BIODIVERSITY ASSESSMENT REPORT

GA-RANKUWA
UNIT 23 & 25

Biodiversity Assessment (Terrestrial & Aquatic) for the Proposed Rezoning and Subdivision of Erven 1719 & 1427 in Ga-Rankuwa, City of Tshwane Metropolitan Municipality, Gauteng Province

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EXECUTIVE SUMMARY

Project Background and Location

The project is the proposed rezoning and subdivision of Erven 1719 and 1427 in Ga-Rankuwa for the creation of Ga-Rankuwa Units 23 & 25, respectively and for the eventual establishment of residential development on the units. The proposed project is located on Erven 1719 and 1427 Ga-Rankuwa within the jurisdiction of the City of Tshwane Metropolitan Municipality, Gauteng Province. The site is located approximately 13 km west of Soshanguve and the R80, and 8km to the north of the N4 towards Brits.

The project consists of a subdivision and rezoning application situated on Erven 1427 and 1719 Ga-Rankuwa for the expansion of the Ga- Rankuwa Township to provide additional single-dwelling house opportunities for the informal settlement that is currently on site.

Setala Environmental (Pty) Ltd has been appointed as the independent environmental assessment practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed project. The applicant is City of Tshwane Metropolitan Municipality.

Flori Scientific Services was appointed to undertake a site investigation and biodiversity assessment for the proposed project. Site investigations were conducted on 13 October 2022.

Vegetation

The study site is situated in the Savanna Biome of South Africa and in the Central Bushveld Bioregion. The site is within the original extent of the veldtype known as **Marikana Thornveld**, which is a threatened veldtype / ecosystem, and has a status of 'Endangered'.

The vegetation of the study site comprises mostly of badly degraded, altered or totally transformed. Excessive and continual removal of trees and shrubs for firewood and clearing of areas for vegetable fields, along with frequent veldfires has badly degraded and altered the veld. There is no pristine or even fairly natural Marikana Thornveld left on the study site.

During field investigations no large, mature trees were observed. No protected trees were observed. No red data listed or orange data listed floral species were found to be present.

Hierarchy of vegetation

Category Description	Classification
Biome	Savanna
Bioregion	Central Bushveld
Vegetation Types	Marikana Thornveld
Status	Threatened (Endangered)

Watercourses

There are no watercourses on the study area, including drainage lines and wetlands.

Fauna

No RDL or faunal SCC were observed in the study area and none are expected to reside permanently in the study area due to the high levels of transformation, and degradation. There are no ideal or sensitive faunal habitats present on the site.

Priority Areas

The study site is not situated within any priority areas.

National priority areas include formal and informal (private) protected areas (nature reserves); important bird areas (IBA); RAMSAR sites; National freshwater ecosystem priority areas (NFEPA) and National protected areas expansion strategy (NPAES) focus areas.

Sensitivity Map

Taking all of the background information and site investigation findings into account the sensitivity of the study area was found to be a mix of 'Low' (transformed areas) and 'Medium' (degraded thornveld).

Sensitivity map for the study area

Conclusions

The conclusions of the site investigations and study are as follows:

- The study site is within the original extent of the veldtype known as Marikana Thornveld, which is a threatened veldtype / ecosystem with a status of 'Endangered'. However, most of the site is

either transformed (by existing houses and fields) or badly degraded (by over-utilisation of resources such as wood).

- During site investigations no red data listed (RDL) fauna or flora, or other species of conservation concern were observed on the study site.
- There are no watercourses in the study area or immediately adjacent, including wetlands.
- The study site is not with any national priority areas.
- Sections of the study site are within a critical biodiversity area (CBA).
- The biodiversity of the study area was found to be a mix of 'Low' (the transformed areas); and 'Medium' (the degraded open thornveld areas).
- All recommended mitigating measures must be implemented and form part of the conditions of any documentation or licences (eg. The EMP).

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LIST OF ACRONYMS

BA	Basic Assessment
CBA	Critical Biodiversity Area(s)
CMA	Catchment Management Agencies
DFFE	Department of Forestry, Fisheries and the Environment
DWS	Department Water and Sanitation
EIA	Environmental Impact Assessment
ESA	Ecological Support Area(s)
IBA	Important Bird Area(s)
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMPAA	National Environmental Management: Protected Areas Act (Act 57 of 2003)
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
NUSP	National Upgrading Support Programme
ODL	Orange Data Listed
PDA	Primary Drainage Area(s)
QDA	Quaternary Drainage Area(s)
RDL	Red Data Listed
SANBI	South African National Biodiversity Institute
SWSA	Strategic Water areas of South Africa
WMA	Water Management Areas
WSA	Water Source Area
WULA	Water Use Licence Application

EXPERTISE & DECLARATION

Expertise of Author

Qualifications & Expertise in: Terrestrial Ecology, Aquatic Ecology and Avifaunal Assessments.

2 Masters degrees (MSc & MBA); 2 Diplomas (Business & Public Speaking).

Author of two books on Cut Flowers of the World. 2010 (1st ed) & 2020 (2nd ed), Briza, Pretoria.

SAQA accreditation and qualifications in training, assessing & service provision (AgriSeta).

Registered with South African Council for Natural Scientific Professions (SACNASP) since 1991. Registration number: 400077/91

21 years experience in technical and managerial positions, project management and consultancy.

19 years experience in writing of articles, books, training material, training & presentations, proposals.

14 years direct experience in EIAs.

Has conducted hundreds of field investigations and compiled hundreds of technical speciaist reports for EIAs, including ecological assessments (fauna & flora), wetland assessments and avifauna impact assessments.

Projects involved in include power lines, roads, quarries, housing developments, mines and wind farms.

Declaration

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the 2014 NEMA Environmental Impact Assessment (EIA) Regulations (as amended on 7 April 2017).

I, Johannes Oren Maree, do hereby declare that I:

Act as an independent specialist in compiling this report;

Do not have any financial interests, or stand to gain in any way in the undertaking of this activity, other than remuneration for work performed;

Do not have, nor will have, any vested interest in the proceeding activity or project;

Have no, neither will engage in, conflicting interests in the undertaking of this activity;

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; and

Will provide competent authority access to my information regarding the report and investigations, whether such information is favourable to the applicant or not.

1 BACKGROUND

1.1 Project Overview

The project is the proposed rezoning and subdivision of Erven 1719 and 1427 in Ga-Rankuwa for the creation of Ga-Rankuwa Units 23 & 25, respectively and for the eventual establishment of mix development on the units. The proposed project is located on Erven 1719 and 1427 Ga-Rankuwa within the jurisdiction of the City of Tshwane Metropolitan Municipality, Gauteng Province. The site is located approximately 13 km west of Soshanguve and the R80, and 8km to the north of the N4 towards Brits. The site is in close proximity to the border between Gauteng and North West. The Surveyor-general reference numbers for these portions are T0JR06030000171900000 and T0JR06040000142700000.

Ga-Rankuwa Unit 23 & 25 is a City of Tshwane Metropolitan Municipality housing project. The project consists of a subdivision and rezoning application situated on Erven 1427 and 1719 Ga-Rankuwa for the expansion of the Ga- Rankuwa Township to provide additional single-dwelling house opportunities for the informal settlement that is currently on site.

Setala Environmental (Pty) Ltd has been appointed as the independent environmental assessment practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed project. The applicant is City of Tshwane Metropolitan Municipality. The scope of the proposal is to apply for environmental authorisation for the proposed residential development.

Application for authorisation of the project is submitted to the Gauteng Department of Agriculture and Rural Development (GDARD), in terms of the National Environmental Management, 1998 (Act 107 of 1998), and the 2014 NEMA Environmental Impact Assessment (EIA) Regulations (as amended on 7 April 2017) promulgated in Government Gazette 40772 and Government Notice (GN) R327, R326, R325 and R324.

Flori Scientific Services was appointed to undertake a site investigation and biodiversity assessment for the proposed project. Site investigations were conducted on 13 October 2022.

1.2 Purpose of the study

The purpose of the study is to conduct a biodiversity impact assessment that consists of a terrestrial and an aquatic ecological assessment (biodiversity assessment) to determine the ecological sensitivities and habitats of the study area. To investigate the fauna and flora and determine if there are any priority species present. To investigate the presence of watercourses and to delineate and assess them, if found to be present. Furthermore, the purpose of the study is to identify any potential fatal flaws, assess impacts, delineated buffer zones (if required), and to recommend mitigating measures aimed at reducing any potential negative impacts the project may have on the natural environment.

1.3 Quality and age of base data

The source and age of the data used included the following:

- Threatened ecosystems: SANBI (www.bgis.sanbi.org) and NEMBA (G 34809, GoN 1002), 9 December 2011).
- Protected areas: Protected Areas Register (PAR): DFFE – (https://portal.environment.gov.za).
- RDL species: Red List of South Africa Plants (latest update) – (www.redlist.sanbi.org).
- Veldtypes and ecosystems: Mucina & Rutherford, 2006. Updated 2012, 2018.
- SANBI data sets – latest updated website data (www. bgis.sanbi.org).
- Environmental Screening Tool – Dept. of Environmental Affairs (Now DFFE) (www.environment.gov.za).
- National Freshwater Ecosystem Priority Areas (NFEPA) – DWS & SANBI databases.
- National Wetland Map 5 (2018) – CSIR, SANBI (www.bgis.sanbi.org).
- Gauteng Conservation Plan (C-Plan) version 3.3.

1.4 Assumptions and Limitations

The assumptions and limitations for the assessment are as follows:

- Information regarding the proposed project as provided by the Client is taken to be accurate.
- Site investigations were undertaken on 13 October 2022, which falls within the wet (summer) season for the region.
- Adequate rainfall had taken place prior to the site visit.
- No additional investigations are required or recommended in terms of biodiversity, including a dry (winter) season assessment, because the area is well known to the Specialist and numerous studies in the area were used as background as well.
- Precise buffer zones or exact GPS positions are accurate to within 2-3m.
- The latest available data sets were used in the environmental screening for the project.
- Data sets, demarcated CBAs, ESAs, Watercourses, etc. will be verified and refined during field investigations (ground-truthing), which is the next phase of the project.
- ArcGIS (v10.8); Google Earth Pro; and other computer-based programmes were used.
- No specific limitations were encountered, which could have a significant impact on the outcomes of the assessment and report findings.
- **NOTE**: Recommendations put forward in the report are based on actual biodiversity and specialist findings, but this does not mean that legal requirements do not still apply. In other words, recommendations do not negate legal requirements as set out in various acts such as NEMA (Act 107 of 1998) and NEMBA (Act 10 of 2004). For example, a buffer zone of X m from the edge of a watercourse might be recommended as adequate, but this does not negate the fact that such activities still trigger regulations such as the 32m from a watercourse in an urban area, as set out in Listed Activities.

1.5 Methodology

1.5.1 Desktop Assessment

A desktop screening assessment was conducted using relevant and latest data sets and satellite imagery for South Africa and the Province, including use of platforms and datasets such as the National Screening Tool (www.screening.environment.gov.za).

Previous relevant studies, reports, photos, etc. were also consulted.

1.5.2 Field Investigations

During site investigations, cognisance was taken of the following environmental features and attributes:

- Biophysical environment;
- Regional and site specific vegetation;
- Habitats ideal for potential red data fauna species, including avifauna;
- Sensitive floral habitats;
- Red data fauna and flora species;
- Fauna and flora species of conservation concern; and
- Watercourses.

Digital photographs and GPS reference points of importance where recorded.

1.5.3 Floral Sensitivity

The methodology used to estimate the floristic sensitivity is aimed at highlighting floristically significant attributes and is based on subjective assessments of floristic attributes. Floristic sensitivity is determined across the spectrum of communities that typify the study area. Phytosociological attributes (species diversity, presence of exotic species, etc.) and physical characteristics (human impacts, size, fragmentation, etc.) are important in assessing the floristic sensitivity of the various communities.

Criteria employed in assessing the floristic sensitivity vary in different areas, depending on location, type of habitat, size, etc. The following factors were considered significant in determining floristic sensitivity:

- Habitat availability, status and suitability for the presence of Red Data species
- Landscape and/or habitat sensitivity
- Current floristic status
- Floristic diversity
- Ecological fragmentation or performance.

