

PROPOSED HOUSING DEVELOPMENT ON PORTION 237 OF FARM HARTEBEEESTPOORT 328

TERRESTRIAL ECOLOGY REPORT

NOVEMBER 2017

PREPARED FOR: HOUSING DEVELOPMENT AGENCY



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Executive Summary

Nemai Consulting has been appointed as the Independent Environmental Assessment Practitioner to undertake an Environmental process for the proposed housing development on farm portion number 237 of Farm Hartebeestpoort 328, in Koedoespoort, situated in the City of Tshwane Municipality, Gauteng Province.

A Terrestrial Ecology Report was undertaken as part of the Environmental Assessment process in order to assess the impacts that the proposed housing development will have on the receiving environment.

The objective of this study is to identify sensitive species and their habitats on the proposed development site in order to inform the proposed layout for the development. The current ecological status and conservation priority of vegetation on the site were assessed. Potential faunal habitats are investigated in the study area and all mammals, birds and reptiles known to occur on site or seen on site were recorded. Red data species (both fauna and flora) that are known to occur on the study area were investigated.

The proposed housing development site (referred to in this report as the study area) falls within the Savanna Biome and this Biome is the largest Biome in South Africa and occupies over one third of the whole area. It is characterized by a grassy ground layer and distinct upper layer of woody plants. The study area falls within the *Endangered* Marikana Thornveld and this vegetation type on site has undergone major transformation mostly by serious alien plant infestation, footpaths, railway lines, building of roads and human settlements with little remnants of this vegetation type remaining on site. The proposed site falls within the *Vulnerable* Marikana Thornveld terrestrial threatened ecosystem. The Gauteng Conservation Plan 3.3 indicated that the study area falls within Critical Biodiversity Area (namely, *Important Area*) and not in an Ecological Support Areas.

Due to habitat fragmentation and human settlements on site, alien vegetation were recorded in abundance. Alien invasive plant species such as *Campuloclinium macrocephalum*, *Cirsium vulgare*, *Lantana camara* and *Solanum mauritianum* were dominant of site. During the field survey, no threatened plant species were observed on site, however only one species of conservation concern was noted, namely *Hypoxis hemerocallidea*, and this species has a conservation status of *Declining*. It is thus recommended that prior to construction, this species must be searched and rescued and then following construction activities, it must be re-established at the site. The major concerns on site are alien invasives, weeds and potential invasives. Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there should be an on-going monitoring program to control and/or eradicate newly emerging invasives. The rehabilitation of disturbed areas should receive high priority and must be included in the Environmental Management

Programme and recommendations regarding the specific plant species used during rehabilitation should be site specific and according to the surrounding vegetation composition.

Most sections of the proposed development site have been transformed, largely due to study area being in an urban complex environment and also due to with existing businesses and industries, railway line and building rubbles remaining on site. The transformation of natural habitats on site habitat and also human presence have negatively impacted on large mammal occurrence, particularly ungulates and predators. Only three animals were recorded during the survey and these mammals are common and are of no conservation importance in the area.

The Important Bird and Biodiversity Areas Programme is a BirdLife International initiative to conserve important bird species and their habitats. It also identifies and works to conserve a network of sites critical for the long-term survival of bird species that are globally threatened, have a restricted range and are restricted to specific biomes/vegetation types. 847 bird species occur in South Africa, with over 15% of South African bird species threatened with extinction, mainly due to loss of suitable habitat. It is therefore important to manage a network of South African 112 Important Bird and Biodiversity Areas to conserve threatened, endemic, biome restricted and congregatory birds. 36 of the Important Bird and Biodiversity Areas are found in KwaZulu-Natal province. Several Conservation and planning tools were consulted for relevancy of this the project and the project area does not fall within any of the Important Bird and Biodiversity Areas. Within the vegetation type found in the study area and immediate surrounding areas, three bird habitat systems were identified.

Exotic trees often provide roosting and nesting substrate for various bird species, and as such their importance for avifauna should not be underestimated. This habitat will mostly be important to physically smaller bird species. Several such stands of trees exist in the study area and could provide refuge for amongst other species: Exotic trees provide perching, roosting and nesting habitat for various raptor species, as well as larger birds such as francolins, Guineafowl, Herons and Hadedda Ibises. Black Sparrowhawk, Rufous-chested Sparrowhawk, Long-crested Eagle and Forest Buzzard. Although stands of *Eucalyptus* are invader species, these stands have become important refuges for certain species of raptors including Long Crested Eagle and Steppe Buzzard. Large *Eucalyptus* trees are also used by the migratory Lesser Kestrels for roosting purposes.

Artificial depressions/concrete canal/ponds: This habitat type was dominated by stands of *Phragmites australis* and *Typha capensis* and was heavily infested by invader species such as *Morus alba*, *Verbena bonariensis*, *Populus deltoids*, and *Canna indica*. However, areas with reeds, sedges or grassy tangles are suitable for Common Waxbills, Bishops and various warblers (Marais and Peacock, 2008).

Grassland: These grassland areas represent a significant feeding area for many bird species in the area. Several typical Red Data grassland species were recorded in the square grid by SABAP2 and it is therefore highly unlikely that these species could occur in the grassland

remaining on the site due to human settlements and disturbances. Frequent burning of habitat can cause major impacts due to reduced or affected foraging, roosting, and nesting sites. Non-threatened species that may from time to time frequent the grassland habitat in the study area are Swainson's Spurfowl, African Pipit, Cape Longclaw, several cisticola species, Long-tailed Widowbird, Rufous-naped Lark and Black-shouldered Kite.

The surrounding buildings, old building materials and trees on site provide suitable habitats and foraging for reptile species recorded on site. Reptiles are extremely secretive and difficult to observe during field surveys. Only one reptile species was noted on site, this being the Montane Speckled Skink. This species is found in a variety of habitats, wet and dry, from grassland and savanna to shrubland, including rock outcrops. It is not considered to be of significant importance from a conservation perspective. No Red Data reptile species were found on site due to no suitable habitats available for such species.

