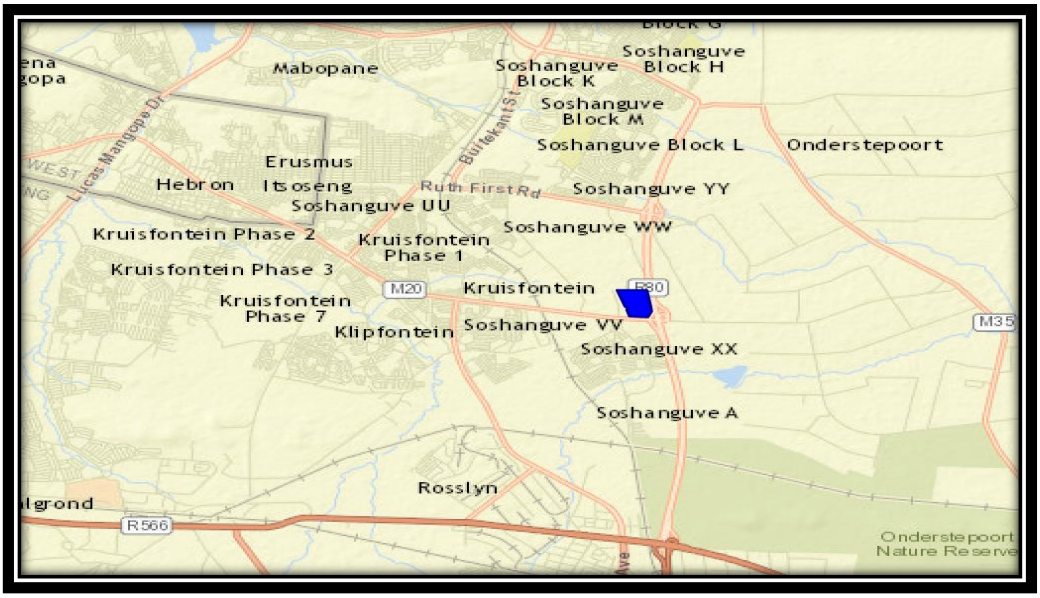
ECOLOGICAL ASSESMENT FOR THE PROPOSED TOWNSHIP DEVELOPMENT ON PORTIONS 15 AND 16 OF THE FARM KRUISFONTEIN 259JR, CITY OF TSHWANE



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1. GLOSSARY

Biodiversity: the number and variety of living organisms on earth, plants, animals and micro-**organisms**, the genes they contain, the evolutionary history and potential they encompass, and the **ecosystems**, ecological processes, and landscapes of which they are integral parts.

NEMA: National Environmental Management Act, 107 of 1998

Habitat: the natural home of species of plants or animals.

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

Alien vegetation: Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally

Degreaser grass: Grass abundant in the veld in good condition which decreases when the veld is underutilise or over utilise

Endangered: Organisms in danger of extinction if the causal factors continue to operate

Exotic vegetation: Vegetation species that originate from outside of the borders of the biome usually international origin

Indigenous vegetation

Increaser 1 grass: grass species that increase in density when the veld is under utilized

Increaser 2 grass: grass species that increase in density when the veld is over utilised trampled and disturbed veld

Increaser 3 grass: grass species that increase in density when the veld is over and under utilized

NFEPA: National Ecosystem Priority Area

NBA: National Biodiversity Assessment

Pioneer species: plant species that is stimulated to grow after disturbance has taken place; this is the first step in natural veld succession after a disturbance

Rare: Organisms with small populations at present

RDL species: organisms that fall into the extinction into the wild (EW) critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status

Urban areas mean areas situated within the urban edge (as defined or adopted by the competent authority), or in instances where no urban edge or boundary has been defined or adopted, it refers to areas situated within the edge of built-up areas;

Watercourse means –

(a) a river or spring;

(b) a natural channel in which water flows regularly or intermittently;

(c) a wetland, pan, lake or dam into which, or from which, water flows; and

(d) any collection of water which the Minister may, by notice in the *Gazette*, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998); and a reference to a watercourse includes, where relevant, its bed and banks;

Wetland means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances support or would support vegetation typically adapted to life in saturated soil.

NEMBA means the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004);

NEMPAA means the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003);

Gauteng Conservation Plan (C-Plan) means a systematic conservation planning tool delineating biodiversity priority areas representative of biodiversity pattern, process and species of special concern, which areas have been identified in three broad categories; namely, Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Protected Areas;

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

CARA means Conservation of Agricultural Resources Act. (Act 43 of 1983)

Vegetation is defined in this context as the vegetation structural and compositional state.
Water regime: when and for how long the soil is flooded or saturated.
Water Quality largely self-explanatory and reflecting the changes in quality because of changes in land use or as a direct result of activities within the wetland itself that could lead to changes in the quality of the water flowing through and within the wetland.
Waterlogged: soil or land saturated with water long enough for anaerobic conditions to develop.

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

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

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

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

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

LIST OF ABBREVIATIONS

Abbreviation	Description
C-Plan	Gauteng Conservation Plan
DAFF	Department of Agriculture, Forestry and Fisheries
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPR	Environmental Management Programme Report
NEMA	National Environmental Management Act
SANBI	South African National Biodiversity Institute
HGM	Hydro-Geomorphic
GPS	Geographical Positioning System
PES	Present Ecological State
IHI	Index of Habitat Integrity
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographic Information Systems
CARA	Conservation of Agricultural Resource Act

2. EXECUTIVE SUMMARY

This report discusses the approach and findings of the desktop and field screening surveys carried out to assess the likelihood of ecological sensitivities occurring on the study area and to identify any matters regarding fauna and flora that should receive attention during the environmental impact assessment process for the proposed Soshanguve township establishment.

The study area is situated within an urban area located on the corner of Hebron and R80 roads. Residential and mining areas dominate the landscape, leaving portions of the surrounding area transformed.

On a regional level, GDARD information baseline highlights the Marikana Thornveld grassland. The results concluded that the vegetation on site is secondary vegetation, the evidence of historical and current activities like sand mining, roads, shopping centre and residential developments determined no ecological sensitivity onsite. The field surveys were done during summer flowering season and the area was observed to support a low diversity of species which can likely support a low diversity of fauna and flora as the area is a build-up.

The requirements to establish any type of development within the property is based on the legal requirements in NEMA 107 of 1998 as amended. It is critical that areas identified and recognised within the development plans to ensure compliance, protection and sustainability of the country's natural resources. A list of plants species that has been recorded to date in representative grid has been obtained from literature and general medicinal plants were also recorded as observed from site surveys done.

The ecological investigation indicated that the development proposal has no direct impact and have low ecological impact. The medicinal plants should be rescued or used for garden land scape purposes. The assessment concluded that no adverse ecological risk can be imposed to the environment by the development.

3. GENERAL INFORMATION

This report is based on survey and assessment techniques which limited by time and budgetary constraints relevant to the type and level of investigation undertaken. The findings, results, observations, recommendations and conclusions given in this report are based on the author's best scientific and professional knowledge as well as available information at the time off the study. Therefore, the author reserves the right to modify aspects of the report including the recommendations if new information become available from on-going research or further work in this field, or pertaining to this investigation.

Although the author exercises due care and diligence in rendering services and preparing documents, the author 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 about services rendered, directly or indirectly by the author and using this document.

