shrub, shrub
THYMELAEACEAE	*Gnidia fastigiata Rendle*	LC	Dwarf shrub
THYMELAEACEAE	*Gnidia polyantha Gilg*	LC	Dwarf shrub, shrub
THYMELAEACEAE	*Passerina montana Thoday*	LC	Dwarf shrub, shrub
TYPHACEAE	*Typha capensis (Rohrb.) N.E.Br.*	LC	Herb, hydrophyte, hyperhydate
URTICACEAE	*Laportea peduncularis (Wedd.) Chew subsp. peduncularis*	LC	Herb
VALERIANACEAE	*Valeriana capensis Thunb. var. capensis*	LC	Herb
VELLOZIACEAE	*Xerophyta retinervis Baker*	LC	Herb
VERBENACEAE	*Chascanum latifolium (Harv.) Moldenke var. latifolium*	LC	Herb
VERBENACEAE	*Verbena bonariensis L.*	Not Evaluated	Herb
VITACEAE	*Cyphostemma sandersonii (Harv.) Desc.*	LC	Climber, succulent
VITACEAE	*Rhoicissus revoilii Planch.*	LC	Climber, shrub, tree
WOODSIACEAE	*Athyrium schimperi Moug. ex Fée*	LC	Geophyte, herb
WOODSIACEAE	*Cystopteris fragilis (L.) Bernh. subsp. fragilis*	LC	Geophyte, herb

Family	Species	Threat status	Growth forms
XYRIDACEAE	*Xyris capensis Thunb.*	LC	Helophyte, herb, hydrophyte

APPENDIX B

Vegetation Index Score

Vegetation Index Score – Montane Grassland

1. *EVC=[(EVC1+EVC2)/2]*

EVC 1 - Percentage natural vegetation cover:

Vegetation cover %	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Site score						X
EVC 1 score	0	1	2	3	4	5

EVC2 - Total site disturbance score:

Disturbance score	0	Very Low	Low	Moderately	High	Very High
Site score		X				
EVC 2 score	5	4	3	2	1	0

2. *SI=(SI1+SI2+SI3+SI4)/4)*

	Trees (SI1)		Shrubs (SI2)		Forbs (SI3)		Grasses (SI4)	
Score:	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State
Continuous							X	X
Clumped			X	X	X	X		
Scattered								
Sparse	X	X						

5. **Present State (P/S) = Currently applicable for each habitat unit**
6. **Perceived Reference State (PRS) = If in pristine condition**
7. Each SI score is determined with reference to the following scoring table of vegetation distribution for present state versus perceived reference state.

8.

	Present state (P/S)			
Perceived Reference state (PRS)	Continuous	Clumped	Scattered	Sparse
Continuous	3	2	1	0
Clumped	2	3	2	1
Scattered	1	2	3	2
Sparse	0	1	2	3

3. *PVC=[(EVC)-(exotic x 0.7) + (bare ground x 0.3)]*

Percentage vegetation cover (exotic):

	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %		X				
PVC Score	0	1	2	3	4	5

Percentage vegetation cover (bare ground):

	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %	X					
PVC Score	0	1	2	3	4	5

4. RIS

Extent of indigenous species recruitment	**0**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
						X
RIS	**0**	**1**	**2**	**3**	**4**	**5**

9. VIS = [(EVC) + (SI x PVC) + (RIS)] = 21

The final VIS scores for each habitat unit are then categorised as follows:

Vegetation Index Score	Assessment Class	Description
22 to 25	**A**	Unmodified, natural
18 to 22	**B**	Largely natural with few modifications.
14 to 18	**C**	Moderately modified
10 to 14	**D**	Largely modified
5 to 10	**E**	The loss of natural habitat extensive
<5	**F**	Modified completely

Vegetation Index Score – Northern Afrotemperate Forest

5. *EVC=[(EVC1+EVC2)/2]*

EVC 1 - Percentage natural vegetation cover:

Vegetation cover %	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Site score						X
EVC 1 score	0	1	2	3	4	5

EVC2 - Total site disturbance score:

Disturbance score	0	Very Low	Low	Moderately	High	Very High
Site score		X				
EVC 2 score	5	4	3	2	1	0

6. *SI=(SI1+SI2+SI3+SI4)/4)*

	Trees (SI1)		Shrubs (SI2)		Forbs (SI3)		Grasses (SI4)	
Score:	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State
Continuous	X	X						
Clumped			X	X	X	X		
Scattered							X	X
Sparse								

10. **Present State (P/S) = Currently applicable for each habitat unit**
11. **Perceived Reference State (PRS) = If in pristine condition**
12. Each SI score is determined with reference to the following scoring table of vegetation distribution for present state versus perceived reference state.

	Present state (P/S)			
Perceived Reference state (PRS)	Continuous	Clumped	Scattered	Sparse
Continuous	3	2	1	0
Clumped	2	3	2	1
Scattered	1	2	3	2

Sparse	0	1	2	3

13.

7. PVC=[(EVC)-(exotic x 0.7) + (bare ground x 0.3)]

Percentage vegetation cover (exotic):

	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %		X				
PVC Score	0	1	2	3	4	5

Percentage vegetation cover (bare ground):

	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %	X					
PVC Score	0	1	2	3	4	5

8. RIS

Extent of indigenous species recruitment	**0**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
						X
RIS	**0**	**1**	**2**	**3**	**4**	**5**

14. VIS = [(EVC) + (SI x PVC) + (RIS)] = 21

The final VIS scores for each habitat unit are then categorised as follows:

Vegetation Index Score	Assessment Class	Description
22 to 25	**A**	Unmodified, natural
18 to 22	**B**	Largely natural with few modifications.
14 to 18	**C**	Moderately modified
10 to 14	**D**	Largely modified
5 to 10	**E**	The loss of natural habitat extensive
<5	**F**	Modified completely

Vegetation Index Score – Wetland/Riparian Habitat Unit

1. *EVC=[(EVC1+EVC2)/2]*

EVC 1 - Percentage natural vegetation cover:

Vegetation cover %	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Site score						X
EVC 1 score	0	1	2	3	4	5

EVC2 - Total site disturbance score:

Disturbance score	0	Very Low	Low	Moderately	High	Very High
Site score			X			
EVC 2 score	5	4	3	2	1	0

2. *SI=(SI1+SI2+SI3+SI4)/4*

	Trees (SI1)		Shrubs (SI2)		Forbs (SI3)		Grasses (SI4)	
Score:	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State
Continuous	X	X						
Clumped			X	X	X			X
Scattered						X	X	
Sparse								

15. **Present State (P/S) = Currently applicable for each habitat unit**

16. **Perceived Reference State (PRS) = If in pristine condition**

17. Each SI score is determined with reference to the following scoring table of vegetation distribution for present state versus perceived reference state.

	Present state (P/S)			
Perceived Reference state (PRS)	Continuous	Clumped	Scattered	Sparse
Continuous	3	2	1	0
Clumped	2	3	2	1
Scattered	1	2	3	2

Sparse	0	1	2	3

3. PVC=[(EVC)-(exotic x 0.7) + (bare ground x 0.3)

Percentage vegetation cover (exotic):

	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %		X				
PVC Score	0	1	2	3	4	5

Percentage vegetation cover (bare ground):

	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %		X				
PVC Score	0	1	2	3	4	5

4. RIS

Extent of indigenous species recruitment	**0**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
						X
RIS	**0**	**1**	**2**	**3**	**4**	**5**

18. VIS = [(EVC) + (Si x PVC) + (RIS)] = 18

The final VIS scores for each habitat unit are then categorised as follows:

Vegetation Index Score	Assessment Class	Description
22 to 25	**A**	Unmodified, natural
18 to 22	**B**	Largely natural with few modifications.
14 to 18	**C**	Moderately modified
10 to 14	**D**	Largely modified
5 to 10	**E**	The loss of natural habitat extensive
<5	**F**	Modified completely

Vegetation Index Score – Secondary Grassland Habitat Unit

9. *EVC=[[(EVC1+EVC2)/2]*

EVC 1 - Percentage natural vegetation cover:

Vegetation cover %	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Site score					X	
EVC 1 score	0	1	2	3	4	5

EVC2 - Total site disturbance score:

Disturbance score	0	Very Low	Low	Moderately	High	Very High
Site score			X			
EVC 2 score	5	4	3	2	1	0

10. *SI=(SI1+SI2+SI3+SI4)/4)*

	Trees (SI1)		Shrubs (SI2)		Forbs (SI3)		Grasses (SI4)	
Score:	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State	Present State	Perceived Reference State
Continuous								
Clumped		X	X	X		X		X
Scattered	X				X		X	
Sparse								

Present State (P/S) = Currently applicable for each habitat unit
Perceived Reference State (PRS) = If in pristine condition

Each SI score is determined with reference to the following scoring table of vegetation distribution for present state versus perceived reference state.

	Present state (P/S)			
Perceived Reference state (PRS)	Continuous	Clumped	Scattered	Sparse
Continuous	3	2	1	0
Clumped	2	3	2	1
Scattered	1	2	3	2
Sparse	0	1	2	3

11. *PVC=[(EVC)-((exotic x 0.7) + (bare ground x 0.3))*

Percentage vegetation cover (exotic):

Vegetation cover %	0%	1-5%	6-25%	26-50%	51-75%	76-100%
			X			
PVC Score	0	1	2	3	4	5

Percentage vegetation cover (bare ground):

	0%	1-5%	6-25%	26-50%	51-75%	76-100%
Vegetation cover %			X			
PVC Score	0	1	2	3	4	5

12. RIS

Extent of indigenous species recruitment	**0**	**Very Low**	**Low**	**Moderate**	**High**	**Very High**
				X		
RIS	**0**	**1**	**2**	**3**	**4**	**5**

VIS = [(EVC)+((SIxPVC)+(RIS))] = 15

The final VIS scores for each habitat unit are then categorised as follows:

Vegetation Index Score	Assessment Class	Description
22 to 25	**A**	Unmodified, natural
18 to 22	**B**	Largely natural with few modifications.
14 to 18	**C**	Moderately modified
10 to 14	**D**	Largely modified
5 to 10	**E**	The loss of natural habitat extensive
<5	**F**	Modified completely

FLORAL, FAUNAL, WETLAND AND AQUATIC ASSESSMENT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR THE PROPOSED COMMISSIEKRAAL COLLIERY, KWAZULU-NATAL PROVINCE

Prepared for

SLR Consulting (Africa) (Pty) Ltd.

July 2015

Section C: Faunal Assessment

Prepared by:	**Scientific Aquatic Services**
Report author:	**C Hooton**
Report reviewer:	**S. van Staden (Pr. Sci. Nat)**
	E. van der Westhuizen
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Date:	**July 2015**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
E-mail: admin@sasenvironmental.co.za

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1. INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a faunal and floral ecological investigation as well as an investigation of the wetland and aquatic resources associated with a proposed new underground coal mine and related surface infrastructure to support a mining operation on the farm Commissiekraal 90HT, hereafter referred to as “subject property”. The subject property is located approximately 28 km north of Utrecht in the eMadlangeni Local Municipality and the Amajuba District Municipality, KwaZulu-Natal. The main land uses at the time of assessment include agriculture, primarily livestock grazing with minor dryland crops, forestry, conservation and tourism.

This report, after consideration and description of the ecological integrity of the subject property, must guide the proponent, authorities and Environmental Assessment Practitioner (EAP), by means of recommendations, as to the most appropriate way forward for further assessment of botanical impacts associated with the proposed development as well as to define the suitability of the subject property for the intended land use, which in this case is the proposed mining development, from a floral ecological point of view.

1.2 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The ecological assessment is confined to the subject property and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment;
- Due to the nature and habits of most faunal taxa it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations are compared with literature studies where necessary, and the use of camera traps were employed to increase observation time;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral communities have been accurately assessed and considered; and
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa on the Subject property may therefore been missed during the assessment. Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa on the Subject property may therefore been missed during the assessment. However this study and the level of effort undertaken is deemed adequate to ensure that decisions can be made based on sufficiently reliable information and observations.

1.3 Indemnity and Terms of use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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1.4 General Site Survey

Three site visits were undertaken during April 2013, December 2013 and February 2014 to determine the ecological status of the subject property and the surrounding areas. A reconnaissance 'drive around' followed by a thorough 'walk through' on foot was undertaken to determine the general habitat types found throughout the subject property and, following this, specific study sites or areas were selected that were considered to be representative of the habitats found within the subject property. Special emphasis was placed on areas that may potentially support faunal Species of Conservation Concern (SCC). Sites were investigated on foot in order to identify the occurrence of the dominant faunal communities, species and habitat diversities. The presence of any faunal inhabitants of the subject property was also assessed through direct visual observation or identifying such species through calls, tracks, scats, burrows and other methods as described in the methodology.

The faunal categories covered in this assessment are mammals, avifauna, reptiles, amphibians, general invertebrates, spiders and scorpions.

2. ASSESSMENT APPROACH

2.1 Faunal Assessment Methodology

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of human habitation within and nearby the subject property and the associated anthropogenic activities may have an impact on faunal behaviour and in turn the rate of observations. In order to increase overall observation time within the study area, as well as increasing the likelihood of observing shy and hesitant species, camera traps were strategically placed throughout the study area. Sherman traps were also used to increase the likelihood of capturing and observing small mammal species, notably small nocturnal mammals.

2.2 Mammals

Small mammals are unlikely to be directly observed in the field because of their nocturnal/crepuscular and cryptic nature. A simple and effective solution to this problem is to use Sherman traps. A Sherman trap is a small aluminium box with a spring-loaded door (Figure 1). Once the animal is inside the trap, it steps on a small plate that causes the door to snap shut, thereby capturing the individual. In the event of capturing a small mammal during the night, the animal would be photographed and then set free unharmed early the following morning. Traps were baited with a universal mixture of oats, peanut butter, and fish paste.

Figure 1: Baited Sherman traps set out within the subject property.

Medium and larger faunal species were recorded during the field assessment with the use of visual identification as well as where, spoor, call, or dung samples can be positively identified. Furthermore, motion sensitive infrared camera traps were used to capture medium to large mammal species (Figure 2). These cameras were placed along trails and near suitable habitat areas and left for the full duration of the field site visit. Specific attention was given to RDL mammal species listed in the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999) in conjunction with the IUCN, 2015.

Figure 2: Digital Camera traps set out within the subject property.

2.3 Avifauna

The Southern African Bird Atlas Project 2 database (http://sabap2.adu.org.za/) lists for the Quarter Degree Square (QDS) 2730AD (Appendix B) was compared with the recent field survey of avifaunal species identified on the study area. Field surveys were undertaken utilising a pair of Bushnell 10x50 binoculars and bird call identification techniques were utilised during the assessment in order to accurately identify avifaunal species. Specific attention was given to RDL avifaunal species listed in the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999) in conjunction with the IUCN, 2015.

2.4 Reptiles

Reptiles were physically identified during the field survey. Mountainous and rocky outcrop areas and fallen dead trees were inspected whilst all reptiles encountered were identified. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which reptile species are likely to occur on the study area. Specific attention was given to RDL reptile species listed in the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999) report in conjunction with the IUCN, 2015.

2.5 Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Amphibian species flourish in and around wetland and riparian areas; which were widespread throughout the subject property. It is unlikely that all amphibian species will have been recorded during the site assessments, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the

environment. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the subject property as well as the surrounding area. Specific attention was given to RDL amphibian species listed in the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999) report in conjunction with the IUCN, 2015.

2.6 Invertebrates

A list of visually identified and observed general invertebrate species was compiled during the field survey. However, due to their cryptic nature and habits, varied stages of life cycles, seasonal and temporal fluctuations within the environment, it is unlikely that all invertebrate species will have been recorded during the site assessment period. Nevertheless, the data gathered during the general invertebrate assessment along with the habitat analysis provided an accurate indication of which invertebrate species are likely to occur on the study area at the time of survey. Specific attention was given to RDL invertebrate species listed in the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999) report in conjunction with the IUCN, 2015.

Figure 3: Picture of an emergence box as used in the subject property.

2.7 Arachnids

Suitable undisturbed habitats, such as rocky areas where spiders and scorpions are likely to reside were searched. Rocks were overturned and inspected for signs of these species. Specific attention was paid to searching for Mygalomorphae arachnids (Trapdoor and Baboon spiders) as well as potential SCC scorpions within the subject property.

2.8 Red Data Species Assessment

Species of Conservational Concern Sensitivity Index Score (SCCSIS)

The term SCC in the context of this report refers to all RD (Red Data) and IUCN (International Union for the Conservation of Nature) listed faunal species, as well as protected species of relevance to the project. The lists below are all specified in legislation with the exception of the IUCN, which is the oldest and largest global environmental organisation. It should be noted that some species or families considered threatened on a national level may not be considered threatened on a provincial level due to various factors such as stable local population trends; for these species provincial status took precedence.

The following legislative and international listings were used during the SCC consideration:

I. **Provincial conservation:** protected species listed in the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999),
II. **National conservation:** National Environmental Management Act (Act 107 of 1998) (NEMA) and National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA), and
III. **Global conservation:** Protected species under International Union for the Conservation of Nature (IUCN). Organisms that fall into the *Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) Least Concern (LC), and Data deficient (DD)* categories of ecological status.

Given the restrictions of field assessments to identify all the faunal species that possibly occur on a particular property, the SCCSIS has been developed to provide an indication of the potential faunal SCC that could reside in the area, while simultaneously providing a quantitative measure of the subject property's value in terms of conserving faunal diversity. The SCCSIS is based on the principles that when the knowledge of a species' historical distribution is combined with a field assessment that identifies the degree to which the subject property supports a species' habitat and food requirements, interpretations can be made about the probability of that particular species residing within the subject property. Repeating this

procedure for all the potential faunal SCC of the area and collating this information then provides a sensitivity measure of the property that has been investigated. The detailed methodology to determine the SCCSIS of the property is presented below:

The probability of Occurrence (POC): Known distribution range (D), habitat suitability of the site (H) and availability of food sources (F) on the site were determined for each of the species. Each of these variables is expressed a percentage (where 100% is a perfect score). The average of these scores provided a POC score for each species. The POC value was categorised as follows:

- **0-20% = Low;**
- **21-40% = Low to Medium;**
- **41-60% = Medium;**
- **61-80% = Medium to High and**
- **81-100% = High**

POC = (D+H+F)/3

Total Species Score (TSS): Species with POC of more than 60% (High-medium) were considered when applying the SCCSIS. A weighting factor was assigned to the different IUCN categories, providing species with a higher conservation status, a higher score. This weighting factor was then multiplied with the POC to calculate the TSS for each species. The weighting as assigned to the various categories is as follows:

- **Data Deficient = 0.2;**
- **Rare = 0.5;**
- **Near Threatened = 0.7;**
- **Vulnerable = 1.2;**
- **Endangered = 1.7 and**
- **Critically Endangered = 2.0**.

TSS = (IUCN weighting*POC) where POC > 60%

Average Total Species (Ave TSS) and Threatened Taxa Score (Ave TT): The average of all TSS potentially occurring on the site is calculated. The average of all the Threatened taxa (TT) (Near threatened, Vulnerable, Endangered and Critically Endangered) TSS scores are also calculated. The average of these two scores (Ave TSS and Ave TT) was then calculated in order to add more weight to threatened taxa with POC higher than 60%.

Ave = Ave TSS [TSS/No of Spp] + Ave TT [TT TSS/No of Spp]/2

SCCSIS: The average score obtained above and the sum of the percentage of species with a POC of 60% or higher of the total number of SCC listed for the area was then calculated. The average of these two scores, expressed as a percentage, gives the RDSIS for the area investigated.

SCCSIS = Ave + [Spp with POC>60%/Total no Of Spp*100]/2

SCCSIS interpretation:

Table 1: SCCSIS value interpretation with regards to faunal SCC importance on the subject property.

SCCSIS Score	SCCSIS mammal importance
0-20%	**Low**
21-40%	**Low-Medium**
41-60%	**Medium**
60-80%	**High-Medium**
81-100%	**High**

Recommendations will be developed to address and mitigate impacts associated with the proposed development. These recommendations will also include general management measures which apply to the proposed development as a whole. Mitigation measures will be developed to address issues in all phases throughout the life of the operation from planning, through construction, operation and through to after care and maintenance.