From a broad and preliminary evaluation of the site in question, it is evident that the proposed development activities will have low to medium impacts on the receiving environment. The development activities proposed within the survey area will therefore not have a significant impact on biodiversity conservation within the region. Generally, the negative impacts to the receiving environment resulting from the proposed development are probably of an acceptable significance and magnitude if appropriate mitigation measures are implemented and construction is implemented in a sensitive manner. The proposed development will cause disruption during the construction phase, but as long as mitigation measures are implemented, these disruptions should have minimal lasting effects on the ecosystems of the proposed development. It is recommended that the larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes.

After conclusion of this Terrestrial Ecology report, it is the opinion of the ecologist that the proposed development be considered favourably provided that the sensitivity map be considered during the planning and construction phases of the proposed development activities in order to aid in the conservation of ecology within the study area.

Table of Contents

1	INTRODUCTION	1
1.1	Objectives of the survey	1
2	RELEVANT LEGISLATION AND GUIDELINES	2
3	SITE LOCATION	2
4	GAUTENG CONSERVATION PLAN	5
5	GAUTENG ENVIRONMENTAL MANAGEMENT ZONES	6
6	LIMITATIONS AND GAPS	8
7	REGIONAL VEGETATION	8
7.1	Marikana Thornveld	10
8	TERRESTRIAL THREATENED ECOSYSTEMS	10
9	METHODOLOGY	12
9.1	Flora	12
9.2	Mammals	13
9.3	Avifauna	13
9.4	Reptiles	14
10	RESULTS AND DISCUSSION	14
10.1	Flora	14
10.1.1	Desktop study results	14
10.1.2	Plant species recorded on the proposed housing development site	15
10.1.3	Alien invasive species recorded on the proposed housing development site	18
10.1.4	Threatened Species, Species of Conservation Concern and Medicinal Plants recorded on the proposed development site	21
10.1.5	Habitat available for species of conservation importance	24
10.2	Fauna	26
10.2.1	Mammals	26
10.2.1.1	Desktop survey results	26
10.2.1.2	Mammals recorded on the proposed housing development site	26
10.2.1.3	Habitat available for species of conservation importance	27

10.2.2	Avifauna	28
10.2.2.1	Desktop survey results	28
10.2.2.2	Field work results	29
10.2.2.3	Habitat requirements for Red Data bird species	35
10.2.3	Reptiles	38
10.2.3.1	Desktop survey results	38
10.2.3.2	Reptiles recorded on site	38
11	TERRSTRIAL ECOLOGICAL SENSITIVITY ANALYSIS OF THE STUDY AREA	38
12	ENVIRONMENTAL IMPACT ASSESSMENT	41
12.1	Methodology	41
12.2	Assessment of Environmental Impacts and Suggested Mitigation Measures	42
13	CONCLUSION AND RECOMMENDATIONS	50
14	REFERENCES	52

List of Tables

Table 1.	Classification of grasses (van Oudtshoorn, 1999)	13
Table 2.	Red Data Plant species recorded in grid cell 2528CB which could potentially occur in the study area (SANBI data).	14
Table 3.	Definitions of Red Data status (Raimondo et al. 1999)	15
Table 4.	Plant species recorded on the proposed housing development site	16
Table 5.	Red Listed plant species which are known to occur in the general vicinity of the project area (Pfab and Victor, 2002).	25
Table 6.	Red Data mammal species recorded in the grid cell 2528CB (ADU, 2017), which could potentially occur on the proposed development site	26
Table 7.	Mammals recorded in the study area	27
Table 8.	Red Data Listed mammal species which could potentially occur in the proposed development site with suitable habitats and their probability of occurrence (Skinner and Chimimba, 2005; Taylor et al. 2015).	27
Table 9.	Red Data Bird species recorded in cell 2528CB which could occur in the study area (Taylor et al. 2015);	29
Table 10.	Bird species recorded along the proposed development site	32

Table 11. Red Data Bird species recorded in grid 2628AA which could potentially occur in the study area (SABAP 1) (Harrison et al. (1997), Barnes (2000), SABAP2, and Tarboton et al. (1987).	36
Table 12. Proposed impacts and the recommended mitigation measures for the proposed housing development site	43

List of Figures

Figure 1. Google Earth image of the proposed housing development site	3
Figure 2. 1:50 000 Topographical map of the proposed housing development site	3
Figure 3. Collage of photographs taken on the proposed housing development site	4
Figure 4. Gauteng C Plan in relation to the proposed development site	6
Figure 5. Gauteng Environmental Management Zones	8
Figure 6. Biome	9
Figure 7. Vegetation Type	9
Figure 8. Terrestrial threatened ecosystem on site	11
Figure 9. Alien plant species <i>Crotalaria agatiflora</i> recorded on site	19
Figure 10. Alien plant species <i>Flaveria bidentis</i> recorded on site	19
Figure 11. Alien plant species <i>Solanum mauritianum</i> recorded on site	20
Figure 12. Alien plant species <i>Robinia pseudoacacia</i> recorded on site	20
Figure 13. Alien plant <i>Campuloclinium macrocephalum</i> recorded on site	21
Figure 14. South African Red data list categories (SANBI)	22
Figure 15. <i>Hypoxis hemerocallidea</i> recorded in the study area	23
Figure 16. The distribution of <i>Hypoxis hemerocallidea</i> on the proposed development site	23
Figure 17. IBA	28
Figure 18. Large stands on Eucalyptus trees on site could be used by the migratory Lesser Kestrels for roosting purposes.	30
Figure 19. Common Reed provides nesting and roosting sites for Bishops.	31
Figure 20. Natural grasslands on site.	31
Figure 21. Hadedda Ibis on site	33
Figure 22. Blacksmith Lapwing (Plover) on site	33
Figure 23. Common Fiscal (Fiscal Shrike) on site	34
Figure 24. Common (Indian) Myna on site	34
Figure 25. Terrestrial ecological sensitivity map of the proposed housing development site	40

1 INTRODUCTION

Nemai Consulting has been appointed as the Independent Environmental Assessment Practitioner to undertake an Environmental process for the proposed housing development on farm portion number 237 of Farm Hartebeestpoort 328, in Koedoespoort, situated in the City of Tshwane Municipality, Gauteng Province.

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The objective of this study is to identify sensitive species and their habitats on the proposed development site in order to inform the proposed layout for the development. The current ecological status and conservation priority of vegetation on the site were assessed. Potential faunal habitats are investigated in the study area and all mammals, birds and reptiles known to occur on site or seen on site were recorded. Red data species (both fauna and flora) that are known to occur on the study area were investigated.