The Environmental Impact Assessment Regulations 2014 require that certain information is included in specialist reports. The terms of reference, purpose of the report, methodologies, assumptions and limitations, impact assessment and mitigation (where relevant to the scope of the work) and summaries of consultations (where applicable) are included within the main report. Other relevant information is set out below:

Expertise of the author

- Extensive experience and working in the field of the ecology, and in specific vegetation and wetland related assessments
- Registered as Professional Natural Scientist with the South African Council for Natural Scientific Professions in the field of Biological Sciences.

Declaration of Independence

Inkuthazo Holdings is an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of National Environmental Management Act, 1998 (Act 107 of 1998).

- I act as the independent specialists; perform the work relating to the project in an objective manner, even if this results in views and findings that are not favorable to the project proponent;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- have expertise in conducting the specialist report relevant to this project, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998; the Act), regulations and any guidelines that have relevance to the proposed activity;
- will comply with the Act, regulations and all other applicable legislation; will consider, to the extent possible, the matters listed in Regulation 8;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose to the project proponent and the competent authority all material information in my possession that reasonably has or may have the potential of influencing -any decision to be taken with respect to the project; and - the objectivity of any report, plan or

document to be prepared by myself for submission to the competent authority or project proponent;

All the information furnished in this document are true and correct; and realize that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Factors limiting the quality of this study

To order to obtain comprehensive understanding of the dynamics of the communities and the status of endemic, rare or threatened ecosystems in the area, ecological assessment/studies should ideally be replicated over several seasons even over several years. However due to project time constraints the field survey was conducted on the 26th April 2018 thus assessment was limited to one site visit. The likelihood of the occurrence of Species of Conservation Concern and the presence of suitable habitat was assessed largely based on previous records for the 2528CA Quarter Degree Square.

Many threatened plant species are strictly seasonal and only flower during that specific period of the year and most threatened faunal species are very secretive and difficult to survey even during thorough field surveys conducted over several seasons. Thus, only plants that are flowering at the time of the site visit were identified with high confidence compared to as plants flower at contrasting times of the year. Though the survey was considered as being successful with the correct identification of the different ecological units it should be indicated that not all the ecological resources present on site could be specifically assessed.

4. INTRODU CTION

South Africa is committed to the conservation of Biological diversity, and has developed several legislative mechanisms to ensure the preservation and sustainable use of biological diversity. However natural resources are continually under threat from the development. Uncontrolled development is one of the biggest threats to the naturally evolved life forms on earth. Past developments around the world have led to the destruction of various plants and animal species and their habitats.

The achievement of a balanced development that satisfies the human needs while also conserving the natural resources and biodiversity is one of the biggest factor and a challenge facing the decision makers in the country today.

Prevention of any destruction of the ecosystems, systematic planning and coordination of human activities and development should receive priority attention. Vegetation is the most physical representation of the natural ecosystems on which all species are ultimately dependent. It is a major component in the ecosystem and as such it is of practical importance to be conserved. It plays a key role in living organisms as primary producers and it also forms a protecting layer covering the soil thereby protecting it against the destruction from wind and water. Vegetation plays a significant role in the protection of other species and soil erosion control.

This ecological assessment is intended to inform the application for environmental authorisation process for the proposed development on part of Portion 15 and Portion 16 of the Farm Kruisfontein 259 JR within the jurisdiction City of Tshwane Metropolitan Municipality. The site is **approximately 30 hectares**.

5. STUDY AREA

The study area is located on part of Portion 15 and Portion 16 of the Farm Kruisfontein 259 JR within the jurisdiction City of Tshwane Metropolitan Municiplaity, approximately east of the R80 and Hebron road, Gauteng **. GPS Coordinates Latitude:** GPS: 25˚34' 40.14" S 28˚ 06'25.79"

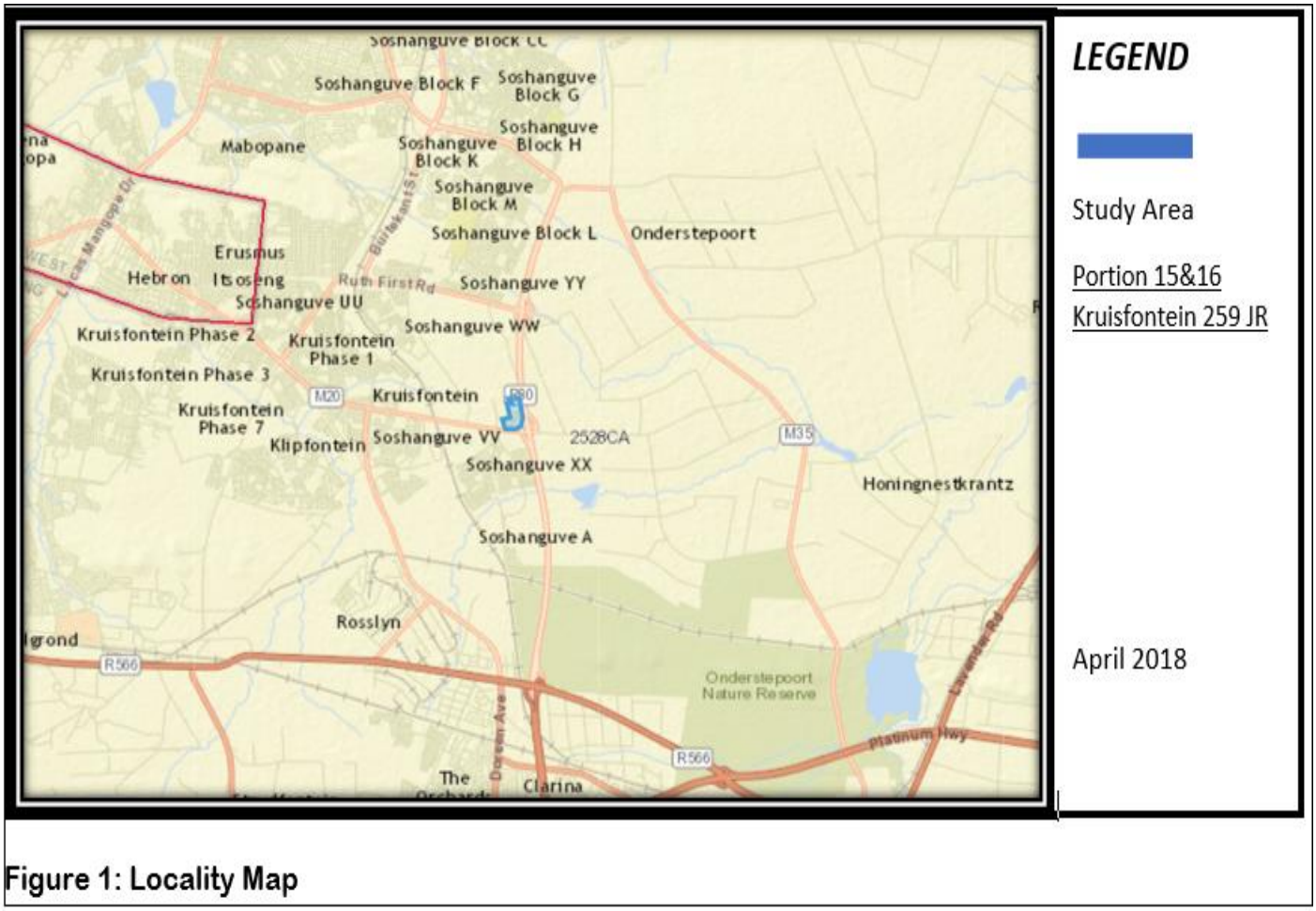


Figure 1: Locality Map

5.1. Surrounding Environment

The area of Soshanguve consists of mixed use developments, including sand mining on the northern side, Soshanguve VV residential on the western side, R80 Mabopane Highway on Eastern side and the site is accessible from Hebron Road.