3. FAUNAL ASSESSMENT RESULTS

After investigation it is evident that four primary habitat units exist within the subject property, namely:

- Wetland habitat;
- Montane Grassland;
- Northern Afrotemperate Forest; and
- Secondary Grassland.

Each of these habitat units are capable of supporting a variety of faunal species, more so as many species will utilise all of the habitat in conjunction for breeding and foraging purposes. Furthermore, it must be noted that the Wetland and Afrotemperate habitat units are considered to be specialised habitats, providing habitat to species that will not occur in the other areas within the subject property. For this reason, they are considered to have the highest sensitivity. The Montane grassland, with its rocky features provides ideal habitat to a number of reptile and invertebrate species, of which some may only occur within this habitat unit of the subject

property. The secondary grassland, although transformed by agricultural activities, provides suitable foraging habitat to a number of avifaunal species, including a number of SCC.

3.1 Mammals

Mammal species, listed below in table 2, were observed during the field assessments through direct observations, spoor and dung as well as the use of motion triggered infrared camera traps set up at localities of perceived high species use in the subject property.

Table 2: Mammal species recorded during the field surveys as well as their 2015 IUCN status.

Scientific Name	Common Name	IUCN
Potamochoerus larvatus	Bushpig	LC
Tragelaphus scriptus	Bushbuck	LC
Felis serval	Serval	LC
Cercopithecus mitis labiatus	Samango monkey	VU
Sylvicapra grimmia	Common Duiker	LC
Aonyx capensis	African Clawless Otter	LC
Lepus saxatilis	Scrub hare	LC
Cynictis penicillata	Yellow mongoose	LC
Papio ursin	Chacma Baboon	LC
Galerella sanguinea	Slender mongoose	LC
Hystrix africaeaustralis	South African Porcupine	LC
Caracal caracal	Caracal	LC
Mastomys natalensis	Natal multimammate mouse	LC
Acomys spinosissimus	Southern African Spiny Mouse	LC

As can be seen from Table 2, the subject property is still capable of providing suitable habitat to a number of mammal species. Although thorough site visits were conducted on three occasions, it remains possible that certain mammal species may not have been detected; notably those that are secretive, well camouflaged, or who are fossorial by nature. Many of the fossorial species' circadian rhythms are still determined by the outside photoperiod, and so will avoid detection or coming to the surface during the daylight hours, when predation risks are considered to be at their highest. For this reason, these species are not always easily identified, and so signs thereof, habitat suitability as well as historical distribution ranges need to be assessed in order to determine species prevalence for an area.

Burrows and mole hills were identified through the subject property, indicating the presence of fossorial species within the subject property. Taking into consideration historical distribution ranges as well as habitat suitability, it is likely that *Cryptomys hottentotus* (African Mole Rat) inhabits the subject property.

Furthermore, it is possible that *Chrysospalax villosus* (Rough-haired Golden Mole), *Amblysomus hottentotus* (Hottentot Golden Mole) and *Chlorotalpa sclateri* (Sclater's Golden Mole) may also inhabit the subject property. These species are very difficult to detect, and their known distribution and inherent population spread have not been fully ascertained. Therefore, it can be inferred that due to the proximity of the subject property to known populations, observed signs of mole activity as well as habitat suitability, it is possible that these species may be located within the subject property. *Cryptomys hottentotus* (African Mole Rat), *Amblysomus hottentotus* (Hottentot Golden Mole) and *Chlorotalpa sclateri* (Sclater's Golden Mole) are listed as Least Concern by the IUCN, whilst *Chrysospalax villosus* (Rough-haired Golden Mole) is listed as Vulnerable. The above mentioned fossorial species will most likely inhabit the secondary grasslands as well as the fringe areas surrounding the wetland habitat units. *Chlorotalpa sclateri* (Sclater's Golden Mole) will most likely inhabit the Afrotemperate Forest and forested kloofs.

Cercopithecus mitis labiatus (Samango Monkey) was observed within the Afrotemperate Forest, and is listed as Vulnerable by the IUCN due to habitat fragmentation and a resultant isolation of subpopulations. This species is endemic to South Africa and has no dispersal between subpopulations, which makes it a high risk species in terms of habitat loss and disturbance. The proposed mining activities and resultant edge effects are may result in the loss of already limited and isolated habitat for this species within the area. It is possible that ancillary impacts from mining activities and associated disturbances from the increased human presence could result in a further decline of population numbers as a result of habitat modification and increased poaching/ hunting pressures.

Other mammal species that will be impacted through the loss or modification of the habitats within the subject property as a result of proposed mining are *Mystromys albicaudatus* (White-tailed Mouse) and *Leptailurus serval* (Serval). These species utilise the wetland and wetland fringe habitats, notably *Mystromys albicaudatus* which requires black loam soils with good vegetation cover. *Leptailurus serval* (Serval) also utilises riparian habitat alongside streams and rivers, and will range up into the montane grasslands in search of prey. *Mystromys albicaudatus* is listed as Endangered whilst *Leptailurus serval* is listed as Least Concern by the IUCN.

Of particular concern is that many of the SCC listed above are noted to have decreasing population trend as a result of habitat fragmentation and/or loss. The increased presence of humans and associated impacts are likely to speed up the decreasing population trend currently experienced by many of these species. As a result, mining activities within the subject property is likely to have a negative impact on faunal species within the area, most notably on

the SCC species which are already limited in distribution and numbers due to human impacts and habitat loss.

Figure 4: *Mastomys natalensis* (Natal multimammate mouse) captured in a Sherman trap within the subject property.

Figure 5: Digital trail camera footage of *Sylvicapra grimmia* (Common Duiker) on the left and *Tragelaphus scriptus* (Bushbuck) on the right

Figure 6: Digital trail camera footage of *Hystrix africaeaustralis* (South African Porcupine) on the left and *Potamochoerus larvatus* (Bush pig) on the right.

3.1.1 Avifauna

One avifaunal SCC was identified within the subject property during the 2013 assessments, namely a possible breeding pair of *Sagittarius serpentarius* (Secretary birds), presented in Figure 7 below. Verbal communication with local inhabitants indicated that other avifaunal SCC such as *Anthropoides paradiseus* (Blue Cranes), *Balearica regulorum* (Grey Crowned Cranes), *Geronticus calvus* (Southern Bald Ibis) and *Tyto capensis* (Grass Owls) utilise the subject property. Subsequently during the 2014 assessments, *Anthropoides paradiseus* (Blue Cranes), *Balearica regulorum* (Grey Crowned Cranes), *Geronticus calvus* (Southern Bald Ibis) were observed within the subject property. *A. paradiseus* and *B. regulorum* are suspected to breed within the secondary grassland next to the cultivated fields and earth dam below the homestead. The loss of these areas will result in a direct loss of habitat for these species, both for breeding and foraging purposes.

The subject property falls within the Grasslands IBA (IBA SA125) which extends across three provinces, namely KwaZulu-Natal, Mpumalanga and the Freestate. This large IBA covers several catchments, containing many perennial rivers and wetlands. These habitat units combined with the grasslands within the IBA provide suitable habitat to many Crane and grassland specialist species. Grasslands throughout southern Africa are under severe pressure as a result of habitat transformation from agriculture and mining. As a result, many habitat specialist species are currently being displaced and as a result are being compressed into increasingly diminishing suitable habitat. The result of this is an increase in competition for resources and breeding habitat, leading to intra-specific species competition, with a net loss of overall species numbers. As such, mining developments and placement of mining infrastructure needs to be increasingly scrutinized, ensuring that sensitive habitats are being conserved whilst suitably managing the increasing demand for natural resources. Suitable mining methods must be used so as to minimise and reduce the impacts of mining activities on the receiving environment, thereby conserving the remaining sensitive habitat units and the species that breed and forage within them. The wetlands, montane grassland and to a degree the secondary grassland habitat units all provide suitable habitat to a number of avifaunal SCC, and as such as far as possible need to be conserved.

Thus, the subject property is considered sensitive in terms of avifaunal habitat, not only for habitat and foraging purposes but for breeding also, and the proposed mining development may pose a significant threat to avifaunal SCC should mining activities and subsequent edge effects affect sensitive faunal habitat such as primary grasslands, wetlands, riparian zones and forests.

Table 3: Avifaunal species recorded during the field surveys as well as their 2015 IUCN status.

Scientific Name	Common Name	IUCN
Hirundo cucullata	Greater Striped Swallow	LC
Numida meleagris	Helmeted Guinea fowl	LC
Buteo buteo	Steppe buzzard	LC
Streptopelia capicola	Cape Turtle Dove	LC
Stigmatopelia senegalensis	Laughing dove	LC
Platalea alba	African Spoonbill	LC
Fulica cristata	Red Knobbed Coot	LC
Alopochen aegyptiaca	Egyptian Goose	LC
Coturnix coturnix	Common quail	LC
Vanellus armatus	Blacksmith Plover	LC
Lanius collaris	Southern Fiscal Shrike	LC
Motacilla capensis	Cape wagtail	LC
Hirundo albigularis	White throated swallow	LC
Elanus caeruleus	Black-Shouldered Kite	LC
Anthus cinnamomeus	African pipit	NYBA
Mirafra africana	Rufous-naped Lark	LC
Certhilauda semitorquata	Eastern Long-billed Lark	LC
Bubulcus ibis	Cattle Egret	LC
Hirundo rustica	Barn swallow	LC
Vidua macroura	Pin-tailed Whydah	LC
Prina subflava	Tawny flanked prina	LC
Prinia hypoxantha	Drakensberg Prinia	LC
Pycononotus tricolor	Darked Capped BulBul	LC
Campicoloides bifasciatus	Buff-streaked chat	LC
Prinia flavicans	Black-chested Prinia	LC
Apus apus	Common swift	LC
Riparia cincta	Banded martin	LC
Camaroptera brachyura	Green-backed Bleating Warbler	LC
Myrmecocichla formicivora	Ant-eating chat	LC
Lophaetus occipitalis	Long crested eagle	LC
Chalcomitra amethystina	Amethyst Sunbird	LC
Lioptilus nigricapillus	Bush blackcap	LC
Anthropoides paradiseus	Blue Crane	VU
Sagittarius serpentarius	Secretary Bird	VU
Ardea melanocephala	Black headed heron	LC
Balearica regulorum	Grey Crowned Crane	VU
Geronticus calvus	Southern Bald Ibis	VU
Buteo rufofuscus	Jackal Buzzard	LC
Macronyx capensis	Cape longclaw	LC
Anthus leucophrys	Plain backed pipit	LC
Buteo trizonatus	Forest buzzard	LC
Pternistis swainsonii	Swainson's Francolin	LC
Batis molitor	Chinspot batis	LC

Scientific Name	Common Name	IUCN
Falco amurensis	Amur falcon	LC
Bostrychia hagedash	Hadeda ibis	LC
Quelea quelea	Red-billed Quelea	LC
Threskiornis aethiopicus	Sacred ibis	LC
Cisticola juncidis	Zitting cisticola	LC
Passer melanurus	Cape sparrow	LC
Euplectes progne	Long tailed Widowbird	LC
Ploceus velatus	Southern Masked Weaver	LC

LC = Least concerned, NYBA = Not yet been assessed by the IUCN, VU = Vulnerable

Figure 7: *Sagittarius serpentarius* (Secretarybird) encountered within the subject property (red circles).

Figure 8: *Geronticus calvus* (Southern Bald Ibis) on the left and *Balearica regulorum* (Grey Crowned-crane) on the right.

3.2 Amphibians

Three common amphibian species were identified during the field assessment, whilst no amphibian SCC were noted. Below listed in table 4 are amphibian species that were observed during the site assessments, whilst table 5 below indicated species that have been recorded previously for the QDS 2730AD as part of the South African Frog Atlas Project (SAFAP).

Table 4: Amphibian species recorded during the field surveys as well as their 2015 IUCN status.

Scientific Name	Common Name	IUCN
Tomopterna natalensis	Natal Sand Frog	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC
Amietia angolensis	Common River Frog	LC

LC = Least concerned, NYBA = Not yet been assessed by the IUCN.

Table 5: Amphibian species previously recorded within the QDS 2730AD.

Scientific Name	Common Name	IUCN Status	QDS
Breviceps mossambicus	Mozambique Rain Frog	Least Concern	2730AD
Vandijkophrynus gariepensis	Karoo Toad	Least Concern	2730AD
Amietophrynus gutturalis	Gutteral Toad	Least Concern	2730AD
Cacosternum boettgeri	Common Caco	Least Concern	2730AD
Cacosternum nanum	Bronze Caco	Least Concern	2730AD
Heleophryne natalensis	Natal Cascade Frog	Least Concern	2730AD
Hyperolius marmoratus taeniatus	Painted Reed Frog	Least Concern	2730AD
Kassina senegalensis	Bubbling Kassina	Least Concern	2730AD
Ptychadena porosissima	Striped Grass Frog	Least Concern	2730AD
Amietia angolensis	Common River Frog	Least Concern	2730AD
Amietia fuscigula	Cape River Frog	Least Concern	2730AD
Semnodactylus wealii	Rattling Frog	Least Concern	2730AD
Strongylopus fasciatus	Striped Stream Frog	Least Concern	2730AD
Strongylopus grayii	Clicking Stream Frog	Least Concern	2730AD
Tomopterna natalensis	Natal Sand Frog	Least Concern	2730AD

The Giant Bullfrog (*Pyxicephalus adspersus),* which is a SCC may occur within the subject property, although none were identified within or in the vicinity of the subject property. However the subject property does fall within the distribution range of this species. *P. adspersus* are known to occur within and nearby riparian and wetland zones, where they remain in cocoons submerged underground during the winter periods, preferably in sandy soils, and only emerge at the start of the rainy season. They breed in shallow waters and can occupy temporary floodplains and rapidly drying pool areas. *P. adspersus* are also known to travel vast distances and may utilise wetlands as migratory corridors. A second amphibian species of concern within the subject property is *Hemisus guttatus* (Spotted Shovel-nosed Frog) which is listed as Vulnerable. This species inhabits grasslands and savannah areas, and breeds within seasonal

pans, swampy areas and in pools near rivers. Thus it is considered likely that the afore mentioned two species may occur within the subject property, as the subject property falls within their distribution ranges and contains suitable habitat for both these species.

Thus, the subject property is considered to be sensitive in terms of amphibian SCC habitat, not only for habitat and foraging purposes but for breeding also. As such the proposed mining development may pose a significant threat to amphibian conservation should mining activities and subsequent edge effects affect sensitive amphibian habitat such as primary grasslands, wetlands and riparian zones.

Figure 9: *Tomopterna natalensis* (Natal Sand Frog) on the left and *Amietia angolensis* (Common River Frog) on the right observed within the subject property.

3.3 Reptiles

Three reptile species were identified during the assessment listed below in table 6. Other common species that might be present on the subject property include the Brown House Snake (*Lamprophis capensis*), the Tropical House Gecko (*Hemidactylus mabouia*) and Aurora snake (*Lamprophis aurora*). The majority of the subject property provides excellent habitat for a high diversity of reptile species as numerous rocky outcrops are scattered throughout grasslands and hillslopes. Consideration needs to give taken that there is a possibility that *Homoroselaps dorsalis* (Striped Harlequin Snake) may be located within the subject property. The subject property does fall within the distribution range of this species; however they are a very secretive species and not easily observed within the field. There have been no records of this species being observed within the subject property, nor within the neighbouring areas. However, suitable habitat for this species does occur within the subject property. This species has been listed as Near Threatened by the IUCN, and as such it is recommended that the sensitive habitat areas be excluded from development.

It is likely that the subject property will be capable of supporting a fairly abundant and diverse range of reptile species. As such, development of any mining infrastructure in the sensitive areas is likely to result in a loss of reptile species and their associated habitat.

Table 6: Reptile species recorded during the field surveys as well as their 2015 IUCN status.

Scientific Name	Common Name	IUCN
Trachylepis punctatissima	Montane Speckled Skink	LC
Cordylus vittifer	Common Girdled Lizard	NYBA
Psammophylax rhombeatus	Spotted Grass Snake	NYBA

3.4 Invertebrates

The invertebrate assessment conducted was a general assessment with the purpose of identifying common species and taxa located within the subject property. As such, the invertebrate assessment will not be an indication of the complete invertebrate diversity potential of the study and surrounding areas. Representatives of commonly encountered families in the Insecta class that were observed during the assessment are listed in the table below.

No invertebrate SCC were encountered during the site assessment. However, a high probability exists that protected invertebrates such as the *Dingana alaedeus* (Wakkerstroom Widow Butterfly), which is protected under the Kwazulu-Natal Nature Conservation Management Amendment Act, 1999 No. 5 of 1999, will be encountered within the subject property. As such, due to the relatively intact habitat within the subject property as well as the subject property's geographical position, it can be considered sensitive and the proposed mining development may pose a significant threat to invertebrate conservation.

Table 7: General results from invertebrate collecting during the assessment of the subject property.

Order	Family	Scientific Name	Common Name	IUCN 2014
Lepidoptera	Pieridae	*Belenois aurota*	Brown-veined White	NYBA
		Eurema hecabe	Common grass Yellow	NYBA
		Beleonis creona	African Common White	NYBA
	Nymphalidae	*Junonia hierta*	Yellow pansy	LC
		Hypolimnas misippus	Common Diadem	NYBA
		Junonia orithya	Blue Pansy	NYBA
		Danaus chrysippus	African Monarch	NYBA
		Leptotes pirithous	Common Blue	NYBA
Isoptera	Termitidae	*Odontotermes latericus*	Harvester Termites	NYBA
Thysanura	Lepismatidae	*Ctenolepisma longicaudata*	Fishmoth	NYBA
Diptera	Calliphoridae	*Chrysomya chloropyga*	Copper tail blow fly	NYBA
		Musca domestica	House fly	NYBA
Orthoptera	Acrididae	*Cannula gracilis*	Grass mimicking Grasshopper	NYBA

Order	Family	Scientific Name	Common Name	IUCN 2014
		Acrida acuminata	Common stick grasshopper	NYBA
		Ancanthacris ruficornis	Garden locust	NYBA
		Oedaleus sp	Yellow Wings	NYBA
	Gryllidae	*Gryllus bimaculatus*	Common garden cricket	NYBA
	Anostostomatidae	*Onosandrus sp*	King Crickets	NYBA
	Pyrgpmorphidae	*Phymateus morbillosus*	Common milkweed locust	NYBA
		Zonocerus elegans	Elegant grasshopper	NYBA
Hymenoptera	Apidae	*Apis mellifera scutellata*	African honey bee	NYBA
	Vespidae	*Belanogaster junceus*	Paper wasp	NYBA
	Termitidae	*Odontotermes latericus*	Harvester Termites	NYBA
Phasmatodea	Bacillidae	*Maransis rufolineatus*	Grass stick insect	NYBA
Coleoptera	Coccinellidae	*Hippodamia variegata*	Spotted amber ladybird	NYBA
		Harmonia axyridis	Harlequin ladybird	NYBA
	Meloidae	*Mylabris oculata*	CMR Bean beetle	NYBA
	Tenebrionidae	*Gonopus tibialis*	Darkling Beetle	NYBA
		Mylabris burmeisteri	Felt Blister Beetle	NYBA
		Decapotoma lunata	Lunate Blister Beetle	NYBA
	Scarabaeidae	*Garreta nitens*	Green Dung Beetle	LC
	Lycidae	*Lycus melanurus*	Hook winged net winged beetle	NYBA
Phasmatodea	Heteronemiidae	*Maransis* rufolineatus	Grass stick insect	NYBA
Mantodea	Mantidae	*Sphodromantis lineola*	African Praying mantis	NYBA
		Epioscoppmantis chalybea	Ground mantis	NYBA
Spirostreptida	Spirostreptidae	*Archispirostreptus sp*	African millipede	NYBA
Scolopendromorpha	Scolopendridae	*Scolopendra morsitans*	Red-headed centipede	NYBA
Hemiptera	Pentatomidae	*Nezara viridula*	Green Vegetable Bug	NYBA

3.5 Arachnids

One spider species was identified during the initial assessment namely *Olurunia ocellata* (Grass Funnel Web Spider). In addition one scorpion species was identified, namely *Opisthacanthus validus* (Figure 10). Neither of these species is protected under the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) or listed in the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999). The majority of the subject property provides excellent habitat for a high diversity of arachnid/scorpion species as numerous rocky outcrops are scattered throughout the rocky grasslands and along the hillslopes.