1.1 Objectives of the survey

In order to achieve the aim stated above, the following objectives are to be achieved:

- To apply relevant literature to determine the diversity and eco-status of the plants, mammals, birds and reptiles on the proposed development site;
- To carry out field surveys to gain an understanding of the diversity and eco-status of taxa which inhabit the proposed study area, as well as the presence of unique habitats that might require further investigation or protection;
- To assess the current habitat and conservation status of plant and animal species on the study area;
- To comment on ecological sensitive species/areas;
- To assess the possible impact of the proposed project on these taxa and/or habitats;
- To list the species on site and to recommend necessary actions in case of occurrence of endangered, vulnerable or rare species or any species of conservation importance; and
- To provide management recommendations to mitigate negative and enhance positive impacts on the proposed development site.

2 RELEVANT LEGISLATION AND GUIDELINES

The following legislations and guidelines are relevant to this project:

- The Constitution, 1996 (Act No. 108 of 1996) – Section 24;
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- The white paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997);
- National Environmental Management Act, 1998 (Act No. 107 of 1998);
- National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004);
- Gauteng Conservation Plan Version 3.3 (2011);
- Gauteng Department of Agriculture and Rural Development (GDARD) Requirements for Biodiversity Assessments Version 3 (2014); and
- Gauteng Provincial Environmental Management Framework (2014).

3 SITE LOCATION

The study area is 18.7480 hectares and is to be developed for the purpose of housing. The site (Portion 237) falls within the boundaries of the City of Tshwane Municipality, Gauteng Province (**Figures 1 and 2**). The proposed development area has an array of businesses most of which are motor vehicle related. Surrounding area to the site includes mainly businesses. There is a primary school, namely Laerskool Lindopark, within 500m of the development site. The suburbs of Eastlynne and Eersterust can be found to the north and the north east of the site respectively. The southern side of the site is bordered by railway tracks leading from the Koedoespoort train station. The collage of photographs on the proposed development site are indicated in **Figure 3** below.



Figure 1. Google Earth image of the proposed housing development site

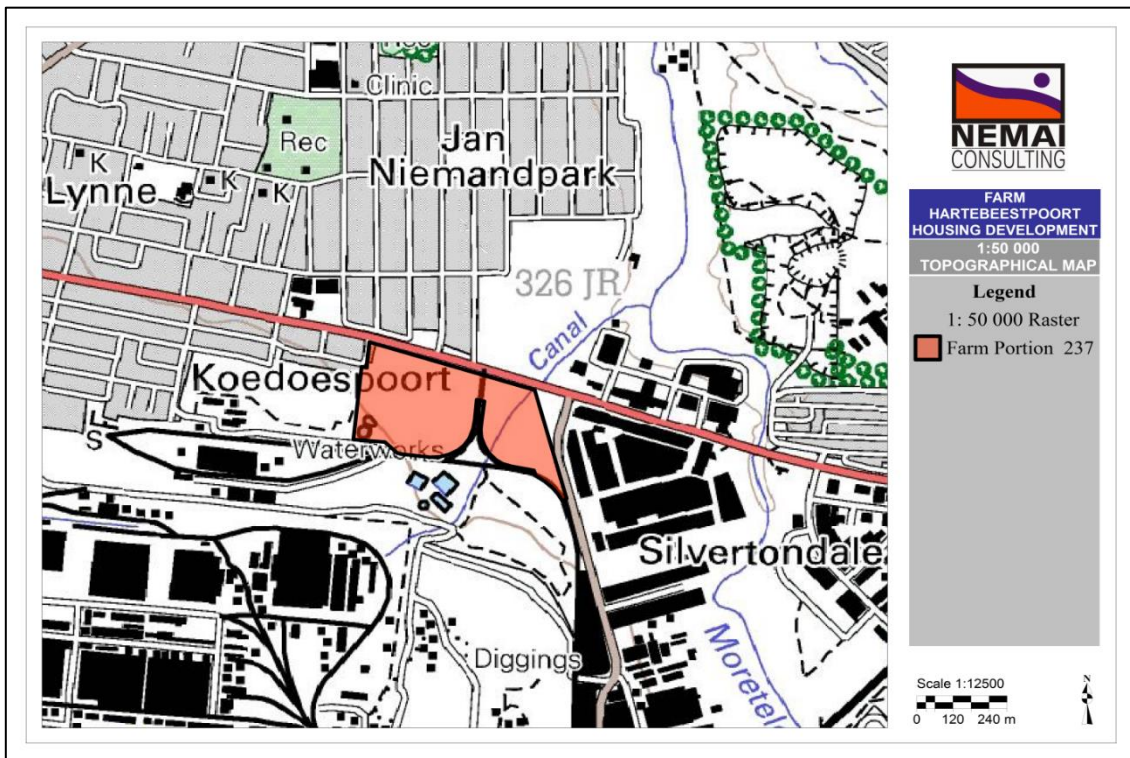


Figure 2. 1:50 000 Topographical map of the proposed housing development site



Figure 3. Collage of photographs taken on the proposed housing development site

4 GAUTENG CONSERVATION PLAN

Gauteng Nature Conservation, a component of the Gauteng Department of Agriculture and Rural Development (GDARD) produced the Gauteng Conservation Plan Version 3.3 (Gauteng C-Plan 3.3, 2011). Gauteng C-Plan 3.3 (2011) contains two major categories to describe areas namely:

1. **Critical Biodiversity Areas** (CBA) that contain three sub-types of areas:

- *Irreplaceable areas*, which are essential in meeting targets set for the conservation of biodiversity in Gauteng province.
- Areas that are *important* for the conservation of biodiversity in Gauteng province.
- *Conserved areas*, which include all existing level 1 and 2 Protected Areas.

Level 1 and Level 2 Protected Areas are proclaimed in terms of relevant legislation (National Environmental Management Protected Areas Act, 2003 (Act No. 57 of 2003) specifically for the protection of biodiversity (or for the purposes of nature conservation).