Floristic Sensitivity Values are expressed as a percentage of the maximum possible value and placed in a particular class or level, namely:

- High: 80 – 100%
- Medium/high: 60 – 80%
- Medium: 40 – 60%

- Medium/low: 20 – 40%
- Low: 0 – 20%

High Sensitivity Index Values indicate areas that are considered pristine, unaffected by human influences or generally managed in an ecological sustainable manner. Nature reserves and well-managed game farms typify these areas. Low Sensitivity Index Values indicate areas of poor ecological status or importance in terms of floristic attributes, including areas that have been negatively affected by human impacts or poor management.

Each vegetation unit is subjectively rated on a sensitivity scale of 1 to 10, in terms of the influence that the particular Sensitivity Criterion has on the floristic status of the plant community. Separate Values are multiplied with the respective Criteria Weighting, which emphasizes the importance or triviality that the individual Sensitivity Criteria have on the status of each community.

Ranked Values are then added and expressed as a percentage of the maximum possible value (Floristic Sensitivity Value) and placed in a particular class or level, namely:

- High: 80% – 100%
- Medium/high: 60% – 80%
- Medium: 40% – 60%
- Medium/low: 20% – 40%
- Low: 0% – 20%

1.5.4 Faunal Sensitivity

Determining the full faunal component of a study area during a short time scale of a few field trips can be highly limiting. Therefore, the different habitats within the study area and nearby surrounding areas were scrutinised for attributes that are deemed to be suitable for high diversity of fauna, as well as for Red Data species. Special consideration was given to habitats of pristine condition and high sensitivity.

Areas of faunal sensitivity were calculated by considering the following parameters:

- Habitat status – the status or ecological condition of the habitat. A high level of habitat degradation will often reduce the likelihood of the presence of Red Data species.
- Habitat linkage – Movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to surrounding habitats and adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area
- Potential presence of Red Data species – Areas that exhibit habitat characteristics suitable for the potential presence of Red Data species are considered sensitive.

The same Index Values, Sensitivity Values and Categories used for the floral sensitivity ratings are used for the faunal sensitivity ratings. The same Go, No-Go criteria and ratings used for the flora component are also used for the faunal component.

1.5.5 Present Ecological State (PES)

The Present Ecological State (PES) is the current (present) ecological condition (state) in which the watercourses are found, prior to any further developments or impacts from the proposed project. The PES of watercourses found in the study area is just as important to determine, as are the potential impacts of the proposed development. The PES of a watercourse is assessed relative to the deviation from the Reference State (also known as the Reference Condition).

The reference state is the original, natural or pre-impacted condition of the system. The reference state is not a static condition but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES Method (DWA, 2005) was used to establish the present state (integrity) of the unnamed drainage line in the study area. The methodology is based on the modified Habitat Integrity approach of Kleynhans (1996, 1999). The criteria used for assessing the PES of watercourses are found in Table 1. The scores for the various attributes are found in Table 2. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a watercourse.

Table 3 provides guidelines for determining the category of the Present Ecological Status (PES) based on the total score determined during assessments. This approach is based on the assumption that extensive degradation of any of the attributes may determine the PES of the watercourse (DWA, 2005).

Table 1: Habitat assessment criteria

Rating Criteria	Relevance
Hydrology	
Flow modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural lands. Changes in flow regime (timing, duration, frequency), volumes, and velocity, which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water quality	
Water Quality Modification	From point or diffuse sources. Measured directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Geomorphology & Hydraulics	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.

Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities, which reduce or changes wetland habitat directly in inundation patterns.
Biota	
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation of Biota	Overgrazing, over fishing, over harvesting of plant material, etc.

Table 2: Scoring guidelines for habitat assessment

Scoring guidelines per criteria	
Natural / unmodified	5
Mostly natural	4
Moderately modified	3
Largely modified	2
Seriously modified	1
Critically modified (totally transformed)	0

Table 3: Wetland integrity categories

Category	Mean Score	Description
A	>4	Unmodified, natural condition.
B	>3 to 4	Largely natural with few modifications, but with some loss of natural habitats.
C	>2,5 to 3	Moderately modified, but with some loss of natural habitats.
D	2 to 2,5	Largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
E	>0	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
F	0	Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

The integrity of watercourses with a category rating of F, E & D were deemed to be Low. Category rating of C was deemed to be Medium, while Category ratings of B & A were deemed to be High.

1.5.6 Ecological Importance and Sensitivity (EIS)

Ecological importance and sensitivity (EIS) looks at the importance of the wetland, watercourse or water ecosystem in terms of biodiversity and maintenance. The determination is not just based on the identified watercourse in isolation, but also its' importance in terms of supplying and maintaining services to the larger catchment and water systems up and downstream.

The ecological sensitivity (ES) part of the EIS looks at how sensitive the system is to changes in services and environmental conditions. The Recommended Environmental Management Class (REMC) is the recommended state to which the watercourse should be returned to or maintained at. The EIS categories and descriptions are outlined in the table below (Table 4).

A high REMC relates to ensuring a high degree of sustainability and a low risk of ecosystem failure occurring. A low REMC would ensure marginal sustainability, but with a higher risk of ecosystem failure. The REMC is based on the results obtained from assessing the ecosystem / watercourse / wetland in terms of EIS, PES and function, and the desire to with realistic recommendations and mitigating actions to return the system to a certain level of functionality and original state.

Table 4: EIS Categories and Descriptions

EIS Categories	Median Range	Category
Wetlands that are considered ecologically important and sensitive on a **national or international** level. The biodiversity of these wetlands is usually very sensitive to flow & habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	Very high 3 - 4	A
Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	High 2 - 3	B
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. They play a small role in moderating the quantity and quality of water of major rivers.	Moderate 1 - 2	C
Wetlands that are not ecologically important and sensitive on any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	Low 0 - 1	D

1.6 Impact Assessment

1.6.1 Criteria for the classification of an impact

Scale (Extent)

Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.

- Site: Within the construction site
- Local: Within a radius of 2 km of the construction site
- Regional: Provincial (and parts of neighbouring provinces)
- National: The whole of the country
- International: Impact is across countries

Duration

Indicates what the lifetime of the impact will be.

- Immediate: The impact will either disappear with mitigation or will be mitigated through natural process in a time span shorter than the construction phase.
- Short-term: The impact will either disappear with mitigation or will be mitigated through natural process within 0 – 5 years.
- Medium-term: The impact will either disappear with mitigation or will be mitigated through natural process within 5 – 15 years.
- Long-term: The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. Impact ceases after the operational life of the activity.
- Permanent: The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

Magnitude (Intensity)

Describes whether an impact is destructive or benign.

- Low: Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
- Medium: Effected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way.
- High: Natural, cultural and social functions and processes are altered to extent that they temporarily cease.
- Very high / Unknown: Natural, cultural and social functions and processes are altered to extent that they permanently cease.

Probability

Probability is the description of the likelihood of an impact actually occurring.

- Improbable: Likelihood of the impact materialising is very low.

- Low probability / possible: The impact may occur.
- Medium probability: It is more than likely that the impact will occur.
- Highly probable: High likelihood that the impact will occur.
- Definite / Unknown: The impact will definitely (most certainly) occur, or is unknown and therefore needs to be afforded a high probability score.

Significance

Significance (environmental significance) constitutes the overall risk and is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both the physical extent and the time scale and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Status

Status gives an indication of the perceived effect of the impact on the area.

- Positive (+): Beneficial impact.
- Negative (-): Harmful or adverse impact.
- Neutral Impact (0): Neither beneficial nor adverse.

It is important to note that the status of an impact is assigned based on the *status quo.* That is, should the project not proceed. Therefore not all negative impacts are equally significant. The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented

1.6.2 Scoring Method

The impact assessment takes into account the nature, scale and duration of the effects on the natural environment and whether such effects are positive (beneficial) or negative (detrimental). A scoring method (rating system) is applied to the potential impact on the affected environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue the following criteria are used and points awarded as shown below in Table 5.

Table 5: Scoring method for impact assessment

Magnitude (Intensity)	**Duration**
10 - Very high/unknown	5 - Permanent
8 - High	4 - Long-term (Impact ceases after operational life of activity)
6 - Moderate	3 - Medium-term (5-15 years)
4 - Low	2 - Short-term (0-5 years)
2 - Minor	1 - Immediate
0 - None	0 - None
Scale (Extent)	**Probability**

5 – International	5 – Definite / Unknown
4 – National	4 – Highly probable
3 – Regional	3 – Medium probability
2 – Local	2 – Low probability
1 - Site only	1 – Improbable
0 – None	0 – None

Once the above factors had been ranked for each impact, the overall risk (environmental significance) of each impact will be assessed using the following formula:

Significance (SP) = [Magnitude (M) + Duration (D) + Scale(S)] x Probability (P)

The maximum value is 100 significance points (SP). Environmental impacts will be rated as either that of High, Moderate or Low significance on the following basis:

- SP ≥60: Indicates **high** environmental significance;
- SP 31 ≥ 59: Indicates **moderate** environmental significance;
- SP ≤ 30: Indicates **low** environmental significance.

2 RECEIVING ENVIRONMENT

2.1 Study Site Location

The study site (which includes both Erven 1719 & 1427) is located south and adjacent to the existing Ga-Rankuwa township Units 23 & 25 (Figure 1). The study site is located approximately 13 km west of Soshanguve and the R80, and 8km to the north of the N4 towards Brits in the City of Tshwane Metropolitan Municipality, Gauteng Province (Figure 1).

- Site Location (Approximate centre):
  - Erf 1719 (Proposed Unit 23): 25°34'40.25"S; 27°58'40.74"E.
  - Erf 1427 (Proposed Unit 25): 25°34'34.17"S; 27°58'22.66"E.
- Quarter Degree Square (QDS): 2527DB.
- Quaternary Drainage Area (QDA): A21J.

Figure 1: Study Site

2.2 Climate

The study site is situated within the summer rainfall region of South Africa and on the boundary between the medium rainfall region (401mm to 600mm per annum) and the medium/high rainfall region (601mm to 800mm per annum) (Figure 2). The average annual rainfall for the area varies between 500 mm to 650 mm. The winters are very dry.

The study site is within the Temperate Climatic Zone of South Africe (Figure 3). The climate is warm to hot during the summer months, with some days becoming very hot, while winter temperatures are typically moderate to cold, and occasionally, but seldom, very cold. The warm summers are long, while the winters are usually short, very dry and with mostly clear skies.

