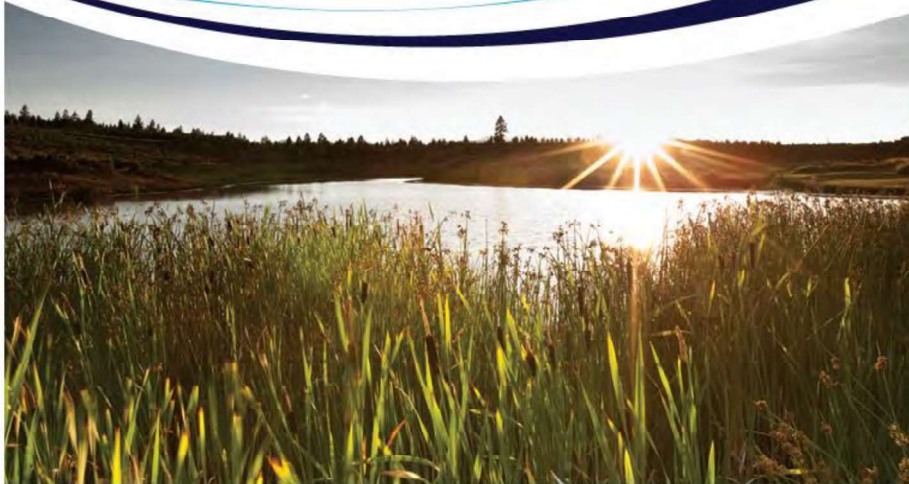# Annexure F – Ecological Assessment Report

ECOLOGICAL ASSESSMENT REPORT FOR THE PROPOSED PENTAGON BUSINESS AND RESIDENTIAL DEVELOPMENT IN THE THABA CHWEU LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

FEBRUARY 2019

TITLE:	Ecological assessment report for the proposed Pentagon Business and Residential Development in the Thaba Chweu Local Municipality, Mpumalanga Province
Authors:	Zona Dotwana
Reviewed by:	Nonkanyiso Zungu
Status of report:	Draft
Document control	
First Issue:	February 2019

Approved by:

…………………………………

Nonkanyiso Zungu, Pr.Nat.Sci (Reg. No. 400194/10)

Specialist Ecologist/Wetland specialist

Date: February 2019

Indemnity

This 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. 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 information available at the time of study. Therefore, the author reserves 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.

Although the author exercised due care and diligence in rendering services and preparing documents, she accepts no liability, and the client, by receiving this document, indemnifies the author against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the author and by the use of this document.

EXECUTIVE SUMMARY

i.   INTRODUCTION

SAZI Environmental Consulting cc was appointed by KHS (Pty) Ltd to undertake a fauna and flora assessment study as part of an Environmental Impact Assessment (EIA) process for a proposed business and residential development (PBRD), within the Thaba Chweu Local Municipality in the Mpumalanga Province.

The purpose was to assess the fauna and flora status and ecological sensitivity of the study area. A site visit was undertaken on 07 February 2019.

ii.   METHODOLOGY

Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford, 2006) as well as the National List of Threatened Ecosystems (2011), where relevant. Critical Biodiversity Areas (CBA's) for the site and surroundings were extracted from the Mpumalanga Biodiversity Sector Plan (MBSP). Information on plant and animal species recorded for the project site were derived based on the distribution records from the literature and various spatial databases such as SABIF/SIBIS database hosted by SANBI as well as the Animal Demographic Unit database. The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2014). Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy (NPAES) (2008).

The random sampling methodology was used for field assessments.

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases.

iii.   RESULTS

The proposed development site is located within the Grassland Biome of South Africa. The study area falls within the Lydenburg Thornveld within the Mesic Highveld Grassland

Bioregion. Vegetation types dominating the project site included graminoids, megagraminoids, flowers and herbs.

- Reptile species

No reptile species were recorded on site.

- Amphibians

No amphibians were recorded on site. Amphibians that may occur within the study area, based on available distribution records and known habitat requirements, are *Amietia delalandii* species.

- Avifauna

The following avifauna species were observed on site: *Vanellus coronatus, Vanellus armatus, Euplectes progne, Euplectes orix,* and evidence of *Numida meleagris* (feathers).

- Invertebrates

The following invertebrate species were observed on site during the time of assessment: Danus chrysippus orientis, Acrea horta, Junonia hierta cabrene, Lampides boeticus.

- Sensitivity

The project area is regarded to be of Medium sensitivity.

iv.   RISK FACTOR AND RECOMMENDATION

Special care should be taken not to damage or remove any such species unless necessary. Individuals of protected species within the development footprint, if found, should be translocated to a safe area on the property. A permit obtainable from the Provincial Nature Conservation office in the relevant government department is required before any protected species may be interfered with. The details of the impacts and recommendations are included in the report.

v.   CONCLUSION

The proposed project site is located within the Lydenburg Thornveld Grassland which is considered to be Vulnerable. The sensitivity of the area was considered to be Medium. No red data species or species of conservation value were observed on site.

Although no sensitive or red data species were observed during the time of assessment, from an ecological perspective, due care must be undertaken when developing on this area and all relevant mitigation measures implemented.

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DEFINITION OF TERMS

Alien species: The alien species are species which is originated from foreign country.

Assessment Criteria: The environmental impacts are assessed with mitigation measures (MM) and without mitigation measures (WMM).

Biodiversity: Biodiversity is the variety of plant and animal life in the world or in a habitat.

Biome: A major biotic unit consisting of plant and animal communities having similarities in form and environmental conditions, but not including the abiotic portion of the environment.

Confidence: The confidence level can be classified as medium during the construction phase. However, the confidence level becomes low during the operational phase.

Conservation: Conservation is the management of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.

Duration: The period of time during which something continues.

Ecosystem: Organisms together with their biotic environment, forming an interacting system, inhabiting an identifiable space.

Ecosystem services: Activities that help to maintain an ecosystem but are not directly part of energy flows and nutrient cycles. Examples include pollination, dispersal, population regulation, and provision of clean water and the maintenance of liveable climates (carbon sequestration).

Endangered: A taxon is endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.

Endemic: An 'Endemic Species' is one that is only found in that region and nowhere else in the world. As such they are of conservation concern because they are not widespread and may be confined to only one or two protected areas.

Exotic: a species introduced either accidentally or deliberately by human actions into places beyond its natural geographical range.

Intensity: The intensity of the development can be categorized as medium since the impacts of the activity will alter the environment due to increased disturbance of the site by heavy machinery.

IUCN: International Union for Conservation of Nature.

Probability: Is a way of expressing knowledge or belief that an event will occur or has occurred.

Red Data: A list of fauna and flora species that require environmental protection.

Significance with and without mitigation: The significance without mitigation is medium; meaning that the impact of the development is of moderate importance and is considered to have a medium negative impact. The significance with mitigation is low, meaning that the negative impact of the operation is of importance but is reduced by the mitigation measures.

Species diversity: A measure of the number and relative abundance of species (see biodiversity).

Species richness: The number of species in an area or habitat.

Declaration of Independence

I, **Zona Dotwana**, in my capacity as a specialist consultant, hereby declare that I -

- Act as an independent consultant;

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);

- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);

- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being a member of the general public;

- This document and all information contained herein is and will remain the intellectual property of Sazi Environmental Consulting and the specialist investigator responsible for conducting the study. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigator;

- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and

- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

_____

A.Z Dotwana   2019.02.19

Environmental Scientist

SACNASP Reg No. 115598

Summary of expertise

Tertiary Qualifications: Med (Environmental Education), Rhodes University

Biodiversity and Conservation Honours, Rhodes University

Environmental Studies, Walter Sisulu Univerity

Tools for Wetland Assessment Course, Rhodes University

Professional Affiliation: SACNASP Reg No.115598 (Candidate Scientist, upgrading to Professional Scientist)

Experience with fauna and flora assessments: 5 years

1. INTRODUCTION

SAZI Environmental Consulting cc was appointed by KHS (Pty) Ltd to undertake a fauna and flora assessment study as part of an Environmental Impact Assessment (EIA) process for a proposed business and residential development (PBRD), within the Thaba Chweu Local Municipality in the Mpumalanga Province.

The purpose was to assess the fauna and flora status and ecological sensitivity of the study area. A site visit was undertaken on 07 February 2019.

1.1. TERMS OF REFERENCE

The terms of reference for the current study were as follows:
- To undertake a vegetation survey on site and provide species lists;
- To identify possible Red Data floral and faunal species and important habitat that may occur within the proposed site;
- To provide a desktop faunal survey of the area;
- To provide an indication of the relative conservation importance and ecological function of the study area in terms of flora and fauna; and
- Identify measures to reduce the impacts, and/or measures to optimise or enhance possible benefits to biodiversity.

1.2. LIMITATIONS AND ASSUMPTIONS

The major potential limitation associated with the project is the narrow temporal window allocated for sampling. Ideally, a site should be visited more than once during different seasons to ensure that the full complement of plant and animal species present are captured. However, this is rarely possible due to time and cost constraints and therefore, the representation of the species sampled at the time of the site visit should be critically evaluated.

Another limitation is that regarding some of the plant species that have no foliage above ground, and for all practical purposes disappear during the dry season when they are dormant, and only reappear after the annual spring rains, some birds migrate; insects and small mammals are inactive, and bullfrogs are buried deep in winter. The majority of threatened

plant species are extremely seasonal only flowering at specific times during the summer months (November-March). Some of the more rare and cryptic plant species may have been overlooked due to their inconspicuous growth forms. Many of the rare and endangered succulent species can only be distinguished (in the field) from their very similar relatives based on their reproductive parts. These plants flower during different times of the year. Multiple visits to any site during the different seasons of the year could therefore increase the chances to record a larger portion of the total species complex associated with the area. The majority of threatened faunal species are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons/ years. No specialist faunal surveys have been historically conducted at this site. The presence of threatened species on site is assessed mainly on habitat availability and suitability as well as desk research (literature, personal records). Most of the red data atlases are outdated as well as inadequate coverage of some areas by the atlases (SAFAP, SARCA).