Thus, the rocky areas are considered sensitive in terms of arachnid habitat provision and the proposed mining development may pose a to arachnid species conservation should the mining activities and subsequent edge effects affect these habitat units.

Figure 10: *Opisthacanthus validus* observed during the site assessment.

4 FAUNAL SCC ASSESSMENT

The SCCIS provides a quantitative measure of the subject property's value in terms of conserving faunal diversity. The SCCIS is based on the principles that when the knowledge of a species' historical distribution as well as conservation status, in this case for the KwaZulu Natal Province, is combined with a field assessment that identify the degree to which the subject property is able to support a species in terms of a species' habitat, distribution and food requirements. Interpretations can then be made about the probability of that particular species residing within the subject property. Repeating this procedure for all the potential faunal SCC of the area and collating this information then provides a sensitivity measure of the subject property that has been investigated.

During the field assessments and in conjunction with communication with land owners, farm workers and other people living in and around the subject property it is evident that the subject property is utilised by a number of avifaunal SCC, for foraging and for breeding. Avifaunal SCC that are known and expected to occur within the study area are listed below in table 8. These species all utilise the montane grasslands, secondary grasslands and wetlands for breeding and foraging purposes. Furthermore, the wetlands within the subject property are

also likely to provide habitat to both *Pyxicephalus adspersus* and *Hemisus guttatus*. Within the afrotemperate forests of the subject property, the *Cercopithecus mitis labiatus* was observed. This species has seen a large decrease in population numbers due mainly to habitat fragmentation as a result of habitat transformation and destruction. May of the remaining populations of *C. mitis labiatus* are isolated to such a point that natural dispersal between populations no longer occurs. With so few remaining habitat areas for *C. mitis labiatus* any further loss of viable habitat areas may impact heavily on the overall survivability of this species.

The subject property also occurs within the Grasslands IBA (SA125). This IBA is of particular importance as it denoted the grassland and wetland areas that provide habitat for a number of SCC. Avifaunal species listed below in table 8 are all important species regionally, and are threatened as a result of habitat modification and loss. The loss or modification of the grassland and wetland habitat units will have a negative impact on avifaunal SCC within the subject property, and is likely to have a knock on population impact on a regional scale.

Table 8: Species with a POC of >60%

Scientific Name	Common Name	IUCN Status	POC %
Chrysospalax villosus	Rough-haired Golden Mole	VU	65.00
Sagittarius serpentarius	Secretary Bird	NT	100.00
Anthropoides paradiseus	Blue Crane	VU	100.00
Balearica reguloru,	Grey Crowned Crane	VU	100.00
Tyto capensis	Grass Owl	VU	70.00
Hemisus guttatus	Spotted Shovel-Nosed Frog	VU	68.33
Pyxicephalus adspersus	Giant Bullfrog	VU	61.67
Geronticus calvus	Southern Bald Ibis	VU	100.00
Mystromys albicaudatus	White-tailed Mouse	EN	66.67
Cercopithecus mitis labiatus	Samango Monkey	VU	100.00

VU = Vulnerable, NT = Near Threatened, EN = Endangered.

The species listed in the table above were then used to calculate the SCCSIS for the site, the results of which are presented in the following table.

Table 9: SCCSIS scoring

Species of Conservational Concern Sensitivity Index Score	
Average Total Species Score	**98**
Average Threatened Taxa Score	**98**
Average (Ave TSS + Ave TT/2)	**98**
% Species greater than 60% POC	**12%**
SCCSIS of Site	**55%**

The SCCSIS assessment of the subject property's potential faunal SCC yielded a score of 55%, indicating that the subject property has a moderate importance with regards to faunal SCC within the region. All species with a POC of 60% or more have an increased probability of either permanently or occasionally inhabiting the subject property, whilst species with a score of 100% were observed and confirmed to occur within the subject property. The species listed above will most likely inhabit the wetland, afrotemperate forest and montane grassland habitats, with some of the avifaunal species utilising the secondary grasslands for foraging and breeding purposes. Placement of any mining infrastructure within the sensitive habitat areas will result in the loss of faunal habitat as well as faunal species within the subject property, notably the above mentioned SCC.

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http://www.iucnredlist.org/about/red-list-overview

APPENDIX A

KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999)

Appendix A1: Specially protected indigenous animals listed in Schedule 4 of the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 199

SCIENTIFIC NAME	**ENGLISH NAME**
MAMMALS	
Amblysomus marleyi	Marley's golden mole
Chrysospalax villosus	Rough haired golden mole
Cloetis percivali	Short eared trident bat
Scotoecus albofuscus	Thomas's house bat
Otomops martiensseni	Large eared free tailed bat
Chaerephon ansorgei	Ansorge's free tailed bat
Proteles cristatus	Aardwolf
Lycaon pictus	Wild dog
Mellivora capensis	Ratel
Poecilogale albinucha	Striped weasel
Aonyx capensis	Clawless otter
Lutra maculicollis	Spotted necked otter
Felis serval	Serval
Felis lybica	African wildcat
Diceros bicornis	Black rhinoceros
Orycteropus afer	Antbear
Ourebia ourebia	Oribi
Neotragus moschatus	Suni
Manis temminickii	Pangolin
BIRDS	
All *Pelecanus* species	all Pelicans
Botaurus stellaris	Bittern
Ciconiidae: all species	all Storks
Geronticus calvus	Bald ibis
Polemaetus bellicosus	Martial eagle
Terathopius ecaudatus	Bateleur
Torgos tracheliotus	Lappetfaced vulture
Trigonoceps occipitalis	White-headed vulture
Gyps coprotheres	Cape vulture
Gyps africanus	White-baked vulture
Gypaetus barbatus	Bearded vulture

Gypohierax angolensis	Palmnut vulture
Necrosyrtes monachus	Hooded vulture
Sarothrura ayresi	*White-winged flufftail*
Gruidae: all species	all Cranes
Neotis denhami	Stanley's bustard
Columba delegorguei	Delegorgue's pigeon
Poicephalus robustus	Cape parrot
Scotopelia peli	Pel's fishing owl
Bucorvus leadbeateri	Ground hornbill
Stactolaema olivacea	Green barbet
Mirafra ruddi	Rudd's barbet
Hirundo atrocaerulea	Blue swallow
Zoothera guttata	Spotted thrush
Buphagidae: all species	all Oxpeckers
Spermestes fringilloides	Pied mannikin

REPTILES

Dermochelys coriacea	Leatherback turtle
Pelusios rhodesianus	Black bellied terrapin
Pelusios castanoides	Yellow bellied terrapin
Python sebae	African rock python
Bitis gabonica	Gaboon viper
Scelotes guentheri	Gunther's burrowing skink
Cryptoblepharus boutonii	Bouton's coral rag skink
Tetradactylus breyeri	Breyer's longtailed seps
Cordylus giganteus	Giant sungazer
Pseudocordylus spinosus	Spiny crag lizard
Pseudocordylus langi	Lang's crag lizard
All *Bradypodion* species	all dwarf Chamaeleons

AMPHIBIANS

Hyperolius pickersgilli	Pickersgill's reed frog
Leptopelis xenodactylus	Long toed tree frog
Arthroleptella ngongoniensis	Mist belt chirping frog
Cacosternum poyntoni	Poynton's caco

BUTTERFLIES AND MOTHS

Stygionympha wichgrafi grisea	Greyish wichfraf's brown
Ornipholidotos peucitia penningtoni	Pennington's white mimic
Durbania amalosa albescens	Amakosa rocksitter
Lolaus lulua	White spotted sapphire
Lepidocrysops ketsi leucomacula	White blotched ketsi blue
Orahrysops Ariadne	Karkloof blue
Hrysoritis orientalis	Eastern opal
Callioratis maillari	Millar's tiger mouth

DRAGONFLIES

Pseudagrion umsingaziense	Umsingazi sprite
Syncordulia gracilis	Yellow synordulia
Urothemis Luciana	St Lucia basker

FRUIT CHAFERS

Ichnestoma nasula

Lamellothyrea descarpentriesi

Elsphinis pumila

Acrothyrea rufofemorata

Eudicella trimeni

MOLLUSCS

Laevicaulis haroldi

ONYCOPHORANS

Opisthopatus roseus

Appendix A2: Protected indigenous animals listed in Schedule 5 of the KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999

SCIENTIFIC NAME	**ENGLISH NAME**
MAMMALS	
Crocidura maquassiensis	Makwassie musk shrew
Suncus lixus	Greater dwarf shrew
Suncus infinitesimus	Lesser dwarf shrew
Chlorotalpa sclateri	Sclater's golden mole
Eidolon helvum	Straw-coloured fruit bat
Nycteris hispida	Hairy slit faced bat
Rhinolophus darling	Darling's horseshoe bat
Rhinolophus lasii	Swinny's horseshoes bat
Myotis welwitschi	Welwitsch's hairy bat
Myotis tricolor	Anchieta's pipistrele
Chalinolobus variegatus	Butterfly bat
Laephotis wintoni	Winton's long-eared bat
Aptesicus rendalli	Rendall's serotine bat
Eptesicus hottentotus	Long-tailed serotine bat
Eptesicus zuluensis	Somali serotine bat
Nycticeicus schlieffenii	Schlieffen's bat
Kerivoula argentata	Damara wolly bat
Kerivoula lanosa	Lesser wolly bat
Ceropthecus mitis	Samango monkey
Vulpes chama	Cape fox
Civetticitis civetta	Civet
Paracynicitis selousi	Selousis mongoose
Helogae parvula	Dwarf mongoose
Htaena brunnea	Brown hyena
Acinonyx jubatus	Cheetah
Panther pardus	Leopard
Panhera leo	Lion
Felis nigripes	Small spotted cat
Oxodonta Africana	Elephant
Ceratotherium simum	White rhinoceros
Dendrohyrax arboreus	Tree dassie

Giraffe cameloprdalis	Giraffe
Connochaetus gnou	Black wildebeest
Alcelaphis buselaphus	Red hartebeest
Damaliscus lunatus	Tsessebe
Philantomba monticola	Blue duiker
Cephalophus natalensis	Red duiker
Oreotragus oreotragus	Klipspringer
Syncerus caffer	Buffalo
Kobus ellipsiprymnus	Waterbuck
Hippopotamus amphibious	Hippopotamus
Parazerus pallitus	Red squirrel
Pedetes capensis	Springhare
Georychuss capensis	Cape molerat
Otomys lamitus	Laminate vlei rat
Otomys sloggetti	Sloggetti's rat
Tatera leucogaster	Bushveld gerbil
Mystromys albicaudatus	White tailed mouse
Steatomys pratensis	Fat mouse
Steatomys krebsii	Krebs's fat mouse
Dasymys incomtus	Water rat
Grammomys cometes	Mozambique woodland mouse
Pronolagus rupestris	Smith's rock hare
Petrodromus tetradactylus	Four-toed elephant shrew

BIRDS

Ardeidae: not in the Bittern Fourth Schedule	All herons, egrets and bitterns (except Botaurus stellaris listed in the Fourth Schedule
Scopus umbretta	Hamerkop
Threskiornithidea:	
All species not in the Fourth Schedule	All ibises and spoonbills (except Bald Ibis Geronticus calvus listed in the Fourth Schedule)
Phoenicopteridae: all species	All Flamingos
Nettapus auritus	*Pygmy Goose*
Accipitridae: all species not in the Fourth Schedule	All diurnal birds of prey (except all vultures listed in the Fourth Schedule
Pandion haliaetus	*osprey*

Turnix hottentotta	*Blackrumped Buttonquail*
Sarothrura: all species not in the Fourth Schedule	All flufftails (except Whitewinged Flufftail Sarothrura ayresi lited in the Fourth Schedule
Podica senegalensis	African Finfoot
Otididae: all species not in the Fourth Schedule	All bustards and korhaans (except Stanley's Bustard Neotis denhami listed in the Fourth Schedule
Jacanidae: all species	All jacanas
Glareola pratinola	Red-winged Pratincole
Hydroprohne caspia	Caspian Tern
Poicephalus cryptoxanthus	Brown headed Parrot
Musophagidae: all species	All louries
Tytonidae and Strigidae: all species	All owls
Caprimulgus natalensis	Natal Nightjar
Halcyon senegaloides	Mangrove Kingfisher
Smithornis capensis	African Broadbill
Zoothera gurneyi	Orange Thrush
Batis fratrum	Woodwards Batis
Anthus brachyurus	Shorttailed Pipit
Hemimacronyx chloris	Yellowbreasted Pipit
Macronyx ameliae	Pinkthroated Longclaw
Nectarinia neergaardi	Neegaar's Sunbird
Mandingoa nitidula	Green Twinspot
Hypargos margaritatus	Pinkthroated Twinspot

REPTILES

Kinixys spekei	Savanna hinged tortoise
Kinixys natalensis	Natal hinged tortoise
Chelonia mydas	Green turtle
Eretmochelys imbricata	Hawksbill turtle
Caretta caretta	Loggerhead turtle
Leptotyphlops sylvicolus	Forest thread snake
Lycodonomorphus laevissimus natalensis	Natal dusky-bellied water snake
Lycodonomorphus whytei	Whyte's water snake
Lamprophis fuscus	Yellow-bellied house snake
Lycophidion variegatum	Variegated wolf snake

Lycophidion pygmaeum	Pygmy wolf snake
Natriciteres variegate	Forest marsh snake
Prosymna janii	Mozambique shovelsnout
Amblyodipsas concolor	Natal purple-glossed snake
Amblyodipsas microphthalma	White-lipped snake
Homoroselaps dorsalis	Striped harlequin snake
Xenocalamus transvaalensis	Transvaal quill-snouted snake
Meizodon semiornatus	Semiornate snake
Philothamnus angolensis	Angola green snake
Dasypeltis medici	East African egg-eater
Montaspis gilvomaculata	Cream-spotted mountain snake
Scelotes inornatus	Smith's burrowing skink
Scelotes bourquini	Bourquin's burrowing skink
Scelotes fitzimonsi	Fitzimon's burrowing skink
Mabuya homalocephala smithii	Smith's red-sided skink
Pedioplanis lineocellata lineocellata	Ocellated sand lizard
Tropidosaura cottrelli	Cottrell's mountain lizard
Tropidosaura Montana natalensis	Natal mountain lizard
Cordylus warreni warren	Warren's girdled lizard
Cordylus warren barbertonensis	Barberton girdled lizard
Crocodylus niloticus	Nile crocodile

AMPHIBIANS

Bufo fenoulheti fenoulheti	Northern pygmy toad
Bufo gariepensis nubicolus	Karoo toad
Bufo pardalis	Leopard toad
Bufo pusillus	Little toad
Hemisus guttatus	Spotted shovel-nosed frog
Hyperolius marmoratus verrucosus	Warty painted reed frog
Afrixalus spinifrons	Natal leaf-folding frog
Strongylopus hymenopus	Berg stream frog
Leptopelis mossambicus	Brown-backed tree frog
Breviceps maculatus	Spotted rain frog
Breviceps verrucosus typanifer	Plaintive rain frog
Arthroleptella hewitti	Natal chirping frog
Cacosternum striatum	Lined caco

Cacosternum nanum parvum	Little bronze caco
Natalobatrachus bonebergi	Kloof frog
Phrynobatrachus acridoides	East African puddle frog
Hildebrandtia ornate ornate	Ornate frog
Pyxicephalus adspersus	Giant bullfrog
Rana dracomontana	Drakenberg river frog
Rana vertebralis	Aquatic river frog
Tomopterna marmorata	Russet-backed sand frog

FRESH WATER FISH

Opsaridium peringueyi	Barred minnow
Silhouettea sibayi	Barebreast goby
Oreochromis placidus	Black tilapia
Ctenopoma intermedium	Blackspot climbing perch
Eleotris melanosoma	Broadhead sleeper
Croilia mossambica	Burrowing goby
Redigobius dewaali	Checked goby
Myxus capensis	Freashwater mullet
Hypseleotris dayi	Golden sleeper
Serranochromis meridianus	Lowveld largemouth
Chiloglanis emarginatus	Pongolo suckermouth
Clarias theodorae	Snake catfish
Nothobranchius orthonotus	Spotted killfish
Brycinus lateralis	Striped robber

BUTTERFLIES

Dingana alaedeus	Wakkerstroom widow
Dingana dingana	Dingaan’s widow
Acraea rabbaiae	Clear-wing acraea
Acraea satis	East Coast acraea
Euryphura achlys	Mottled green nymph
Durbania amakosa flavida	Amakosa rocksitter
Aslauga australis	Southern purple
Lolaus diametra natalica	Natal Yellow-banded sapphire
Hypolycaena lochmophila	Coastal hairstreak
Capys penningtoni	Pennington’s protea-butterfly

Aloeides merces	Wakkerstroom copper
Chrysoritis oreas	Drakensberg daisy copper
Chrysoritis phosphor borealis	Scarce scarlet
Anthene minima	Little hairtail
Lepidochrysops pephredo	Estcourt blue
Papilio euphranor	Forest swallowtail
Spialia confusa confua	Confusing sandman
Abantis bicolor	Bicoloured skipper
Metisella meninx	Marsh sylph
Metisella syrinx	Bamboo sylph
Borbo ferruginea dondo	Ferrous skipper
Fresna nyassae	Variegated acraea hopper

DRAGONFLIES

Chlorolestes draconicus	Drakensberg sylph
Pseudagrion newtoni	Newton's sprite
Enallagma rotundipenne	Scarce blue
Enallagma sinuatum	Mysterious blue
Agriocnemis falcifera falcifera	Sickle wisp
Agriocnemis gratiosa	Zanzibar wisp
Agriocnemis pinheyi	Pinhey's wisp
Agriocnemis ruberrima ruberrima	Red wisp
Onychogomphus supinus	Scarce hooktail
Gynacantha zuluensis	Zulu darner
Hemicordulia asiatica	Asian hemicordulia
Orthetrum robustum	Robust orthetrum
Diplacodes deminuta	Tiny percher
Trithemis pluvialis	River dropwing
Zyxomma atlanticum	Cryptic zyxomma
Parazyxomma flavicans	Scarce zyxomma
Aethriamanta rezia	Rezia