2. **Ecological Support Areas** (ESA) are an imperative part of Gauteng C-Plan 3.3 (2011) to ensure sustainability in the long term. ESA are part of the entire hierarchy of biodiversity, but it is not possible to include all biodiversity features in them. Landscape features associated with ESA (termed spatial surrogates for ESA) that are essential for the maintenance and generation of biodiversity in sensitive areas, and therefore that require sensitive management were incorporated into C-Plan 3.3 (2011). Spatial surrogates included dolomite, rivers, wetlands, pans, corridors for climate change and species migration, ridges and low cost areas for Johannesburg and Tshwane.

The proposed housing development site falls within the CBA and not an ESA region and the CBA on site is an *Important Area* (**Figure 4**).

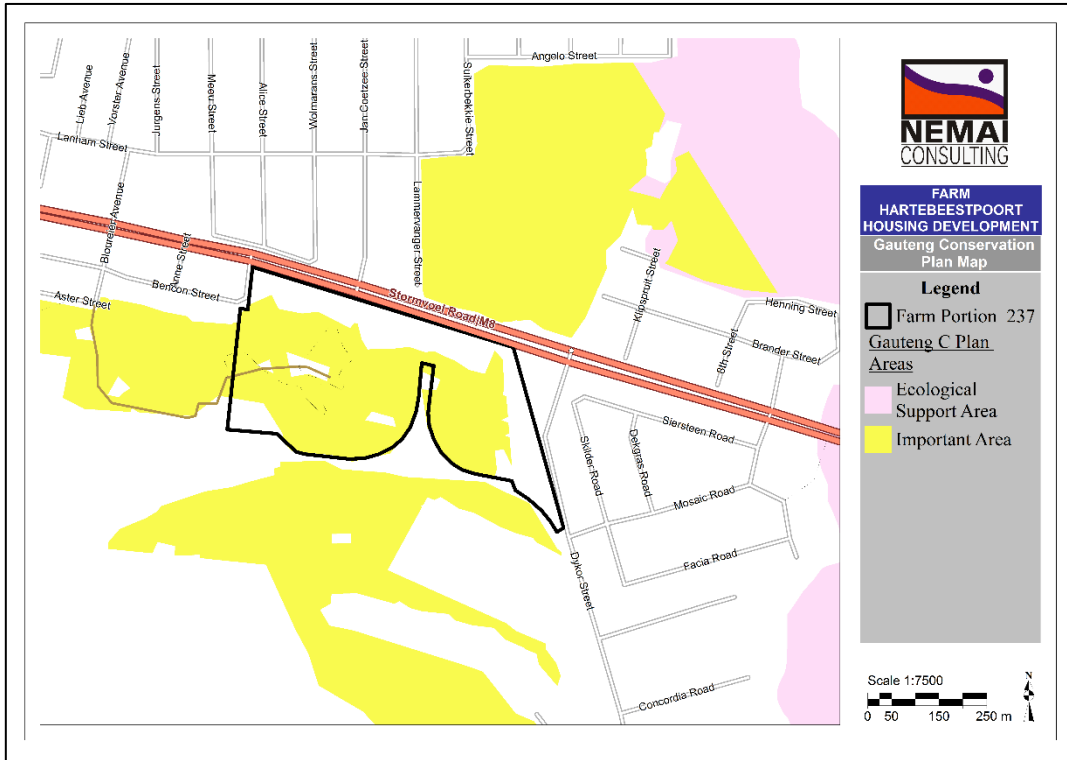


Figure 4. Gauteng C Plan in relation to the proposed development site

5 GAUTENG ENVIRONMENTAL MANAGEMENT ZONES

The Gauteng Environmental Management Framework (EMF) should be used as a tool to identify areas where certain types of development would be compatible, conditionally compatible, and undesirable. These areas are called the Environmental Management Zones (EMZs). The EMF specifies the guidelines to follow for each EMZ as well as for the Special Control Zones. The EMZs were derived from the desired state (Gauteng C-Plan 3.3, Gauteng Agriculture Potential Atlas IV, Gauteng SDF, and Area Based Plans), the environmental sensitivity (Gauteng C-Plan, Gauteng Ridges Policy, surface hydrological features and current land use zoning) as well as the unique control areas. The EMZs also took the Gauteng Growth and Management Perspective, 2014, into account and is therefore aligned to the general development policy for Gauteng province.

Five EMZs, Protected Areas and Special Control Zones were identified where specific planning and policy measures are necessary to achieve the development objective of those areas:

- Zone 1: Urban Development Zone
- Zone 2: High Control Zone (within the urban development zone)
- Zone 3: High Control Zone (outside the urban development zone)

- Zone 4: Normal Control Zone
- Zone 5: Industrial and Large Commercial Focus Zone
- Protected Areas
- Special Conservation Zone
- Special Control Zones:
 - Dinokeng special management zone
 - The Cradle of Humankind World Heritage Site (CoHWHS) special control zone
 - CoHWHS environmental management zones
 - Vaal Dam special management zone
 - Johannesburg South special control zone
 - Johannesburg North special management zone (the Greater Kyalami Conservancy)

The proposed housing development falls predominately within Zone 1 of the EMF (**Figure 5**), with sections of the site falling within Zones 3 and 4. According to the Gauteng EMF (2014), housing developments are compatible with different zones depending on the type of residential development that it is. The intention with Zone 1 is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development within the urban development zones as defined in the Gauteng Spatial Development Framework (GSDF), in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas. Zone 3 is sensitive to development activities and in several cases also have specific values that need to be protected. Conservation and related tourism and recreation activities should dominate development in this zone. With Zone 4, the intention is to promote agricultural and rural development that supports agriculture as this zone is dominated by agricultural uses outside the urban development zone.