6. CLIMATE

The climate of the study area is characterised by summer rainfall with very dry winters. Effectively three seasons, namely a cool dry season from May to mid-August, a hot dry season from mid-August to about October and a hot wet season from about November to April. MAP from 500-700 mm. Frost formation is infrequent. Mean monthly maximum and minimum temperatures for Geode hoop (in the northern part of this vegetation unit) 35.3°C and -3.1°C for November and June respectively. (Mucina& Rutherford,2006).

Geology & Soils: The large southern and eastern parts of this area are underlain by granite of the Lebowa Granite Suite and some granophyre of the Rashoop Granophyre Suite (both Bushveld Complex, Vaalian). In the north, the sedimentary rocks of the Waterberg Group (Mokolian Erathem) are most

important. Specifically, sandstone, conglomerate and siltstone of the Alma Formation and sandstone, siltstone and shale of the Vaalwater Formation. Well-drained, deep Hutton or Clovelly soils often with a catenary sequence from Hutton at the top to Clovelly on the lower slopes; shallow, skeletal Glenrosa soils also occur. Land types mainly Bb, Fa, Ba, Bd and Ac.

Vegetation & Landscape Features Low undulating areas, sometimes between mountains, and sandy plains and catenas supporting tall, deciduous *Terminalia sericea* and *Burkea africana* woodland on deep sandy soils (with the former often dominant on the lower slopes of sandy catenas) and low, broad-leaved *Combretum* woodland on shallow rocky or gravelly soils. Species of *Acacia*, *Ziziphus* and *Euclea* are found on flats and lower slopes on eutrophic sands and some less sandy soils. *A. tortilis* may dominate some areas along valleys. Grass-dominated by the herbaceous layer with relatively low basal cover on dystrophic sands.

Catchment: Freshwater Ecosystem Priority Areas (FEPAs) are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for serving ecosystems and associated biodiversity of rivers and wetlands. The study area is not within a river FEPA catchment.

Figure 2: A map showing the water catchment in terms of the Critical Biodiversity Areas: NFEPAs. The site area is in quaternary catchment A21E in the Sub Catchment Apies/Pienaars Crocodile West and Marico Water Management Area

7. APPROACH, AIM OF THE STUDY AND SCOPE OF WORK

Inkuthazo Environmental Consulting was appointed to undertake ecological assessment for the proposed township development on part of Portion 15 and Portion 16 of the Farm Kruisfontein 259 JR within the jurisdiction City of Tshwane Metropolitan Municipality, Gauteng. The survey is required to map the habitats found on the site as well as to assess the potential presence of legally protected species, list the declared weeds or alien invader species as listed in the Conservation of Agricultural Resources Act (Act 43 of 1983) in terms of CARA, 198 alien species are declared weeds and invaders and ascribed in categories,

The approach for the project included:

- Description of the regional, local vegetation and watercourse of the site
- Field survey for investigation and records of the following
  a) Species of special biodiversity concern,
  b) Geo-reference sensitive communities (habitats) and
  c) List the identified plant species onsite.
- Mapping of various plant communities and indicate their ecological sensitivity, sensitive areas and no go areas if any
- An Assessment (identification and rating) of the potential impacts on the ecosystems and
- Provide recommendations on possible mitigation/management measures and rehabilitation procedures

8.AIM OF THE STUDY

Inkuthazo Holdings was appointed to undertake an Ecological Assessment for the proposed development. The survey requires one to map the habitats found on the site as well as to assess the potential presence of legally protected species and any other notable habitats and species. The survey focuses on the status of the threatened ecosystem and plants species occurring or which are likely to occur on the study site. The study includes the description of sensitive habitats within 200m of the site. The primary aim of this project report is to investigate and present options for enhancing and /or maintaining biodiversity to mitigate the impacts of the proposed development and related infrastructure with the overall objective of preventing further loss of biodiversity. The findings are based on the assessment of the Present Ecological Status and the suitability of the study area and the surrounding environment for the proposed development on part of Portion 15 and Portion 16 of the Farm Kruisfontein 259 JR within the jurisdiction City of Tshwane Metropolitan Municipality.

The objectives of this study were to:

- Identify, describe and delineate the biodiversity sensitivity features onsite.
- Compile overall environmental sensitivity map.
- Provide mitigation measures for the protection of biophysical environment.
- Minimisation of habitat fragmentation.
- Assess the Present Ecological Status (PES) of the study area.
- List the perceptible flora of the site and recommend steps to be taken should threatened plant species, species of conservation concern or protected plant species be found on site.
- Highlight potential impacts of the development on the fauna and flora of the proposed site.
- Investigate the possible occurrence of watercourses and any biodiversity feature within the study area and on the neighbouring properties up to 200 meters extended study area.
- Preserve water resources in line with the objectives of the goals set out in the River Health Assessment undertaken by DWS and thereby ensuring that the limited available resources are utilised to the maximum benefit to the inhabitants and society if applicable.
- Identify possible impacts and provide mitigation measures for negative impacts and enhance positive impacts.
- Recommend suitable buffer zones within the study site.
- Provide recommendations regarding appropriate mitigation and management measures to be implemented should the proposed developmental activities be authorised.

Scope of work

- Indicate the medicinal plants and alien plants recorded.
- Comment on the connectivity with the natural vegetation on site.
- Comment on the Present Ecological state (PES).
- Evaluate the conservation importance and significance of the site.
- Propose management recommendations to minimise the impacts should the proposed development be approved.
- Identification of all legislations and guidelines governing the proposed activities.

9. LEGISLATIVE FRAMEWORK

The construction of the proposed development needs to take cognizance of the legislative requirements, policies, strategies, guidelines and principles of the relevant regulatory documents of the City of Tshwane, such as the National Spatial Development Framework, the City of Johannesburg Integrated Development Plan and Biodiversity Plan, the and the National Environmental Management Act (NEMA).

The National Environmental Management Act (NEMA) sets out several principles (chapter 1 S2) to give guidance to developers, private land owners, members of public and authorities. Principle number three determines that a development must be socially, environmentally and economically sustainable. Number 4(a) states that all relevant factors must be considered, *inter alia* i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ii)that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and viii) that negative impacts on the environment and on people' environment rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

The National Environmental Management Biodiversity Act (NEMBA 2004) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA, the protection of species and ecosystems that warrant national protection and the use of indigenous biological resources in a sustainable manner, amongst other provisions. Furthermore, NEMBA states that the loss of biodiversity includes *inter alia* the loss of biodiversity after all measures to avoid, reduce or remedy biodiversity loss have been taken, residual impacts remains and these are predicted to be medium to high.