The site visit took place in summer, the lists of fauna and flora for the site were based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

1.3. BACKGROUND AND LEGAL FRAMEWORK

Environmental Impact Assessments (EIAs) are required in South Africa in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) and its' associated EIA Regulations. Developments likely to have a major impact require scoping and EIA, and those likely to have a lesser impact require a Basic Assessment.

If natural vegetation will be affected by a proposed development, a specialist botanical survey should be commissioned as part of the environmental assessment process. If a subpopulation of a species of conservation concern is found to occur on the proposed development site, it would be one indicator that the proposed activity is likely to result in loss of biodiversity, bearing in mind that loss of subpopulations of these species will either increase their extinction risk or may in fact result in their extinction. The detection of a threatened species on a site during an environmental assessment should result in an Environmental Authorisation from the competent authority that avoids, mitigates, remedies or offsets loss of habitat for the species in question. The competent authority may also refuse authorisation for the proposed activity.

1.4. GENERAL REGULATORY REQUIREMENTS

Specialists' reports must comply with Appendix 6 of Government Notice No. 326 of 07 April 2017 as published under sections 24(5), and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and whereby the following are to be included:

- The details of:
    - o The specialist who prepared the report; and
    - o The expertise of that specialist to compile a specialist report including curriculum vitae.
- A declaration that the specialist is independent in a form as may be specified by the competent authority;
- An indication of the scope of, and the purpose for which, the report was prepared;
- The date and season of the site investigation and the relevance of the season to the outcome of the assessment;
- A description of the methodology adopted in preparing the report or carrying out the specialised process; the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;
- An identification of any areas to be avoided, including buffers;
- A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;
- A description of any assumptions made and any uncertainties or gaps in knowledge;
- A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;
- Any mitigation measures for inclusion in the EMPR;
- Any conditions for inclusion in the environmental authorisation;
- Any monitoring requirements for inclusion in the EMPR or environmental authorisation;
- A reasoned opinion-
    - o As to whether the proposed activity or portions thereof should be authorised;
    - o If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPR, and where applicable, the closure plan;
- A description of any consultation process that was undertaken during preparation of the specialist report;
- A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

Any other information requested by the competent authority.

1.5. GENERAL LOCATION AND LANDUSE

The proposed site is located approximately 6 km from the Mashishing (Lydenburg) city centre, within the Thaba Chweu Local Municipality in the Limpopo Province (Figure 2). The general view of the proposed site is illustrated in Figure 1 below.

The area of concern has the following land uses:

- Urban areas to the north east and west;
- Open space;
- Old lands to the north and west; and
- A lodge and church to the south.
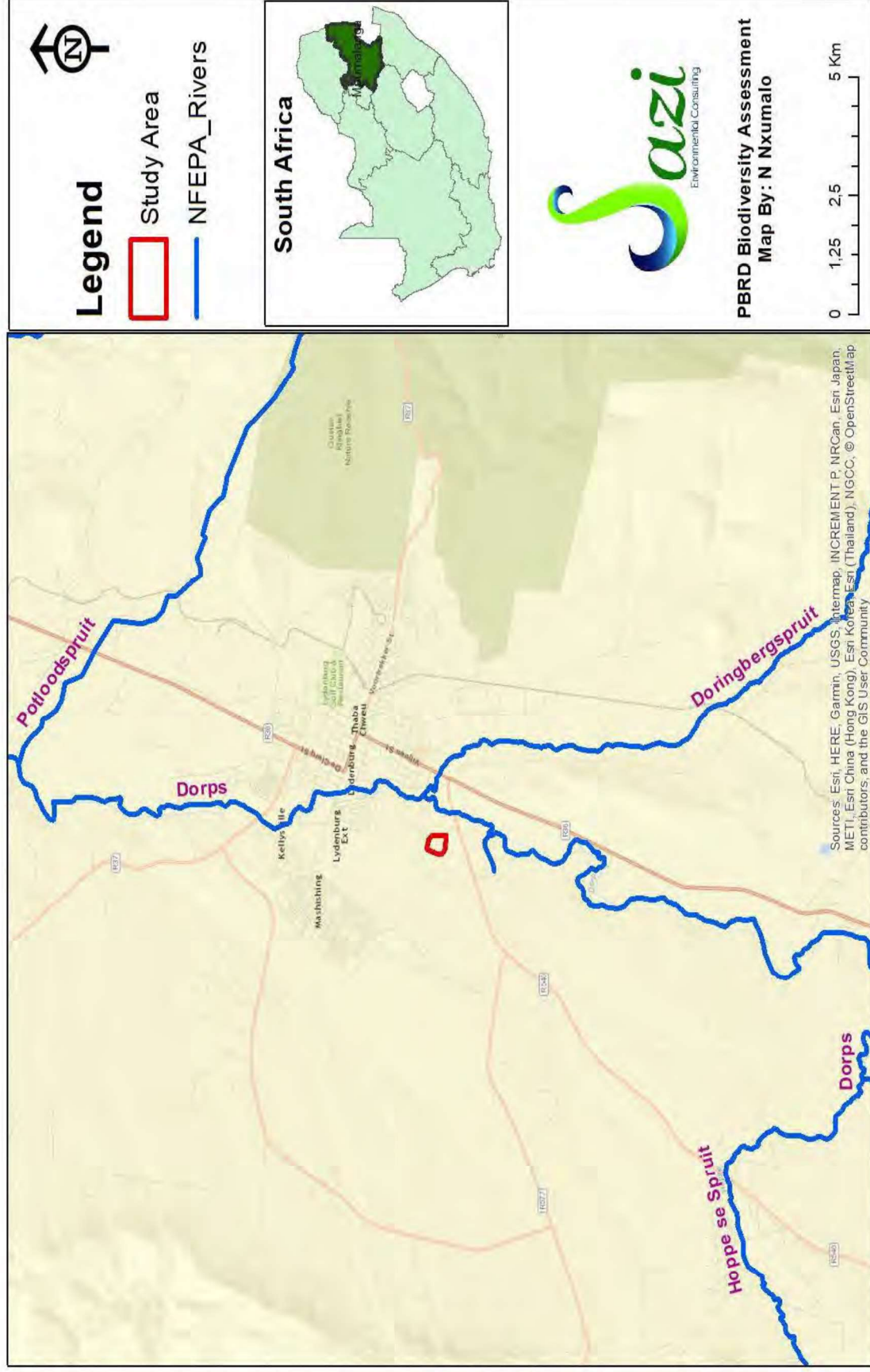

Figure 1: General view of the site

Figure 2: Location of the proposed project

2. METHODOLOGY

DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study include the following:

2.1.1. VEGETATION

Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford, 2006) as well as the National List of Threatened Ecosystems (2011), where relevant. Critical Biodiversity Areas (CBA's) for the site and surroundings were extracted from the Mpumalanga Biodiversity Sector Plan (MBSP). Information on plant and animal species recorded for the project site were extracted from the SABIF/SIBIS database hosted by SANBI as well as the Animal Demographic Unit database. The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2014). Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy (NPAES) (2008).

The following books (but not limited to) were used to identify flora species observed on site:
- Red list of South African Plants (Raimando et al., 2009);
- Guide to grasses of Southern Africa (Oudtshoorn, 2012);
- Photo guide of wild flowers of South Africa (Manning, 2012);
- Guide to plant families of southern Africa (Koekemoer, Steyn and Bester, 2014); AND
- Field guide to trees of southern Africa (van Wyk and van Wyk, 2013).

2.1.2. FAUNA

Lists of mammals, reptiles and amphibians which are likely to occur on the site were derived based on distribution records from the literature and various spatial databases (SANBI's SIBIS and BGIS databases).
Literature consulted includes Friedmann and Daly (2004) and Stuart & Stuart (2015) for mammals. Sasol Birds of Southern Africa (Sinclair et al., 2011) was used for avifauna identification.

The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site. The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 2014.2 and where species have not been assessed under these criteria, the CITES status is reported where possible.

2.1.3. SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the observed presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

Low – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.

Medium- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.

High – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.

Very High – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

In some situations, areas were also classified between the above categories, such as Medium-High, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories.

2.1.4. CRITICAL BIODIVERSITY AND ECOLOGICAL SUPPORT AREAS

The Mpumalanga Biodiversity Sector Plan (MBSP, 2014) was used to determine the ecological status of the study area. Landscape features associated with ESAs that are essential for the maintenance and generation of biodiversity in sensitive areas and that require sensitive management were incorporated into MBSP. Spatial surrogates included dolomite, rivers, wetlands, pans, corridors for climate change and species migration, ridges and low-cost areas for Mpumalanga.

2.1.5. SITE VISIT

Random 20 × 20 quadrats were set out, species were identified and recorded (Mueller-Dombois & Ellenberg, 1974). Repetitive sampling method was undertaken where three plots were set out in each section of the site. Mammals were identified by visual sightings through random quadrat walks.

During the site visit, all sensitive features present within and around the area of concern were noted and recorded. A full plant species list for the site was developed and all fauna observed were recorded. Mammals on site were also identified by burrows, droppings and nests/roost. The presence of sensitive habitats, sites with rare/ endangered within the site were noted in the field and recorded on a GPS.