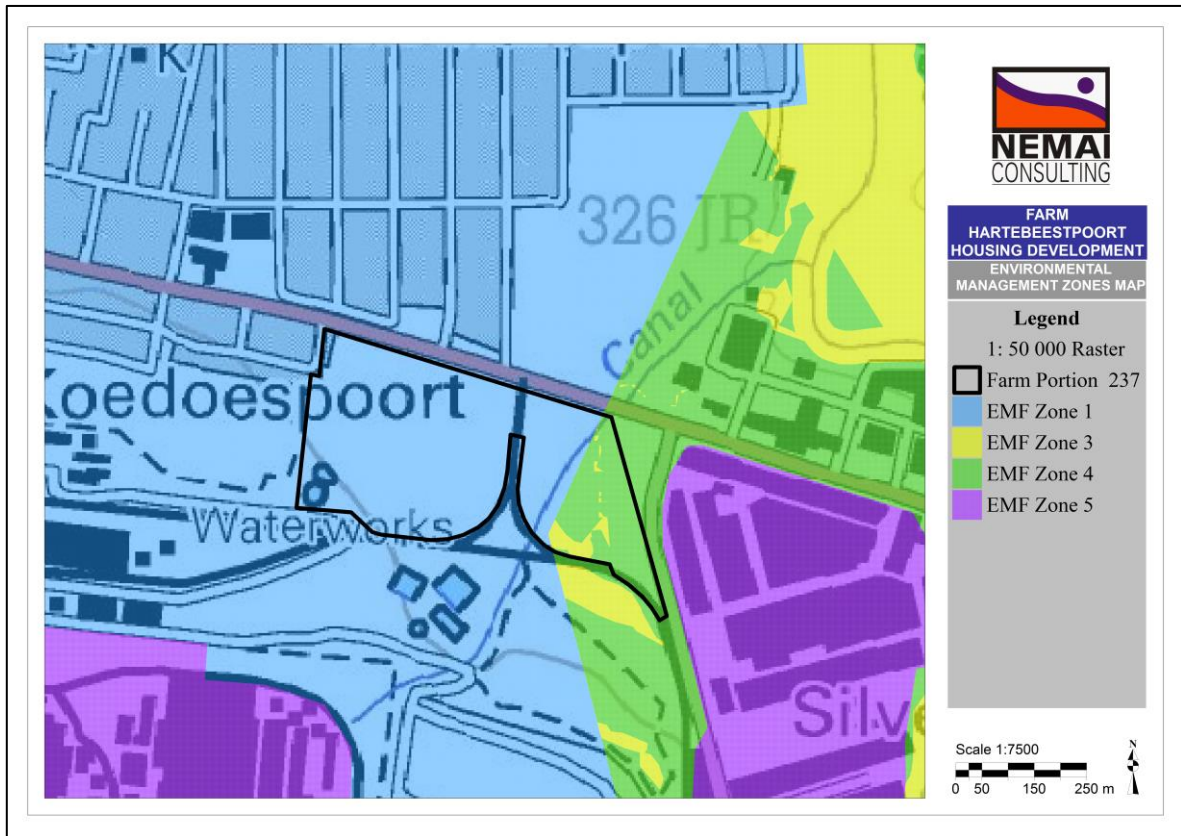


Figure 5. Gauteng Environmental Management Zones

6 LIMITATIONS AND GAPS

The constraints or limitations to the survey included:

- Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage and Nemai Consulting can thus not accept responsibility for conclusions and mitigation measures made in good faith based on information gathered or databases consulted at the time of the investigation.

7 REGIONAL VEGETATION

The study area falls within the Savanna biome (SANBI, 2012) (**Figure 6**) and this Biome is the largest Biome in southern Africa, occupying 46% of its area, and over one-third the area of South Africa. It is well developed over the lowveld and Kalahari region of South Africa and is also the dominant vegetation in Botswana, Namibia and Zimbabwe. It is characterized by a grassy ground layer and distinct upper layer of woody plants (Low and Rebelo, 1996). SANBI

(2012) classified the study area as falling within the Marikana Thornveld (**Figure 7**). This vegetation type on site has undergone major transformation mostly by serious alien plant infestation, by building of roads, railway lines, business areas and human settlements with little remnants of this vegetation type remaining on the proposed development site.