National Water Act (NWA, 1998) The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, that comprises water courses, surface water, estuaries, or aquifers. The National Water Act (NWA) (Act No.36 of 1998) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way:

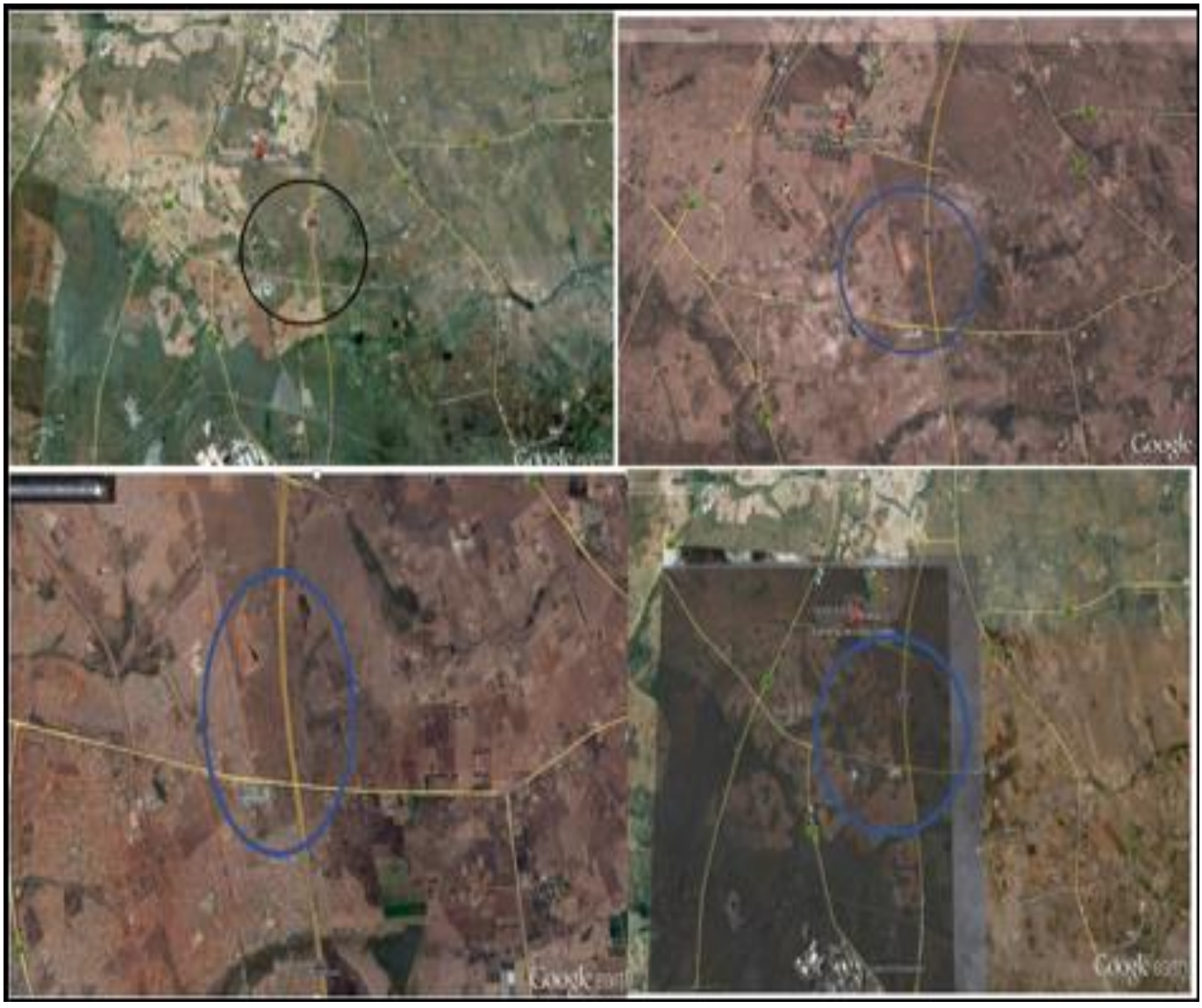
Conservation of Agricultural Resources Act (Act 43of 1983) as amended in March 2001–sets out the regulations regarding the control of weeds and invasive plants and provide the list of declared plants, in which they are divided into three categories. There is an exception in the regulations regarding biological control reserves.

10. METHODOLOGY

10.1. Desktop Survey and Literature Review

The description of the regional vegetation relied on literature from Mucina & Rutherford (2006) while the Gauteng Conservation Plan Version 3.3 was consulted on possible sensitivities that could be present on the study area and was also used as a baseline in the evaluation of ecologically sensitive areas. In addition, national biodiversity datasets were also used to provide the background for the site ((i.e. NFEPA, NBA etc.)

In addition, historic aerial images (Google Earth) were assessed prior to the field survey to identify disturbances that took place, over time.



The description of the regional vegetation relied on literature from Mucina & Rutherford (2006) which classifies the vegetation which occurs within the study area as Marikana Thornveld Grassland. It is considered as “Vulnerable” as very little of this vegetation type falls into statutorily conserved areas. The remaining grassland has been or is undergoing transformation through urbanisation and various developments within the Gauteng Province.

The Gauteng Conservation Plan Version 3.3 was consulted on possible sensitivities that could be present on the study area and was also used as a baseline in the evaluation of ecologically sensitive areas. In addition, national biodiversity datasets were also used to provide the background for the site ((i.e. NFEPA, NBA etc.) as well as the historic aerial images (Google Earth) were assessed prior to the field survey to identify disturbances that took place, over time. The GDARD databases for the specific farm portions and quarter degree were obtained from South African National Biodiversity (SANBI) indicated the following red data species potentially occur in the area

- *Habenaria kraenziliniana*

The IUCN conservation status categories on which the Threatened Species Programme, Red List of South African Plants (2013) were also used. The presence of rare and protected species or suitable habitat was recorded during the site visit.

This study presents the results of the flora of the study site, based on a desktop and field assessment as well as mapping from aerial imagery. The requirement of the study was to assess the sensitivity of the vegetation of the site and to assess the possibility of any threatened plant species occurring there.

The IUCN conservation status categories on which the Threatened Species Programme and the Red List of South African Plants (2013) were also consulted. The presence of rare and protected species or suitable habitat was recorded during the site visit. As per the recent vegetation mapping of the country, the study area falls within the Marikana Thornveld Grassland. This vegetation type is considered by Mucina *et.al* (2006) to be Endangered, with 3% of the remaining vegetation of this type being conserved, with a conservation target of 24% and 66% is transformed mostly by urbanization, which is spreading rapidly, (Mucina *et al*. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), also lists this vegetation type as Endangered.

10.2 Vegetation Survey

The basic method that was used during the vegetation survey was line transects that were walked on the site surveyed to record the plant species present. Rare and threatened plant species and any botanically sensitive sites or habitats were searched for in the various vegetation units.

The vegetation survey was conducted on site on 26th April 2018. The vegetation was in a moderate condition and most species could be identified. The determination of the availability of the suitable habitats and threatened ecosystem was also conducted. Species of special biodiversity concern were searched for and the location of their populations was geo-referenced using a GPS.

Habitat assessment was undertaken by professional, suitably qualified specialists. The GDARD Minimum Requirements for Biodiversity Assessment, March 2014 was used as a guide. Habitats within the site were mapped and the dominant plant species present in each habitat recorded.