Searches were undertaken specifically for Red List plant species (according to SANBI and GDARD) and any other species with potential conservation value. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute. For all threatened plant species that may occur along the proposed site, a rating of the likelihood of it occurring is given as follows:

- **LOW**: no suitable habitats occur on site / habitats on site do not match habitat description for species;
- **MEDIUM**: habitats on site match general habitat description for species (e.g. grassland), but detailed microhabitat requirements (e.g. rocky grassland on shallow soils overlying dolomite) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;
- **HIGH**: habitats found on site match very strongly the general and microhabitat description for the species (e.g. rocky grassland on shallow soils overlying dolomite);
- **DEFINITE**: species found on site.

All exotic species categorised as alien invaders or weeds (as listed in Alien and Invasive Species List, 2014) were recorded.

3. RESULTS

3.1. VEGETATION

The proposed site is located within the Grassland Biome of South Africa (Mucina & Rutherford, 2006) with approximately two percent currently conserved (Le Roux, 2002). The study area falls within the Lydenburg Thornveld within the Mesic Highveld Grassland Bioregion (Mucina and Rutherford, 2006) (Figure 3). Lydenburg Thornveld is currently listed as Vulnerable. The conservation target is 27% and 2% is protected (Gustav Klingbiel and Ohrigstad Dam Nature Reserves). A total of 22% of this unit has been transformed mainly by dryland and irrigated cultivation. Rainfall is generally too low for aforestation or plantations. Erosion from very low (45%), low (26%) and moderate (18%) (Mucina & Rutherford 2006).

Dominant and important taxa found in the Lydenburg Thornveld includes the following:

Graminoids

Aristida canescens, Aristida congesta, junciformis, Cymbopogon caesius, Dihetropogon amplectens, Heteropogon contortus, Themeda triandra, Hyparrhenia hirta, Cynodon dactylon, Panicum natalensis, Panicum maximum, Melinis repens, Setaria sphacelata, Digitaria sanguinalis, Eragrostis curvula, Eragrostis racemosa.

Herbs

Acanthospermum rigidum, Achyranthes aspera var. sicula, Conyza bonariensis, Crotalaria lotoides, Cyperus esculentus, Mariscus congestus, Pseudognaphalium luteo-album, Richardia brasiliensis, Solanum panduriforme, Sonchus wilmsii, Tagetes minuta, Verbena bonariensis, Wahlenbergia caledonica, Nidorella hottentotica, Vernonia oligocephala, Zornea milneana, Senecio inornatus, Merremia tridentata, Dicerocaryum eriocarpum, Rubus sp., Asclepias fruticosa, Helichrysum rugilosum, Hypoxis rigidula var. pilosissima, Aloe greatheadii var. davyana, Lantana rugosum; Ipomoea spp.

Trees

Vachellia robusta subsp. robusta, Vachellia karroo, Senegalia caffra, Cussonia transvaalensis, Searsia pyroides, Celtis africana, Combretum erythrophyllum, Dombeya rotundifolia.

Shrubs

Diospyros lycoides subsp. guerkei, Euclea crispa subsp. crispa, Rhemnus prinoides, Senecio microglossus, Lippia javanica, Acacia ataxacantha, Dichrostachys cinerea, Euphorbia clavariodes.

Alien invasive species

Acacia mearnsii*, Opuntia ficus-indica*, Cotoneaster pannosus*, Cotoneaster franchetii*, Populus x canescens, Eucalyptus grandis*, Ipomoea alba*, Ipomoea indica*, Ipomoea purpurea*, Lantana camara*, Melia azedarach*, Jacaranda mimosifolia*, Morus alba*, Ricinus communis*, Robinia pseudoacacia*, Solanum mauritianum*

Red data species

Hypoxis hemerocallidea and suitable habitat for several red listed species within primary thornveld and grassland.
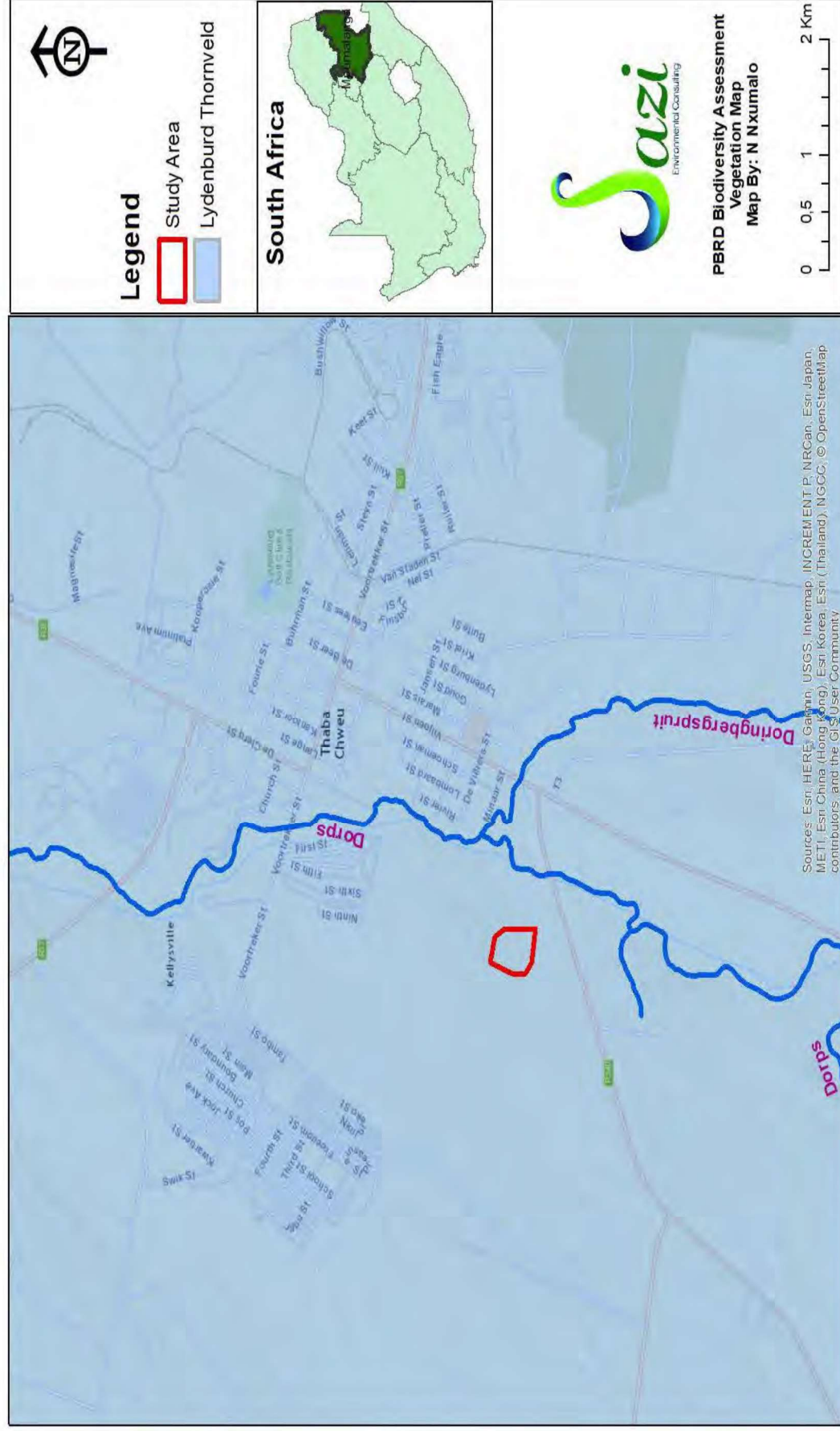
Figure 3: Vegetation cover within the study area

3.2. VEGETATION IDENTIFIED ON SITE

Different plant communities are found within the proposed site and these include but not limited to the following, graminoids, flowers, herbs and very sparsely located trees. Figure 4 below depicts the general overview of the vegetation observed on site. Alien invasive species were also noted on site.
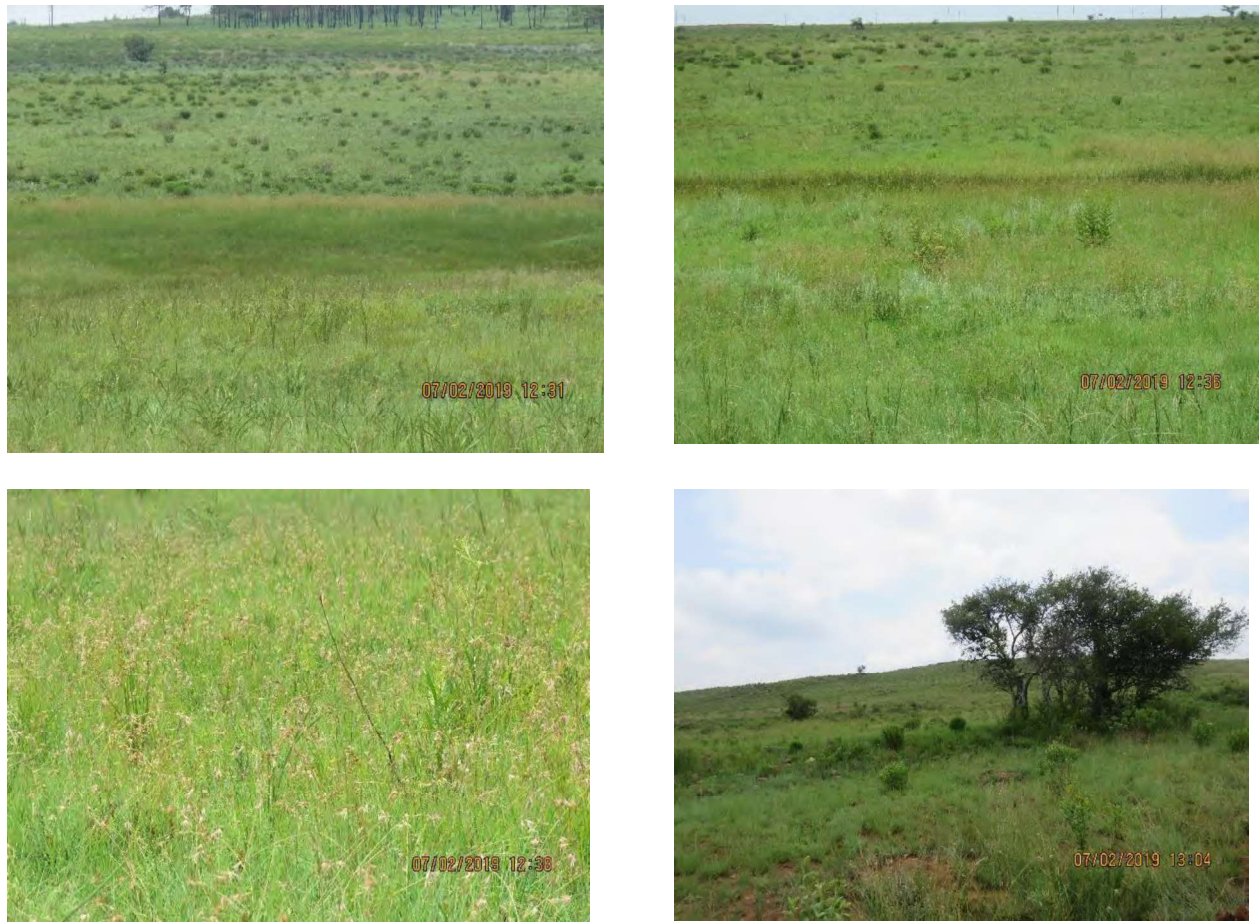