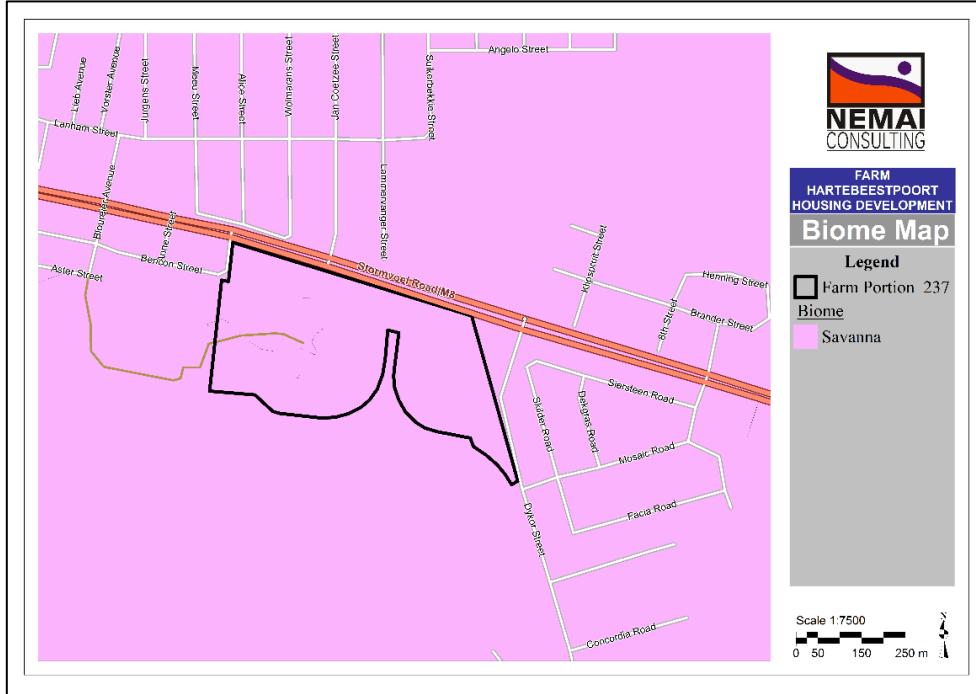


Figure 6. Biome

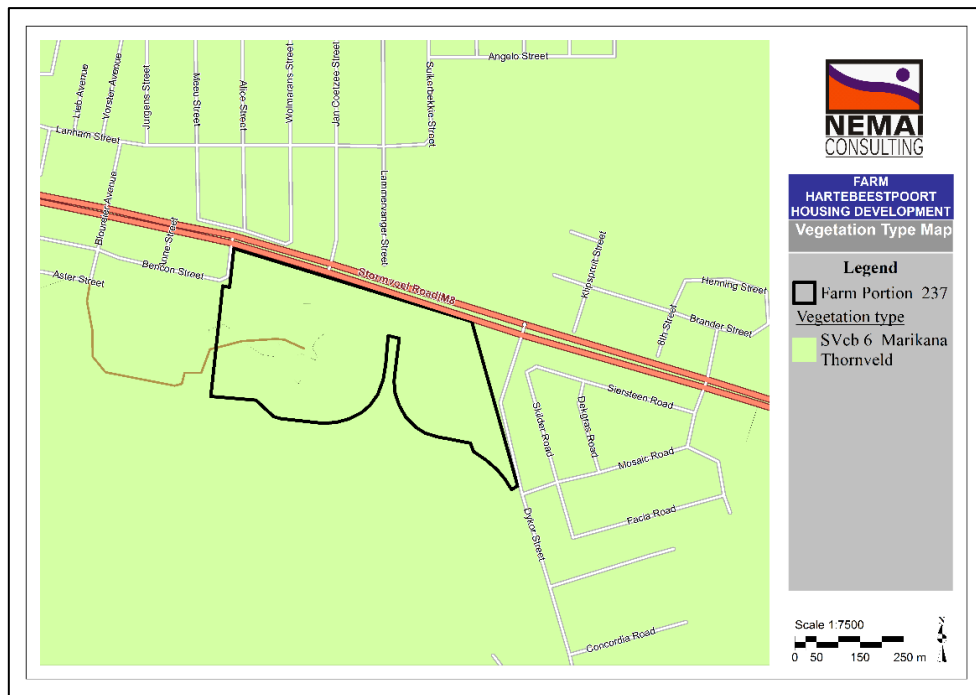


Figure 7. Vegetation Type

The description of the vegetation type follows below:

7.1 Marikana Thornveld

Marikana Thornveld occurs at an altitude between 1050 m and 1450 m. It is described as open *Acacia karroo* woodland, occurring in valleys and slightly undulating plains with some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other habitats protected from fire. The climate is moderate and this is a strongly seasonal summer-rainfall region with very dry winters. The mean annual precipitation is 600 – 700 mm with incidence of frost frequent in winter (Mucina and Rutherford, 2006).

The conservation status of Marikana Thornveld is **Endangered**, with 48% transformed and industrial development is a major threat to the remainder. Its conservation target is 19%, with less than 1% of it statutorily conserved in the Magaliesberg Nature Area and Onderstepoort Nature Reserve. More than 48% has already undergone transformation due to cultivation, mines, and building of roads. Agricultural and industrial developments are a threat of land transformation. Alien invasive plants occur in high densities particularly along drainage lines (Mucina and Rutherford, 2006).

8 TERRESTRIAL THREATENED ECOSYSTEMS

The South African National Biodiversity Institute (SANBI), in conjunction with the Department of Environmental Affairs (DEA), released a draft report in 2009 entitled “Threatened Ecosystems in South Africa: Descriptions and Maps”, to provide background information on the above List of Threatened Ecosystems (SANBI, 2009). The purpose of this report was to present a detailed description of each of South Africa’s ecosystems and to determine their status using a credible and practical set of criteria. The following criteria were used in determining the status of threatened ecosystems:

- Irreversible loss of natural habitat;
- Ecosystem degradation and loss of integrity;
- Limited extent and imminent threat;
- Threatened plant species associations;
- Threatened animal species associations; and
- Priority areas for meeting explicit biodiversity targets as defined in a systematic conservation plan.

In terms of section 52(1) (a), of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), a national list of ecosystems that are threatened and in need of protection was gazetted on 9 December 2011 (Government Notice 1002 (Driver *et al.* 2004).

The list classified all threatened or protected ecosystems in South Africa in terms of four categories; Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Protected. The purpose of categorising these ecosystems is to prioritise conservation areas in order to reduce the rates of ecosystem and species extinction, as well as preventing further degradation and loss of structure, function, and composition of these ecosystems. It is estimated that Threatened Ecosystems make up 9.5% of South Africa, with critically endangered and endangered ecosystems accounting for 2.7%, and vulnerable ecosystems 6.8% of the land area. It is therefore vital that Threatened Terrestrial Ecosystems inform proactive and reactive conservation and planning tools, such as Biodiversity Sector Plans, municipal Strategic Environmental Assessments (SEAs) and Environmental Management Frameworks (EMFs), EIAs and other environmental applications (Mucina and Rutherford, 2006).

The proposed housing development falls within the *Vulnerable* Marikana thornveld terrestrial threatened ecosystem (**Figure 8**)