FRUIT CHAFERS

Pachnoda discolor

Uloptera planate

Cytothyrea rubriceps ichthyurus

Trichocephala brincki

Caelorrhina relucens

Lonchothyrea mozambica

Heteroclita raeuperi

Anoplocheilus globosus

Phoxomeloides laticincta

Taurhina splendens

Anisorrhina serripes

Raceloma jansoni

Raceloma natalensis

Diplognatha striata

Rhinocoeta cornuta

Xeloma aspersa

Xeloma leprosa

Cosmiophaenia rubescens

Rhabdotis semipunctata

Rhabdotis sobrina

Polystalactica furfurosa

Discopeltis bellula

Discopeltis tricolor tricolor

Pseudoclinteria cincticollis

MOLLUSCS

Chlamydephorus burnupi

Chlamydephorus dimidius

APPENDIX B

South African Bird Atlas Project 2 list for quadrant 2730AD

Common name	Afrikaans name	Scientific name	Status
Common Fiscal	Fiskaallaksman	*Lanius collaris*	
Cape Turtle-Dove	Gewone Tortelduif	*Streptopelia capicola*	
Hadeda Ibis	Hadeda	*Bostrychia hagedash*	
Dark-capped Bulbul	Swartoogtiptol	*Pycnonotus tricolor*	
African Stonechat	Gewone Bontrokkie	*Saxicola torquatus*	
Greater Striped Swallow	Grootstreepswael	*Hirundo cucullata*	
Long-tailed Widowbird	Langstertflap	*Euplectes progne*	
African Pipit	Gewone Koester	*Anthus cinnamomeus*	
Cape Canary	Kaapse Kanarie	*Serinus canicollis*	
Cape Longclaw	Oranjekeelkalkoentjie	*Macronyx capensis*	
Anteating Chat	Swartpiek	*Myrmecocichla formicivora*	
Jackal Buzzard	Rooiborsjakkalsvoel	*Buteo rufofuscus*	
Cape Robin-Chat	Gewone Janfrederik	*Cossypha caffra*	
Levaillant's Cisticola	Vleitinktinkie	*Cisticola tinniens*	
Bokmakierie Bokmakierie	Bokmakierie	*Telophorus zeylonus*	
Cape White-eye	Kaapse Glasogie	*Zosterops virens*	
Banded Martin	Gebande Oewerswael	*Riparia cincta*	
Barn Swallow	Europese Swael	*Hirundo rustica*	
Cape Crow	Swartkraai	*Corvus capensis*	
Red-winged Starling	Rooivlerkspreeu	*Onychognathus morio*	
Pied Starling	Witgatspreeu	*Spreo bicolor*	
Bar-throated Apalis	Bandkeelkleinjantjie	*Apalis thoracica*	
Zitting Cisticola	Landeryklopkloppie	*Cisticola juncidis*	
Southern Boubou	Suidelike Waterfiskaal	*Laniarius ferrugineus*	
Southern Red Bishop	Rooivink	*Euplectes orix*	
Buff-streaked Chat	Bergklipwagter	*Oenanthe bifasciata*	
White-throated Swallow	Witkeelswael	*Hirundo albigularis*	
Southern Grey-headed Sparrow	Gryskopmossie	*Passer diffusus*	
Helmeted Guineafowl	Gewone Tarentaal	*Numida meleagris*	
Cape Grassbird	Grasvoel	*Sphenoeacus afer*	
Malachite Sunbird	Jangroentjie	*Nectarinia famosa*	
Black-headed Heron	Swartkopreier	*Ardea melanocephala*	
Wing-snapping Cisticola	Kleinste Klopkloppie	*Cisticola ayresii*	
Red-eyed Dove	Grootringduif	*Streptopelia semitorquata*	
Cape Batis	Kaapse Bosbontrokkie	*Batis capensis*	
Cape Wagtail	Gewone Kwikkie	*Motacilla capensis*	
Red-chested Cuckoo	Piet-my-vrou	*Cuculus solitarius*	
Southern Bald Ibis	Kalkoenibis	*Geronticus calvus*	VU
Pin-tailed Whydah	Koningrooibekkie	*Vidua macroura*	
Egyptian Goose	Kolgans	*Alopochen aegyptiacus*	
White-rumped Swift	Witkruiswindswael	*Apus caffer*	
African Paradise-Flycatcher	Paradysvlieevanger	*Terpsiphone viridis*	
Wailing Cisticola	Huiltinktinkie	*Cisticola lais*	
Cape Weaver	Kaapse Wewer	*Ploceus capensis*	
Southern Masked-Weaver	Swartkeelgeelvink	*Ploceus velatus*	
Drakensberg Prinia	Drakensberglangstertjie	*Prinia hypoxantha*	
Fork-tailed Drongo	Mikstertbyvanger	*Dicrurus adsimilis*	
Black-headed Oriole	Swartkopwielewaal	*Oriolus larvatus*	
Speckled Mousebird	Gevlekte Muisvoel	*Colius striatus*	
Common Waxbill	Rooibeksysie	*Estrilda astrild*	
Red-knobbed Coot	Bleshoender	*Fulica cristata*	
Olive Bush-Shrike	Olyfboslaksman	*Telophorus olivaceus*	

Common name	Afrikaans name	Scientific name	Status
Barratt's Warbler	Ruigtesanger	*Bradypterus barratti*	
Rufous-naped Lark	Rooineklewerik	*Mirafra africana*	
Spur-winged Goose	Wildemakou	*Plectropterus gambensis*	
Black-collared Barbet	Rooikophoutkapper	*Lybius torquatus*	
Fan-tailed Widowbird	Kortstertflap	*Euplectes axillaris*	
Bush Blackcap	Rooibektiptol	*Lioptilus nigricapillus*	NT
Sombre Greenbul	Gewone Willie	*Andropadus importunus*	
White Stork	Witooievaar	*Ciconia ciconia*	
Amur Falcon	Oostelike Rooipootvalk	*Falco amurensis*	
Black Cuckoo	Swartkoekoek	*Cuculus clamosus*	
Long-billed Pipit	Nicholsonse Koester	*Anthus similis*	
Lazy Cisticola	Luitinktinkie	*Cisticola aberrans*	
African Wattled Lapwing	Lelkiewiet	*Vanellus senegallus*	
Speckled Pigeon	Kransduif	*Columba guinea*	
Forest Canary	Gestreepte Kanarie	*Crithagra scotops*	
Cattle Egret	Veereier	*Bubulcus ibis*	
Yellow-billed Duck	Geelbekeend	*Anas undulata*	
Red-winged Francolin	Rooivlerkpatrys	*Scleroptila levaillantii*	
African Firefinch	Kaapse Vuurvinkie	*Lagonosticta rubricata*	
Common Quail	Afrikaanse Kwartel	*Coturnix coturnix*	
Black Saw-wing	Swartsaagvlerkswael	*Psalidoprocne holomelaena*	
Red-capped Lark	Rooikoplewerik	*Calandrella cinerea*	
Black-shouldered Kite	Blouvalk	*Elanus caeruleus*	
Diderick Cuckoo	Diederikkie	*Chrysococcyx caprius*	
Greater Double-collared Sunbird	Groot-rooibandsuikerbekkie	*Cinnyris afer*	
Red-collared Widowbird	Rooikeelflap	*Euplectes ardens*	
Cloud Cisticola	Gevlekte Klopkloppie	*Cisticola textrix*	
Dark-capped Yellow Warbler	Geelsanger	*Chloropeta natalensis*	
Yellow-fronted Canary	Geeloogkanarie	*Crithagra mozambicus*	
Steppe Buzzard	Bruinjakkalsvoel	*Buteo vulpinus*	
Pale-crowned Cisticola	Bleekkopklopkloppie	*Cisticola cinnamomeus*	
Little Swift	Kleinwindswael	*Apus affinis*	
Secretarybird Secretarybird	Sekretarisvoel	*Sagittarius serpentarius*	NT
Crowned Lapwing	Kroonkiewiet	*Vanellus coronatus*	
African Sacred Ibis	Skoorsteenveer	*Threskiornis aethiopicus*	
Red-throated Wryneck	Draaihals	*Jynx ruficollis*	
Cape Rock-Thrush	Kaapse Kliplyster	*Monticola rupestris*	
Little Grebe	Kleindobbertjie	*Tachybaptus ruficollis*	
African Quailfinch	Gewone Kwartelvinkie	*Ortygospiza atricollis*	
Tawny-flanked Prinia	Bruinsylangstertjie	*Prinia subflava*	
Yellow-crowned Bishop	Goudgeelvink	*Euplectes afer*	
Reed Cormorant	Rietduiker	*Phalacrocorax africanus*	
Amethyst Sunbird	Swartsuikerbekkie	*Chalcomitra amethystina*	
Chorister Robin-Chat	Lawaaimakerjanfrederik	*Cossypha dichroa*	
Blue Crane	Bloukraanvoel	*Anthropoides paradiseus*	VU
Cape Sparrow	Gewone Mossie	*Passer melanurus*	
Laughing Dove	Rooiborsduifie	*Streptopelia senegalensis*	
White-bellied Korhaan	Witpenskorhaan	*Eupodotis senegalensis*	VU
Swainson's Spurfowl	Bosveldfisant	*Pternistis swainsonii*	
Red-billed Quelea	Rooibekkwelea	*Quelea quelea*	
Blacksmith Lapwing	Bontkiewiet	*Vanellus armatus*	
Karoo Thrush	Geelbeklyster	*Turdus smithi*	
Klaas's Cuckoo	Meitjie	*Chrysococcyx klaas*	
Plain-backed Pipit	Donkerkoester	*Anthus leucophrys*	
Olive Thrush	Olyflyster	*Turdus olivaceus*	
Yellow Bishop	Kaapse Flap	*Euplectes capensis*	
White-breasted Cormorant	Witborsduiker	*Phalacrocorax carbo*	
Yellow-breasted Pipit	Geelborskoester	*Anthus chloris*	VU

Common name	Afrikaans name	Scientific name	Status
Common Moorhen	Grootwaterhoender	*Gallinula chloropus*	
Eastern Long-billed Lark	Grasveldlangbeklewerik	*Certhilauda semitorquata*	
Grey Crowned Crane	Mahem	*Balearica regulorum*	VU
Crested Barbet	Kuifkophoutkapper	*Trachyphonus vaillantii*	
Lesser Striped Swallow	Kleinstreepswael	*Hirundo abyssinica*	
Yellow-throated Woodland-Warbler	Geelkeelsanger	*Phylloscopus ruficapilla*	
Horus Swift	Horuswindswael	*Apus horus*	
Black-throated Canary	Bergkanarie	*Crithagra atrogularis*	
African Black Duck	Swarteend	*Anas sparsa*	
South African Cliff-Swallow	Familieswael	*Hirundo spilodera*	
African Marsh-Harrier	Afrikaanse Vleivalk	*Circus ranivorus*	VU
Hamerkop Hamerkop	Hamerkop	*Scopus umbretta*	
Streaky-headed Seedeater	Streepkopkanarie	*Crithagra gularis*	
Neddicky Neddicky	Neddikkie	*Cisticola fulvicapilla*	
Village Weaver	Bontrugwewer	*Ploceus cucullatus*	
Rock Martin	Kransswael	*Hirundo fuligula*	
Alpine Swift	Witpenswindswael	*Tachymarptis melba*	
White-starred Robin	Witkoljanfrederik	*Pogonocichla stellata*	
Lemon Dove	Kaneelduifie	*Aplopelia larvata*	
Brown-throated Martin	Afrikaanse Oewerswael	*Riparia paludicola*	
Willow Warbler	Hofsanger	*Phylloscopus trochilus*	
Golden-breasted Bunting	Rooirugstreepkoppie	*Emberiza flaviventris*	
Olive Woodpecker	Gryskopspeg	*Dendropicos griseocephalus*	
Blue Waxbill	Gewone Blousysie	*Uraeginthus angolensis*	
Groundscraper Thrush	Gevlekte Lyster	*Psophocichla litsipsirupa*	
Little Rush-Warbler	Kaapse Vleisanger	*Bradypterus baboecala*	
Black-winged Lapwing	Grootswartvlerkkiewiet	*Vanellus melanopterus*	NT
Croaking Cisticola	Groottinktinkie	*Cisticola natalensis*	
Rock Kestrel	Kransvalk	*Falco rupicolus*	
Red-faced Mousebird	Rooiwangmuisvoel	*Urocolius indicus*	
Yellow-billed Kite	Geelbekwou	*Milvus aegyptius*	
Black Cuckooshrike	Swartkatakoeroe	*Campephaga flava*	
Black Crake	Swartriethaan	*Amaurornis flavirostris*	
Pied Kingfisher	Bontvisvanger	*Ceryle rudis*	
Mountain Wheatear	Bergwagter	*Oenanthe monticola*	
Striped Pipit	Gestreepte Koester	*Anthus lineiventris*	
African Purple Swamphen	Grootkoningriethaan	*Porphyrio madagascariensis*	
Half-collared Kingfisher	Blouvisvanger	*Alcedo semitorquata*	NT
African Spoonbill	Lepelaar	*Platalea alba*	
African Snipe	Afrikaanse Snip	*Gallinago nigripennis*	
African Dusky Flycatcher	Donkervlieevanger	*Muscicapa adusta*	
Verreaux's Eagle	Witkruisarend	*Aquila verreauxii*	
Common Swift	Europese Windswael	*Apus apus*	
African Hoopoe	Hoephoep	*Upupa africana*	
Familiar Chat	Gewone Spekvreter	*Cercomela familiaris*	
Fiscal Flycatcher	Fiskaalvlieivanger	*Sigelus silens*	
Wahlberg's Eagle	Bruinarend	*Aquila wahlbergi*	
African Black Swift	Swartwindswael	*Apus barbatus*	
Grey Heron	Bloureier	*Ardea cinerea*	
African Olive-Pigeon	Geelbekbosduif	*Columba arquatrix*	
South African Shelduck	Kopereend	*Tadorna cana*	
House Sparrow	Huismossie	*Passer domesticus*	
Brown-backed Honeybird	Skerpbekheuningvoel	*Prodotiscus regulus*	
Swee Waxbill	Suidelike Swie	*Coccopygia melanotis*	
Terrestrial Brownbul	Boskrapper	*Phyllastrephus terrestris*	
Black-backed Puffback	Sneeubal	*Dryoscopus cubla*	
Denham's Bustard	Veldpou	*Neotis denhami*	VU
Ground Woodpecker	Grondspeg	*Geocolaptes olivaceus*	

Common name	Afrikaans name	Scientific name	Status
Black Stork	Grootswartooievaar	*Ciconia nigra*	NT
Black-crowned Tchagra	Swartkroontjagra	*Tchagra senegalus*	
Cape Bunting	Rooivlerkstreepkoppie	*Emberiza capensis*	
Golden-tailed Woodpecker	Goudstertspeg	*Campethera abingoni*	
Orange-breasted Waxbill	Rooiassie	*Amandava subflava*	
African Palm-Swift	Palmwindswael	*Cypsiurus parvus*	
Kurrichane Thrush	Rooibeklyster	*Turdus libonyanus*	

FLORAL, FAUNAL, WETLAND AND AQUATIC ASSESSMENT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR THE PROPOSED COMMISSIEKRAAL COLLIERY, KWAZULU-NATAL PROVINCE

Prepared for

SLR Consulting (Africa) (Pty) Ltd.

July 2015

Section D - Wetland Assessment

Prepared by: **Scientific Aquatic Services**
Report author **S. van Staden (Pr. Sci. Nat)**
E. van der Westhuizen
Report Reference: **SAS 213081**
Date: **July 2015**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
E-mail: admin@sasenvironmental.co.za

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1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to provide floral, faunal, wetland and aquatic ecological scoping level input as part of the Environmental Assessment (EIA) and authorisation process for a proposed greenfields coal mine (near Wakkerstroom), 45km east of Paulpietersburg, and 28km north east of Utrecht in the KwaZulu-Natal Province of South Africa.

The entire subject property and its immediate surrounds can be broadly defined as agricultural land where rural settlements and agricultural activities dominate the landscape. This report, after consideration and description of the ecological integrity of the property, must guide proponent and authorities, by means of recommendations, as to the viability of the proposed mining development through consideration of the ecological aspects present on the subject property with specific focus on Ecological Importance and Sensitivity and the Present Ecological State (EIS) and (PES). This scoping report will also highlight future methods of assessment that will be utilised to assess the subject property during the EIA phase of the development.

1.2 Scope

Specific outcomes in terms of the wetland assessment will be:

- To define the Present Ecological State (PES) of each wetland system within the subject property;
- To determine the functioning of each system and the environmental and socio-cultural services that the systems provide;
- To advocate a Recommended Ecological Category (REC) for each wetland feature; and
- To delineate all wetlands or riparian zones occurring within the assessment site.

1.3 Legislation

The following legal framework was considered during this assessment:

- National Environmental Management Act (Act No. 107 of 1998); (NEMA)

- National Water Act (Act No. 36 of 1998)
- Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)
- The Constitution of South Africa Act of 1996 (Act No. 108 of 1996)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
- The Protected Areas Act (Act 57 of 2003) (In conjunction with the National Environmental Management: Biodiversity Act (Act No. 10 of 2004))
- Convention on Biological Diversity (1995)
- World Summit for Sustainable Development (2002)
- KwaZulu-Natal Nature Conservation Management Act (Act No 5 of 1999)

2 WETLAND ASSESSMENT METHODOLOGY

2.1 Desktop Study

Wetland specific information resources taken into consideration during the desktop assessment of the subject property included:

- National Freshwater Ecosystem Priority Areas (NFEPAs), 2011
  - NFEPA water management area (WMA)
  - NFEPA wetlands/ National wetlands map
  - Wetland and estuary FEPA
  - FEPA (sub)WMA % area
  - Sub water catchment area FEPAs
  - Water management area FEPAs
  - Fish sanctuaries
  - Wetland ecosystem types
- The Kwa-Zulu Natal Freshwater Systematic Conservation Plan (2007) was consulted to ascertain the presence of any freshwater resources earmarked for protection or already protected in relation to the subject property.

2.2 Classification System for Wetlands and other Aquatic Ecosystems in South Africa

All wetland features encountered within the subject property were assessed using the Classification System for Wetlands (hereafter referred to as the 'Classification System') and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis *et al*., 2013).

A summary of Levels 1 to 4 of the Classification System for Inland Systems are presented in Table 1 and 2 below.

Table 1: Classification structure for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	**LEVEL 2: REGIONAL SETTING**	**LEVEL 3: LANDSCAPE UNIT**
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table 2: Hydrogeomorphic (HGM) Units for Inland Systems, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River (Channel)	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional stream	Active channel
		Riparian zone
	Upper foothill rivers	Active channel
		Riparian zone
	Lower foothill rivers	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothill rivers	Active channel
		Riparian zone
	Upland floodplain rivers	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

2.3 Inland systems

For the purposes of the Classification System, Inland Systems are defined as an aquatic ecosystem that have no existing connection to the ocean[1] (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but which are inundated or saturated with water, either permanently or periodically.

It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

2.3.1 Level 1: Ecoregions

For Inland Systems, the regional spatial framework that has been included at Level 2 of the Classification System is that of DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et al.,* 2005). There are a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland (Figure 1). DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

2.3.2 Level 2: NFEPA Wet Veg Groups

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina and Rutherford, 2006) groups vegetation types across the country according to Biomes, which are then divided into Bioregions – composite spatial terrestrial units defined on the basis of similar biotic and physical features and processes at the regional scale (Mucina and Rutherford, 2006).

To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups, and it is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

[1] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e. the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

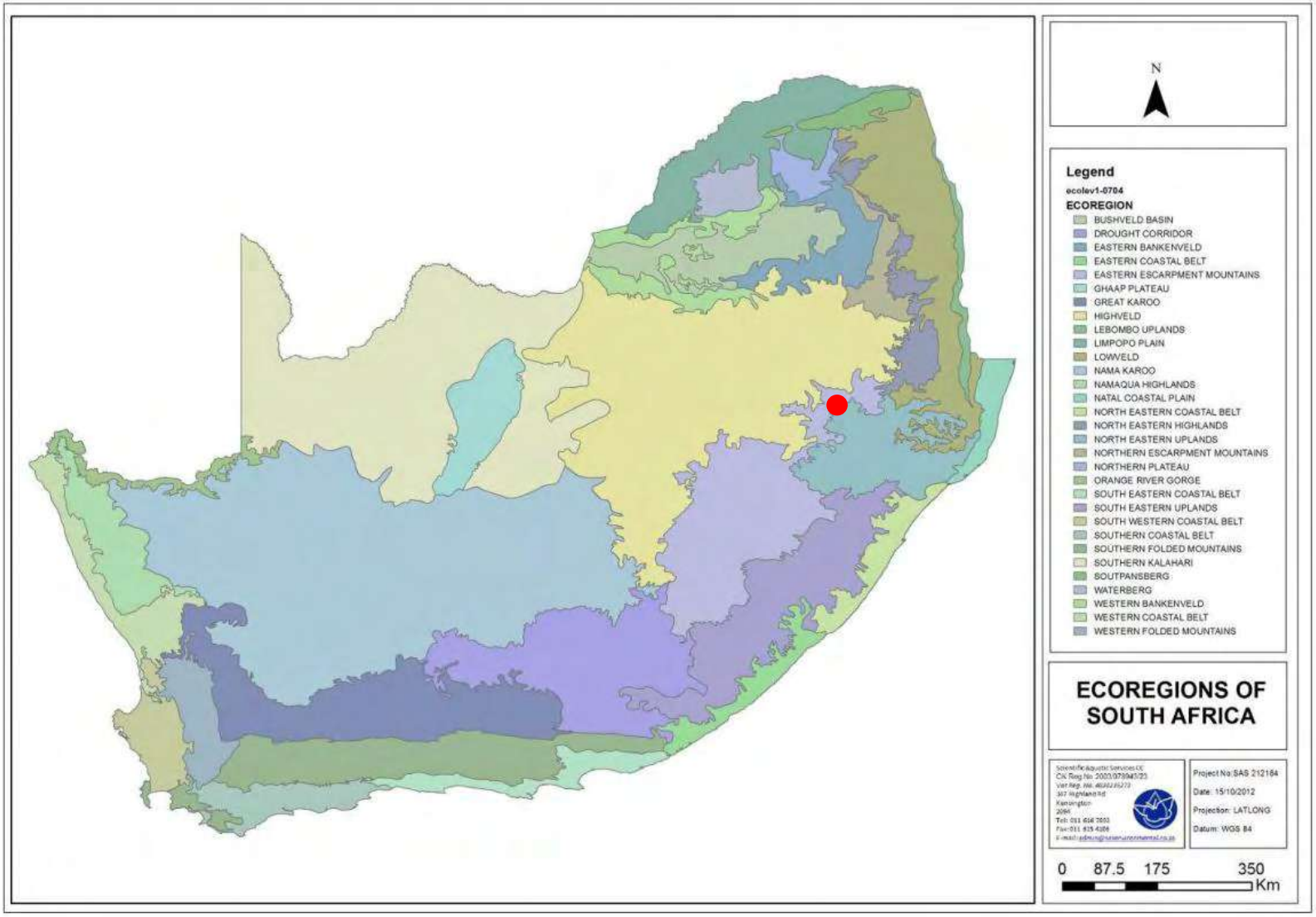

Figure 1: Map of Level 1 Aquatic Ecoregions of South Africa (approximate location of subject property indicated in red).