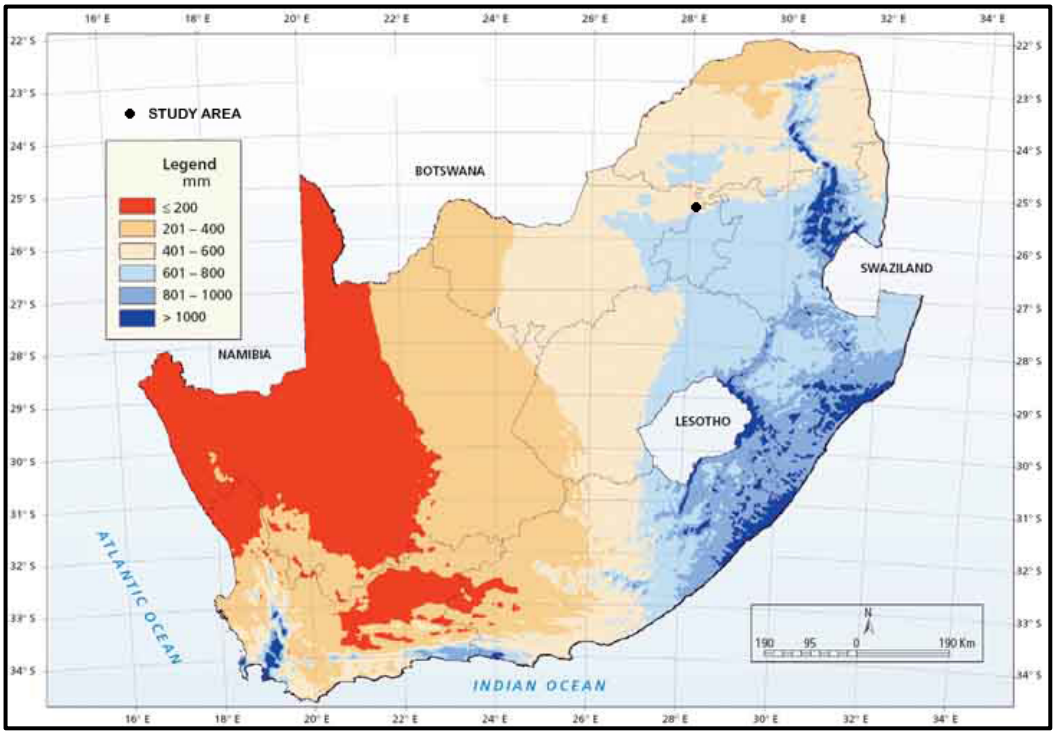


Figure 2: Rainfall Regions of South Africa

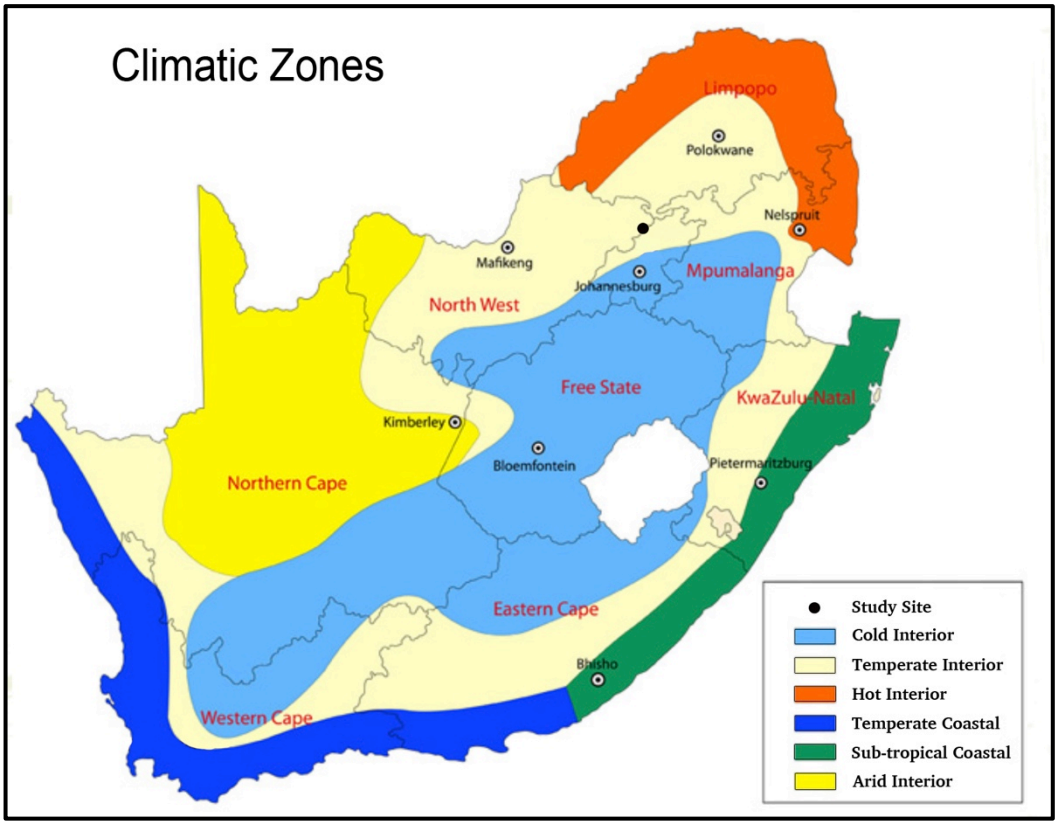


Figure 3: Climatic Regions of South Africa

2.3 Current Landcover and Land Use

The current landcover of the study site is a mix of open vacant land and informal settlements and solid built houses and other structures scattered throughout the area. The land use is that of suburban areas with the open areas used of various related activities as well as for grazing of free-roaming cattle and goats. There are also numerous small vegetable patches (small fields) in the study area along with vehicle tracks and illegal dumping. Wood from small trees and shrubs is also collected by the locals for firewood.

2.4 Vegetation

The study site is situated in the Savanna Biome of South Africa and in the Central Bushveld Bioregion of the biome. The site is within the original extent of the veldtype commonly known as **Marikana Thornveld** (Figure 5). The veldtype is a threatened veldtype / ecosystem, and has a status of 'Endangered' (Skowno, 2019).

Marikana Thornveld is characterised open *Vachellia* (*Acacia*) *karroo* (Sweet Thorn) woodland, occurring in valleys and slightly undulating plains, and some lowland hills. Shrubs tend to be denser along drainage lines, on termitaria and rocky outcrops or in other habitat protected from fire (Mucina & Rutherford, 2010).

Table 6: Hierarchy of vegetation

Category Description	Classification
Biome	Savanna
Bioregion	Central Bushveld
Vegetation Types	Marikana Thornveld
Status	Not threatened (Least Concern)

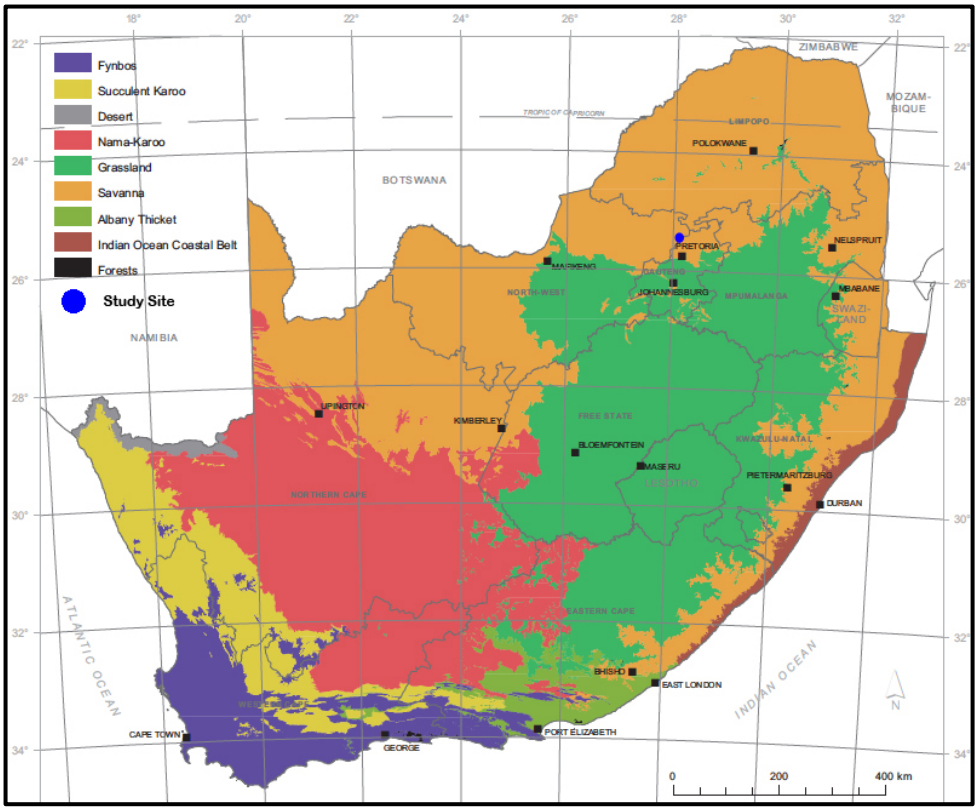


Figure 4: Biomes of South Africa

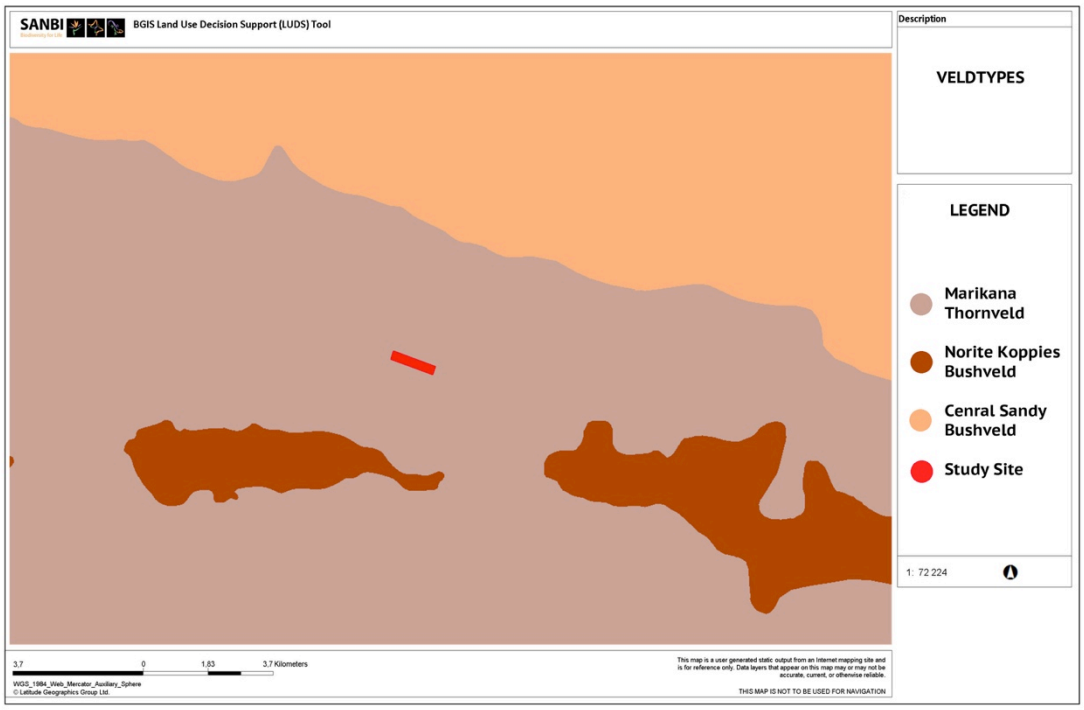


Figure 5: Veldtypes

The study site is within the original extent of Marikana Thornveld, which is dominated by thorn trees (mainly sweet thorn). The vegetation of the study site comprises mostly of badly degraded, altered or

totally transformed veld. Excessive and continual removal of trees and shrubs for firewood and clearing of areas for vegetable fields, along with frequent veldfires has badly degraded and altered the veld. There is no pristine or even fairly natural Marikana Thornveld left on the study site.

During field investigations no large, mature trees were observed. No protected trees were observed. No red data listed or orange data listed floral species were found to be present.

Table 7: Photos of the vegetation of the study site

	Study Site Some open Marikana Thornveld with informal dwellings on the site in the background
	Small shack on the study site with most of the thorn trees cleared in the surrounding area

	A small section of more 'natural but still badly degraded Marikana Thornveld on the study site. Evidence of veldfires through the site and veld is evident with the black at the base of the new emerging grass and some dead, blackened shrubs
	More established settlements on the study site
	Open, badly degraded thornveld with no mature thorn trees in view. The veld is badly degraded and altered by frequent veldfires and constant removal of small trees and shrubs for firewood and other uses

2.5 Protected Trees

No national or provincial protected tree species are present within the study site.

2.6 Conservation status

The conservation status (or threat status) of the veldtype in which the study site is situated is shown in the table below (Table 8). The status is based on Skowno (2019).

Table 8: Veldtype status

Veldtype	Status	Info
Marikana Thornveld	Endangered (EN)	Less than 1% statutorily conserved in, for example, Magaliesberg Nature Area. More conserved in addition in other reserves, mainly in De Onderstepoort Nature Reserve. Considerably impacted, with 48% transformed, mainly cultivated and urban or built-up areas. Most agricultural development of this unit is in the western regions towards Rustenburg, while in the east (near Pretoria) industrial development is a greater threat of land transformation. Erosion is very low to moderate. Alien invasive plants occur localised in high densities, especially along the drainage lines (Mucina & Rutherford, 2010)

Table 9 below, gives a basic description of the status categories. The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or protected. The main purpose for the listing of threatened ecosystems is an attempt to reduce the rate of ecosystem and species destruction and habitat loss, leading to extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI).