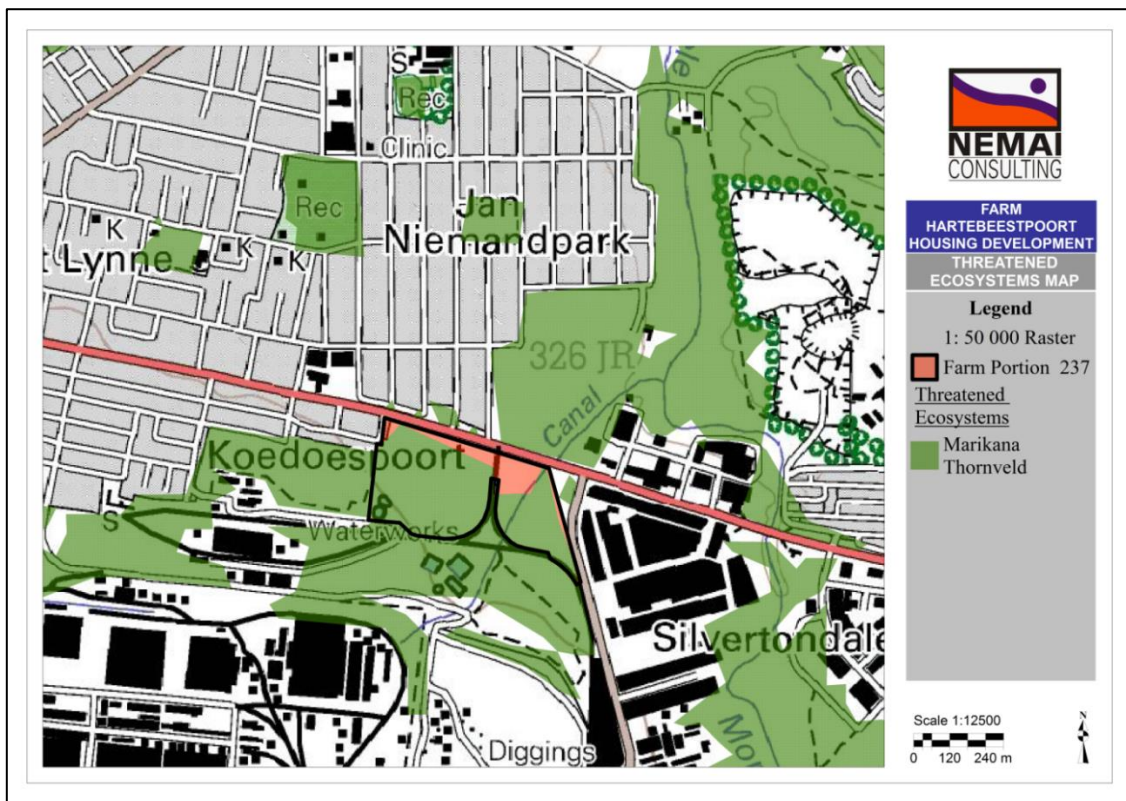


Figure 8. Terrestrial threatened ecosystem on site

9 METHODOLOGY

9.1 Flora

The flora assessment consisted of two complementary approaches:

- A desktop analysis, which included literature review, local knowledge, topographical maps, and Google Earth imagery; and
- Site visit was conducted in November 2017.

Satellite imagery of the area (Google Earth) was studied in order to acquire a three dimensional impression of the topography and land use and also to identify potential “hot-spots” or specialized habitats such as wetlands, natural grasslands and rivers on or near the proposed housing development site.

The Pretoria Computerised Information System (PRECIS) list of Red Data plants recorded in the 2528CB quarter degree grid square was consulted to verify the record of occurrence of the plant species seen in the vicinity of the study area. The site sampled is also only a very small portion of the whole grid and so habitats suitable for certain species in the PRECIS list may not be present at the areas sampled. The vegetation map published in Mucina and Rutherford (2006) was consulted to identify vegetation units that are found in the study area. The desktop component of the study of the habitats of the Red-Data-listed plants was conducted before the site visit.

The habitats on the study area were inspected in a random zigzag fashion, paying particular attention to areas that at first sight appeared to be sensitive. All general observations were noted such as grasses, herbs (forbs), shrubs and trees. The habitats suitable for Red Data listed species known to occur in the quarter degree grid square were examined intensively for the presence of such species. Attention was also paid to the occurrence of medicinal, alien and declared weed species. Field guides such as van Wyk *et al.* (1997), Pooley (1998), van Oudshoorn (1999) and Manning (2009) were utilised during the field work.

Exotic and invasive plant species were categorised according to the framework laid out by The Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983). CARA defines weeds as alien plants, with no known useful economic purpose that should be eradicated. Invader plants, also considered by the Act, can also be of alien origin but may serve useful purposes as ornamental plants, as sources of timber, or other benefits such as medicinal uses (Henderson, 2001). These plants need to be managed and prevented from spreading.

Invasive species are controlled by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) - Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. The AIS Regulations list four (4) different categories of invasive species that must be managed, controlled or eradicated from areas where they may cause harm to the environment, or that are prohibited to be brought into South Africa.

Invasive plant species are divided into four categories, namely:

- Category 1a: Invasive species which must be combatted and eradicated. Any form of trade or planting is strictly prohibited.
- Category 1b: Invasive species which must be controlled and wherever possible, removed and destroyed. Any form or trade or planting is strictly prohibited.
- Category 2: Invasive species, or species deemed to be potentially invasive, in which a permit is required to carry out a restricted activity. Category 2 species include commercially important species such as pine, wattle and gum trees.
- Category 3: Invasive species which may remain in prescribed areas or provinces. Further planting, propagation or trade, is however prohibited.

According to van Oudtshoorn (1999), a grass species reacts to grazing in one of two ways: it can either become more or less abundant. **Table 1** describes the classification of grasses.

Table 1. Classification of grasses (van Oudtshoorn, 1999)

Class	Description	Examples
Decreasers	Grasses that are abundant in good veld, but that decrease in number when the veld is overgrazed or undergrazed.	<i>Themeda trianda</i> , <i>Digitaria eriantha</i>
Increaser 1	Grasses that are abundant in underutilised veld. These grasses are usually unpalatable, robust climax species that grow without any defoliation	<i>Hyperthelia dissoluta</i> , <i>Trachypogon spicatus</i>
Increaser 2	Grasses that are abundant in overgrazed veld. These grasses increase due to the disturbing effect of overgrazing and include mostly pioneer and subclimax species	<i>Aristida adscensionis</i> , <i>Eragrostis rigidor</i>
Increaser 3	Grasses that are commonly found in overgrazed veld. These are usually unpalatable, dense climax grasses	<i>Sporobolus africanus</i> , <i>Elionurus muticus</i>
Invaders	All plants that are not indigenous to an area. These plants are mostly pioneer plants and are difficult to eradicate	<i>Arundo donax</i>

9.2 Mammals

A mammal site visit was conducted in November 2017, and during this visit, the observed and presence of mammals associated with the recognized habitat types of the study site were recorded during the day. No night surveys were undertaken. Adjoining properties were also scanned for important faunal habitats. During the site visit, mammals were identified by spoor, burrow and visual sightings through random transect walks. Locals were also interviewed to provide species lists on their properties.

9.3 Avifauna

Avifauna site visit was conducted to record the presence of bird species associated with the habitat systems on the studied site and to identify possible sensitive areas. The study site was surveyed on foot and in the process sightings were recorded through random transects walks.

Adjoining properties were also scanned for important bird species and/or habitats. Birds were identified visually using 10X42 Bushnell Waterproof binoculars, by call and from feathers. Where necessary, identifications were verified using Sasol Birds of Southern Africa (Sinclair *et al.* 2002) and the Chamberlain Guide to Birding Gauteng (Marais and Peacock, 2008).