At Level 3 of the Classification System for Inland Systems, a distinction is made between four Landscape Units (Table 1) on the basis of the landscape setting (i.e. topographical position) within which a Hydrogeomorphic (HGM) Unit is situated, as follows (Ollis *et al.,* 2013):

- Slope: an inclined stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.
- Valley floor: The base of a valley, situated between two distinct valley side-slopes.
- Plain: an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land.
- Bench (hilltop/saddle/shelf): an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

2.3.3 Level 4: Hydrogeomorphic Units

Eight primary HGM Types are recognised for Inland Systems at Level 4A of the Classification System (Table 2), on the basis of hydrology and geomorphology (Ollis *et al*., 2013), namely:

- Channel (River): a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
- Channelled valley-bottom wetland: a valley-bottom wetland with a river channel running through it.
- Unchannelled valley-bottom wetland: a valley-bottom wetland without a river channel running through it.
- Floodplain wetland: the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank.
- Depression: a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates.
- Wetland Flat: a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat.
- Seep: a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope.

Seeps are often located on the side-slopes of a valley but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the Classification System to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for "channel", "flat" and "valleyhead seep") is used, for example, in the tools developed as part of the Wetland Management Series including WET-Health (Macfarlane *et al.,* 2008) and WET-EcoServices (Kotze *et al.,* 2009).

Healthy wetlands are known to provide important habitats for wildlife and to deliver a range of important goods and services to society. Management of these systems is therefore essential if these attributes are to be retained within an ever changing landscape. The primary purpose of this assessment is to evaluate the ecophysical health of wetlands, and in so doing promote their conservation and wise management.

At Level 4B of the classification system, certain of the primary HGM Units can further be divided into sub-categories on the basis of longitudinal geomorphological zonation or localised landform, as follows:

- Channels (including their banks) are divided into six primary longitudinal zones and three zones associated with a rejuvenated longitudinal profile, according to the geomorphological zonation scheme of Rowntree & Wadeson (2000). The sub-categories are *Mountain Headwater Stream, Mountain Stream, Transitional River, Upper Foothill River, Lower Foothill River,* and *Lowland River* (i.e. the primary zones); and *Rejuvenated Bedrock Fall, Rejuvenated Foothill River,* and *Upland Floodplain River* (i.e. the zones associated with a rejuvenated long profile).
- Channelled and unchannelled valley-bottom wetlands are divided into '*valley-bottom flats'* and *'valley-bottom depressions'*.
- Floodplain wetlands are divided into *'floodplain depressions'* and *'floodplain flats'*.

2.4 Wet-Ecoservices (2009)

"The importance of a water resource, in ecological, social or economic terms, acts as a modifying or motivating determinant in the selection of the management class" (DWA, 1999). The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et al.* (2009). An assessment was

undertaken that examines and rates the following services according to their degree of importance and the degree to which the service is provided:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate trapping;
- Nitrate removal;
- Toxicant removal;
- Erosion control;
- Carbon storage;
- Maintenance of biodiversity;
- Water supply for human use;
- Natural resources;
- Cultivated foods;
- Cultural significance;
- Tourism and recreation; and
- Education and research.

The characteristics were used to quantitatively determine the value, and by extension sensitivity, of the wetlands. Each characteristic was scored to give the likelihood that the service is being provided. The scores for each service were then averaged to give an overall score to the wetland.

Table 3: Classes for determining the likely extent to which a benefit is being supplied.

Score	Rating of the likely extent to which the benefit is being supplied
<0.5	Low
0.6-1.2	Moderately low
1.3-2	Intermediate
2.1-3	Moderately high
>3	High

2.5 WET-Health

Healthy wetlands are known to provide important habitats for wildlife and to deliver a range of important goods and services to society. Management of these systems is therefore essential if these attributes are to be retained within an ever changing landscape. The primary purpose

of this assessment is to evaluate the eco-physical health of wetlands, and in so doing to promote their conservation and wise management.

Level of Evaluation

Two levels of assessment are provided by WET-Health:

- Level 1: Desktop evaluation, with limited field verification. This is generally applicable to situations where a large number of wetlands need to be assessed at a very low resolution; or
- Level 2: On-site evaluation. This involves structured sampling and data collection in a single wetland and its surrounding catchment.

Framework for the Assessment

A set of three modules has been synthesised from the set of processes, interactions and interventions that take place in wetland systems and their catchments: hydrology (water inputs, distribution and retention, and outputs), geomorphology (sediment inputs, retention and outputs) and vegetation (transformation and presence of introduced alien species).

Units of Assessment

Central to WET-Health is the characterisation of HGM Units, which have been defined based on geomorphic setting (e.g. hillslope or valley-bottom; whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated) and pattern of water flow through the wetland unit (diffusely or channelled) as described under the Classification System for Wetlands and other Aquatic Ecosystems in Section 2.5.

Quantification of Present State of a wetland

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present State score. This takes the form of assessing the spatial *extent* of the impact of individual activities and then separately assessing the *intensity* of the impact of each activity in the affected area. The extent and intensity are then combined to determine an overall *magnitude* of impact. The impact scores, and Present State categories are provided in Table 4.

.

Table 4: Impact scores and categories of Present State used by WET-Health for describing the integrity of wetlands.

Impact category	Description	Impact score range	Present State category
None	Unmodified, natural	0-0.9	A
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	B
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2-3.9	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
Serious	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognisable.	6-7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been completely modified with an almost complete loss of natural habitat and biota.	8-10	F

Assessing the Anticipated Trajectory of Change

As is the case with the Present State, future threats to the state of the wetland may arise from activities in the catchment upstream of the unit or within the wetland itself or from processes downstream of the wetland. In each of the individual sections for hydrology, geomorphology and vegetation, five potential situations exist depending upon the direction and likely extent of change (Table 5).

Table 5: Trajectory of Change classes and scores used to evaluate likely future changes to the present state of the wetland.

Change Class	Description	HGM change score	Symbol
Substantial improvement	State is likely to improve substantially over the next 5 years	2	↑↑
Slight improvement	State is likely to improve slightly over the next 5 years	1	↑
Remain stable	State is likely to remain stable over the next 5 years	0	→
Slight deterioration	State is likely to deteriorate slightly over the next 5 years	-1	↓
Substantial deterioration	State is expected to deteriorate substantially over the next 5 years	-2	↓↓

Overall health of the wetland

Once all HGM Units have been assessed, a summary of health for the wetland as a whole needs to be calculated. This is achieved by calculating a combined score for each component by area-weighting the scores calculated for each HGM Unit. Recording the health assessments for the hydrology, geomorphology and vegetation components provide a summary of impacts, Present State, Trajectory of Change and Health for individual HGM Units and for the entire wetland.

2.6 Ecological Importance and Sensitivity (EIS)

The method used for the EIS determination was adapted from the method as provided by DWA (1999) for wetlands. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed.

A series of determinants for the EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The mean of the determinants is used to assign the EIS category as listed in Table 6 below.

Table 6: Descriptions of the EIS Categories.

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

2.7 Recommended Ecological Category (REC)

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability, but carries a higher risk of ecosystem failure" (DWA, 1999).

The REC (Table 7) was determined based on the results obtained from the PES, reference conditions and EIS of the resource (sections above), and is followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.

A wetland may receive the same class for the PES as the REC if the wetland is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the wetland feature.

Table 7: Description of REC classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

2.8 Wetland Delineation

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

The wetland zone delineation took place, according to the method presented in the Department of Water Affairs and Forestry (DWAF, 2005) document "A practical field procedure for identification and delineation of wetlands and riparian areas. An updated draft version of this report is also available and was therefore also considered during the wetland delineation (DWAF, 2008). The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The position in the landscape, which will help identify those parts of the landscape where wetlands are more likely to occur;
- The type of soil form (i.e. the type of soil, according to a standard soil classification system), since wetlands are associated with certain soil types;

- The presence of wetland vegetation species; and
- The presence of a redoxymorphic soil feature, which are morphological signatures that appear in soils with prolonged periods of saturation.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWAF, 2005 and 2008).

Riparian and wetland zones can be divided into three zones (DWAF, 2005). The permanent zone of wetness is nearly always saturated. The seasonal zone is saturated for a significant period of wetness (at least three months of saturation per annum) and the temporary zone surrounds the seasonal zone and is only saturated for a short period of saturation (typically less than three months of saturation per annum), but is saturated for a sufficient period, under normal circumstances, to allow for the formation of hydromorphic soils and the growth of wetland vegetation. The object of this study was to identify the outer boundary of the temporary zone and then to identify a suitable buffer zone around the wetland area.

3 AQUATIC ECOLOGICAL CHARACTERISTICS OF THE SUBJECT PROPERTY

3.1 Ecoregions

When assessing the ecology of any area (aquatic or terrestrial), it is important to know which ecoregion the subject property is located within. This knowledge allows for improved interpretation of data to be made, since reference information and representative species lists are often available on this level of assessment, which aids in guiding the assessment.

The subject property falls within the *Eastern Escarpment Mountains Aquatic Ecoregion* and is located within the W42A quaternary catchment. Figure 2 below indicates the aquatic ecoregions and quaternary catchment of the subject property.

Table 8: Summary of the ecological status of the Eastern Escarpment Mountains Ecoregion.

MAIN ATTRIBUTES	EASTERN ESCARPMENT MOUNTAINS
Terrain Morphology: Broad division (dominant types in bold) (Primary)	Plains; Low Relief (limited) Lowlands; Hills and Mountains: Moderate and High Relief; Open Hills; Lowlands; Mountains: Moderate to High Relief; **Closed Hills; Mountains: Moderate and High Relief**
Vegetation types (dominant types in bold) (Primary)	South Eastern Mountain Grassland; **AltiMountain Grassland; AfroMountain Grassland;** Moist Upland Grassland; North Eastern Mountain Grassland; **Moist**

MAIN ATTRIBUTES	EASTERN ESCARPMENT MOUNTAINS
	Cold Highveld Grassland; Moist Cool Highveld Grassland; Moist Sandy Highveld Grassland; Dry Sandy Highveld Grassland Natal Central Bushveld (limited); Patches Afromontane Forest
Altitude (m a.m.s.l) (modifying)	1100-3100; 3100-3500 limited
MAP (mm) (Secondary)	400 to 1000
Coefficient of Variation (% of annual precipitation)	<20 to 35
Rainfall concentration index	30 to 65
Rainfall seasonality	Early to late summer
Mean annual temp. (°C)	<8 to 18
Mean daily max. temp. (°C): February	<10 to 28
Mean daily max. temp. (°C): July	<10 to 22
Mean daily min. temp. (°C): February	<6 to 16
Mean daily min temp. (°C): July	<-2 to 4
Median annual simulated runoff (mm) for quaternary catchment	10 to >250

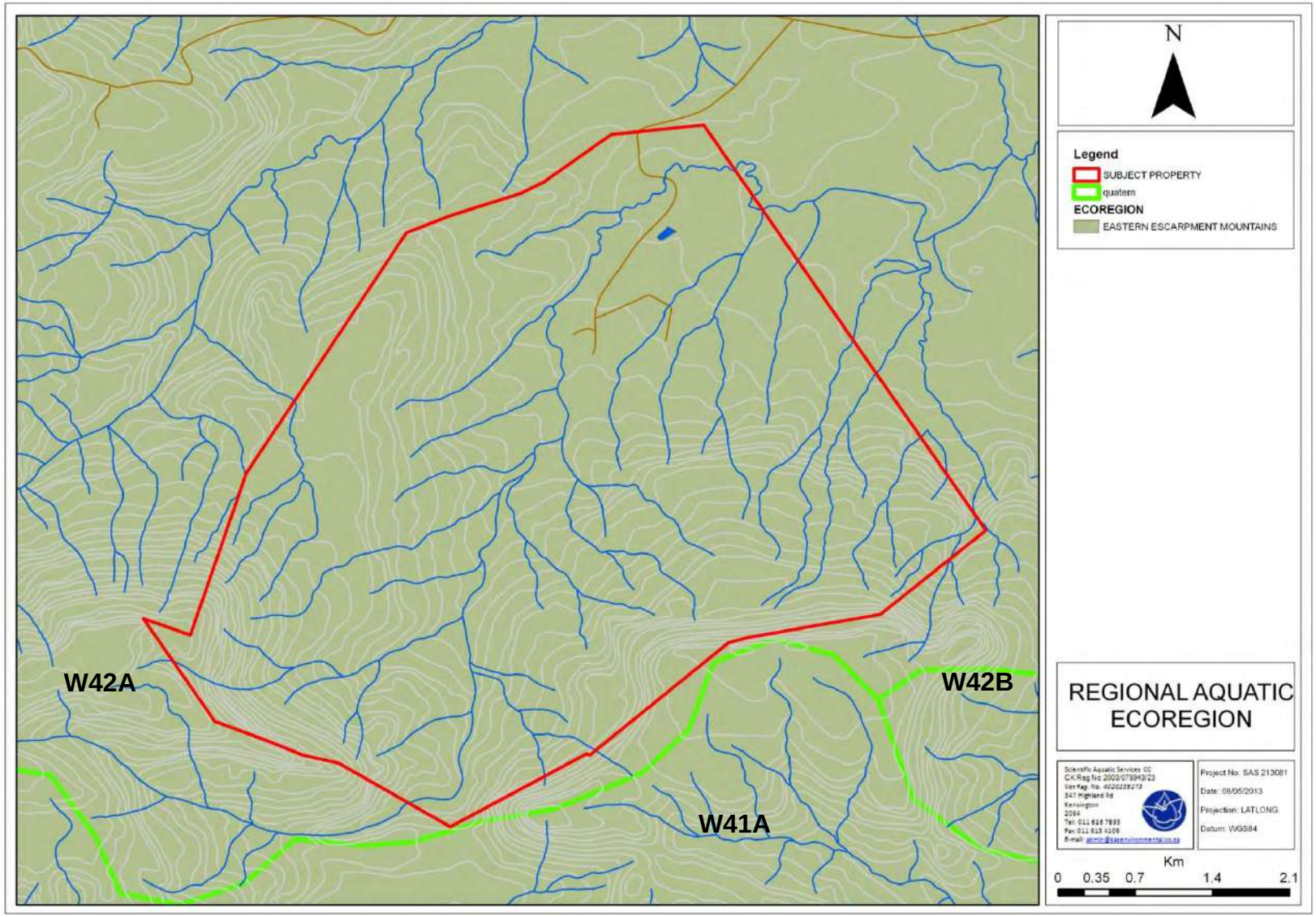

Figure 2: Ecoregions associated with the subject property (Mucina and Rutherford, 2006)

3.2 Ecostatus

Water resources are generally classified according to the degree of modification or level of impairment. The classes, used by the South African River Health Program (RHP), are presented in the table below and will be used as the basis of classification of the systems in this desktop study, as well as future field studies.

Table 9: Classification of river health assessment classes in line with the RHP

Class	Description
A	Unmodified, natural.
B	Largely natural, with few modifications.
C	Moderately modified.
D	Largely modified.
E	Extensively modified.
F	Critically modified.

Studies undertaken by the Institute for Water Quality Studies assessed all quaternary catchments as part of the Resource Directed Measures for Protection of Water Resources. In these assessments, the Ecological Importance and Sensitivity (EIS), Present Ecological Management Class (PEMC) and Desired Ecological Management Class (DEMC) were defined and serve as a useful guideline in determining the importance and sensitivity of aquatic ecosystems, prior to assessment or as part of a desktop assessment.

This database was searched for the three catchments of concern in order to define the EIS, PEMC and DEMC. The results of the assessment are summarised in the table below.

Table 10: Criteria and attributes assessed during the determination of the PES.

Catchment	Resource	EIS	PESC	DEMC
W42A	Pongolo	High	CLASS A	B: Sensitive systems

W42A

According to the ecological importance classification for the quaternary catchment, the system can be classified as a *Sensitive System* which, in its present state, can be considered a Class A (unmodified, natural) stream.

The points below summarise the impacts on the aquatic resources in the quaternary catchment W42A (Kleynhans 1999):

- Impacts as a result of bed modification within the system are considered very low.
- Marginal flow modifications occur within the quaternary catchment.

- Impacts on the system as a result of the introduced aquatic biota are low with special mention of Trout Species.
- Impact due to inundation is very low.
- Riparian zones and stream bank conditions are considered to be marginally impacted.
- Impact as a result of water quality modification is very low.

In terms of ecological functions, importance and sensitivity, the following points summarise the conditions in this catchment:

- The riverine systems in this catchment have a high diversity of habitat types which include rapids, riffles, mountain torrents and mountain riffles.
- The quaternary catchment has a very low importance in terms of conservation and natural areas.
- Fish species within the system, with special mention of *Chiloglanis anoterus* (Rock Catlet) and *Chiloglanis emarginatus* (Pongolo Suckermouth) have a high intolerance to flow and flow related water quality changes.
- The quaternary catchment is regarded as having a very high importance for rare and endangered species conservation with special mention of *Chiloglanis emarginatus* (Pongolo Suckermouth).
- The quaternary catchment is considered of high importance in terms of provision of migration routes with special mention of migration routes for bird species at high altitudes.
- The quaternary catchment has a high importance in terms of providing refugia for aquatic community members.
- The quaternary catchment can be considered to have a high sensitivity to changes in water quality and a very high sensitivity to changes in water flow.
- The quaternary catchment is of high importance in terms of species richness.
- The quaternary catchment is of no importance in terms of endemic and isolated species.

3.3 General Importance of the Subject Property with regard to the National Freshwater Ecosystem Priority Areas (2011) Database

The SANBI Wetland Inventory (2006) and National Freshwater Ecosystem Priority Areas (NFEPA) (2011), databases was consulted to define the aquatic ecology of the wetland or river systems close to or within the subject property that may be of ecological importance. Aspects applicable to the subject property and surroundings are discussed below:

- The subject property falls within the Usuthu to Mhlathuze Water Management Area (WMA). Each Water Management Area is divided into several sub-Water Management Areas (subWMA), where catchment or watershed is defined as a topographically defined area which is drained by a stream or river network. The Sub-Water management unit indicated for the subject property is the Pongola sub-WMA.
- The western border of the subject property falls within a Fish Fresh Water Ecosystem Priority Area (FISHFEPA) (Figure 3). River FEPAs achieve biodiversity targets for river ecosystems and threatened fish species, and were identified in rivers that are currently in a good condition (A or B ecological category). Their FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources.
- The remainder of the subject property falls within a Fish Support Area (FSA) (Figure 3) which is regarded important in terms of a fish sanctuary for threatened fish species.
- The Pandana River runs through the centre of the subject property from the south to the north.
- The Pandana River is a perennial river classified as a Class A (unmodified, natural) river. It is not free flowing and is not classified as a flagship river.
- The subject property contains three wetland features as listed by the NFEPA database (2011). A large, natural bench wetland feature is located in the west of the subject property, a small, natural slope wetland feature is located in the south of the subject property and a small, artificial valley floor wetland feature is located in the north of the subject property (Figure 4).
- The conditions of the wetlands within the subject property are depicted in Figure 5 below and includes:
    - Category AB (Wetlands in a natural or good condition - percentage natural land cover >75%). This category includes the large bench wetland to the west of the subject property as well as the small slope wetland to the south of the subject property.
    - Category Z3 (Wetlands in a critically modified condition – percentage natural land cover <25%). This category includes the small valley floor wetland to the north of the subject property.
- The wetlands within the subject property were ranked according to general importance depicted in Figure 6 below.
    - Rank 2 – Wetlands within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands of exceptional biodiversity importance with valid reasons documented or as containing wetlands that are

good, intact examples from which to choose. Includes the large bench wetland to the west of the subject property.