The Braun-Blanquet survey principles were used to describe plant communities as ecological units for this study and to assess the species richness compared to other similar sites in this vegetation unit. An ecological sensitivity of the plant communities was assessed and categorised per habitat and plant species assemblages. For each species, the likelihood that it occurs at the site was rated to the following aspects**:**

SENSITIVITY ANALYSIS AND CRITERIA

Low: The available habitat does not appear to be suitable for the species and it is unlikely that the species occur on the site

Medium: The habitat is broadly suitable or marginal and the species may occur on site

High: There is suitable habitat and macro-habitats at the site and it is highly probable that the species occur on site

Definite: Species that were directly observed at the site

Vegetation sensitivity

In general, the ecological sensitivity of any piece of land is based on its inherent ecosystem services and overall preservation of biodiversity. Thus, relate to:

- Species diversity, endemism (unique species or unique processes) and the high occurrence of the species of special concern or ecosystem protected by legislation -conservation importance;
- The degree of ecological connectivity between systems with the land scape matrix. Thus, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive-ecological function.

10.3. Data Recorded and processing

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

10.4. Protected plants and Red / orange data species

A list of protected and specially protected plants was obtained from the National Environmental Management: Biodiversity Act. A species list of the red data species previously recorded near the proposed development as per GDARD C-Plan was searched for however none was observed.

10.5. Red data species

An investigation was carried out on rare and protected plants that might possibly occur in the region. For this investigation, the National Red/Orange List of Threated Plants of South Africa, South African National Biodiversity Institute (SANBI) website and the Plants of South Africa (POSA) website was also used.

10.6. Conservation status of vegetation

10.6.1. National Status

The conservation status of the Marikana Thornveld Grassland is Endangered. The conservation target is of this vegetation is 19%. Less than 1% statutorily conserved in, for example, Magaliesberg Nature Area. More grassland conserved 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.

Marikana Thornveld Grassland is listed as Endangered in the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).

Table1: Conservation status of vegetation types occurring in the study area, according to Driver et al. 2005/ Mucina et al. 2005 and the National Ecosystem List of the National Environmental Management: Biodiversity Act.

Name of vegetation type	**Marikana Thornveld grassland**
Code as used in the Book - contains space	SVcb6
Conservation Target (percent of area) from NSBA	19%
Protected (percent of area) from NSBA	2.4% (+2.2%)
Remaining (percent of area) from NSBA	75.9%
Description of conservation status from NSBA	Vulnerable
Description of the Protection Status from NSBA	Poorly protected
Area (sqkm) of the full extent of the Vegetation Type	17242.50
Name of the Biome	Savanna Biome
Name of Group (only differs from Bioregion in Fynbos)	Central Bushveld Bioregion
Name of Bioregion (only differs from Group in Fynbos)	Central Bushveld Bioregion

Important Taxa Tall Trees: *Acacia burkei* (d), *A. robusta*, *Sclerocarya birrea* subsp. *caffra*. Small Trees: *Burkea africana* (d), *Combretum apiculatum* (d), *C. zeyheri* (d), *Terminalia sericea* (d), *Ochna pulchra*, *Peltophorum africanum*, *Rhus leptodictya*. Tall Shrubs: *Combretum hereroense*, *Grewia bicolor*, *G. monticola*, *Strychnos pungens*. Low Shrubs: *Agathisanthemum bojeri* (d), *Indigofera filipes* (d), *Felicia fascicularis*, *Gnidia sericocephala*. Geoxylic Suffrutex: *Dichapetalum cymosum* (d). Woody Climber: *Asparagus buchananii*. Graminoids: *Brachiaria nigropedata* (d), *Eragrostis pallens* (d), *E. rigidior* (d), *Hyperthelia dissoluta* (d), *Panicum maximum* (d), *Perotis patens* (d), *Anthephora pubescens*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Brachiaria serrata*, *Elionurus muticus*, *Eragrostis nindensis*, *Loudetia simplex*, *Schmidtia pappophoroides*, *Themeda triandra*, *Trachypogon spicatus*. Herbs: *Dicerocaryum senecioides* (d), *Barleria macrostegia*, *Blepharis integrifolia*, *Crabbea angustifolia*, *Evolvulus alsinoides*, *Geigeria burkei*, *Hermannia lancifolia*, *Indigofera daleoides*, *Justicia anagalloides*, *Kyphocarpa angustifolia*, *Lophiocarpus tenuissimus*, *Waltheria indica*, *Xerophyta humilis*. Geophytic Herb: *Hypoxis hemerocallidea*. Succulent Herb: *Aloe greatheadii* var. *davyana*.

Biogeographically Important Taxa (Central Bushveld endemics) Graminoid: *Mosdenia leptostachys*. Herb: *Oxygonum dregeanum* subsp. *canescens* var. *dissectum*.

10.6.2. *Provincial C-Plan status*

The Gauteng C-Plan version 3.3 classifies the natural vegetation of the province per conservation value in decreasing value, as follows:

1. Protected
2. Irreplaceable
3. Important
4. Ecological Support Area

The ecological sensitivity of the plant communities was assessed and categorized per habitat and plant species assemblages.

11. Findings

- Mielie Field
- Road traversing the site to the sand mining area
- Building rubble/Dumping

12. Results

Habitat degradation is one of the main reasons for plant species becoming extinct in a particular /area. Threatened species are also seen as indicators of the overall health of an ecosystem (Hilton-Taylor, 1996).

The study area is classified as Ecological Support Area in terms of Gauteng Conservation Plan 3.3. However, the study site does not provide suitable habitat for any near threatened/Orange Listed species.

The site is located on degraded grassland dominated by *Hyparrhenia hirta* and *Melins repens.* At present the site is vacant land being used by locals and mining trucks as a pass through. Most of the site is characterised by the degraded grassland that varies in density and species composition. The area has termite's mounds and shallow gravelly soils. A single plant of Searsia lancea was observed on vegetation unit. No red data species occurs in this vegetation unit, probably because of the degraded state of habitat.

The study area is *1,4 km away from Kaalplaasspruit* and *3 km away from Onderstepoort Nature Reserve.*

There is an existing residential development on the western side of the study site R80 on the eastern side and Hebron on the southern direction of the study area. The area is an open with evidence of dumped rubble and a mielie field. Some declared alien invasive species and weeds are present within the area including *Pinus patula, Searsia lancea, Bidens pilosa, Cynodon dactylon, Datura stramonium, Lantana camara, Opuntia ficus-indica, Pennisetum clandestinum*

The vegetation units are secondary vegetation characterised mostly by the garden ornament plants and are declared invaders in terms of National Biodiversity Act and Conservation of Agricultural Resources Act.

The study area is an isolated veld with no resemblance of any ecological attribute, from ecological perspective is regarded as having low conservation value.

The vegetation is totally transformed, characterised mostly by the alien invasive plants which are declared invaders. **The study area has no conservation value and from ecological perspective is regarded as having low conservation value.**

Figure 2: Pictures shows the status of the vegetation onsite.

Vegetation unit is located on the Southern section of the study area and is approximately 1.39ha. The area was previously used for planted pasture land hence the homogeneous composition of the vegetation being dominated by alien invasive species. The following species are amongst the species occurring onsite:*Tagetes munita,Verbena bonariensis, Melia azedarach, Ziziphus mucronata, Widdringtonia nodiflora,Solanum panduriforme, Vahelia Caffra, Vernonia cinereal, jamacaru, Lippia javanica, Dicoma anomola.*

The vegetation unit is totally transformed.