Figure 4: General view of the vegetation on the proposed site

3.3. GRAMINOIDS

The following grass species observed on site included the following: *Themeda trianda,* which dominated the site*, Hyparrhenia tamba, Hyparrhenia hirta, Eragrostis curvula, Cymbopogon excavates* and *Imperata cylindrica.* Table 1 and 2 below show the graminoid species that were observed on site.

Table 1: Species description of the grass species observed on site

Family	Genus	Species	Conservation status
Poaceae	*Themeda*	*triandra*	LC
Poaceae	*Panicum*	*natalensis*	LC
Poaceae	*Hyparrhenia*	*hirta*	LC
Poaceae	*Hyparrhenia*	*tamba*	LC
Poaceae	*Eragrostis*	*curvula*	LC
Poaceae	*Eragrostid*	*racemosa*	LC
Poaceae	*Imperata*	*cylindrica*	LC
Poaceae	*Cymbopogon*	*excavates*	LC
Poaceae	*Heteropogon*	*contortus*	LC

LC – Least Concern

Table 2: Some of the grass species observed on site

	Hyparrhenia hirta
	Themeda triandra

	Imperata cylindrica (foreground)

3.4. MEGAGRAMINOIDS

The following megagraminoids were observed at the edge of the site: *Phragmites australis*, *Arundo donax* and *Cyperus rotundus*. Table 3 and Table 4 below show the megagraminoid species that were observed on site.

Table 3:Megagraminoid species observed on site

Family	Genus	Species	Conservation Status
Poaceae	*Phragmites*	*australis*	LC
Cyperaceae	*Cyperus*	*immensus*	LC
Cyperaceae	*Cyperus*	*rupestris*	LC
Poaceae	*Arundo*	*donax*	AI

LC – Least Concern

AI – Alien invasive

Table 4:Some of the megagraminoids observed on site

	Phragmites australis
	Cyperus rotundus (foreground)

3.5. TREES AND SHRUBS

The proposed development site was completely void of trees, with two individuals of the *Celtis africana* tree species located within the surrounds of the site. Shrubs species identified on site included the following: *Euclea crispa subsp. Crispa*, *Diospyros lycioides*, *Lippia javanica* and *Populux canescens*. Table 5 below lists the shrubs observed on site while Table 6 illustrates some of the trees and shrubs that were observed on site.

Table 5: Species description of trees and shrubs observed on site

Family	Genus	Species	Conservation status
Cannabaceae	*Celtis*	*africana*	LC
Verbenaceae	*Lippia*	*javanica*	LC
Ebeneceae	*Diospyros*	*lycioides*	LC
Ebeneceae	*Euclea*	*crispa*	LC
Salicaceae	*Populus x*	*canescens*	AI

LC – Least Concern

AI – Alien invasive

Table 6: Some of the trees and shrubs observed on site

	Celtis africana
	Lippia javanica

	Diospyros lycioides

3.6. FLOWERS AND HERBS

The herb and flower species identified on site included the following: *Verbena oligocephala, Verbena bonariensis Senecio macroglossus, Euphorbia clavarioides, Cucumis africanus, Berkheya speciosa, Taraxum officinale, Ipomoea purpurea, Ipomoea indica, Lantana camara, Helichrysum ruderale, Hypoxis rigidula (*dominant on site*) and Nidorella resedifolia.* Table 7 provides a list of the flowers and herbs observed on site together with their conservation status. Table 8 below illustrates of some flowers and herbs that were observed on site.

Table 7: Species description of flowers and herbs observed on site

Family	Genus	Species	Conservation status
Verbenaceae	*Verbena*	*oligocephala*	LC
Verbenaceae	*Verbena*	*bonariensis*	AI
Asteraceae	*Senecio*	*microglossus*	LC
Euphorbiaceae	*Euphorbia*	*clavarioides*	LC
Cucurbitaceae	*Cucumis*	*africanus*	LC

Asteraceae	*Taraxum*	*officinale*	LC
Asteraceae	*Berkheya*	*speciosa*	LC
Convolvulaceae	*Ipomoea*	*purpurea*	AI
Convolvulaceae	*Ipomoea*	*indica*	AI
Ortheziidae	*Lantana*	*camara*	AI
Asteraceae	*Helichrysum*	*ruderale*	LC
Hypoxidaceae	*Hypoxis*	*rigidula*	LC
Asteraceae	*Nidorella*	*resedifolia*	LC

AI – Alien invasive

LC – Least Concern

Table 8: Some of the flowers and herbs observed on site

	Euphorbia clavarioides
	Vernonia oligocephala

	Hypoxis rigidula
	Lantana camara

3.7. DECLARED WEEDS AND INVADERS

Concern is growing over the way in which alien/exotic plants are invading large areas within South Africa. Invasive species are a major threat to the ecological functioning of natural systems as well as the productive use of the land and should ideally be removed if they are serving no ecological function. In terms of the amendments to the regulations under the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014, landowners are legally responsible for the control of invasive alien plants on their properties. There are currently 198 alien species listed as declared weeds and invaders, and have been divided into three categories (Henderson, 2001):

- Category 1 plants are prohibited and must be controlled;
- Category 2 plants (commercially used plants) may be grown in demarcated areas proving that there is a permit and that steps are taken to prevent their spread; and
- Category 3 plants (ornamentally used plants) may no longer be planted; existing plants

may remain, as long as all reasonable steps are taken to prevent the spreading there of, except within the flood line of watercourses and wetlands.

The area for the proposed development housed some alien invasive plants. Table 9 below gives a list of alien invasive species observed on site together with their invader category.

Table 9: Alien Invasive plants identified on site

Scientific name	Common name	Invader Category
Arundo donax	Giant reed	Category 1
Verbena bonariensis	Tall verbena	Category 1b
Populus x canescens	Grey poplar	Category 2
Ipomoea purpurea	Morning glory	Category 1b
Ipomoea indica	Blue morning glory	Category 1
Lantana camara	Wild sage	Category 1b

3.8. MEDICINAL PLANTS

Medicinal plants are plants which are used in herbalism and thought to have certain extractable/compound in their leaves, stems, flowers and fruit for medicinal purposes. These extracts are used as inputs in the pharmaceutical, nutraceutical, insecticide and other chemical industries. South Africa is home to a diversity of cultural groups all of which utilise plant species for some   purpose. A number of these species are highly prized for their traditional healing properties; especially for "*muthi*" (they have ethno-medicinal value). An estimated 28 million people in South Africa consume about 19 500 tonnes of medicinal plant material per annum (Mander, 1998).

Some of the following medicinal plants were observed on site during the assessment:

- *Hypoxis rigidula* - The rootstock is traditionally used to treat a wide variety of ailments. Weak infusions and decoctions of the corm are used as a strengthening tonic and during convalescence, and against tuberculosis and cancer;
- *Lippia javanica* - This herb is also said to be affective against fever, especially in cases of malaria, influenza, measles, and as a prophylactic against lung infections. The smoke from the herb has proven to be affective, if inhaled, against asthma, chronic coughs and pleurisy;

- *Cucumis africanus* - In South African traditional medicine the fruit, leaf or root of *C. africanus* is used as an emetic, purgative or enema for various ailments. The boiled leaf is used as a poultice. The plant has also been used as an animal medicine;
- *Euphorbia clavarioides* - *It is used in the preparation of bird lime as well as relieving swollen feet and treating leprosy*; and
- *Taraxum officinale* - Dandelion is used for loss of appetite, upset stomach, intestinal gas, gallstones, joint pain, muscle aches, eczema, and bruises. Dandelion is also used to increase urine production and as a laxative to increase bowel movements. It is also used as skin toner, blood tonic, and digestive tonic.

3.9. FAUNA (VERTEBRATES AND INVERTEBRATES)

The presence of fauna was dependent and based primarily on evidence of their occurrence (droppings, burrows, nests, spoor and visual confirmation). Mole hills, termite mounds (*Trinervitermes haberlandii)*, feathers and nests were observed on site (Figure 5).