- Rank 5 – Wetlands within a subquaternary catchment identified by experts at the regional review workshops as containing impacted Working for Wetlands sites. Includes the small slope wetland to the south of the subject property
- Rank 6 – All other wetlands (no importance). Includes the artificial valley floor wetland to the north of the subject property.

- No wetlands within the subject property are considered important with regards to the conservation of biodiversity.
  - Expertid = 0; No importance.
- The large bench wetland feature in the west of the subject property (Figure 7) is shown to have sightings of or breeding areas for cranes (1 = importance indicated).
- The large bench wetland feature to the west of the subject property is indicated as a FEPA Wetland. Wetland FEPAS currently in a good ecological condition should be managed to maintain this condition.
- No RAMSAR wetlands are located within or close to the subject property.
- No wetlands are indicated to fall within 500m of an IUCN threatened frog point locality.

The large bench wetland feature in the west of the subject property is considered to be of high importance with regards to the conservation of biodiversity. This feature is a natural feature which is in a good or natural condition. It has been listed as a wetland within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands of exceptional biodiversity importance with valid reasons documented or as containing wetlands that are good, intact examples from which to choose. This feature is also regarded as important with regards to the conservation of crane species and is listed a FEPA wetland which should be managed in order to maintain its good ecological condition. The small slope wetland feature to the south of the subject property is also considered of some conservation importance due to its natural condition and due to its listing as a Working for Wetlands site.

3.4 The Kwa-Zulu Natal Freshwater Systematic Conservation Plan (2007)

The Kwa-Zulu Natal Freshwater Systematic Conservation Plan (2007) was consulted in order to determine whether any freshwater conservation areas will be affected by the proposed mining development. According to the database, the subject property falls within a freshwater

catchment earmarked for conservation (Figure 10). Areas earmarked for conservation are optimal biodiversity areas required to meet biodiversity targets.

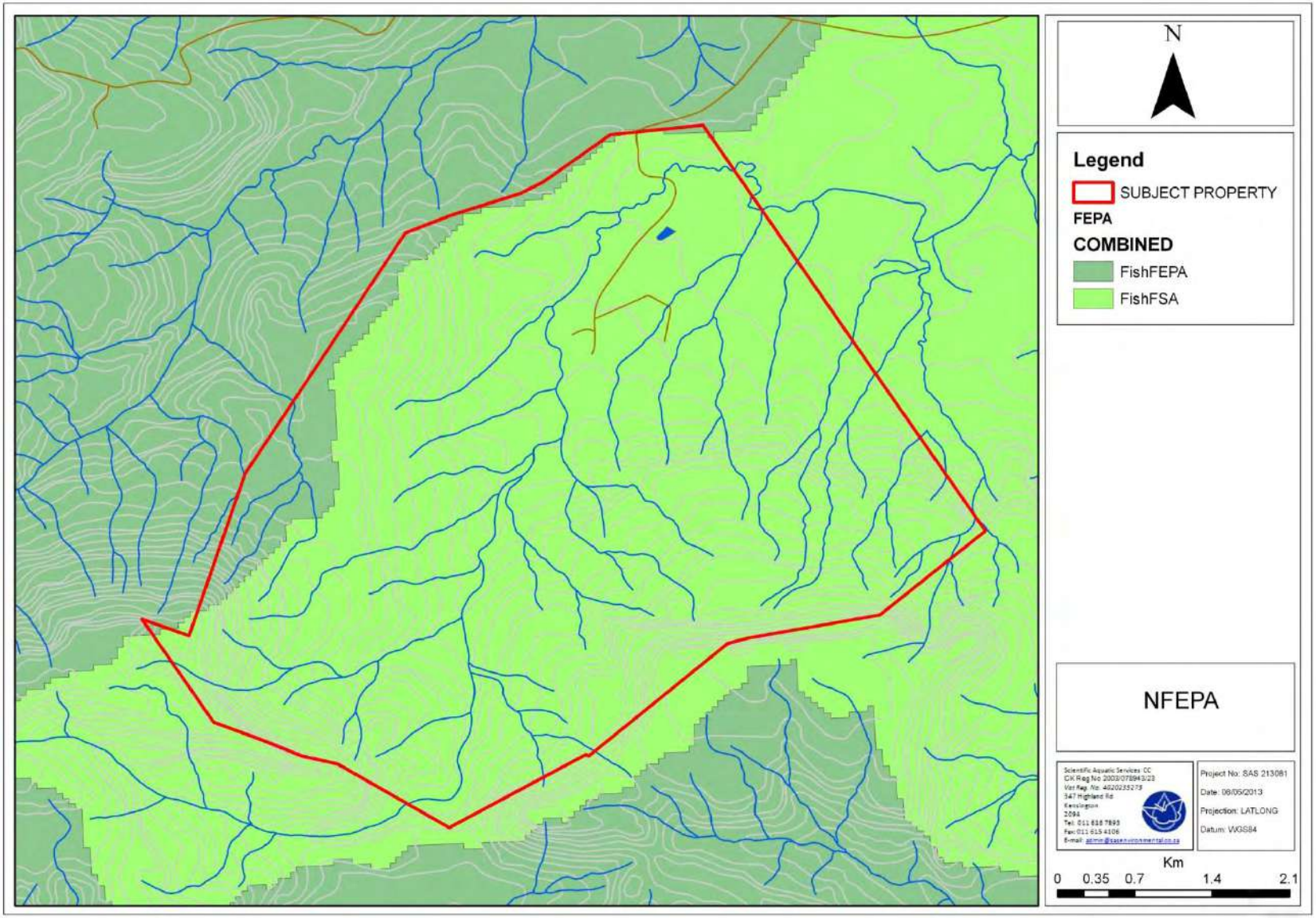

Figure 3: Fish FEPAs and Fish FSAs associated with the subject property.

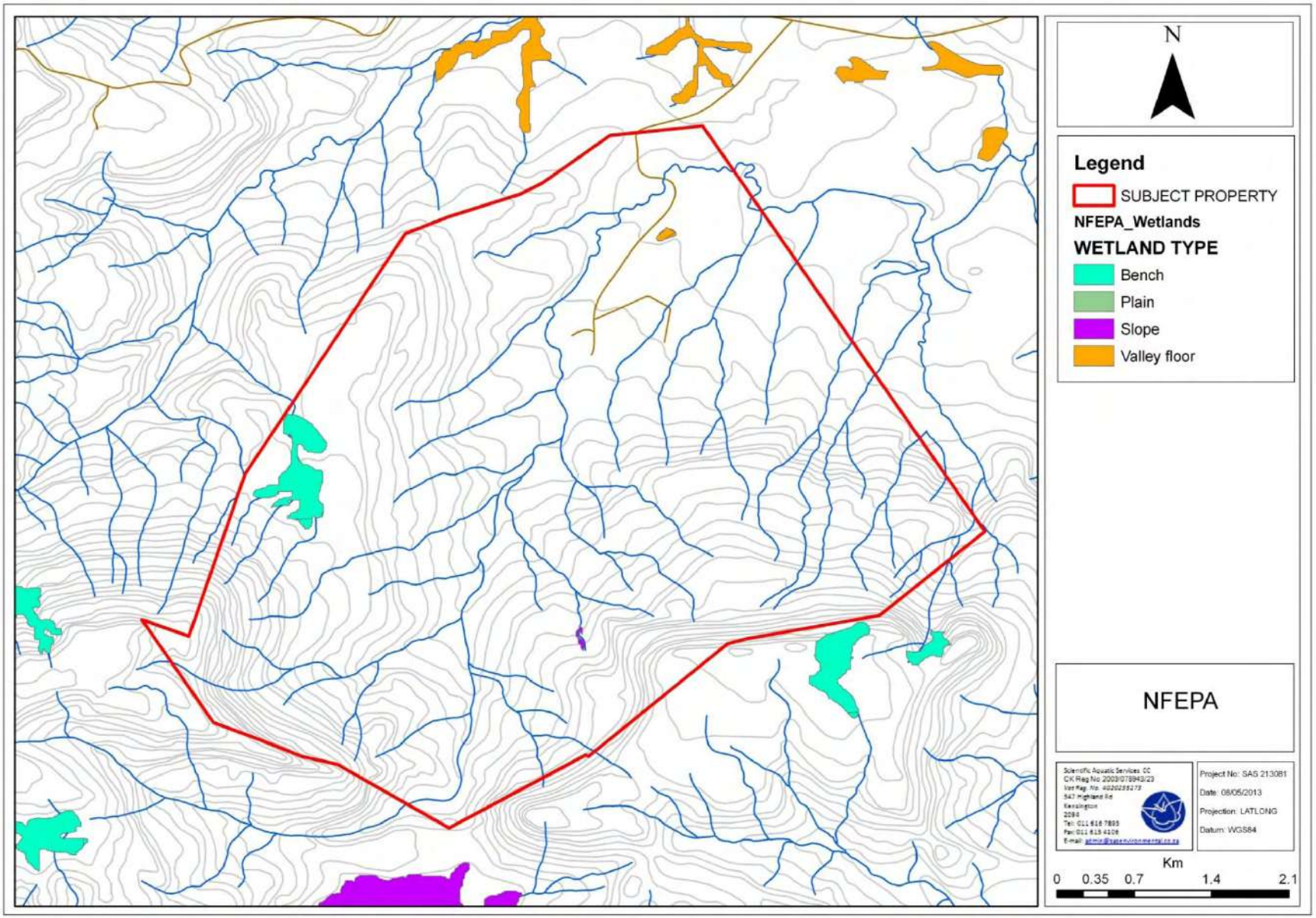

Figure 4: Wetland conditions as defined by the NFEPA wetland map.

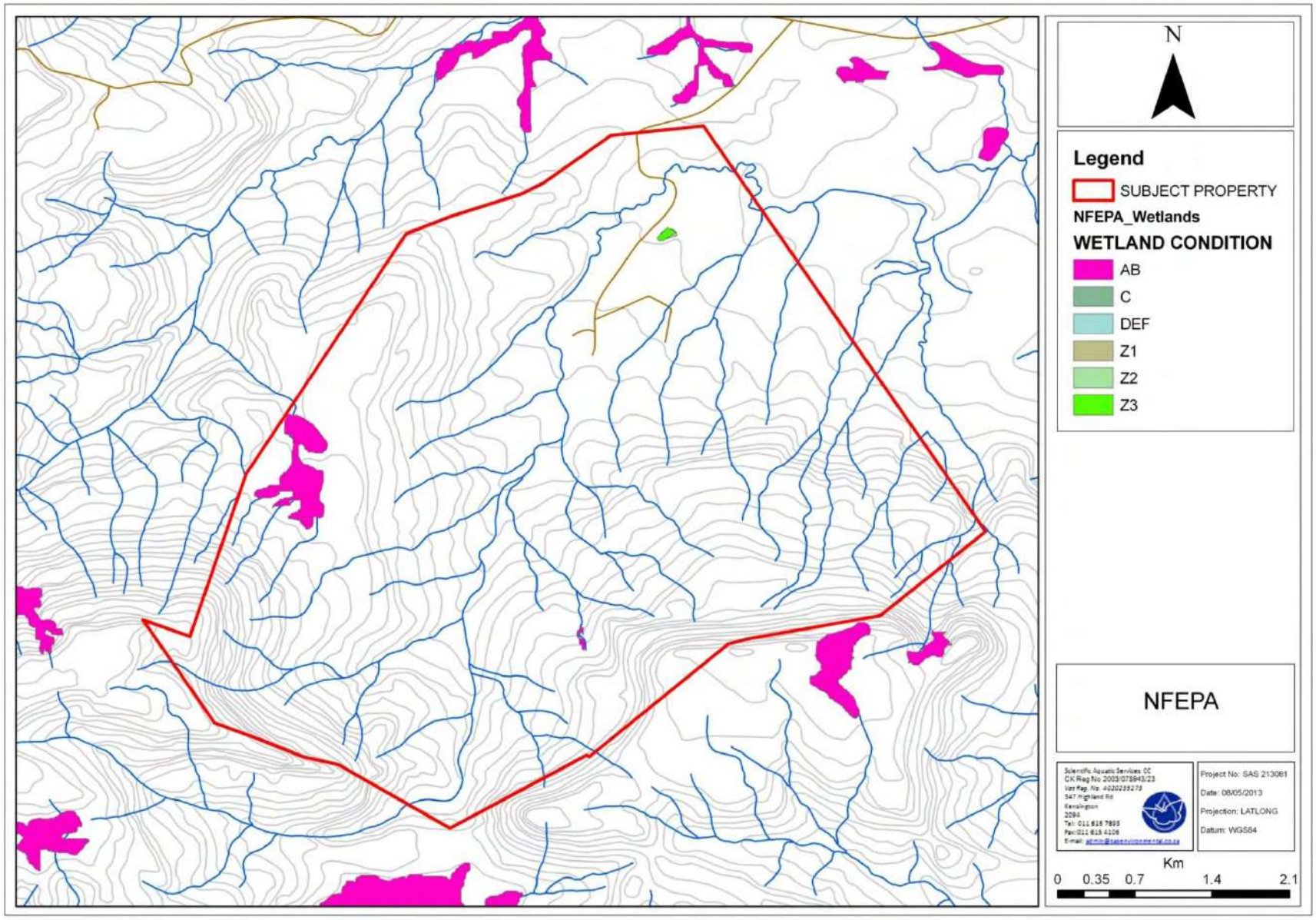

Figure 5: Wetland conditions as defined by the NFEPA wetland map.

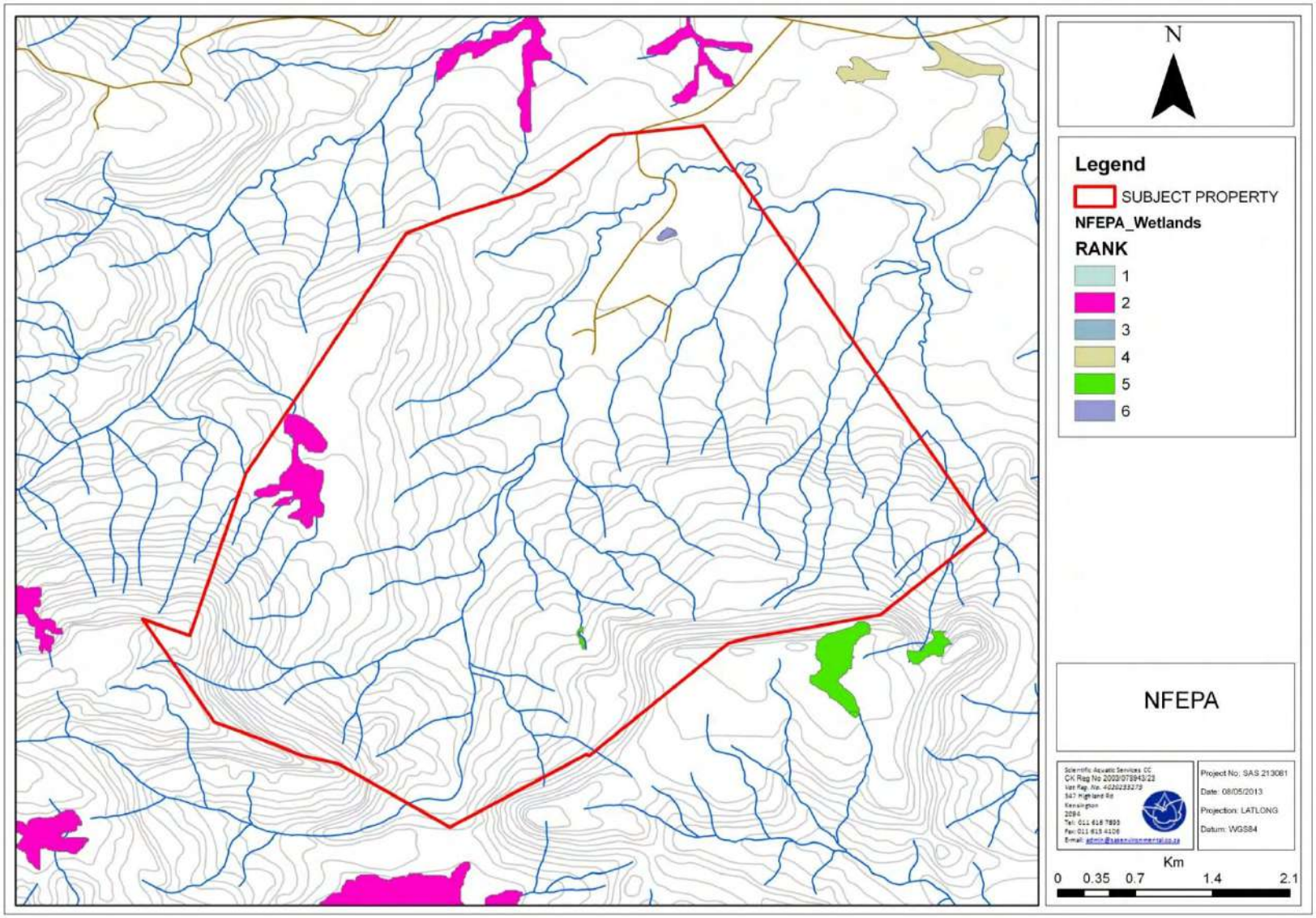

Figure 6: Ranks according to general importance.