Table 9: Ecosystem Status: Simplified explanation of categories used

STATUS	% Transformed	Effect on Ecosystem
Least Threatened (LT)	0-20% (<20% loss)	No significant disruption of ecosystem functions
Vulnerable (VU)	20-40% (>20% loss)	Can result in some ecosystem functions being altered
Endangered (EN)	40-60% (>40% loss)	Partial loss of ecosystem functions
Critically Endangered (CR)	>60% or BT Index for that specific veldtype	Species loss. Remaining habitat is less than is required to represent 75% of species diversity

Source: South African National Spatial Biodiversity Assessment Technical Report. Volume 1: Terrestrial Component. 2004. SANBI. Mucina & Rutherford (eds) (2010).

Note: BT stands for the Biodiversity Threshold and is an index value that differs for each veldtype. In other words, because the composition, recovery rate, etc. differs for each veldtype there will be a different threshold (in this case percentage transformed) at which species become extinct and ecosystems breakdown. That is, at which point the veldtype is critically endangered.

Figure 6 uses the term 'Least Concern' which is similar to that of 'Least Threatened'.

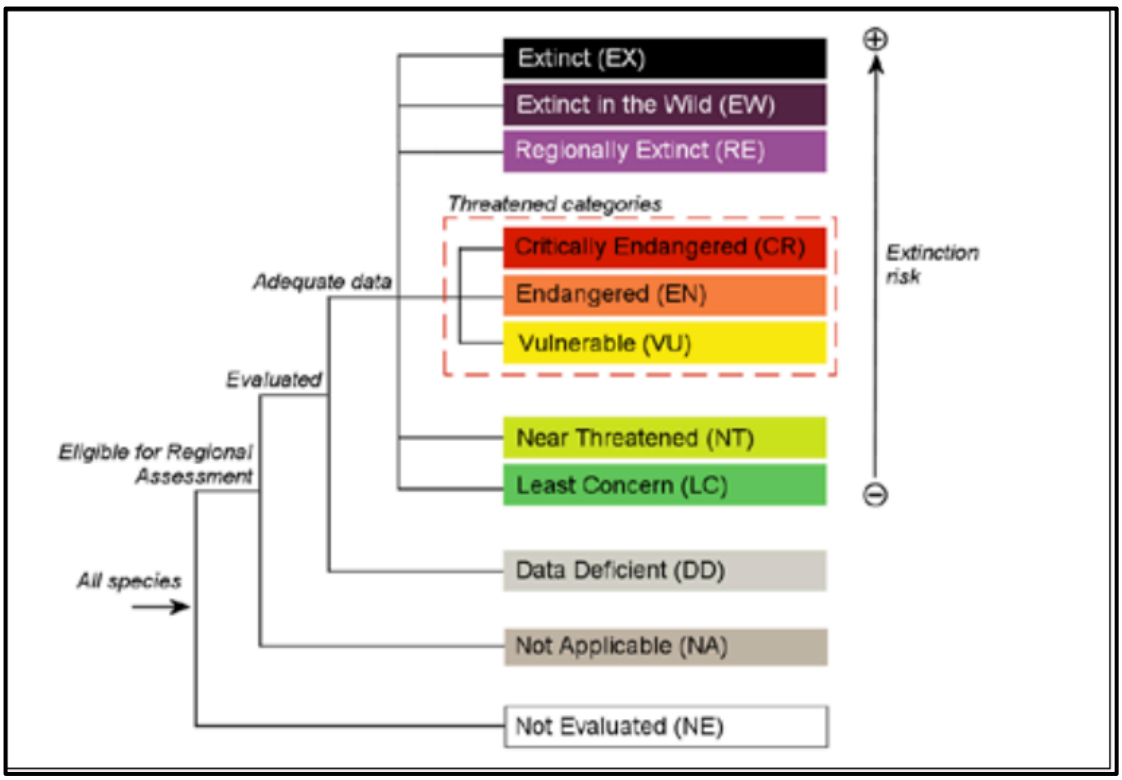


Figure 6: Structure of categories used at the regional level

2.7 Fauna

Of the 295 species and subspecies of South African mammals evaluated, 57 (19.3%) were assigned threat categories according to the IUCN Red List criteria as follows: 10 (3.4%) Critically Endangered 18 (6.1%) Endangered and 29 (9.8%) Vulnerable.

53 (18%) Species were assessed as being Data Deficient and therefore, a threat category could not be assigned to these species. 38 (12.9%) Species were assessed as being Near Threatened and 147 (49.8%) as Least Concern (Red Data Book of South African Mammals: A Conservation Assessment).

During the field investigations no species of conservation concern (SCC) were observed and none are expected to occur. The site is also outside of the known areas of some SCC such as Julian's Golden Mole (*Neamblysomus julianae*), which is critically endangered (CR).

The maps below show the location of the study site in relation to hotspots for SCC for butterflies, lizards and snakes (Figure 7, Figure 8, Figure 9). The study site is not situated within any of these faunal hotspots.

Invertebrates such as spiders, scorpions and butterflies are important faunal groups, but are difficult to fully assess in a short time period. During field investigations specific attention was given to priority species such as *Mygalomorphae arachnids* (Trapdoor and Baboon spiders) and red data butterflies. No priority species were observed. According to the Gauteng: State of the Environment Report (2011), spiders and scorpions are no longer included in the list of conservation priorities for the Province due to

the lack and paucity of data on spiders and the wide distribution of scorpions. Conservation efforts are now more focused on specific species, as opposed to faunal groups.

Currently there are three invertebrate species of conservation concern in Gauteng, which qualify for IUCN Red List status, namely two butterflies (the Highveld blue (*Lepidochrysops praeterita*) and the Heidelberg copper (Chrysoritis aureus)) and a scarab beetle (*Ichnestoma stabbiai*).

Recorded butterfly fauna in the Gauteng Province fall into: 5 families, 16 subfamilies, 90 genera, 211 species and 1 additional subspecies (212 taxa). Shared endemic genera: 8. Exclusively endemic species: 1 (1 taxon). Exclusively endemic subspecies: none. Shared endemism: 19 species and 2 subspecies (21 taxa). The proposed Red List taxa for the province is: 6 (SA Red Data Book: Butterflies. SANBI. 2009).

Gauteng butterfly hot spots are the Suikerbosrand Nature Reserve (*Aloeides dentatis dentatis, Chrysoritis aureus, Orachrysops mijburghi, and Metisella meninx*); and South of Carletonville and Hillshaven (*Lepidochrysops praeterita, and Platylesches dolomitica*) (SA Red Data Book, 2009).

Table 10: RDL Invertebrate species for the Gauteng Province

Scientific Name	Common name	GDARD Status	Present in study area
Lepidochrysops praeterita	Highveld Blue Butterfly	VU	No
Chrysoritis aureus	Heidelberg Copper	VU	No
Ichnestoma stobbiai	Stobbia's Fruit Chafer Beetle	VU	No
Aloeides dentatis dentatis	Roodepoort Copper Butterfly	VU	No
Orachrysops mijburghi	Mijburgh's Blue	VU	No
Metisella meninx	Marsh Sylph	VU	No
Platylesches dolomitica	Dolomite Hopper	VU	No

The main 'hotspots' for SCC of butterflies, snakes and lizards will be in the more secluded Magaliesberg Mountains and along the Hartebeespoort Dam, which are more formally protected.

During field investigations no priority or species of conservation concern (SCC) of any mammals or other faunal groups were observed.

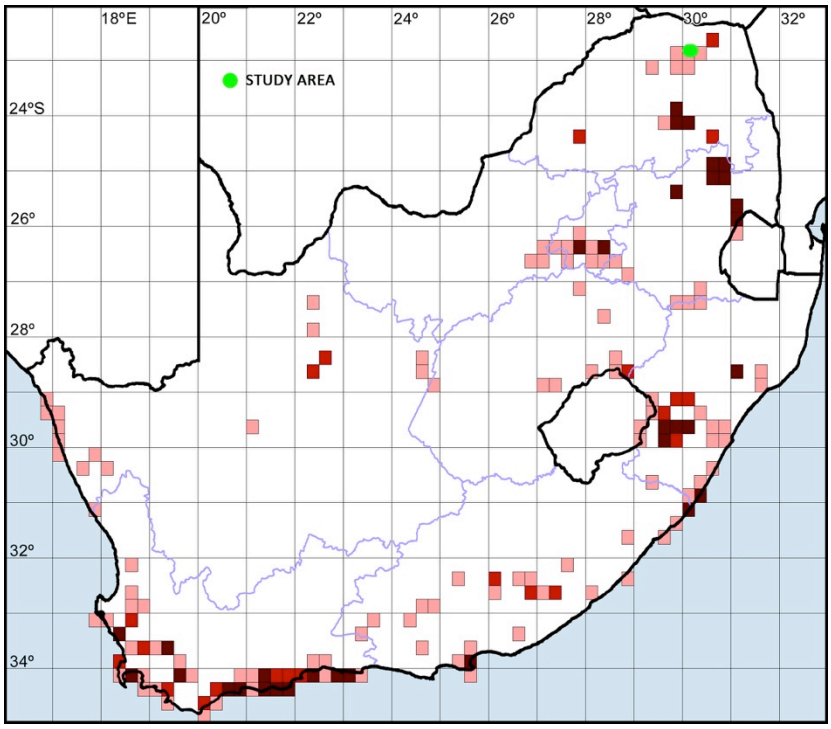


Figure 7: Hotspots for Priority Butterflies

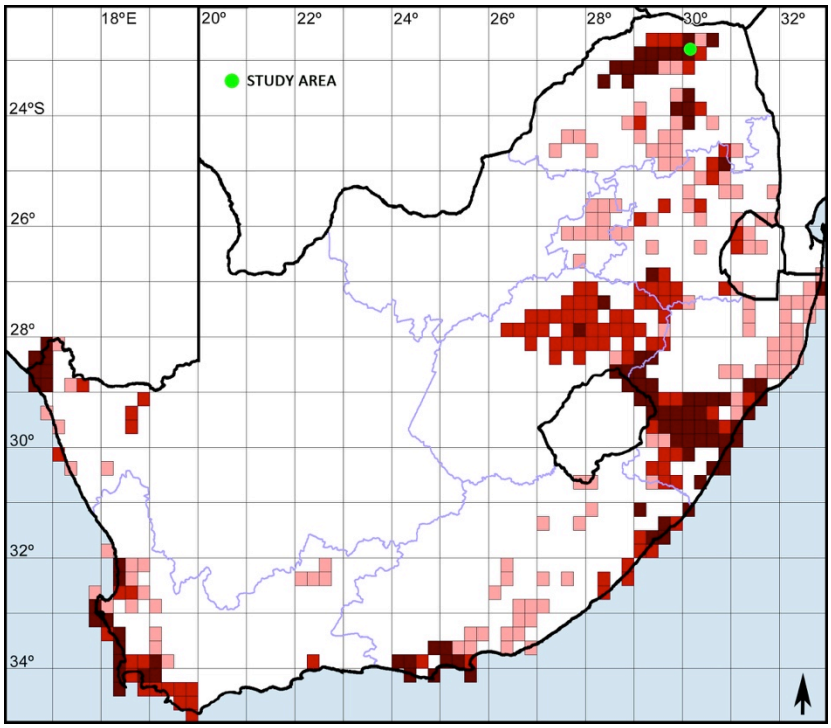


Figure 8: Hotspots for Priority Lizards

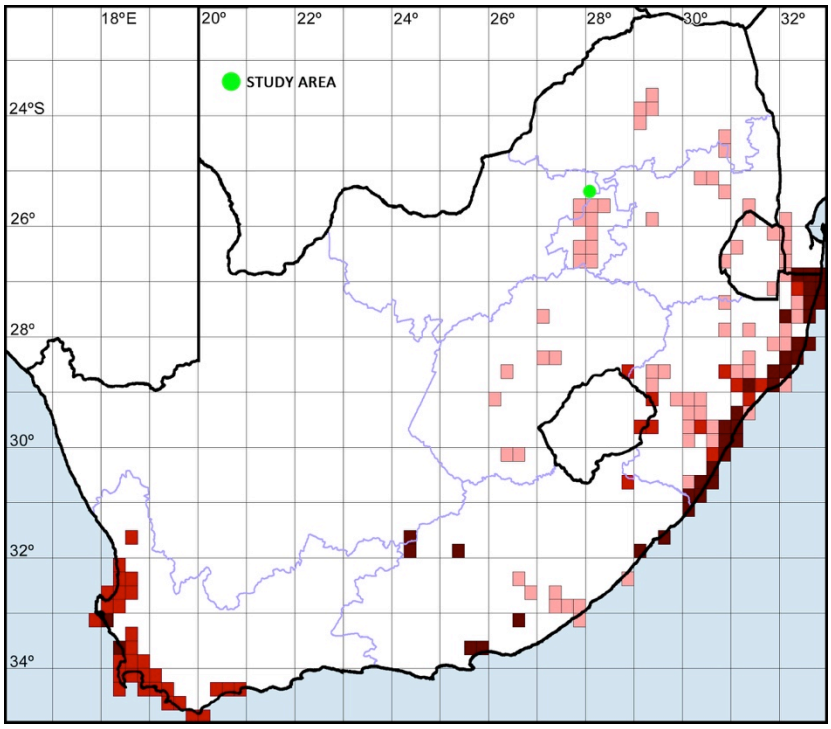


Figure 9: Hotspots for Priority Snakes

2.8 Watercourses

There are no rivers or streams in the study area. The nearest river or large stream is the Rosespruit (Rose Stream), which is southwest of the study site at varying distances of between 1,7km and 1,5km (Figure 10).