Table 2: Provisional checklist of plant species found onsite

Species	
Aloe transvalaensis	*Nidorella hottentotta*
Aristida congesta	
Opuntia ficus-indica	
Stenostaphrum secundatum	*Garden ornaments*
Bidens pilosa	*Pelargonium luridum*
Diospyros lyciodes	
Combretum zeheri	*Eragrostis chloromelas*
Aloe transvaalensis	
Euclea crispa	*Rhus lancea*
Helichrysumnudifolium	*Tagetes munita*
Hyparrhenia hirta	*Cucumis zeyheri*
Ziziphus mucronata	*Felicia municata*
Lipia javanica	*Solanum xanthocarpum*
Meliaa zeradach	*Monsonia angustifolia*
Cymbopogon species	*Senegalia caffra*
Elephantorrhiza elephantine	*Verbena bonariensis*
Stoebe vulgaris	*Conyza podocephala*

Pennisetum clandestinum (declared invader)	*Cynodon dactylon*
Parinari capensis	*Cyperus esculentus*
Sersia lancea	
Solanum mauritianum (Declared weed category 1)	*Campuloclinium grandiflorum (PomPom weed) (Declared weed Category 1)*
Sporobolus africanus	*Cyperus spp.*
Acacia vahelia	*Melia azedarach*

Invasive alien species and exotic weeds

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

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

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones. Vehicles often transport many seeds and some may be of invader species, which may become established along the roads inside the mine where the area is disturbed. The construction phase of development in the area will almost certainly carry the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that invasive alien species such as the seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites.

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

Goals for addressing the problem of Invasive Alien Species (IAS) in the project area should include the following:

- Prevention: Keeping an IAS from being introduced onto the mine ecosystem. Ideally, this usually means keeping alien plants from entering the mine.
- Early detection: Locating IAS before they have a chance to establish and spread. This usually requires effective, site-based inventory and monitoring programmes.
- Eradication: Killing the entire population of IAS. Typically, this can only be accomplished when the organisms are detected early.
- Control: The process of long-term management of the IAS' population size and distribution when eradication is no longer feasible.
- Institute strict control over materials brought onto site, which should be inspected for potential invasive invertebrate species and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual insecticides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Alien invasive tree species such as blue gum should be eradicated.

Control involves killing the plants present, killing the seedlings which emerge and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act or in terms of Working for Water guidelines.

Rehabilitate disturbed areas as quickly as possible so as to reduce the area where invasive species would be at a strong advantage and most easily able to establish itself. Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds.

Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented. A plan should be developed for control of noxious weeds and invasive plants that could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations. Require the use of certified weed-free mulching. Prohibit the use of fill materials from areas with known invasive vegetation problems. The spread of invasive non-native plants should be avoided by keeping vehicles and equipment clean and reseeding disturbed areas with native plants. Scientists and field workers use a range of methods to control invasive alien plants

These include:

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

13.1. Flora

The site is transformed due to anthropogenic activities like farming and continuous developments such as roads, mall etc . There is no primary vegetation on site, the area is a build up with no connection to any ecological functioning systems. The study area has been used by trucks to transverse the mining area.

Floral community provide information regarding the ecological status of the habitat units within the study area. If the species composition is quantitatively determined and characteristics of all components of the

floral community are taken into consideration, it is possible to determine the Present Ecological Status (PES) of the study area.

Any identified species within the study area is specifically adapted to specific growth conditions. This transformed sensitivity to specific conditions make species good indicators of the veld conditions.

No red data species were found during the survey and it highly unlikely that any of such species would be present onsite due to the location of the site.

No protected trees listed in terms of the National Forest Act,1998 (Act. 84 of 1998) are known to occur in the 2528CA quarter degree square.

13.2. Fauna & Birds

No mammal species were observed during site surveys around the study area. Birds found onsite are known to be common in Gauteng area.

13.3. Wetlands

No wetland observed on site.

13.4. Ridges

There were no ridges found to occur on the study area.

Ecological Importance and Sensitivity (EIS)

Ecological importance is an expression of wetlands importance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAF,1999). The classification of water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity such as species diversity and abundance.
- Ecological functions including groundwater recharge, provision of specialised habitat and dispersal corridors.
- Basic human needs including subsistence water use.

Natural vegetation has been completely altered because of urbanisation, and farming activities. There is no evidence on frequencies of occurrence due to continuous habitat fragmentation. The Ecological Importance and Sensitivity (EI&S) is MARGINAL/LOW, the number of functional habitat types and species diversity is low because of the complete alteration in morphology and natural flow regime. **Therefore, the overall EcoStatus for this study area is Poor.**

EROSION AND SURFACE RUNOFF

Urban development is characterised by large areas of sealed surfaces such as roads, houses etc. Impermeable surface cover ranges from 15% to 60% of suburban areas to almost 100% in central business districts. Infiltration is considerably reduced with an increase in surface run-off. Run-off is generally discharged to surface water systems, plant materials and sewage. Construction activities will have short term erosion if adequate measures are implemented to control the surface run off.

Sheet erosion occurs when run-off surface water caries away successive thin layers of soil over large patches of bare earth. This type of erosion is most severe on sloping soils, which are weakly structured with low infiltration, which promotes rapid run-off. It occurs on the site where vegetation has been destroyed. Continual erosion in sheet-eroded slopes is a common cause of the gully erosion. Gully erosion results from increased flow along the drainage line, especially where protective vegetation has been removed and soils readily transported. A gully has steep, bare sides and is often narrow and deep. Once formed, a gully usually spreads through continual slumping of soil at the gully heads.

14.OVERALL ENVIRONMENTAL SENSITIVITY MAP

15.IMPACT ASSESSMENT OF THE PROPOSED TOWNSHIP DEVELOPMENT

Significance of the potential impacts on the floral habitat due to the proposed residential development is discussed in the table below. A summary of all potential pre-construction, construction, operational, decommissioning and post closure impacts if any will be provided after the impact discussion. The impact assessment presented below indicates the required mitigatory and management measures needed to minimise potential ecological impacts and presents an assessment of the significance of the impacts taking into consideration the available mitigation measures, if they are fully implemented.

General daily impacts which may impact on the floral ecosystem will include any activities which take place within Soshanguve development project study area that may impact on the receiving environment. Below are the highlighted impacts with essential mitigation measures relevant to sensitive floral related areas identified in this report.

- All soils compacted because of construction activities falling outside the development footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.
- Erosion control and management measures should be in place and should include berms, soil trap, hessian curtains and storm water diversion away from the areas susceptible to erosion.
- No dumping of waste should take place in the construction areas if spills occur they should be cleaned up immediately.
- Ingres of hydrocarbons into the topsoil resulting from vehicle breakdown or any other machinery should be prevented always.