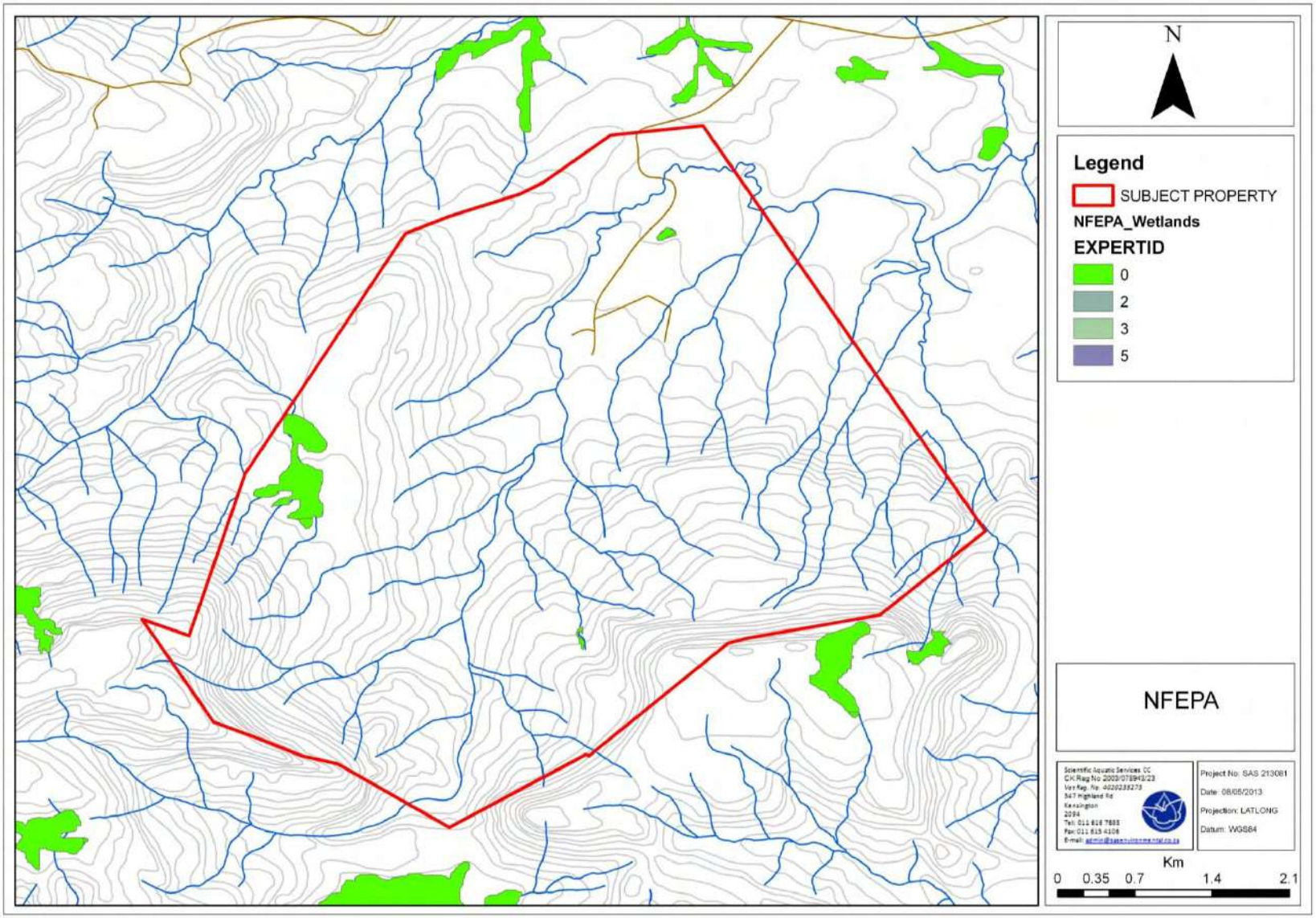

Figure 7: Wetlands indicated to be of importance towards biodiversity conservation (0 = no importance indicated).

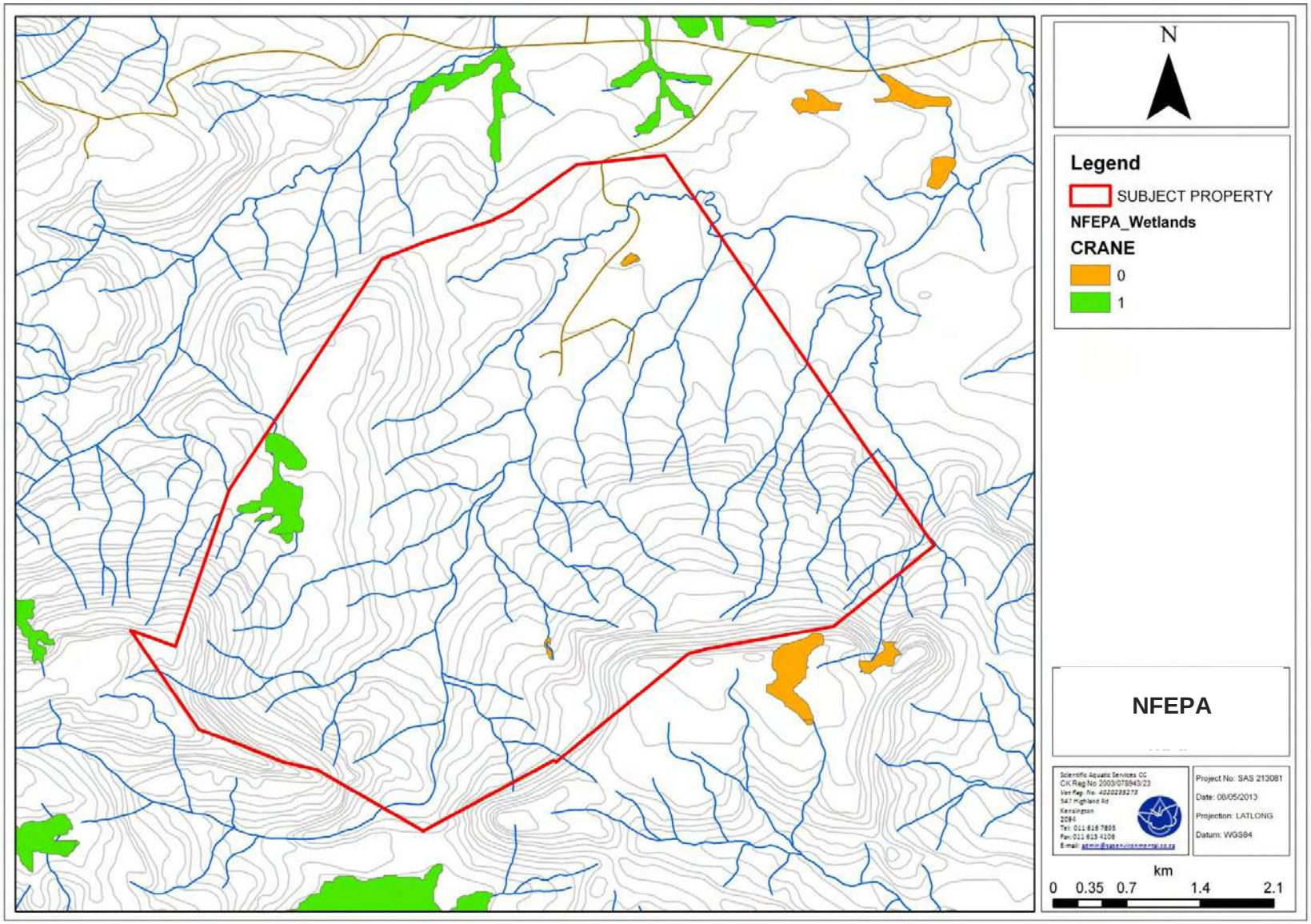

Figure 8: Wetlands indicated to be of importance towards crane conservation (1 = importance indicated).

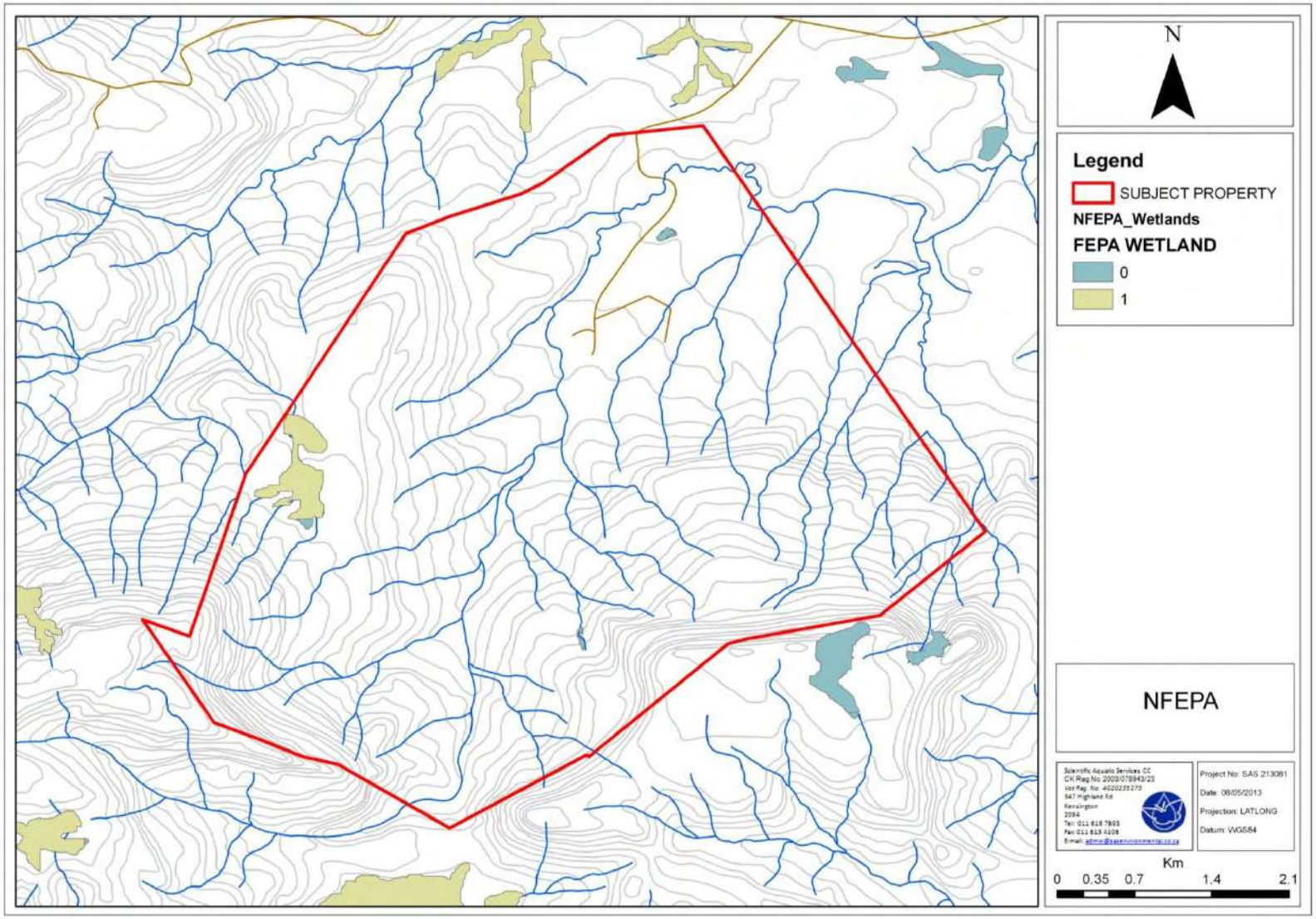

Figure 9: FEPA wetlands located within the subject property boundary (1= FEPA wetland).

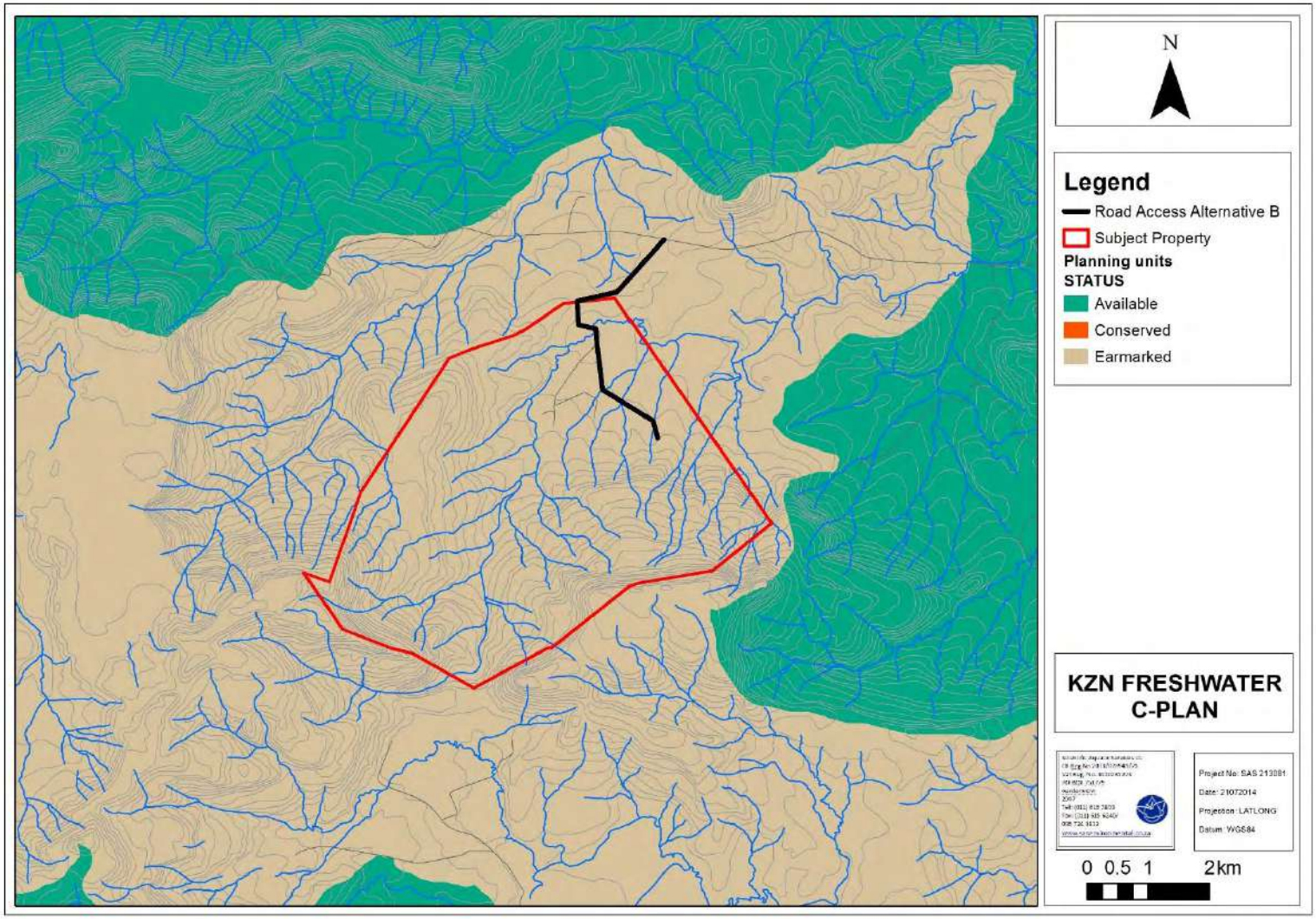

Figure 10: Importance according to the KZN Freshwater Conservation Plan

4 RESULTS

4.1 Wetland System Characterisation

The wetland features identified during the assessment of the subject property was categorised according to the classification system as described in Section 2.3 of this report. The results of the wetland system characterisation are illustrated in the table below.

Table 11: SANBI National Wetland Classification for wetland areas present within the subject property.

Level 1: System	Level 2: Regional Setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit
Inland: An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The subject property falls within the Eastern Escarpment Mountains Ecoregion **NFEPA WetVeg Groups** ➢ Mesic Highveld Grassland Group5 and 8	**Valley Floor:** The typically gently sloping, lowest surface of a valley	**Lower Foothill River:** Lower-gradient, mixed-bed alluvial channel with sand and gravel dominating the bed and may be locally bedrock controlled; reach types typically include pool riffle or pool-rapid, with sand bars common in pools; pools are of significantly greater extent than rapids or riffles. Characteristic gradient is 0.001–0.005.
Inland: An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The subject property falls within the Eastern Escarpment Mountains Ecoregion **NFEPA WetVeg Groups** Mesic Highveld Grassland Group5 and 8	**Channel (river, including the banks):** an open conduit with clearly defined margins that (i) continuously or periodically contains flowing water, or (ii) forms a connecting link between two water bodies.	**Transitional River:** moderately steep stream dominated by bedrock and boulders; reach types include plain-bed, pool-riffle or pool-rapid; usually in confined or semi-confined valley. Characteristic gradient is 0.02–0.039.
Inland: An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The subject property falls within the Eastern Escarpment Mountains Ecoregion **NFEPA WetVeg Groups** Mesic Highveld Grassland Group5 and 8	**Valley floor:** The typically gently sloping, lowest surface of a valley	**Channelled valley bottom wetland:** A valley bottom wetland with a river channel running through it.
Inland: An ecosystem that has no existing connection to the ocean but which is inundated or saturated with water, either permanently or periodically.	**Ecoregion:** The subject property falls within the Eastern Escarpment Mountains Ecoregion **NFEPA WetVeg Group:** Mesic Highveld Grassland Group 5 and 8	**Bench:** Bench (hilltop/saddle/shelf): an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on	**Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat

Level 1: System	Level 2: Regional Setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit
		two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope on one side and a down-slope on the other side in the same direction)	

The wetlands were classified as Inland systems falling within the Eastern Escarpment Mountains Ecoregion and within the Mesic Highveld Grassland Groups 5 and 8 wetland vegetation groups. The bench wetlands are situated in the higher altitude areas, while the Pandana River is characterised as a lower foothill river. Several smaller tributaries to the Pandana River, especially in the higher altitude areas, were classified as transitional rivers. In the lower lying areas where the gradient was more gentle, several channelled valley bottom wetlands were encountered.

Overall, the systems consisted of permanent, seasonal and temporary zones, which were identified primarily by means of soil wetness indicators and indicators of phorolyses as indicated by mottling of soils. Soil types with gleyed soils and lower chroma soils were extensively used to define the wetland boundary with a relatively clear contact between high chroma terrestrial soils and low chroma wetland soils evident along most of the length of the wetland features. The figures below present representative photographs of the wetlands in the subject property.

Figure 11: Wetlands encountered in the subject property. Note trampling by cattle on the right.

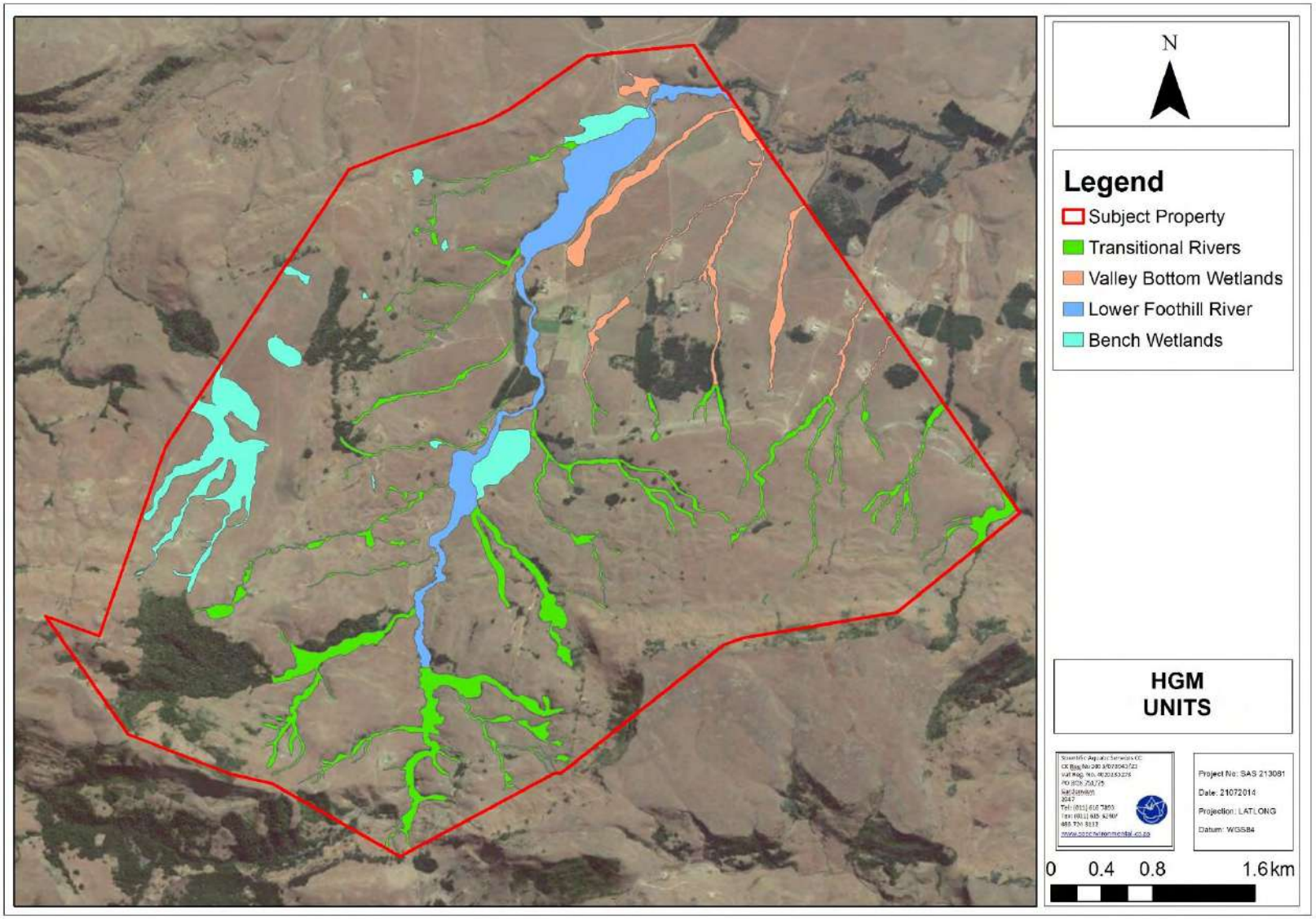

Figure 12: Map of the wetland features within the subject property.