The latest national wetland map (Map 5, 2018) shows no wetlands in the study site or within a 500m radius of the study site boundaries.

Figure 10: Main Rivers & Streams in the region

2.9 Classification of watercourses

Watercourses identified are classified along different hydrogeomorphic (HGM) units, up to Level 4, in terms of various levels as refined for South Africa by Kleynhans, *et. al*. (2005) and used in the Classification System for Wetlands user manual – SANBI Series 22 (Ollis *et. al.* 2013) (Table 11).

There are no watercourses on the study site and therefore no need for any classifications to be done.

Table 11: Classification levels 1 - 4

LEVEL 1 System	LEVEL 2 Regional setting (Ecoregion)	LEVEL 3 Landscape Unit	LEVEL 4 HGM Unit	
			HGM Type	Landform
Inland	SA Ecoregions according to DWS and/or NFEPA	• Valley floor • Slope • Plain • Bench	River	• Mountain headwater stream • Mountain stream • Transitional stream • Upper foothill • Lower foothill • Lowland • Rejuvenated foothill • Upland floodplain
			Channelled valley bottom wetland	
			Unchannelled valley bottom wetland	
			Floodplain Wetland	
			Depression	• Exorheic

				• Endorheic • Dammed
			Seep	• With channel outflow (connected) • Without channel outflow (disconnected)
			Wetland flat	

2.10 Present Ecological State of Watercourses

All watercourses identified during field investigations are assessed in terms of the state of ecological health. That is to say, in terms of the existing (Present) Ecological State (PES). The assessment criteria and structure are based on the modified Habitat Integrity approach of Kleynhans (1996, 1999).

There are no watercourses in the study area and therefore obviously no PES could be conducted.

vary across the length of their course. The PES ratings are calculated in the area of the study area.

2.11 Ecological Importance & Sensitivity of Watercourses

The Ecological Importance and Sensitivity (EIS) ratings of watercourses identified during site investigations are typically conducted.

2.12 Drainage Regions

South Africa is geographically divided up into a number of naturally occurring Primary Drainage Areas (PDAs) and Quaternary Drainage Areas (QDAs). The different areas are demarcated into Water Management Areas (WMAs) and Catchment Management Agencies (CMAs). As of September 2016, there are officially nine WMAs, which correspond directly in demarcation to the CMAs (Government Gazette, 16 September 2016. No.1056, pg. 169-172).

The study site is within PDA of **A** and the QDA of **A21J**.

Table 12, below, gives a summary of information for the catchment areas for the study site.

Table 12: Summary of Catchment Area information

Level	Category
Primary Drainage Area (PDA)	A
Quaternary Drainage Area (QDA)	A21J
Water Management Area (WMA) – Previous / Old	Crocodile (West) & Marico
Water Management Area (WMA) – New (as of Sept. 2016)	Limpopo (WMA 1)
Sub-Water Management Area	Upper Crocodile
Catchment Management Agency (CMA)	Limpopo (CMA 1)
Wetland Vegetation Ecoregion	Central Bushveld (Group 2)
Flagship Rivers	No
Fish FEPA	No

Fish FSA	No
Fish Corridor	No
Fish Migratory	No
Priority Quaternary Catchment	No
SWSA (National importance)	No
WSA (Sub-national, provincial importance)	No

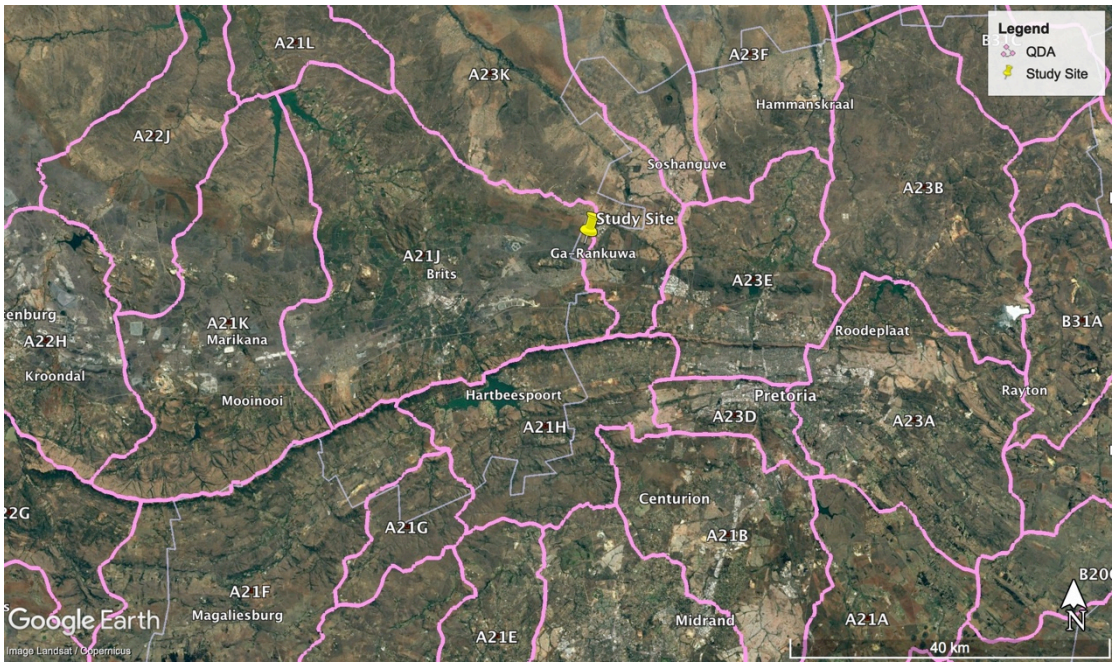


Figure 11: Quaternary Drainage Areas (QDAs)

The study site is situated in the top end of the quaternary drainage area (QDA) of A21J. The site is also at the top end of the smaller, sub-catchment area (highlighted in turquoise) in which it is situated (Figure 12). The surface stormwater in the sub-catchment, including that falling on the study site, drains into the Rosespruit and then westward and eventually into the Crocodile River and then the Limpopo River. The sub-catchment is not a priority sub-catchment in terms of fish FEPA or fish corridors, compared to the sub-catchment to the east, which is.

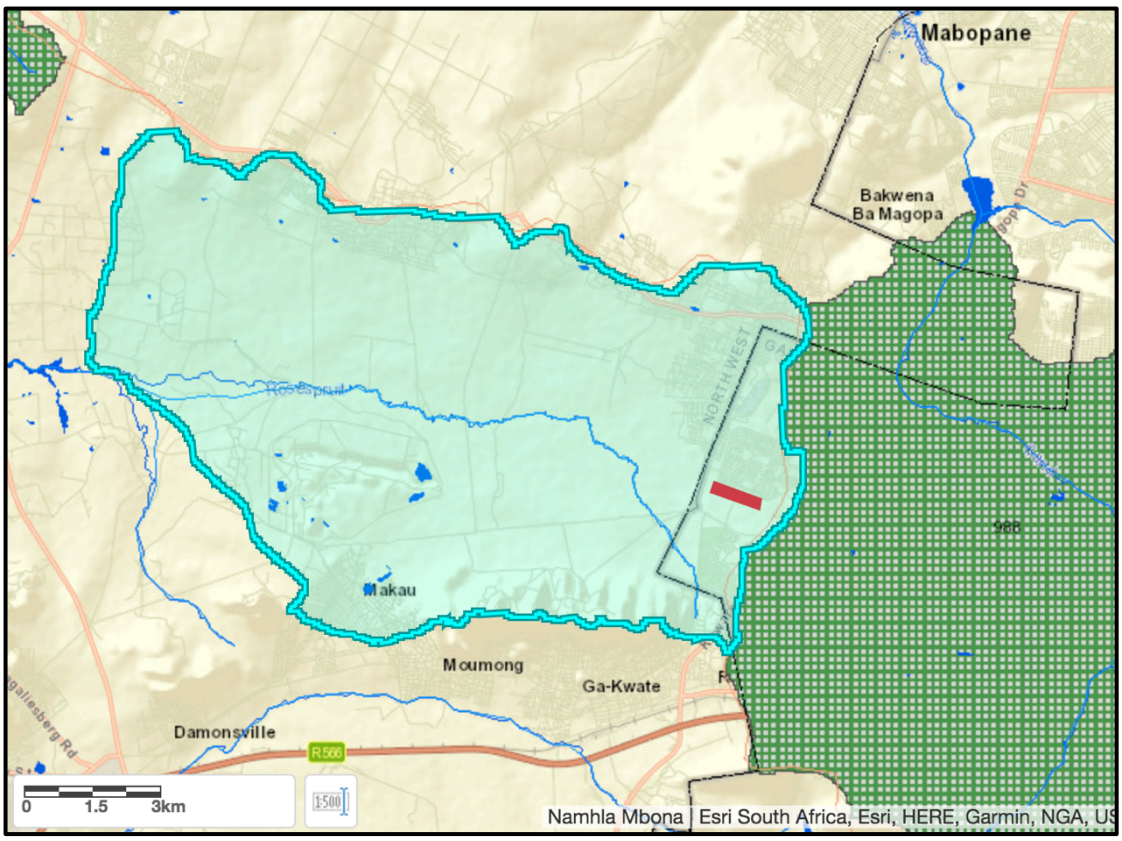


Figure 12: Sub-Catchment in which the study site (red) is situated

2.13 Strategic Water Source Areas

The study site is not situated within any Strategic Water Source area of South Africa (SWSA), or important Water Source Area (WSA) of the Province.

That is, not within a groundwater (gw) or a surface water (sw) SWSA. The study site is outside of, but borders on, the West Rand Cast Belt, which is a national gw-SWSA.

A Water Source Area (WSA) is a water catchment or aquifer system that either supplies a relatively large volume of water for its size or is the primary source of water for a town, city or industrial activity. Strategic Water Source Areas of South Africa (SWSA) are defined as areas of land that either: (a) supply a large) volume of surface water runoff (i.e. watercourses) in relation to their size and so are considered nationally important; (b) have relatively high groundwater recharge and groundwater forms a nationally important resource; (c) areas that meet both criteria (a) and (b) (WRC, 2019).

According to SANBI, a Strategic Water Source Areas of South Africa (SWSA) are those areas that supply a disproportionate amount of mean annual runoff in relation to the size of the geographical region. These areas are important because they have the potential to contribute significantly to overall water quality and supply, supporting growth and development needs that are often a far distance away. These areas make up 8% of the land area across South Africa, Lesotho and Swaziland, but provide 50% of the water in these countries (SANBI).