TABLE : IMPACT ASSESSMENT ON FLORA HABITAT, ECOLOGY, DIVERSITY AND PROPOSED MITIGATION MEASURES

Nature of the impact	Positive/ Negative impact	Significance of potential impact BEFORE mitigation		Mitigation Measures	Significance of potential impact AFTER mitigation	
		Spatial Scale	Significance		Spatial Scale	Significance
Pre-construction and Construction Phase						
Nature of the impact Layout planning and design leading to overall loss of flora habitat	Negative impact	Local	Medium	• The boundaries of the development footprint areas are to be clearly defined. It should be ensured that all activities remain within the defined footprint should vegetation be cleared outside the development footprint; the affected areas should be rehabilitated to the better condition. The study must be safely fenced prior construction. • Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect flora habitat, need to be strictly managed. • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed residential development and associated infrastructure development activities. • It must be ensured that construction related waste or spillage and effluent do not affect the immediate and	Local	Low
Site clearing and the disturbance of soils	Negative impact	Local	Medium		Local	Low
Movement of construction vehicles during construction	Negative impact	Local	Medium		Local	Low
Proliferation of alien species may alter plant community structure	Negative impact	Local	Medium		Local	Low
Soil compaction because of construction	Negative impact	Local	Medium		Local	Low

activities may alter plant community structure and				surrounding habitat boundaries. • Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the development footprint areas. Alien plant seed dispersal within the top layers of the soil within footprint areas, should be controlled. • All soils compacted because of construction activities should remain within footprint areas, ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all development phases including rehabilitation phases to prevent loss of floral habitat in surrounding areas.		
Dust generation from construction vehicles in areas clear from vegetation	Negative impact	Local	Medium		Local	Low
Operation and Rehabilitations phases						
Loss of flora biodiversity Contamination of soils due to a lack of infrastructure maintenance	Negative impact	Local	Medium	• All development footprint areas and areas affected by the Proposed Soshanguve township development and associated infrastructure development should remain to the investigated area and should not encroach onto surrounding environment. • Removal of the alien and weed species encountered on the property must take place to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational and rehabilitation/ maintenance phases. Species specific and area specific eradication recommendations: • No species of special concern were observed onsite therefore no mitigation measures applicable. • Footprint areas should be kept as small as possible when removing alien plant species. • Informal fires near development area should be prohibited during all development phases.	Local	Low
Direct impact on floral habitat during rehabilitation	Negative impact	Local	Medium		Local	Low
Loss of floral biodiversity through invasion of alien species	Negative impact	Local	Medium		Local	Low
Alteration of floral community structure due to invasion of alien vegetation leading to loss of floral biodiversity	Negative impact	Local	Medium		Local	Low
Loss of wetland / water resources habitat and its associated biota	Negative impact	Local	Medium	The construction activities for the proposed residential development should be developed outside sensitive areas. The storm water management plan should be in place and be maintained. The construction contractors should be adequately informed of the boundaries of the area. There is no wetland onsite. The	Local	Low

				introduction of exotic and alien invasive plants for landscaped areas should be avoided. This would ensure that the area is adequately managed from inferior quality storm water runoff from the developed site and prevent the opportunity for alien invasive plant growth in the surrounding catchment area.		

16. RECOMMENDED MITIGATION MEASURES

This report recommends that the storm water management plan should be in place with proper monitoring plans and should be considered as part of the environmental management plan. Any invasive or alien species observed to grow within the area and within the entire development footprint should be removed and destroyed.

Mitigation Measures

- All areas with compacted soils should be rehabilitated, stripped or ripped to break the compacted soil surface to approximate natural slope of the proposed development area so as to allow revegetation and erosion control. Access tracks should be limited to the planned access points.
- Storm water outlets should be designed and constructed so that no concentration of flow takes place off the development.
- Soil erosion and storm water management, together with management of exotic vegetation following the site clearance must form an integral part in managing in long-term,
- The existing fence within the development area should be kept during construction so that impacts are limited to the development footprint.

The introduction of exotic and alien invasive plants for landscaped areas if any should be avoided. Pollution prevention measures should be put in place for the site to ensure that there is no risk of pollution spills or contaminated runoff entering any water resource including ground water. The storm water management plan should ensure that the surface and subsurface flow from development is connected to the existing storm water channel.

17.MOTIVATION FOR THE REMOVAL OF ALIEN INVASIVE VEGETATION

South Africa is a signatory to the Convention of Biodiversity (1992) which states that member countries are obliged to prevent the introduction of, control or eradicate those alien species, which threaten ecosystems, habitats or species.

The control of alien invasive vegetation is important to prevent challenges associated with the proliferation of these plants. Generally, they tend to be problematic due to their high levels of proliferation and their tendency to take over the area. Invasion of alien vegetation causes:

- Changes to fauna in the area: indigenous birds, insects, mammals are not adapted to feed on or nest in alien plants and consequently migrate to other the areas.
- A decline in species diversity: many alien plants are capable of creating mono-specific stand over large areas.
- Local or total extinction of indigenous species.
- Ecological imbalance: increase risk of catastrophic events like flooding due to excessive growth of vegetation.

- ❖ Increase fire hazard: Most alien plants are re flammable and may enhance runaway fires by increasing the fuel load. These create hot fires which sterilise the soil and kill deep growing roots which result in ongoing erosion problems.
- ❖ Reduction in conservation value: monotonous stands of tall alien trees obscure views of the scenery and natural species rich vegetation.
- ❖ Depletion of water resource: the invasive plants usually use more water than the plants they replace.
- ❖ Changing natural soil composition: the soil of the area is sandy; nitrogen poor and vegetation cannot survive under the changed condition.

18.NO-GO AREAS

The no-go areas would imply that the area is not developed. No freshwater features and biodiversity sensitive environment occur within the study area footprint therefore the potential impact of the no-go areas in terms of direct loss of important sensitive habitat would not be affected and is not applicable. With mitigations in place, environmental risks can be reduced.

19. DISCUSSION

Following the investigations and ground truthing, potential direct ecological impact of the proposed development on the biodiversity anticipated.

All aspects of the environment, especially living organisms, are vulnerable to disturbance of their habitat. The proposed development area is not a suitable habitat for any biodiversity species and will not impact nor modify the vegetation and faunal habitats on the footprint areas to a varying extent.

Most sensitive sections: It is evident from the distribution of biodiversity, presence of threatened species and sites of scientific interest, that the proposed development has the potential for negative impact on the flora and faunal of the study area in the area, although in general most of the area has been extensively degraded and impacts cannot be compared to pristine vegetation units of the Grassland Biomes and vegetation types in Gauteng.

Most sensitive habitats: Many threatened species are grassland and wetland specialists, linked to these habitats either for breeding, feeding or shelter. Major impacts on intact grassland should be avoided wherever possible during the construction phase. Impacts on the fauna and associated habitats will be minimal. The importance of rehabilitation and implementation of mitigation processes to prevent negative impacts on the environment during and after the construction phase of the development should be considered a high priority. The proposed site for the development has been extensively degraded through weeds and alien species invasion and rubble dumping.

No red data plant species were found on the site due to the state of the vegetation and physical environment of the larger area mostly not being suitable for any of the red data plant species that may be found in the area.

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

- ➢ Most of the area has a low sensitivity due to the degraded state of the vegetation;

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

- ➢ Destruction or disturbance to sensitive ecosystems leading to reduction in the overall extent of a habitat;
- ➢ Increased soil erosion;
- ➢ Impairment of the movement and/or migration of animal species resulting in genetic and/or ecological impacts;

- Soil and water pollution through spillages;
- Establishment and spread of declared weeds and alien invader plants;
- Impacts of human activities on fauna and flora of the area during construction;

The fringes of much of the undeveloped portion of the property have been used for illegal dumping. The study site is situated at the Grassland Biome (Mucina & Rutherford, 2006). The vegetation type, Marikana Thornveld Grassland, is of high conservation priority. However, this vegetation has been totally transformed.
Mitigation measures are provided that would reduce these impacts from a medium to a lower significance. Furthermore, the proposed layout plan of the development should be consistent with the mitigation measures stipulated in this report, and the impact on the ecosystem should be kept to a minimum

20. RECOMMENDED MITIGATION MEASURES

This report recommends that the storm water management plan should be in place with proper monitoring plans and should be considered as part of the environmental management plan. Any invasive or alien species observed to grow within the area and within the entire development footprint should be removed and destroyed.