4.2 Wetland Function Assessment

Wetland function and service provision were assessed for the wetland features within the subject property. The average scores for the assessed systems are presented in the following table along with the radar plot in the figure that follows the table.

Table 12: The wetland function and service provision for the wetland features.

Ecosystem service	Transitional Rivers	Bench Wetlands	Lower Foothill River	Valley Bottom Wetlands
Flood attenuation	2.4	2.2	2.5	2.9
Streamflow regulation	2.4	2.2	2.5	2.9
Sediment trapping	2	2.8	2.4	2.6
Phosphate assimilation	1.8	2	2.3	2.4
Nitrate assimilation	1.8	2	2.3	2.4
Toxicant assimilation	1.8	2	2.3	2.4
Erosion control	2.8	2.4	2.1	2.3
Carbon Storage	1.6	3	2.2	3
Biodiversity maintenance	3.5	3.5	3.5	3.5
Water Supply	2.3	2.3	2.3	2.3
Harvestable resources	1.9	1.5	1.8	1.6
Cultivated foods	1.4	1.4	2.2	2.2
Cultural value	1	1	1	1
Tourism and recreation	1.1	1.1	1.2	1.2
Education and research	1.8	1.8	1.7	1.6
SUM	**29.6**	**31.2**	**32.3**	**34.3**
Average score	**2.0**	**2.1**	**2.2**	**2.3**

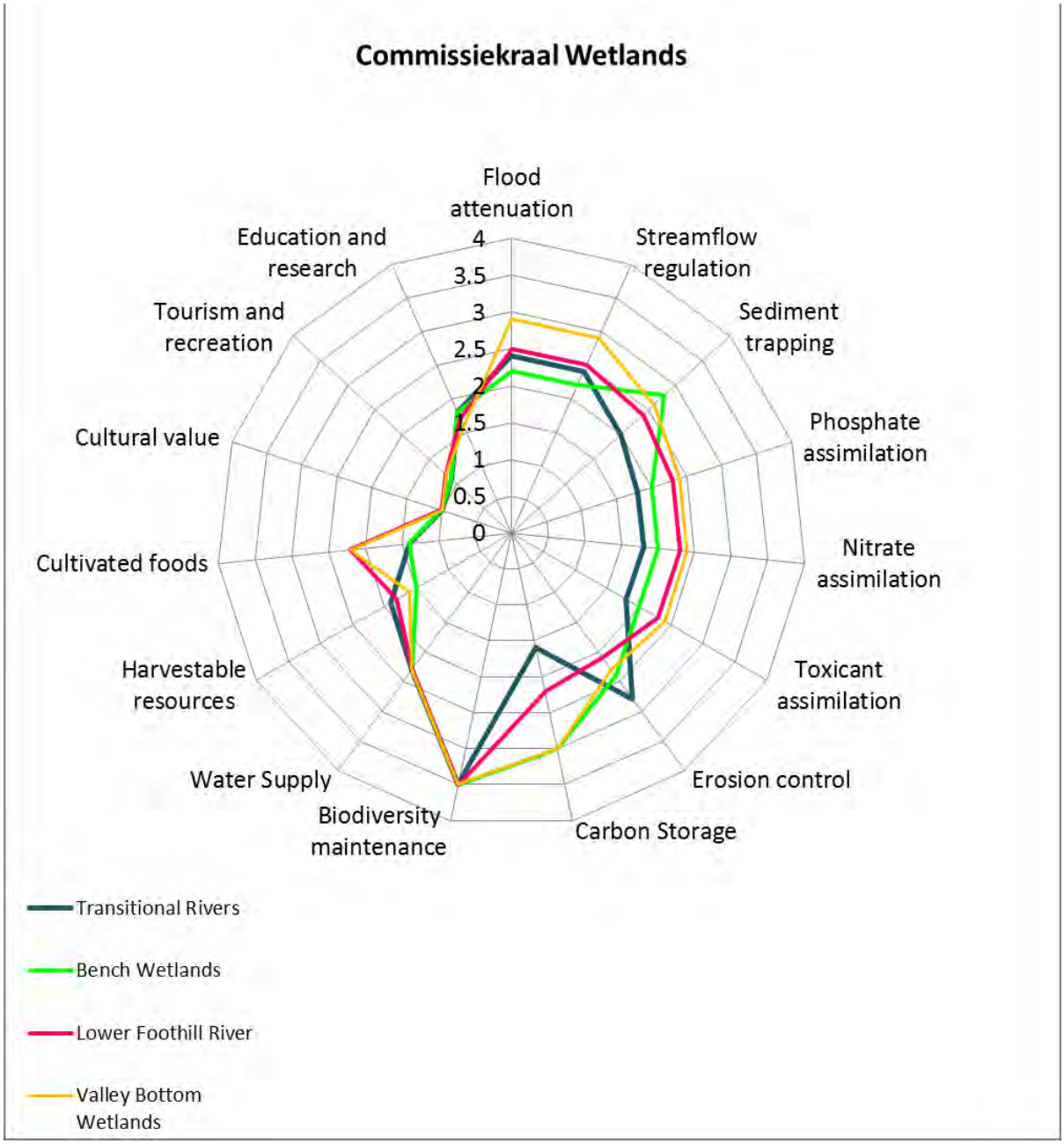

Figure 13: Radar plot of wetland services provided.

In summary, the lower foothill river obtained an overall ecological service provision score of 2.2, the bench wetlands obtained a score of 2.1, the valley bottom wetlands obtained a score of 2.3 and the transitional rivers obtained a score of 2.0, which places the wetlands in a moderately high class of ecological service provision.

From the results of the assessment, it is evident that the majority of the wetland features important in terms of flood attenuation, streamflow regulation and nutrient assimilation as they are situated in an agricultural area. Furthermore, the systems play the most important role in terms of biodiversity maintenance, as several protected floral and faunal species are

associated with the wetlands (refer to Section B and C of the baseline reports). As the systems are situated in the upper catchment of the Pongolo River which is an important river in terms of water supply for agricultural areas, they are also important in terms of water supply.

In summary, it is clear that the various wetland systems within the subject property provide moderately high levels of ecological and socio-cultural services, and impacts associated with proposed mining (especially decant of polluted water) are likely to significantly affect these systems, especially in terms of the importance of the system with regard to agricultural areas downstream.

4.3 WET-Health Assessment

The wetlands were classified as Inland systems falling within the Eastern Escarpment Mountains Ecoregion and within the Mesic Highveld Grassland 5 and 8 vegetation groups. The wetland systems were assessed according to the WET-Health methodology described in Section 2.5.

Three modules were assessed namely hydrology, geomorphology and vegetation. Each HGM unit was assessed separately, after which the sum of the individual area weighted scores for each HGM unit was taken as the final score of each module considered representative of the wetland feature as a whole. A summary of the results is provided in the tables below.

4.3.1 Transitional Rivers

Table 13: Summary of the overall health of the Transitional River features based on impact score and change score.

Hydrology		Geomorphology		Vegetation	
Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
B	→	A	→	B	↓

The overall score for the wetland system that aggregates the scores for the assessed three modules, namely hydrology, geomorphology and vegetation, was calculated using the formula[2] as provided by the WET-Health methodology. The overall score calculated was 1.4, falling within Category B (Largely natural with few modifications).

[2] ((Hydrology score) x 3 + (geomorphology score) x2 + (vegetation score) x 2))/ 7 = PES

The present hydrological state of the HGM unit calculated a score that falls within Category B (Largely natural with few modifications). Any deviation from a Category B in the future is considered unlikely, provided that the current land use is continued. Erosion and consequent deposition and changes in runoff intensity is considered marginal within the wetland system, as a result the calculated score falls within the present geomorphic Category A (Unmodified/natural) with indications of the system continuing along this trend. The present vegetation state is considered to fall within Category B (Largely natural with few modifications). Vegetation composition has been slightly altered but introduced alien and/or ruderal species are still clearly less abundant than characteristic indigenous wetland species, however a decrease in the vegetation condition is likely as alien floral invasion is likely to increase.

4.3.2 Bench Wetlands

Table 14: Summary of the overall health of the Bench Wetland features based on impact score and change score.

Hydrology		Geomorphology		Vegetation	
Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
B	→	A	→	B	↓

The overall score for the bench wetland system that aggregates the scores for the assessed three modules, namely hydrology, geomorphology and vegetation, was calculated using the formula[3] as provided by the WET-Health methodology. The overall score calculated was 1.4, falling within Category B (Largely natural with few modifications).

The present hydrological state of the HGM unit calculated a score that falls within Category B (Largely natural with few modifications). Any deviation from a Category B in the future is considered unlikely, especially in the higher altitude areas, provided that the current land use is continued. Erosion and consequent deposition and changes in runoff intensity is considered marginal due to limited trampling by cattle recorded, as a result the calculated score falls within the present geomorphic Category A (Unmodified/natural) with indications of the system continuing along this trend.

The present vegetation state is considered to fall within Category B (Largely natural with few modifications). Vegetation composition has been slightly altered by the invasion of alien floral species, most notably *Acacia mearnsii,* however, these species are still clearly less abundant

[3] ((Hydrology score) x 3 + (geomorphology score) x2 + (vegetation score) x 2))/ 7 = PES

than characteristic indigenous wetland species. A decrease in the vegetation condition is likely as alien floral invasion is likely to increase.

4.3.3 Lower Foothill River

Table 15: Summary of the overall health of the Lower Foothill River feature based on impact score and change score.

Hydrology		Geomorphology		Vegetation	
Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
C	→	B	→	D	↓

The overall score for the lower foothill river system that aggregates the scores for the assessed three modules, namely hydrology, geomorphology and vegetation, was calculated using the formula[4] as provided by the WET-Health methodology. The overall score calculated was 2.8, falling within Category C (A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact).

The present hydrological state of the HGM unit obtained a score that falls within Category C (Moderately modified), as several crossings, cattle paths and runoff from surrounding homesteads have likely altered the hydrological regime, although any deviation from a Category C in the future is considered unlikely, provided that the current land use is continued. Few signs of incision or other geomorphological impacts were recorded, as a result the calculated score falls within the present geomorphic Category B (Largely natural) with indications of the system continuing along this trend.

The vegetation component falls within Class D (Largely modified), as a result of severe encroachment by *Acacia mearnsii,* which has, in some areas, completely replaced the indigenous wetland species. A decrease in the vegetation condition is likely as alien floral invasion is likely to increase.

[4] ((Hydrology score) x 3 + (geomorphology score) x2 + (vegetation score) x 2))/ 7 = PES

4.3.4 Valley Bottom Wetlands

Table 16: Summary of the overall health of the Valley Bottom Wetland features based on impact score and change score.

Hydrology		Geomorphology		Vegetation	
Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
C	→	B	→	C	↓

The overall score for the valley bottom wetlands that aggregates the scores for the assessed three modules, namely hydrology, geomorphology and vegetation, was calculated using the formula[5] as provided by the WET-Health methodology. The overall score calculated was 2.6, falling within Category C (A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact).

The present hydrological state of the HGM unit obtained a score that falls within Category C (Moderately modified), as an earth dam, crossing structures and runoff from surrounding homesteads have likely altered the hydrological regime with any significant deviation from a Category C in the future unlikely, provided that the current land use is continued. No significant geomorphological impacts were recorded, as a result the calculated score falls within the present geomorphic Category B (Largely natural) with indications of the system continuing along this trend.

The vegetation component falls within Class C (Moderately modified), as a result of edge effects from agricultural activities, cattle grazing and encroachment by alien floral species. A decrease in the vegetation condition is likely, should current land use practices continue.

4.4 Ecological Importance and Sensitivity Assessment

The Wetland EIS determination method was applied according to the protocol of DWAF (1999). The aim of the application of this method is to clearly define the importance of each system. The wetland EIS was defined for the various wetland features identified within the subject property.

[5] ((Hydrology score) x 3 + (geomorphology score) x2 + (vegetation score) x 2))/ 7 = PES

Table 17: Score sheet for determining the EIS of the wetland systems.

Determinant	Transitional Rivers	Bench Wetlands	Lower Foothill River	Valley Bottom Wetlands	Confidence
PRIMARY DETERMINANTS					
1. Rare & Endangered Species	3	4	3	3	4
2. Populations of Unique Species	3	3	3	2	4
3. Species/taxon Richness	3	3	2	2	4
4. Diversity of Habitat Types or Features	2	2	2	2	4
5. Migration route/breeding and feeding site for wetland species	3	4	3	3	4
6. PES as determined by WET-Health assessment	4	4	3	3	4
7. Importance in terms of function and service provision	3	3	3	3	4
MODIFYING DETERMINANTS					
8. Protected Status according to NFEPA Wetveg	4	4	4	4	4
9. Ecological Integrity	4	4	2	2	4
TOTAL	29	30	25	24	
MEAN	3.22	3.33	2.78	2.67	
OVERALL EIS	**A**	**A**	**B**	**B**	

Based on the findings of the study it is evident that from a wetland point of view, the Transitional Rivers and Bench Wetlands fall within Class A systems, indicating a very high EIS. The Lower Foothill Rivers and Valley Bottom Wetlands obtained a high EIS score (Class B). Thus, it is evident that the wetland systems within the subject property are of high to very high sensitivity, and any impacts due to mining are likely to be highly significant both regionally and locally. In this regard, specific mention is made of possible dewatering of surface water systems and also possible decant of polluted water, which are likely to decrease the EIS of the wetlands during the life of mine and post-closure.

4.5 Recommended Ecological Category

According to the resource directed measures for protection of water resources[6] a wetland or river may receive the same class for the PES as the REC if the habitat is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as to enhance the PES of the feature. The results obtained from the assessments indicate relatively low levels of transformation on all levels of ecology. It is therefore recommended that the features be assigned the same REC as the PES Class calculated. The EIS and REC values are presented in the table below. It is evident that the wetland systems within the subject property are of high

[6] DWA and Forestry, South Africa *Version 1.0 of Resource Directed Measures for Protection of Water Resources 1999*

to very high sensitivity, and any impacts due to mining are likely to be highly significant both regionally and locally. In this regard, specific mention is made of possible dewatering of surface water systems and also possible decant of polluted water, which are likely to provide a significant challenge to maintain the REC of the wetlands during the life of mine and post-closure.

Table 18: Assigned REC Classes.

Feature	Wetland PES Classes	EIS Class	REC Class
Transitional Rivers	B	A	B
Bench Wetlands	B	A	B
Lower Foothill River	C	B	C
Valley Bottom Wetlands	C	B	C

4.6 Legislative requirements and Buffer Allocations

The wetland EIS was utilised to determine the sensitivity of the various wetland systems. From the figure below, the Class A EIS systems are considered to be of very high sensitivity, while the Class B EIS systems are considered to be of high sensitivity. Legislative requirements were used to determine the extent of buffer zone required for all wetland types. The wetlands associated with the subject property are defined as watercourses. If any activities are to take place within 100 meters or the 1:100 year flood lines exemption terms of Regulation GN 704 of the NWA, 1998 (act no. 36 of 1998) needs to be obtained. Section 21 of the NWA (Act 36 of 1998) as well as General Notice no. 1199 of 2009 as it relates to the NWA will also apply and therefore a Water Use License will be required. A 32m buffer is indicated around all features which will require authorisation in terms of the National Environmental Management Act (NEMA) 107 of 1998 if any activities are to take place within the buffer zone.

After the assessment it can be concluded that the wetland resources are of significant importance in terms of function and service provision with special mention of biodiversity. The wetland resources associated with the subject property are largely intact and are therefore important in terms of biodiversity value as they provide habitat and migratory corridors for a diversity of faunal and floral species. The wetland resources also have significant downstream importance for biodiversity maintenance and other basic ecosystem services as it is situated in the upper catchment of the Pongolo River system, and any detrimental impact on these systems will be of high significance, both locally and downstream.

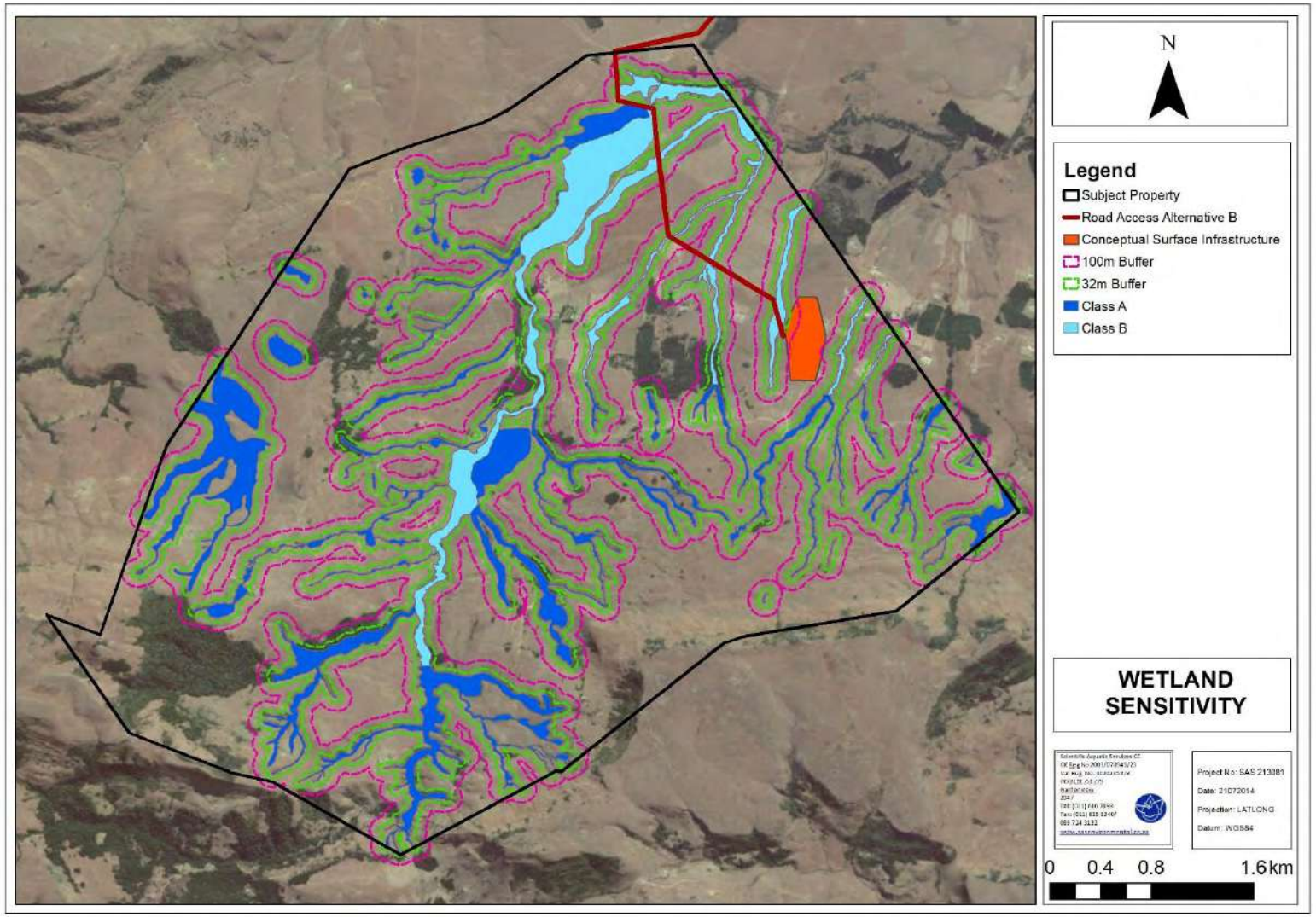

Figure 14: Conceptual representation of the wetland features present within the subject property with associated buffers.

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