2.14 National Priority areas

The study site is not within or immediately adjacent to any national priority areas. The closest priority area is the Magaliesberg IBA, which is approximately 5km south of the site. The IBA area also includes the Magaliesberg Biosphere Conservation Area.

National priority areas include formal and informal (private) protected areas (nature reserves); important bird areas (IBA); RAMSAR sites; National freshwater ecosystem priority areas (NFEPA) and National protected areas expansion strategy (NPAES) focus areas.

According to the Protected Areas Register, which is maintained by the Department of Department of Forestry, Fisheries and the Environment (DFFE) (https://portal.environment.gov.za), the study site is not within a protected area.

2.15 Gauteng Ridges

The study site is not situated on any ridge or within 200m of any Class 1 or Class 2 ridges.

All ridges in Gauteng have been classified into four classes, based on the percentage of the ridge that has been transformed (mainly through urbanization) using the 1994 CSIR/ARC Landcover data. This forms the basis of the development guidelines that are detailed the GDARD's Development Guideline For Ridges (Pfab, 2001). In the light of the motivations presented in the report and due to the extremely limited distribution, rarity and threatened status of the ridges in Gauteng, it is was deemed imperative that the Department adopts a strict no-go or low impact development policy for these systems. However, this policy, by necessity, will have to be adapted according to the current transformed status of some of these ridges (Pfab, 2001).

Please note that although rocky outcrops are not covered by the policy (since their small area coverage does not allow the classification of these features as ridges) they are regarded as sensitive areas characterized by high biodiversity and as such a no-go development policy should be applied. Implementation of this guideline is specifically needed at the local council level during the passing of building plans (Pfab, 2001).

Table 13: Description and Conditions on Class 1 & Class 2 Ridges

Ridge Class	Policy
Class 1 (0-5% transformed) includes Suikerbosrand & parts of Magaliesberg	No further development allowed (including residential). Strict no-go policy. No further subdivisions will be allowed and consolidation of subdivisions will be encouraged. If developer should wish government to deviate from strict no-go policy, a full EIA (including public participation exercise) is required with full set of specialist reports including (but not limited to): • An ecological study, including both functional (ecological processes including connectivity function of ridge at a landscape level perspective) and compositional (biodiversity) aspects • A Red Data study for both fauna and flora

	• An invertebrate study • A hydrological / geohydrological study • A geotechnical study • A pollution study, including both air and water pollution • A social study, including cultural, historical and open space value aspects • A visual study • A study of service provision and access All specialist studies to examine cumulative impacts. A 200m buffer zone of low impact development is required around Class 1 ridges. Development proposals within the buffer zone should proceed at least to the mini EIA stage.
Class 2 (5-35% transformed) includes parts of Magaliesberg, World Heritage site, Klipriviersberg, Bronberg, Skurweberg	No further subdivisions will be allowed and consolidation of subdivisions will be encouraged. No-go development policy; low impact (e.g. tourism developments) will be considered requiring full EIA (including public participation exercise) with full set of specialist reports including (but not limited to): • An ecological study, including both functional (ecological processes including connectivity function of ridge at a landscape level perspective) and compositional (biodiversity) aspects • A Red Data study for both fauna and flora • An invertebrate study • A hydrological / geohydrological study • A geotechnical study • A pollution study, including both air and water pollution • A social study, including cultural, historical and open space value aspects • A visual study • A study of service provision and access. All specialist studies to examine cumulative impacts. Ecological footprint of low impact developments to cover no more than 5% of a property. All impacts for these developments must be sufficiently mitigated. A management plan to maintain the ecological integrity of remaining property is required and implementation is the responsibility of the developer. A 200m buffer zone of low impact development is required around class 2 ridges. Development proposals within the buffer zone should proceed at least to the mini EIA stage.

2.16 Gauteng EMF Zones

The study site is situated within the Gauteng EMF Zones of 3 & 4 (Figure 13). However, it is not completely clear if under the Gauteng Province's Human Settlement Housing Project if the entire area is now demarcated as Zone 1.

Zone 2 is a 'high control zone' within the urban development and low control zones of 1 & 4.

The Gauteng Environmental Management Framework (GEMF / EMF) has demarcated the province into various EMF Zones in terms of development. The EMF Zones were derived from the desired state, the environmental sensitivity as well the unique control areas as identified in sections 1, 2 and 3 of the GEMF. The zones were also presented to the Gauteng Planning Forum where it was generally accepted as a suitable contribution to facilitate appropriate development in Gauteng Province. The final demarcated zones also took the Gauteng Growth and Management Perspective, 2014, into account and are therefore aligned to the general development policy for Gauteng.

Five EMZs were identified and overlaying those a further six Special Management Areas were identified where specific planning and policy measures are necessary to achieve the development objective of those areas. One of the Special Management Areas is the Cradle of Humankind World Heritage Site (CoHWHS) for which a recent EMF has been completed. It was decided to incorporate that EMF within the GPEMF (the only other EMF to be incorporated as a whole).

Zone 2 is a 'high control zone' within the urban development and low control zones of 1 & 4. The study site is situated within Zone 4.

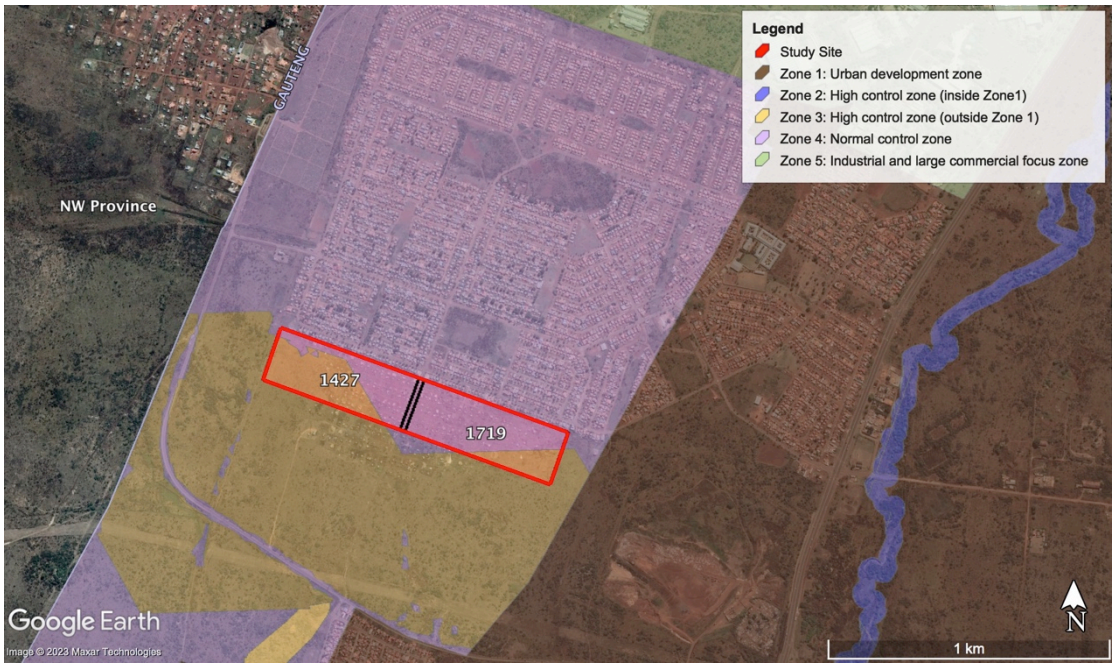


Figure 13: Gauteng EMF Zones in the area of the Study Site

2.17 Critical Biodiversity Areas & Ecological Support Areas

According to the Gauteng Conservation Plan (C-Plan) Version 3.3, the study site is partially within a demarcated Critical Biodiversity Area (CBA), but not within an Ecological Support Area (ESA) (Figure 14). The CBA is a CBA 2 – Important and not a CBA 1 – Irreplaceable. The reasons given for the demarcation in the C-Plan data is: Biodiversity feature description**:** Red Listed plant habitat and Prime vegetation. However, there are no Red Data Listed (RDL) plants present and the area is not prime vegetation

(Marikana Thornveld). However, it is understandable as Marikana Thornveld is endangered and there is a steady loss of this vegetation unit due to urbanisation and agriculture.

Critical biodiversity areas (CBAs) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI, 2007). These form the key outputs of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision-making tools. CBAs are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services (SANBI).
Ecological Support Areas (ESAs) are mostly natural or semi-natural areas that are often used to buffer CBAs as well as form corridors for the movement of fauna between CBAs and other natural areas.

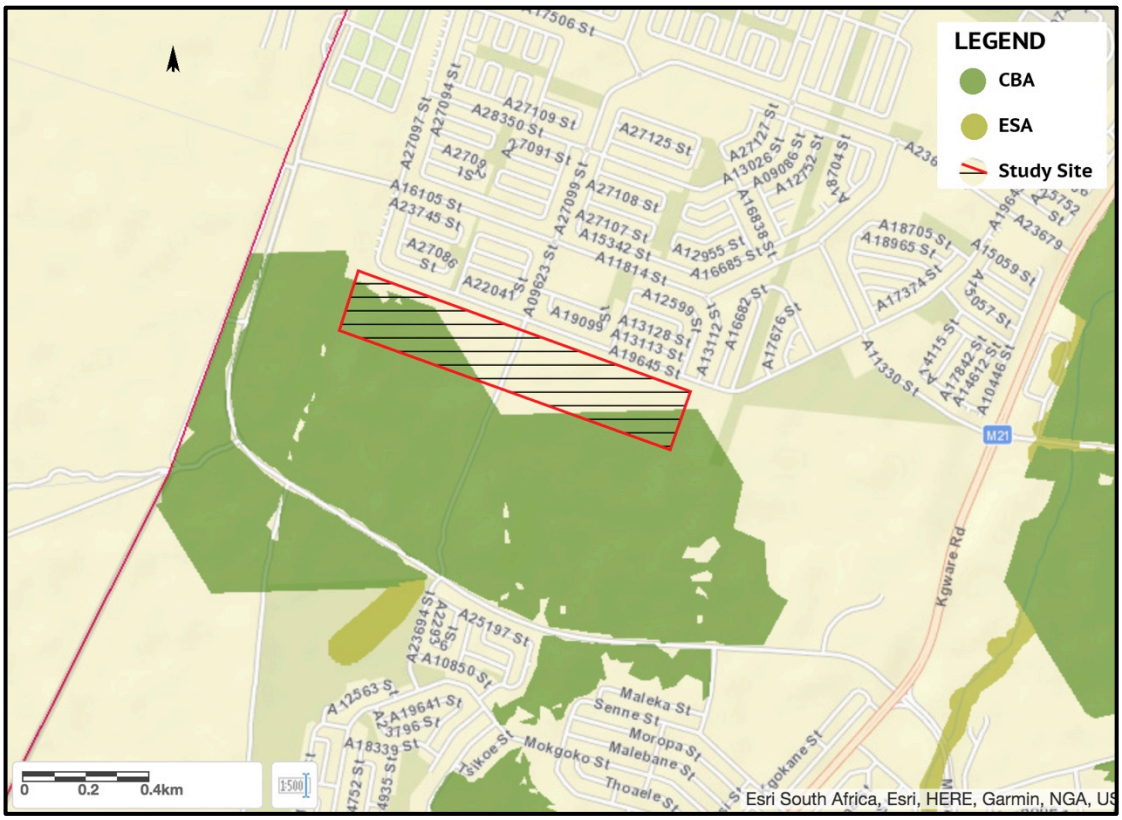


Figure 14: Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

2.18 National Screening Tool

The National Screening Tool (www.screening.environment.gov.za) is a desktop assessment and guideline implemented by the DFFE.

The assessments of sensitivities according to the screening tool (accessed in January 2023) are as follows:

- Terrestrial Biodiversity Theme Sensitivity: Very High.

- Aquatic Biodiversity Theme Sensitivity: Low.
- Animal Species Theme Sensitivity: Medium.
- Plant Species Theme Sensitivity: Medium.

Table 14, below, shows the screening tool maps for the study area and surrounds. The screening tool is a desktop screening which needs to be ground-truthed. During field investigations the Aquatic theme sensitivity was verified to be 'Low' and the Animal theme sensitivity was verified to be 'Medium'.