Termite mound

Feathers

Animal burrow

Figure 5: Showing evidence of fauna on the proposed site

4. MAMMALS

Mpumalanga and Limpopo Provinces are faunally diverse with approximately 163 mammal species consisting of 98 smaller and 64 larger species. Anthropogenic land conversion and habitat degradation and fragmentation mainly due to agricultural and mining activities are major threats to the continued existence of endemic and threatened fauna in the Mpumalanga province.

No small mammal trappings were conducted due to time constraints and the limitations that the results from single night or brief field surveys would pose. The brief fieldwork was augmented with previous surveys in similar habitats as well as published data. No mammal species were observed on site. Those that may occur within the study area, based on available distribution records and known habitat requirements, are listed in the (table 10). These were downloaded from the Animal Demographic Unit website, http://mammalmap.adu.org.za/ on 15 February 2019 for the quarter degree square (qds) 2530AB in which the proposed site occurs.

Table 10:Mammal species that may occur on site

Scientific name	Common name	Threatened status
Redunca arundinum	Southern reedbuck	LC
Papio ursinus	Chacma baboon	LC
Epomophorus sp.	Epauletted fruit bats	LC

4.1. REPTILES

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe during field surveys. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Due to human presence in the surrounding areas coupled with increased habitat destruction and other disturbances are all causal factors in the alteration of reptile species occurring within the proposed site and surrounding areas.

Several termite mounds, *Trinervitermes haberlandii*, were observed within the grassland vegetation units. Termite mounds offer important refuges for numerous frog, lizard and snake species. Large numbers of species of mammal, birds, reptiles and amphibians feed on the emerging winged termites. These mass emergences coincide with the first heavy summer rains and the emergence of the majority of herpetofauna. Moribund termite mounds also provide a nesting site for snakes (Striped Harlequin Snake, Yellow Bellied House Snake), lizards (varanids) and refuge habitats for several smaller mammals (shrews) and frogs.

The indiscriminate killing of all snake species as well as the illegal collecting of certain species for private and the commercial pet industry reduces reptile populations especially snake populations drastically. The frequent burning of the grassland and bushveld vegetation will have a high impact on remaining reptiles. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas increasing predation risks.

No reptile species was observed during the field assessment. Those that may occur within the study area, based on available distribution records and known habitat requirements, are listed in the (table 11). These were downloaded from the Animal Demographic Unit website, http://sarca.adu.org.za on 15 February 2019 for the quarter degree square (qds) 2530AB in which the proposed site occurs.

Table 11: Reptile species that may occur on site

Scientific name	Common name	Threatened status
Agama atra	Southern rock agama	LC
Philothamnus semivariegatus	Spotted bush snake	LC
Trachylepis punctatissima	Speckled rock skink	LC
Psammophis mossambicus	Olive grass snake	LC
Dispholidus typus virdis	Northern boomslang	LC
Duberria lutrix lutrix	South African slug-eater	LC
Trachylepis varia sensu lato	Common variable skink complex	LC

4.2. AMPHIBIANS

Amphibian surveys by Jacobsen (1989), as well as recent and current surveys suggest that over 50 species of amphibians currently occur in the Provinces of Limpopo and Mpumalanga. The present study concentrated mainly on Red Data species and species that are threatened or have relatively restricted distributions. Eight species are considered as important for setting conservation priorities in Mpumalanga: *Vandijkophrynus* (Bufo) *gariepensis nubicolus* (Karroo toad), *Hadromophryne* (Heleophryne) *natalensis* (Cascade Frog/Natal Ghost Frog), *Hemisus guttatus* (Spotted shovel-nosed Frog), *Hyperolius semidiscus* (Yellow-striped Reed Frog); *Strongylopus wageri* (Plain Stream Frog), Giant Bullfrog (*Pycicephalus adspersus*), Greater Leaffolding Frog (*Afrixalis fornasinii*) and Whistling Rain Frog (*Breviceps sopranus*).

The amphibian populations in Mpumalanga are faced with several environmental threats. Habitat destruction and alien vegetation resulting in fragmentation of populations is probably

the major threats facing all frog species. Another threat to the continued survival of these frog species, is the damming of rivers, streams and wetlands for various developments.

No actual survey was undertaken due to extreme time constraints for an adequate herpetological survey. Comprehensive herpetological surveys can only be undertaken throughout the duration of the wet season (November-March). It is only during this period that accurate frog lists can be compiled.

Amphibians that may occur within the study area, based on available distribution records and known habitat requirements, are listed in (table 12). These were downloaded from the Animal Demographic Unit website, http://sarca.adu.org.za on 15 February 2019 for the quarter degree square (qds) 2530AB in which the proposed site occurs.
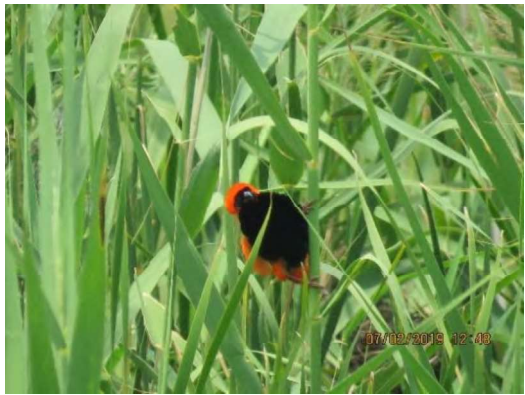
Table 12: Amphibians that may occur on site

Scientific name	Common name	Threatened status
Amietia delalandii	Delalande's River Frog	LC

4.3. AVIFAUNA

The following avifauna species were observed on site: *Vanellus coronatus, Vanellus armatus, Euplectes progne, Euplectes orix,* and evidence of *Numida meleagris* (feathers) (Table 13). The following Table depicts avifauna species occurring on site:

Table 13:Some of the avifauna species observed on site

	Euplectes orix
	Euplectes progne

Numida meleagris (feathers)

Bird species that may occur within the study area, based on available distribution records and known habitat requirements, are listed in the Table 14. These were downloaded from the Animal Demographic Unit website, http://vmus.adu.org.za/vm_view_db.php on 15 February 2019 for the quarter degree square (qds) 2530AB in which the proposed site occurs.

Table 14: Birds that may occur on site

Scientific name	Common name	Threatened status
Euplectes albonotatus	White-winged widow bird	LC
Turdus libonyanus	Kurrichane thrush	LC
Psophocichla litsipsirupa	Groundscraper	LC
Accipiter tachiro	African Goshawk	LC
Promerops gurneyi	Gurney's sugarbird	LC
Anthus similis	Long-billed pipit	LC
Lophaetus occipitalis	Long-crested eagle	LC
Vidua macroura	Pin-tailed whydah	LC
Prinia subflava	Tawny-flanked prinia	LC
Parus niger	Southern black tit	LC
Campephaga flava	Black cuckooshire	LC
Telophorus sulfureopectus	Orange-breasted bush shrike	LC

4.4. INVERTEBRATES

The following invertebrate species were observed on site during the time of assessment: *Danus chrysippus orientis, Acrea horta, Junonia hierta cabrene, Lampides boeticus.*

Table 15: Invertebrates observed on site

	Lampides boeticus
	Junonia hierta cabrene

4.5. INSECTS

A number of species of the Elegant grasshopper (*Zonocerus elegans*) were observed on site (Figure 6).

Figure 6: Insects observed on site

4.6. RED DATA SPECIES

According to the IUCN Red Data database, threatened species are species that are facing a high risk of extinction. Any species classified in the IUCN categories of Critically Endangered, Endangered or Vulnerable is a threatened species (Figure 6).

Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the following categories:

- **Extinct in the Wild (EW**) - A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

- **Regionally Extinct (RE)** - A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.

- **Near Threatened (NT)** - A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

- **Critically Rare -** A species is Critically Rare when it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.

- **Rare** – A species is rare when species are uncommon, scarce or infrequently encountered.
- **Declining**- A taxon is declining when species are decreasing in numbers.
- **Data Deficient** - A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
- **Insufficient Information** (DDD) - A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
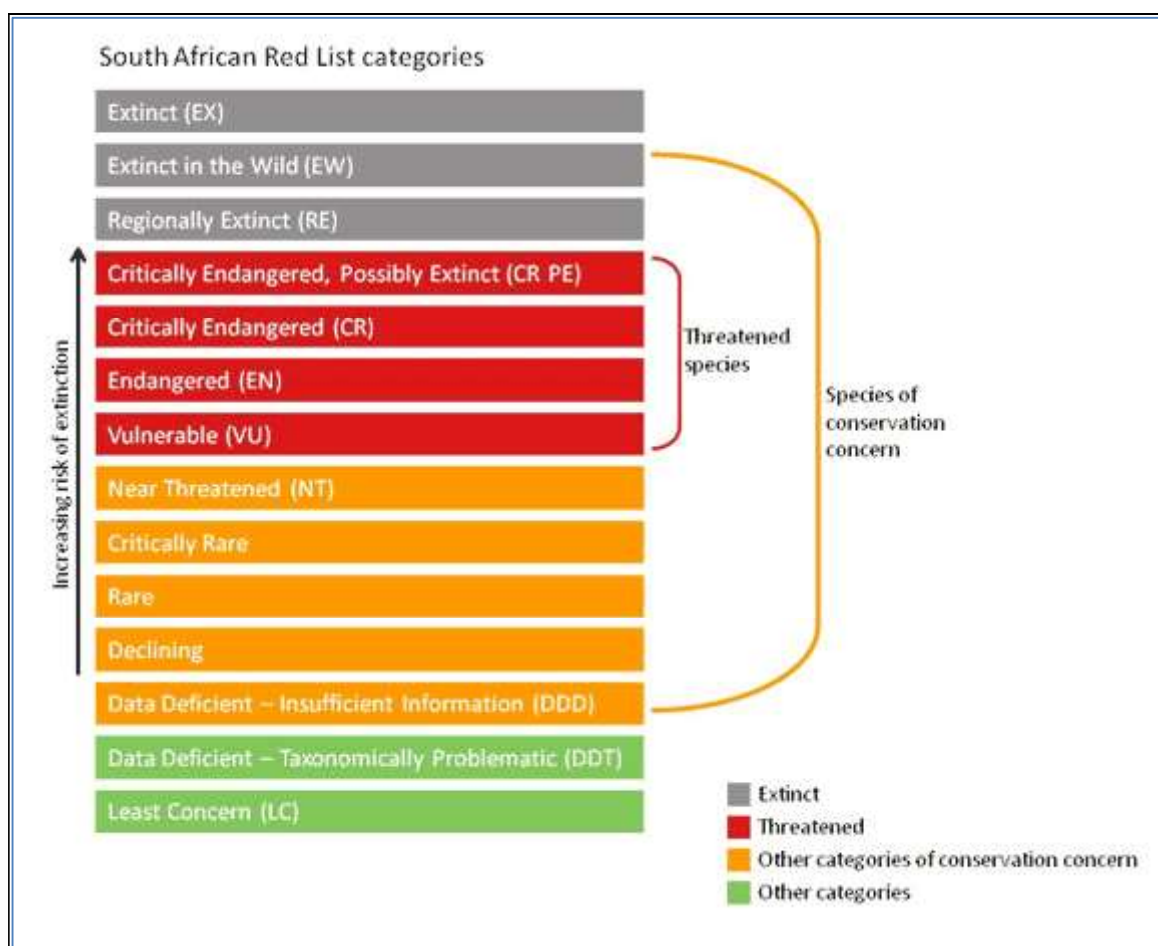