Mitigation Measures

- All areas with compacted soils should be rehabilitated, stripped or ripped to break the compacted soil surface to approximate natural slope of the proposed. Development area to allow revegetation and erosion control. Access tracks should be limited to the planned access points.
- Storm water outlets should be designed and be connected to the existing nearby storm water channel so as to avoid concentration of flow takes place of the development.
- Soil erosion and storm water management, together with management of exotic vegetation following the site clearance must form an integral part in managing in long-term.
- The development area should be fenced off before commencement of construction activities so that impacts are limited to the development footprint. Erosion control and management measures should be in place and should include berms, soil trap, hessian curtains and storm water diversion away from the areas susceptible to erosion. It should be ensured that bare soils from construction area are located outside any drainage areas.
- No dumping of waste should take place in the construction areas if spills occur they should be cleaned up immediately.
- Ingres of hydrocarbons into the topsoil because of vehicle breakdown or any other machinery should be prevented always.
- Drive ways and construction areas should be sprayed with water in order to cub dust generation especially during dry season, Caution for conserving water should be given so no over spraying of those areas as over spraying on can consequently results in sediment loss.

The introduction of exotic and alien invasive plants for landscaped areas if any should be avoided. Pollution prevention measures should be put in place for the site to ensure that there is no risk of pollution spills or contaminated runoff entering any water resource including ground water. The storm water management plan should ensure that the surface and subsurface flow from development is connected to the existing stormwater channel.

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

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

Mitigation measures are provided that would reduce these impacts from a medium to a lower significance. Furthermore, the proposed layout plan of the development should be consistent with the mitigation measures stipulated in this report, and the impact on the ecosystem should be kept to a minimum.

Specialist Opinion

Based on the site observations and the findings the study area is open veld posing an environmental risk to the community. The dumping of construction waste, other unknown materials pose a risk. Alien invasive plants present are a threat to natural resources. These plants pose a direct threat to the indigenous vegetation not only in the area but to the ecological functioning of natural systems and the productive use of the land. They intensify the environmental impacts like fires and increase soil erosion. They are also consuming too much water so areas with these plants are prone to very serious environmental, agricultural areas and biodiversity destructions. Having said that these plants should be cleared on the area by means of foliar treatment and any re-growth should be treated with suitable registered herbicide. The area does not have any sound ecological function nor any special species of biodiversity concern that may require conservation except the antelopes observed which should be removed from the site as per the recommendations. As the area is constantly urbanised it is of the specialist's view that the proper storm management plan should be in place.

21.RECOMMENDATIONS

Any medicinal plants encountered within the proposed site, should be rescued or can be used for landscaping after construction. Site clearance and preparations for construction should be done outside the rainy seasons.

Most invasive plants and some garden ornaments inhibit growth of indigenous plants, consume high volume of water and make it impossible for any natural vegetation to survive within the surrounding areas. Use of indigenous plants should be priority.

South Africa being a water scarce country which is under threat of drought it is advisable to prevent any loss of water, means of harvesting rain water should be considered as an option as well as avoiding garden plantation/ornaments that consumes too much water, having said that the storm water management plan must ensure that the development does not impact on any water course.

The storm water management for the proposed development should be connected to the existing system. Storm water discharge points from the proposed development site should include litter traps so that no litter from the development site pollutes nor cause pressure to the existing storm water drainage system within the surrounding areas.

The principles of the progressive rehabilitation statement should be followed wherever possible. This includes the rehabilitation statement of the disturbed areas on an ongoing basis, immediately after the specified construction activities for that are concluded.

22.CONCLUSION

The study area is located within the developed area. The section investigated is degraded due to the anthropogenic activities such as residential area, roads, mielie field and a shopping centre. The site is an isolated veld which does not resemble a natural ecosystem.

All aspects of the environment, especially living organisms, are vulnerable to disturbance of their habitat. If we can bring about a more integrated approach to living within our ecosystems, we are much more likely to save the fundamental structure of biodiversity. Positive contributions can be made even on a small scale such as within the proposed development. All stakeholders need to be involved to avoid a loss of biodiversity in the area. However, it was ascertained that the historical vegetation has undergone a serious modification which was a result of the surrounding activities. Therefore, the grassland is transformed and is not deemed important in terms of local or regional conservation targets.

Although the area is historical natural the assessment ascertained that it does not contribute to any ecological conservation importance, that means the proposed development will not impact on any the vegetation and faunal habitats of the development footprint. Due consideration should be given to the layout of the proposed development where feasible, optimised to avoid cumulative impacts from the mining nearby the propose development site.

The proposed development should avoid negative impacts to the surrounding environment. Several mitigation measures have been recommended to minimise impacts. Negative impacts can be minimised by strict enforcement and compliance with an Environmental Management Plan which considers the recommendations for managing impacts.

The study site is located within the developed area previously farming areas and now some residential, sand mining nearby and business areas like the mall. The section investigated is an isolated area surrounded by the development like the nearby mining area, residential area, shopping mall and roads. It is degraded by the on-going and historic anthropogenic activities and that has caused the encroachment of alien and invasive plant species such as lantana camara, black jack and *lipia javanica*. There is dumping of some building rubble on site. Due to the severity of transformation, the study area is not deemed significant and important in terms of habitat provision for Marikana Thornveld grassland and vegetation of the study area does not resemble primary natural Grassland or any natural vegetation.

The largest part of the study consists of an isolated veld that is overgrazed, a road traversing the site to the mining area, the area is isolated land that does not resemble any ecological attribute.

The vegetation is degraded/transformed with no resemblance to any natural vegetation of these areas. The constructed dirt roads, previous farming contributed to the degradation of the threatened ecosystem and now there is no trace of any species of ecological concern. Alien invasive plants present onsite causes further degradation so it is recommended that control measures be in place. The vegetation units do not have any linkages to the natural ecosystem in the surrounding area.

No red data species were found to be present on the site and it is unlikely that such species will be present due to the general degraded condition of the area. It is recommended that *any medicinal plant that may be encountered* be rescued and be used for landscaping so to avoid the impact significance with the loss of the medicinal plant species.

Based on the findings of this ecological assessment, vegetation can be summarised as being transformed grassland, due to current and previous land uses, the activities which include farming, residential, roads etc. led to very limited floristic diversity and vegetation structure. No possible impacts on the floral ecology within the surroundings of the subject property should mitigation measures for vegetation species be implemented.

Recommendations made and conclusions reached are based not only on the occurrence of individual species, but more appropriately on habitats and ecosystem processes.

This assessment concludes that the area is not ecological sensitive and is deemed suitable for the planned proposed development. , It is further recommended that air quality/pollution monitoring be conducted in order to provide a basis for evaluating the vulnerability of the community to air pollution as there is a mining area nearby the proposed development.

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

The study site is located within the developed area mostly comprising mostly of residential development. The section investigated does not resemble any natural vegetation. Thus, it is not deemed significant in terms of habitat provision for the threatened species.

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