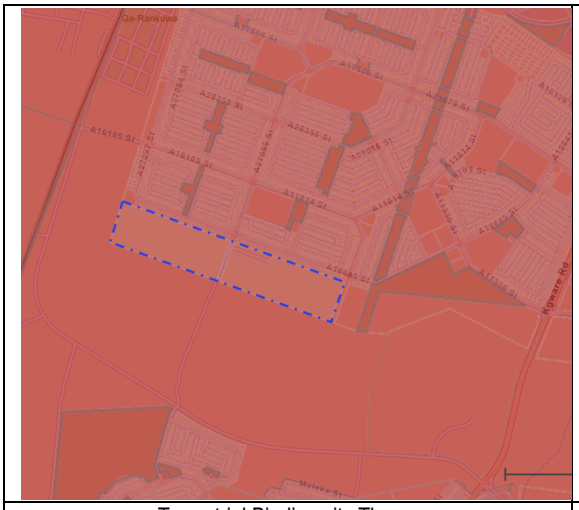
However, the plant theme sensitivity was found to be 'Low' and not 'Medium', due to high levels of transformation by areas totally cleared for houses and fields, while open areas where badly degraded by over-utilisation of resources such as wood for firewood, etc. However, it is understood and appreciated that the study site is within a threatened veldtype / ecosystem and in terms of that the sensitivity level of 'Medium' is also accepted.

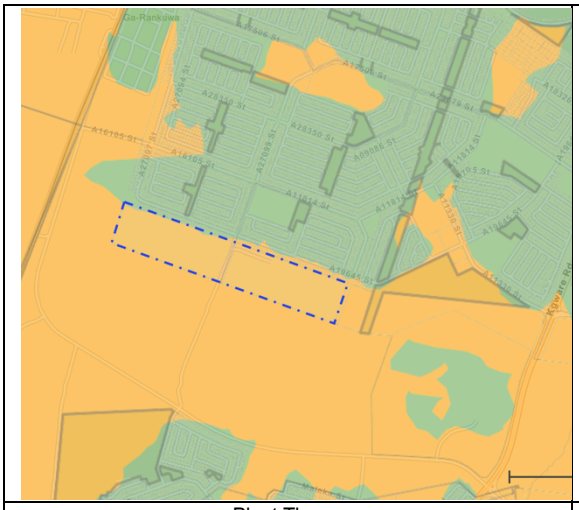
The overall biodiversity theme sensitivity of 'Very High' is disputed. During site investigations the overall sensitivity, which includes the other themes of aquatic, plant, and animal was found to be in reality 'Low' and for the same reasons given for the plant theme sensitivity. The loss of vegetation in turn is loss of habitat for fauna, including RDL or SCC fauna. The high levels of urbanisation on the site and surrounding the site also have large negative impact on all wild fauna in the area. These impacts include high levels of illegal hunting and snaring, etc.

In summary, the screening tool sensitivities for the plants and animals were verified (confirmed), but the sensitivities for the overall terrestrial and aquatic are disputed.

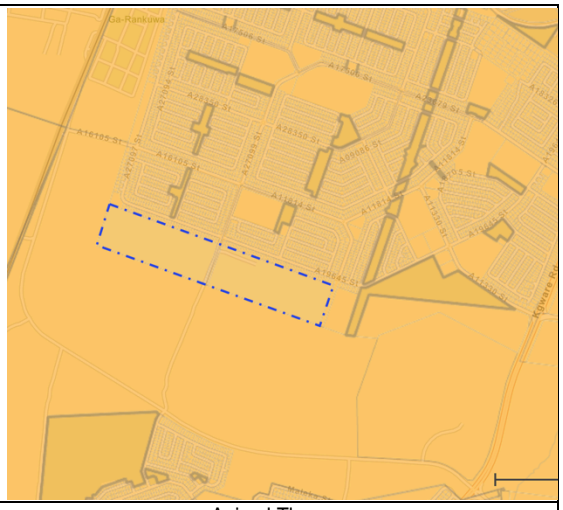
The overall biodiversity theme was ground-truthed to be a mix of 'Medium' and 'Low'. Medium for the degraded, still open thornveld areas and low for the totally transformed areas with dwellings and cleared yards.

Table 14: Screening Tool Maps

	
Terrestrial Biodiversity Theme	Aquatic Biodiversity Theme



Plant Theme



Animal Theme

Dotted blue line: Study Site. Red: Very High Sensitivity. Orange: Medium Sensitivity. Green: Low Sensitivity

2.19 Ecological Sensitivity Assessment

The sensitivity assessment identifies those areas and habitats within the study site that have a high conservation value and that may be sensitive to disturbance. All watercourses, including seasonal streams and drainage lines are, by default, viewed as sensitive, even if they are degraded. Areas or habitats have a higher conservation value (or sensitivity) based on their threatened ecosystem / veldtype status; ideal habitat for priority species (including Red Data species); species-richness; distinctive habitats; etc. Demarcated priority areas such as nature reserves also have a higher ecological sensitivity, even if not within a threatened ecosystem.

The sensitivities of the habitats are first assessed separately in terms of fauna and flora (Table 15 & Table 16) and then combined into an overall ecological sensitivity analysis (Table 17).

Note: The final / overall ecological sensitivity is taken to be that of the highest individual rating of the Floristic and Faunal Sensitivity.

Two distinctive habitats were identified, namely, Transformed (houses, roads, fields) and Thornveld (open thornveld).

2.19.1 Floristic Sensitivity Analysis

Table 15: Floristic sensitivity analysis

Criteria	Distinctive habitats in the study area	
	Transformed	Thornveld
Red Data Species	0	2
Habitat Sensitivity	0	5
Floristic Status	2	5
Floristic Diversity	2	5
Ecological Fragmentation	5	5
Sensitivity Index	18%	44%

Sensitivity Level	Low	Medium

High: 80 – 100%; Medium/high: 60 – 80%; Medium: 40 – 60%; Medium/low: 20 – 40%; Low: 0 – 20%

2.19.2 Faunal Sensitivity Analysis

Table 16: Faunal sensitivity analysis

Criteria	Distinctive habitats in the study area	
	Transformed	Thornveld
Red Data Species	0	4
Habitat Sensitivity	0	4
Faunal Status	2	5
Faunal Diversity	2	5
Ecological Fragmentation	5	5
Sensitivity Index	18%	46%
Sensitivity Level	Low	Medium

High: 80 – 100%; Medium/high: 60 – 80%; Medium: 40 – 60%; Medium/low: 20 – 40%; Low: 0 – 20%

2.19.3 Ecological Sensitivity Analysis

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated sensitivity unit of the two categories is taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature (Table 17).

Table 17: Ecological sensitivity analysis

Ecological community	Floristic sensitivity	Faunal sensitivity	Ecological sensitivity
Transformed	Low	Low	Low
Thornveld	Medium	Medium	Medium

High: 80 – 100%; Medium/high: 60 – 80%; Medium: 40 – 60%; Medium/low: 20 – 40%; Low: 0 – 20%

2.20 Buffer Areas

There are no sensitive habitats on the study site such as (eg. Koppies), watercourses (e.g. rivers, wetlands), or patches of pristine Marikana Thornveld that need to be protected with buffers. Furthermore, much of the CBA area and 'open veld' bordering on the south of the site is also filling up with informal settlements. So there is not need to protect this area with a buffer along the southern boundary of the study site.

In other words, no buffers area required for the project.

2.21 Sensitivity Map

Taking all of the above information and findings into account the sensitivity of the study area was found to be a mix of 'Low' and 'Medium' (Figure 15). The open thornveld is highly degraded and altered and even though some of it is within a demarcated CBA and Marikana Thornveld is a threatened veldtype, in

reality the ecological state and sensitivity in terms of conservation in that area is 'Medium'. The transformed areas have a sensitivity of 'Low'.

Figure 15: Sensitivity map for the study area

3 IMPACT ASSESSMENT

3.1 Existing Impacts

The largest existing impacts on the area are the increasing high levels of urbanisation and development. Including in these negative impacts are all the relevant and typical anthropogenic activities and impacts that accompany urban expansion and development. The study area is theoretically vacant land or open thornveld. However, it has been badly degraded and transformed by fairly new expansion of informal settlements and 'formal' structures, brick houses, roads and electricity infrastructure.

3.2 Potential Impacts

The project and related activities will have moderate negative impacts on the study site and moderate to low impacts on the larger region. Impacts include the typical and standard negative impacts that accompany most township developments, such as loss of natural vegetation, loss of faunal habitat, fringe impacts, etc.

The project will have no positive impacts on the environment. However, it is strongly recommended that open public spaces be zoned and development and that large amounts of indigenous trees (sweet thorn, karee, white stinkwood be planted in the parks (public open spaces) and along the main roads.

3.3 Assessment of potential impacts

The assessment of potential impacts on the natural environment arising from the project and related activities is shown below in Table 18.

The scoring method used in the impact assessment is as follows:

Significance (SP) = [extent (E) + duration (D) + magnitude (M)] x probability (P).

The maximum value is 100 significance points (SP). Environmental impacts will be rated as either that of High, Moderate or Low significance on the following basis:

SP ≥60: **High**; SP 31 ≥ 59: M**oderate**; SP ≤ 30: **Low**.

Further explanation of the assessment methodology is found in the section on methodology

3.4 Cumulative Effect

The Cumulative Effect can be defined as the total negative impacts on the natural environment which are caused by the combined (total) effects of past, current and future activities. Cumulative impacts (or the cumulative effect) are the sum of the overall impacts arising from the project (under the control of the developer / contractor), other activities (that may be under the control of others, including other developers, local communities, government and landowners) and other background pressures and trends which may be unregulated, including existing impacts.

The cumulative impacts are:

- Moderate in terms of localised impact on the study site.
- Moderate in terms of cumulative impact on the region, but lower than in terms of the localised impact.

Table 18: Assessment of Potential Impacts

Potential Impacts arising from Project	Phase of Project	Impact Rating (Low: <30; Moderate: 31-59; High: >60)					
		Extent	Duration	Magnitude	Probability	Total	**Significance**
Total Impact of Proposed Project	**Pre-Mitigation**	Local (2)	Long-term (4)	High (8)	High (4)	56	**Moderate**
	Post Mitigation	Site (1)	Long-term (4)	Moderate (6)	Medium (3)	33	**Moderate**
Mitigating Measures	1. Impacts on the existing natural environment related to the project are '**MODERATE**' 2. Any temporary storage, lay-down areas or accommodation facilities to be setup in the study area itself and not within any open veld outside of the study site. 3. Ensure small footprint during construction phase, with high controls on fringe impacts on any adjacent thornveld. 4. No buffer zones are required. These are 'No-Go' zones in terms movement of vehicles and contractors, as well as development of houses and other buildings. However, no new access roads may be developed through the open thornveld outside of the study site during the construction phase. 5. All hazardous materials must be stored appropriately to prevent these contaminants from entering the water environment (including the groundwater). 6. All excess materials brought onto site for construction must be removed after construction.						