Figure 7: IUCN Red data categories

No red data species were observed on site during the time of assessment. In addition, no species of conservation value were identified on site. Table 16 lists the threatened vegetation species found in the Mpumalanga Province.

Table 16: List of threatened vegetation in the Mpumalanga Province

Family	Species	Status
ACANTHACEAE	*Dyschoriste perrottetii*	Vulnerable
AMARYLLIDACEAE	*Crinum macowanii*	Rare
ANACARDIACEAE	*Searsia sekhukhuniensis*	Rare
APOCYNACEAE	*Brachystelma stellatum*	Vulnerable
AQUIFOLIACEAE	*Ilex mitis* var. *mitis*	Declining
ARACEAE	*Zantedeschia pentlandii*	Vulnerable
ASPHODELACEAE	*Aloe cooperi subsp. cooperi*	Declining
ASPHODELACEAE	*Aloe integra*	Vulnerable
ASPHODELACEAE	*Aloe reitzii*	Near Threatened
ASPHODELACEAE	*Kniphofia triangularis subsp. obtusiloba*	Vulnerable
CELASTRACEAE	*Lydenburgia cassinoides*	Near Threatened
HYACINTHACEAE	*Eucomis vandermerwei*	Vulnerable
HYACINTHACEAE	*Merwilla plumbea*	Near Threatened
HYPOXIDACEAE	*Hypoxis hemerocallidea*	Declining
IRIDACEAE	*Gladiolus rufomarginatus*	Rare
ORCHIDACEAE	*Disa extinctoria*	Near Threatened
ORCHIDACEAE	*Schizochilus lilacinus*	Rare
PASSIFLORACEAE	*Adenia wilmsii*	Endangered
RHIZOPHORACEAE	*Cassipourea malosana*	Declining
THYMELAEACEAE	*Gnidia variabilis*	Vulnerable

5. SENSITIVITY OF THE OVERALL AREA

5.1. MPUMALANGA BIODIVERSITY SECTOR PLAN

The Mpumalanga province has developed the Mpumalanga Biodiversity Sector Plan (MBSP). The main purpose of a biodiversity sector plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land-use and development planning, environmental assessments and authorisations, and natural resource management. A biodiversity sector plan achieves this by providing a CBA map (or maps) of terrestrial and freshwater areas that are important for conserving biodiversity pattern and ecological processes – these areas are called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). According to the MBSP, CBAs are areas that are required to meet biodiversity targets for species, ecosystems or ecological processes. Ecological Support Areas are defined as areas that are not essential for meeting biodiversity targets, but

that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services.

The proposed area of concern is located within an important and necessary area (Figure 8). This means that even though no red data or threatened species were observed during the time of assessment, due diligence and care must be undertaken during construction.
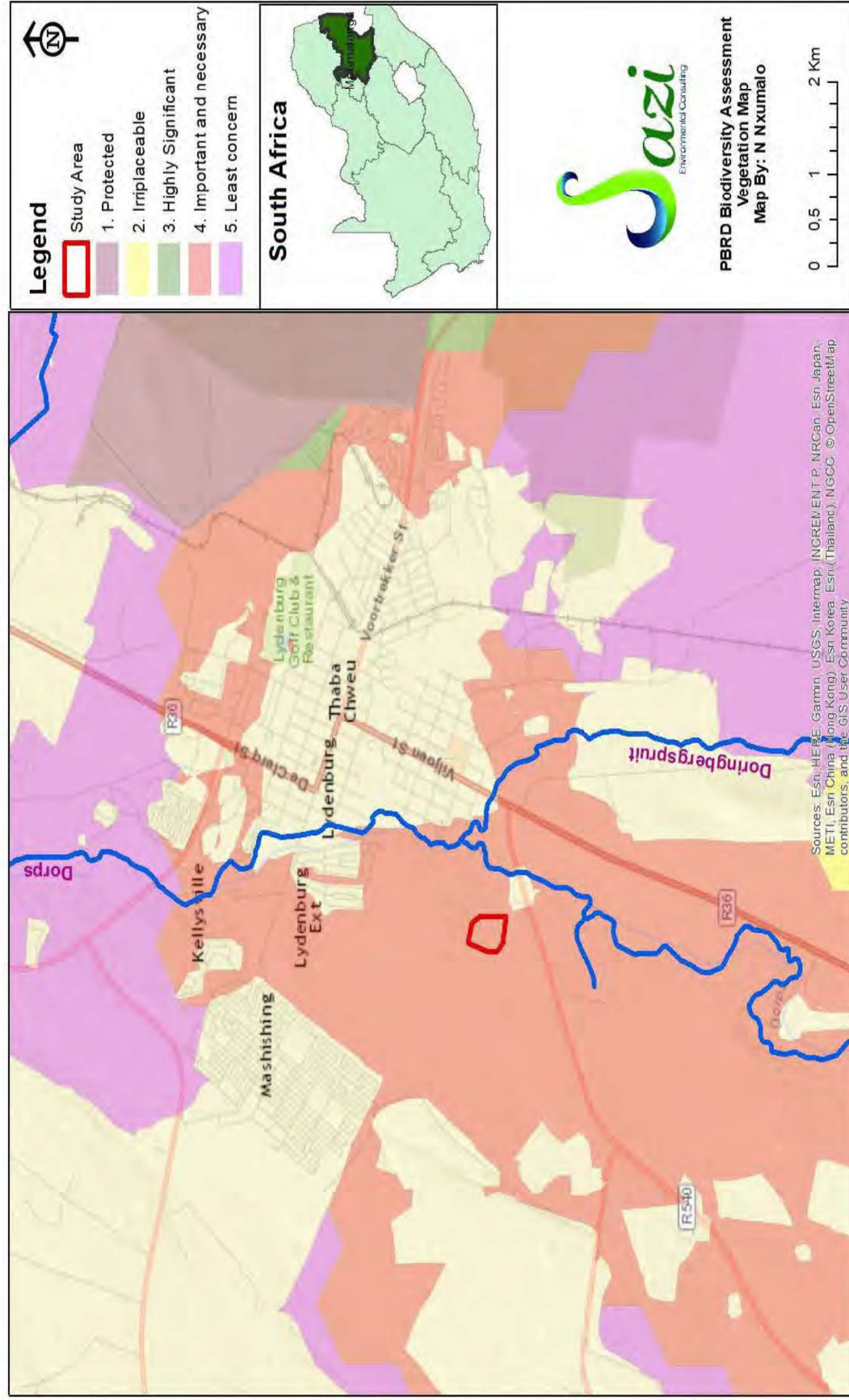
Figure 8: Proposed development lies within an important area