	7. Very strict control and monitoring must be put in place to ensure that no building rubble, excavated soils and rocks, etc. are dumped in the nearby open veld. All rubble must be transported to a registered landfill site and proof of off-loading obtained and kept on site with other records for easy inspection and site audits. 8. No open trenches or mounds of soils to be left. All disturbed areas to be re-contoured to blend in with original contours and lines of undisturbed and undeveloped adjacent areas. 9. A rehabilitation plan for the project is required. 10. A weed control programme is required. 11. Site specific stormwater management plan is required, which should form part of the initial engineering / layout plans of the project. As part of the plan all attempts must be made to keep the surface stormwater flow / movement as free and natural as possible. 12. Public Open Spaces are essential and must be included in the final layout plans. 13. It is recommended that numerous indigenous trees be planted in the public open spaces and along the main streets in the townships.						
Cumulative Effect on a local scale		Site (1)	Long-term (4)	High (8)	High (4)	52	**Moderate**
Cumulative Effect on a regional scale		Site (1)	Long-term (4)	Moderate (6)	Medium (3)	33	**Moderate**
Individual Impacts (Low: <30; Moderate: 31-59; High: >60)							
		Extent	Duration	Magnitude	Probability	Total	Significance
1. Loss of natural vegetation	**Pre-Mitigation**	Site (1)	Long-term (4)	High (8)	High (4)	52	**Moderate**
	Post Mitigation	Site (1)	Long-term (4)	High (8)	High (4)	52	**Moderate**
Mitigating Measures	1. The loss of natural vegetation will be moderate on the localised footprint of the proposed development even though the study area is within a threatened veldtype. This is because there are high levels of transformation and degradation of the study site with no pristine or good thornveld present. 2. There are no protected trees or other RDL plant species on site. 3. The loss of vegetation can be slightly offset (although not fully) with the implementation of good sized public open spaces and the planting of numerous indigenous trees. 4. A weed control programme must be implemented. This can form part of the routine maintenance programme for the overall Townships. The responsibility falls to the municipality once operational and this is usually problematic due to lack of implementation. 5. A site-specific rehabilitation plan is required for the project.						
2. Loss or impact on wildlife	**Pre-Mitigation**	Site (1)	Long-term (4)	Moderate (6)	Medium (3)	33	**Moderate**
	Post Mitigation	Site (1)	Long-term (4)	Moderate (6)	Low (2)	22	**Low**
Mitigating Measures	1. Care must be taken not to interact directly with any wild life encountered. 2. Any bird nests or active animal burrows encountered during construction phase must not be interfered with. If encountered must first be discussed with specialist as how best to proceed. 3. Some form of offset is recommended such as establishment of bat houses and owl boxes. These can be set up in the public open spaces and/or along the western boundary of the study site, which opens up into existing thornveld.						
3. Impeding & Impounding waterflow	**Pre-Mitigation**	Local (2)	Short-term (2)	Low (4)	Low (2)	16	**Low**
	Post Mitigation	Site (1)	Short-term (2)	Minor (2)	Low (2)	10	**Low**
Mitigating Measures	1. There are no watercourses on the study site. However, surface stormwater flow may be diverted but the flow must be kept as natural as possible where possible. 3. Erosion potential is low on the study site due to the flatness of the topography and total lack of any significant ravines or valleys.						

6. Fringe impacts	**Pre-Mitigation**	Local (2)	Medium (3)	Low (4)	Medium (3)	27	**Low**
	Post Mitigation	Site (1)	Medium (3)	Low (4)	Medium (3)	24	**Low**
Mitigating Measures	1. Due to the nature of the project the potential for any significant fringe impacts are realistic and inevitable. Depending on the amount of offset and containment the fringe impacts might increase over time, but they are initially low due to the mostly built up areas surrounding the study area. 2. Care must be taken with heavy machinery used on the project. All access roads used during construction must be monitored and maintained. 3. Soils and stones excavated may be used on site as backfill, fixing of roads, filling of dongas, etc. 4. Excavated soils and rocks may not be simply dumped in any nearby open veld. 5. All temporary access roads, laydown areas, temporary camps, site offices, etc. must be fully rehabilitated by the contractors prior to final signing off of the construction phase of the project. 6. Dust suppression must be used during the dry autumn and winter months during construction.						

4 CONCLUSIONS

4.1 Conclusions

The conclusions of the site investigations and study are as follows:

- The study site is within the original extent of the veldtype known as Marikana Thornveld, which is a threatened veldtype / ecosystem with a status of 'Endangered'. However, most of the site is either transformed (by existing houses and fields) or badly degraded (by over-utilisation of resources such as wood).
- During site investigations no red data listed (RDL) fauna or flora, or other species of conservation concern were observed on the study site.
- There are no watercourses in the study area or immediately adjacent, including wetlands.
- The study site is not with any national priority areas.
- Sections of the study site are within a critical biodiversity area (CBA).
- The biodiversity of the study area was found to be a mix of 'Low' (the transformed areas); and 'Medium' (the degraded open thornveld areas).
- All recommended mitigating measures must be implemented and form part of the conditions of any documentation or licences (eg. The EMP).

5 APPENDICES

5.1 List of floral species identified on site

Trees and Shrubs

Senegalia (Acacia) caffra, Vachellia (Acacia) *gerrardii, Vachellia* (Acacia) *karroo, Combretum molle, Seaersia lancea, Ziziphus mucronata.*

Grasses

Elionurus muticus, *Eragrostis lehmanniana*, *Setaria sphacelata*, *Themeda triandra*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Fingerhuthia africana*, *Heteropogon contortus*, *Hyperthelia dissoluta*,

Protected Trees

None.

Aquatic Species

None.

Alien Species

Melia azeradarach, Schinus molle, Senna septemtrionalis.

5.2 Marikana Thornveld

Below is the list of dominant plant species that characterise Marikana Thornveld (Mucina & Rutherford, 2010).

Tall Tree: *Acacia burkei*. Small Trees: *Acacia caffra* (d), *A. gerrardii* (d), *A. karroo* (d), *Combretum molle* (d), *Rhus lancea* (d), *Ziziphus mucronata* (d), *Acacia nilotica, A. tortilis* subsp. *heteracantha*, *Celtis africana*, *Dombeya rotundifolia*, *Pappea capensis*, *Peltophorum africanum*, *Terminalia sericea*. Tall Shrubs: *Euclea crispa* subsp. *crispa* (d), *Olea europaea* subsp. *africana* (d), *Rhus pyroides* var. *pyroides* (d), *Diospyros lycioides* subsp. *guerkei*, *Ehretia rigida* subsp. *rigida*, *Euclea undulata*, *Grewia flava*, *Pavetta gardeniifolia*. Low Shrubs: *Asparagus cooperi* (d), *Rhynchosia nitens* (d), *Indigofera zeyheri*, *Justicia flava*. Woody Climbers: *Clematis brachiata* (d), *Helinus integrifolius*. Herbaceous Climbers: *Pentarrhinum insipidum* (d), *Cyphostemma cirrhosum*. Graminoids: *Elionurus muticus* (d), *Eragrostis lehmanniana* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Aristida scabrivalvis* subsp. *scabrivalvis*, *Fingerhuthia africana*, *Heteropogon contortus*, *Hyperthelia dissoluta*, *Melinis nerviglumis*, *Pogonarthria squarrosa*. Herbs: *Hermannia depressa* (d), *Ipomoea obscura* (d), *Barleria macrostegia*, *Dianthus mooiensis* subsp. *mooiensis*, *Ipomoea oblongata*, *Vernonia oligocephala*. Geophytic Herbs: *Ledebouria revoluta*, *Ornithogalum tenuifolium*, *Sansevieria aethiopica*.

(d) = Dominant.

5.3 Definitions

5.3.1 Wetlands

'Wetland' is a broad term and for the purposes of this study it is defined according the parameters as set out by the Department of Water & Sanitation (DWS) in their guideline (A practical field procedure for identification and delineation of wetlands and riparian areas, 2005).

According to the DWS document and the National Water Act (NWA) a wetland is defined as, "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near 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*."

Furthermore, the guidelines stipulate that wetlands must have one or more of the following defining attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and
- A high-water table that results in saturation at or near surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

5.3.2 Seep Wetlands

A seep is a wetland area located on gently to steeply sloping land and dominated by colluvial (i.e. gravity-driven), unidirectional movement of water and material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend onto a valley floor.

Water inputs are primarily via subsurface flows from an up-slope direction. Water movement through the seep is mainly in the form of interflow, with diffuse overland flow (known as sheetwash) often being significant during and after rainfall events.

Seeps are characterised by their association with geological formations (lithologies) and topographic positions that either cause groundwater to discharge to the land surface or rain-derived water to 'seep' down-slope as subsurface interflow. Examples of places where these conditions occur are (1) on slopes where the water table intersects the land surface, resulting in groundwater discharge directly to the land surface; (2) land that is down-slope of a break in slope of (Ollis, *et. al*. 2013. SANBI Biodiversity Series 22).

5.3.3 Riparian zones

Riparian vegetation is typically zonal vegetation closely associated with the course of a river or stream and found in the alluvial soils of the floodplain. According to the National Water Act (NWA) riparian habitat is defined as including "*The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.*"

It is important to note that the NWA states that the riparian zone has a floral composition distinct from those of adjacent areas. The NWA also defines riparian zones as areas that "*commonly reflect the high-energy conditions associated with the water flowing in a water channel, whereas wetlands display more diffuse flow and are lower energy environments*."

Figure 16, below, shows the basic classification of wetlands.

Hydrogeomorphic types		Description	Source of water maintaining the wetland[1]	
			Surface	Sub-surface
Floodplain		Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel		Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans)		A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[1] Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source: * Contribution usually small

*** Contribution usually large

*/ *** Contribution may be small or important depending on the local circumstances

*/ *** Contribution may be small or important depending on the local circumstances.

 Wetland

Figure 16: Basic classification of wetlands

5.4 Buffer Zones vs Regulated Zones

A buffer zone implies or talks to a zone or area in which "nothing" should be done, or no activities are allowed to take place. A regulated zone (or area), has certain legal implications, under which certain or regulated activities may or may not take place.

The following areas / zones and regulations are relevant:

- The 32 m in the NEMA listed activities. This is 32 m from the 1:1 year flood line or first flood bank of the active stream area. This is not 32 metres from the 1:100 year flood line or 32 metres from the 500 m zone of the delineated wetland as determined by DWS. Experts keep on using definitions in the NEMA to support or define things or issues in the NWA or vice versa. This should not be done).
- The 1:100 flood line, or the riparian area (which ever is the furthest) as defined by the GN509 in terms of the NWA; or
- The wetland area and 500 m from the wetland area as defined by GN509 in terms of the NWA. This 500 m area is not a buffer zone, but a zone of observation to determine the presence of nearby wetlands that might required buffering.

These areas are the "Extent" or "regulated area" of a watercourse. In other words areas in which the applicable legislation applies. Before any activity can take place as defined by the legislation the activity must be authorised in terms of that legislation. The term is "Regulated Area".

This means an activity may take place within a regulated area. Only if after the necessary environmental evaluation processes have been followed and it has been determined that the impacts are acceptable or the mitigating actions implemented will address any unacceptable impacts.

5.5 Short CV of Specialist

QUALIFICATIONS

2000 MBA, Oxford Brookes University (England)
1998 Diploma in Small Business Management (Damelin College)
1988 MSc (Rand Afrikaans University)
1987 BSc (Hons.) (Rand Afrikaans University)
1986 BSc (Rand Afrikaans University)

FURTHER TRAINING AND DEVELOPMENT

- Diploma in Public Speaking & Communications Ambassador College (USA)
- SAQA Accreditation and Qualifications in Training, Assessing & Service Provision (AgriSeta)
- SASS 5 Training Course

PUBLICATIONS

- Co-Authored Book: Cut Flowers of the World. 2010. Briza, Pretoria.
- Cut Flowers of the World, 2ed. 2020. Briza, Pretoria.
- 100s of articles for popular magazines such as Farmer's Weekly & SA Landscape

PROFESSIONAL MEMBERSHIPS

- SA Council of Natural Scientific Professions (SACNASP)
    - Reg. No. 400077/91

- South African Wetland Society
    - Reg. No: 998061
- Society of Wetland Scientists

PROFESSIONAL EXPERIENCE
Position: **Director / Owner**
Employer: Flori Scientific Services
Period: 2000 to current
Scope of Work Done:

- Conduct specialist studies and reasearch for EIA projects.
- Specialist studies and consultancy includes
- Ecological studies
- Aquatic and Wetland assessments
- Avifaunal impact assessments
- Risk Matrices for water use licences
- Specialist Environmental Consultant
- Environmental Control Officer (ECO) work
- Specialist work involves field investigations and report writing.

Position: **Technical Manager**
Employer: Sunbird Flowers (Pty) Ltd
Period: 1997 - 2000
Scope of Work Done:

- Consulted on and managed projects in the agricultural & floricultural industries, with specific emphasis on high-yield agriculture.
- Managed existing and new projects.
- Involved in all aspects of project management from managing, planning; costing; marketing; budgeting, technical and training.
- Assisted emerging rural farmers in most aspects of agriculture

(i.e. Cut flower and vegetable production) including setting up of business plans, marketing, training and costings.

- Did “turn-key” projects in most agriculture related fields. This included – Tunnel and greenhouse production; Hydroponics; vegetables, cut flowers; field crops.

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