5.2. THREATENED ECOSYSTEM

There are no threatened ecosystems within the study area (Figure 9). The study area is also far from ecological corridors (Figure 10).
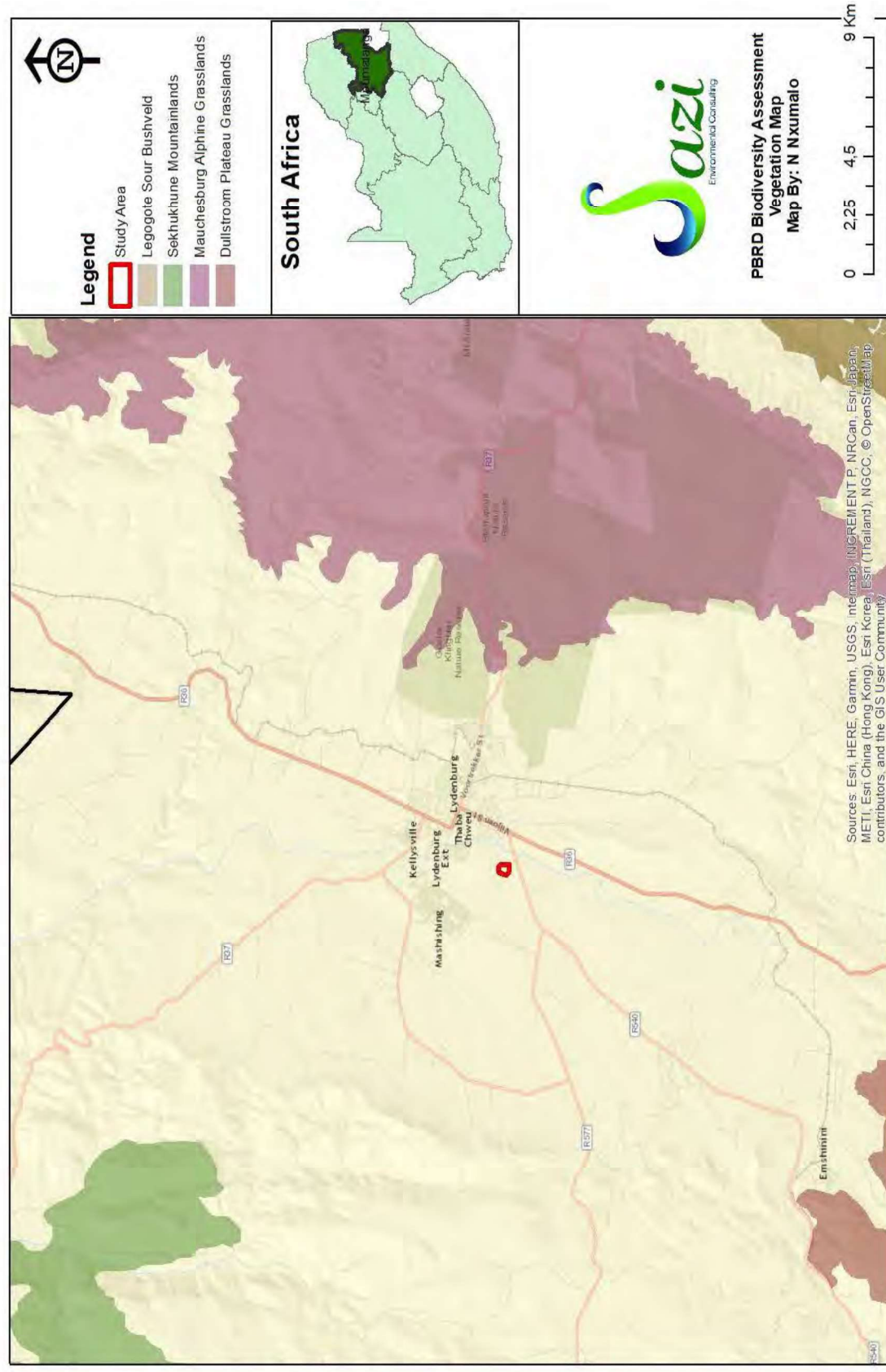
Figure 9: Ecosystem status within the assessment area
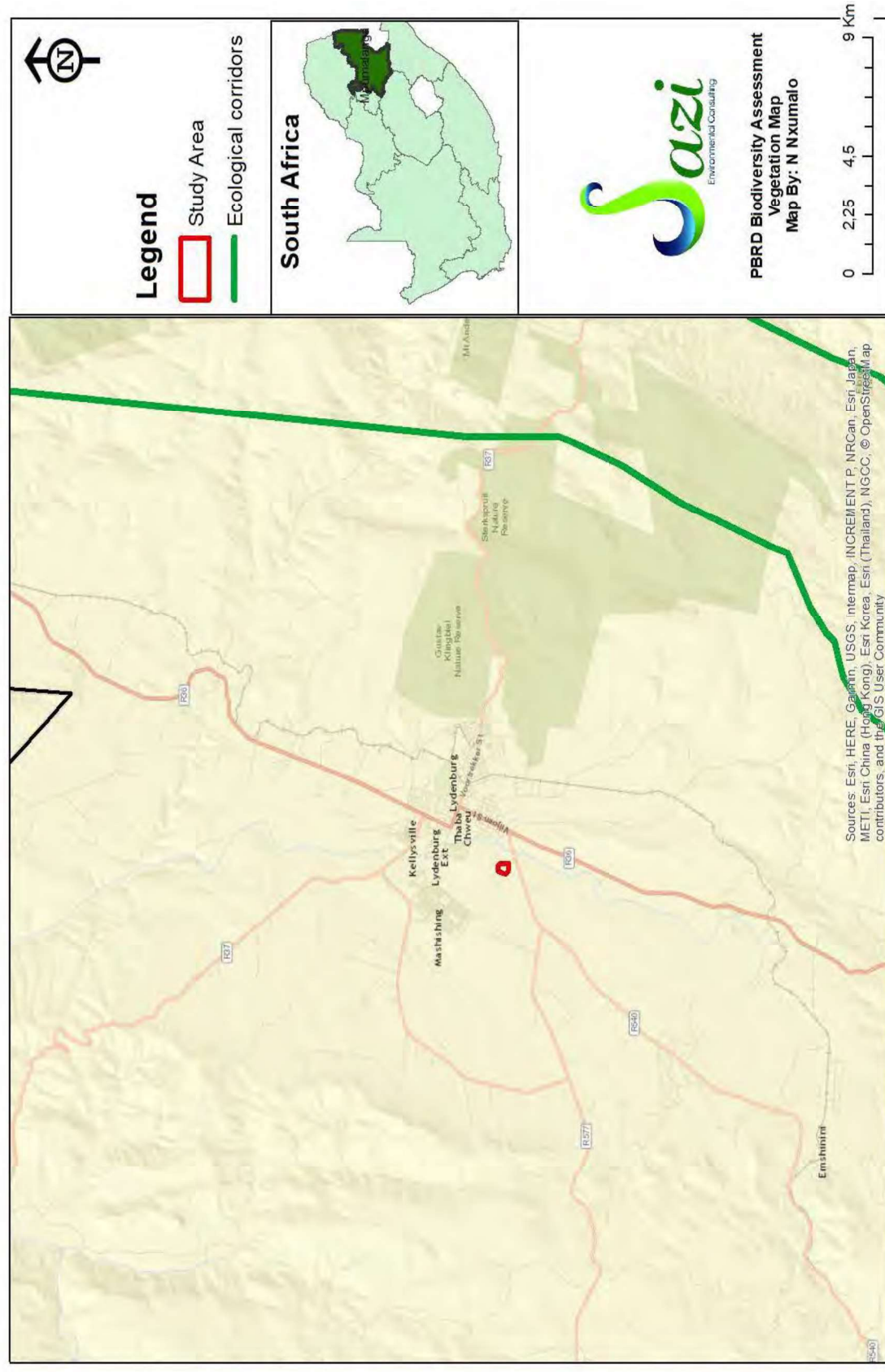
Figure 10: Ecological corridors in relation to the study area

5.3. SENSITIVE AREAS WITHIN ASSESSMENT SITE

Even though no red data species or species of conservation concern were identified on site during the time of assessment, the site can be regarded as **Medium** sensitivity (Figure 11) for the following reasons:

- The site is located within the Vulnerable Lydenburg Thornveld Vegetation;
- There are wetland areas within 500m of the site but not on the site itself;
- The majority of the surrounding areas of the site have not been developed; and
- There is a river flowing in close proximity to the site.

Figure 11: Sensitivity of the study area

6. IMPACT RISK ASSESSMENT

Nature is the bedrock of humankind as it provides us with many services that are essential for our survival. These services can be best provided when the natural environment is in an unaltered state. However, development is an inevitable part of human development but even so, prior to any development the following factors (which determine the significance of impacts of development) should first be determined:
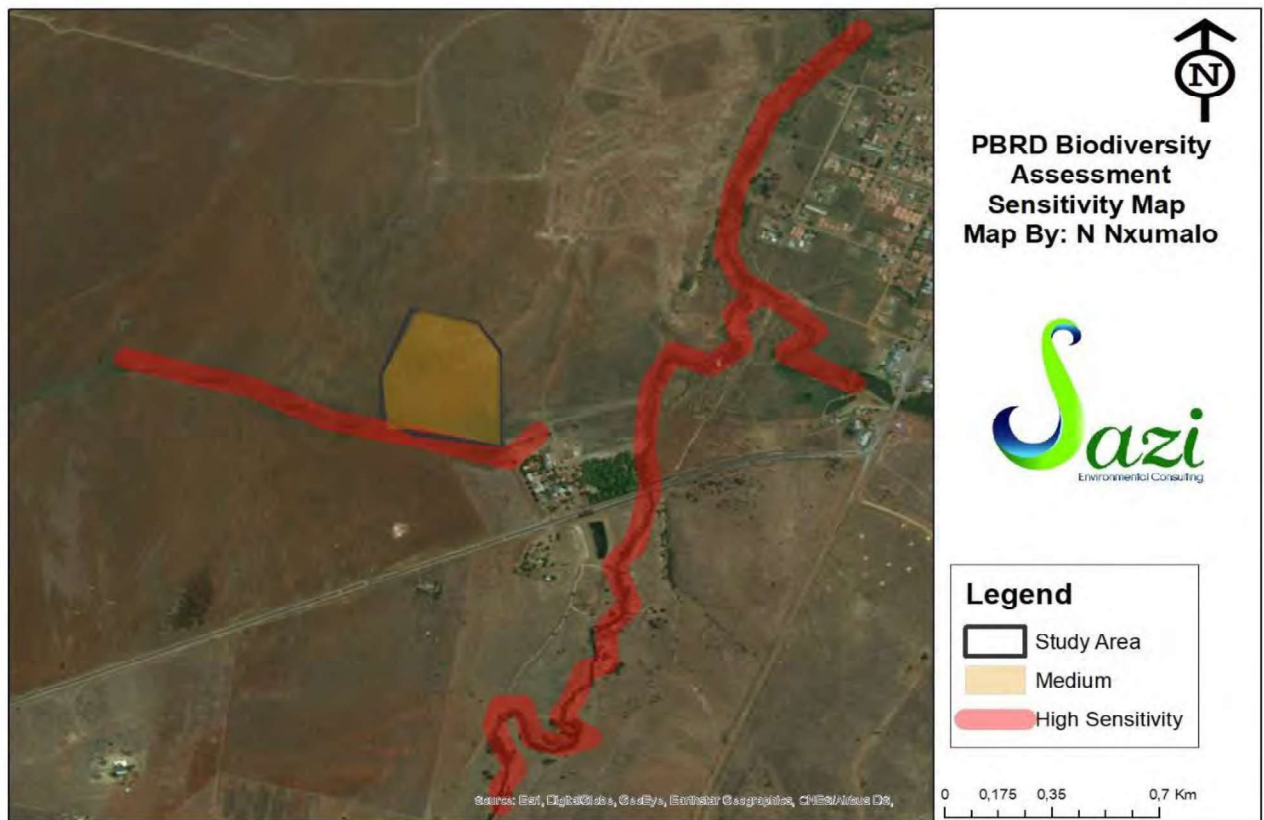
- Extent of the impact;

- Duration of the impact;

- Intensity of the impact;

- Probability of occurrence of the impact; and

- Significance of the impact with or without mitigation.

Once the significance of impacts due to a proposed development have been ascertained, proper and relevant mitigation measures that can decrease the level of impacts can be developed and implemented. However, if the impacts are found to be significant and will have a detrimental effect on threatened ecosystems and vegetation units, then development should not advance.

6.1. POTENTIAL IMPACTS ON VEGETATION

The proposed Pentagon Business and Residential Development activities involve a change of land use and thus often loss of natural habitat, which is the greatest threat to floral species in South Africa. In terms of the principles of NEMA (Section 2), sustainable development requires the consideration of all relevant factors including disturbance of ecosystems and loss of biodiversity, both of which should be avoided or, if that is not possible, should be minimized and remedied.

Special care should be taken not to damage or remove any such species unless necessary. Individuals of protected species within the development footprint, if found, should be translocated to a safe area on the property. A permit obtainable from the Provincial Nature

Conservation office in the relevant government department is required before any protected species may be interfered with.

Potential ecological impacts resulting from the development and operation of the project would stem from a variety of different activities and risk factors associated with the construction and operational phases of the project.

6.2. IMPACT ASSESSMENT CRITERIA

The assessment of possible impacts during the various stages of the proposed development was done through the establishment of the following criteria shown in the table below.

Table 17: Impact assessment criteria

DURATION (D)	MAGNITUDE (M)	
5 – Permanent	10 - Very high/do not know	
4 - Long term (ceases with operational life)	8 - High	
3 - Medium term (5-15 years)	6 - Moderate	
2 - Short term (0-5 years)	4 - Low	
1 - Immediate	2 - Minor	
SCALE (S)	**PROBABILITY (P)**	
5 - International	5 - Definite/do not know	
4 - National	4 - Highly probable	
3 - Regional	3 - Medium probability	
2 - Local	2 - low probability	
1 - Site	1- Improbable	
0 - None	0 - None	
SIGNIFICANCE POINTS (SP) = (D+M+S) X P		
HIGH (H) = >60 POINTS		
MODERATE (M) = 30-60 POINTS		
LOW (L) = <30 POINTS		

NO SIGNIFICANCE = 0	
POSITIVE IMPACT	

6.3. IMPACT ASSESSMENT

The Table below illustrates the list of activities that could have impacts on flora and fauna as a result of the proposed development.

Table 18: Impact assessment table for the proposed activity

Impact	Source	Duration	Magnitude	Scale	Probability	Mitigation without mitigation	Significance + mitigation
Loss of protected or rare plant species	Land clearing	Short-Long Term during construction and maintenance	Moderate	Local	Highly probable	Medium-High	Medium
Natural vegetation destruction	Land clearing/vegetation removal	Medium	Moderate	Local	Definite	Medium-High	Medium
Soil loss/soil erosion	Land clearing/vegetation clearing	Medium Term	Moderate	Local	Definite	Medium-Low	Low
Loss of faunal habitat	Land clearing/vegetation clearing	Medium	Moderate	Local	Definite	Medium-High	Medium
Threatened fauna	Increased human presence	Short-Long Term during construction and maintenance	Moderate	Local	Highly Probable	Medium	Low
Alien vegetation encroachment	Clearing of indigenous vegetation for construction purposes	Medium	High	Regional	Highly Probable	Medium	Low

7. MITIGATION OF POTENTIAL IMPACTS DURING CONSTRUCTION

7.1. NATURAL VEGETATION DESTRUCTION AND DISTURBANCE

The removal of vegetation is a consequence of the construction of the proposed development. Storage facilities, disposal and storage of waste has flattened vegetation which has resulted in the destruction of natural vegetation. Mitigation measures recommended include:

- An independent Ecological Control Officer (ECO) should be appointed to supervise the process;
- In this case where construction has commenced, a rehabilitation plan must be in place and implemented;
- The area where construction will take place should be marked off with a fence or any other form of demarcation in order to keep vegetation destruction to minimum and confined to a single area;
- Provision of adequate toilet facilities must be implemented to prevent the possible contamination of ground water in the area. Mobile toilets must be provided in order to minimise unauthorised traffic of construction workers outside of the designated areas;
- All temporary stockpile areas including litter and dumped material and rubble must be removed on completion of construction. All alien invasive plant should be removed from the site to prevent further invasion;
- Make use of existing roads (both vehicles and pedestrians);
- Construction in sensitive areas should be avoided and prohibited;
- Collection of firewood and traditional medicinal plants is strictly prohibited.
- No fires should be allowed; and
- A rehabilitation plan for vegetation should be in place and implemented.

7.2. SOIL EROSION AND RUN-OFF

During the construction phase, vegetation will be removed leaving soil exposed and vulnerable to erosion especially during rain events where run-off will be produced causing sedimentation. The consequence of eroded soil will be alien vegetation encroachment as aliens spread easily in disturbed soil. Mitigation measures recommended include;

- All areas susceptible to erosion must be protected;

- Vegetation removal should be done when construction is about to begin and preferably during the dryer months;

- Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion;

- Only the area to be constructed on should vegetation be removed from; and

- Make use of existing roads.

7.3. ALIEN VEGETATION ENCROACHMENT

Alien vegetation spreads easily on disturbed soil and is likely to occur on the disturbed soil that has been removed and stockpiled. To combat the potential increase of alien vegetation in the area, the following mitigation measures are recommended;

- Alien species (including their seedlings and saplings) identified within the study area should be removed (manually preferably) to prevent their spreading; and

- Monitoring of disturbed areas is essential to combat and mitigate alien encroachment.

8. MITIGATION OF POTENTIAL IMPACTS ON FAUNA DURING THE CONSTRUCTION AND OPERATIONAL PHASE

Fauna present in the area will also be impacted upon during the construction and operational phase of the development. These potential impacts are discussed below together with their recommendations.

8.1. FAUNA MANAGEMENT AND RECOMMENDATIONS

Extensive habitat transformation and degradation (soil erosion) within and immediately adjacent to the proposed alignment should be prevented. Reptile lists require intensive surveys. Reptiles are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons. Most reptile species are sensitive to severe habitat

alteration and fragmentation. The following are recommended mitigation measure for faunal management:

- No termite mounds should be intentionally destroyed. Any lizards, geckos, agamids, monitors or snakes encountered should be allowed to escape to a suitable habitat away from the disturbance;
- No reptile should be intentionally killed or collected during any phase of the project;
- Educational programmes for the contractor's staff must be implemented to ensure that project workers are alerted to the possibility of snakes being found during vegetation clearance. The construction team must be briefed about the management of snakes in such instances. In particular, construction workers are to go through courses to ensure that threatened snakes, such as pythons, are not killed or persecuted when found; and
- No specific recommendations are made for the protection of burrowing red data mammals. Consideration could be given to rescuing the animals where their burrows are found in advance of construction. This is not recommended as a general prescription since the chances of digging out live mammals are small.

9. CONCLUSION

The proposed project site is located within the Lydenburg Thornveld Grassland which is considered to be Vulnerable. The sensitivity of the area was considered to be Medium. No red data species or species of conservation value were observed on site.

Although no sensitive or red data species were observed during the time of assessment, from an ecological perspective, due care must be undertaken when developing on this area and all relevant mitigation measures implemented.

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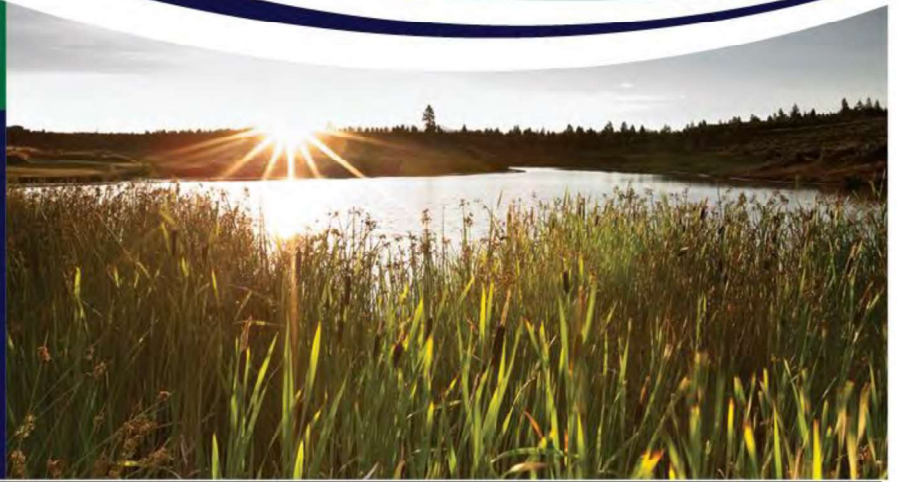
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