9.4 Reptiles

The reptile assessment was conducted during the day. During the field visit, the observed and derived presence of reptiles associated with the recognised habitat types of the study site were recorded. This was done with due regard to the known distributions of Southern African reptiles. Reptiles were identified by sightings during random transect walks. Possible burrows or other reptile retreats were inspected for any inhabitants. Locals were also interviewed to provide species lists on their properties.

10 RESULTS AND DISCUSSION

10.1 Flora

10.1.1 Desktop study results

The proposed housing development site is located within the 2528CB quarter degree square in terms of the 1:50 000 grid of South Africa. SANBI uses this grid system as a point of reference to determine any Red Data plant species or any species of conservation importance occurring in South Africa. This can be used to determine the list of species which may potentially occur within an area. **Table 2** provides details on the Red Data plant species which could potentially occur in the study area as they were recorded in 2528CB grid cell, which the proposed development falls into. Red Data plant species list of the species that could occur in the study area was requested from GDARD and those plants are marked with an asterisk (*). The definitions of the conservation status are provided in **Table 3**.

Table 2. Red Data Plant species recorded in grid cell 2528CB which could potentially occur in the study area (SANBI data).

Family	Species	Threat status	Growth forms
Amaryllidaceae	<i>Boophone disticha</i> (L.f.) Herb.	Declining	Geophyte
Amaryllidaceae	<i>Crinum macowanii</i> Baker	Declining	Geophyte
Anacardiaceae	<i>Searsia gracillima</i> (Engl.) Moffett var. <i>gracillima</i>	NT	Dwarf shrub
Apocynaceae	<i>Stenostelma umbelluliferum</i> (Schltr.) S.P.Bester & Nicholas	NT	Geophyte
Aquifoliaceae	<i>Ilex mitis</i> (L.) Radlk. var. <i>mitis</i>	Declining	Shrub
Asphodelaceae	<i>Trachyandra erythrorrhiza</i> (Conrath) Oberm.	NT	Geophyte

Family	Species	Threat status	Growth forms
Asteraceae	<i>Callilepis leptophylla</i> Harv.	Declining	Herb
Crassulaceae	<i>Adromischus umbraticola</i> C.A.Sm. subsp. <i>umbraticola</i>	NT	Dwarf shrub
Crassulaceae	<i>Kalanchoe longiflora</i> Schltr. ex J.M.Wood	VU	Dwarf shrub
Ericaceae	<i>Erica nematophylla</i> Guthrie & Bolus	VU	Shrub
Fabaceae	<i>Acacia erioloba</i> E.Mey.	Declining	Shrub
Fabaceae*	<i>Argyrolobium campicola</i> Harms	NT	Herb
Fabaceae	<i>Argyrolobium megarrhizum</i> Bolus	NT	Dwarf shrub
Gunneraceae	<i>Gunnera perpensa</i> L.	Declining	Herb
Hyacinthaceae	<i>Bowiea volubilis</i> Harv. ex Hook.f. subsp. <i>volubilis</i>	VU	Climber
Hypoxidaceae	<i>Hypoxis hemerocallidea</i> Fisch., C.A.Mey. & Avé-Lall.	Declining	Geophyte
Mesembryanthemaceae	<i>Lithops lesliei</i> (N.E.Br.) N.E.Br. subsp. <i>lesliei</i>	NT	Succulent
Orchidaceae*	<i>Habenaria kraenzliniana</i> Schltr.	NT	Geophyte
Proteaceae	<i>Leucadendron cinereum</i> (Sol. ex Aiton) R.Br.	VU	Shrub

Note: VU=Vulnerable; NT=Near Threatened

Table 3. Definitions of Red Data status (Raimondo et al. 1999)

Symbol	Status	Description
VU	Vulnerable	A taxon is Vulnerable when the best available evidence indicates that it meets any of the five International Union for Conservation of Nature (IUCN) criteria for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild.
NT	Near Threatened	A taxon is Near Threatened when available evidence indicates that it is close to meeting any of the five IUCN criteria for Vulnerable, and is therefore likely to qualify for a threatened category in the near future.
N/A	Declining	A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.

10.1.2 Plant species recorded on the proposed housing development site

The study area is situated in an area with existing businesses and industries (north and east), human settlements (north), canal, railway line (southern side), building rubbles, ponds and natural grasslands and stands of *Eucalyptus* sp. The anthropogenic disturbances on site has transformed the natural Marikana thornveld with little remnants of this vegetation type still occurring on site. As a consequence of the high levels of disturbance, the dominant habitat

structure comprised primarily of weeds and/or alien invasive plant species. All of the species recorded on the proposed development site are listed in **Table 4** below. Species of conservation concern noted on site are indicated in **BOLD**.

Table 4. Plant species recorded on the proposed housing development site

Scientific Name	Common name	Ecological status	Form
<i>Acacia karroo</i> (<i>Vachellia karroo</i>)	Sweet thorn	Medicinal	Tree
<i>Acacia mearnsii</i>	Black Wattle	Invader 2	Tree
<i>Acacia sieberiana</i>	Paperbark thorn		Tree
<i>Albuca setosa</i>	Soldier-in-the-box		Herb
<i>Aloe greatheadii</i> var. <i>davyana</i>	Spotted aloe	Medicinal	Succulent
<i>Aloe transvaalensis</i> (=A. <i>zebrina</i>)	Zebra leaf aloe	Medicinal	Succulent
<i>Alternanthera pungens</i>	Khakhiweed	Weed	Herb
<i>Amaranthus hybridus</i>	Pigweed	Weed	Herb
<i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	White-flowered Mexican poppy	Category 1b	Herb
<i>Aristida stipitata</i>	Long-awned Grass	Increaser 2	Grass
<i>Arundo donax</i>	Spanish reed	Category 1b	Reed
<i>Asparagus laricinus</i>	Bergkatbos		Herb
<i>Berkheya setifera</i>	Buffalo-tongue Berkheya	Medicinal	Herb
<i>Bidens pilosa</i>	Common Black-jack	Weed	Herb
<i>Bidens formosa</i>	Cosmos	Weed	Herb
<i>Bulbostylis burchellii</i>	Joang-Ba-Nokana		Sedge
<i>Campuloclinium macrocephalum</i>	Pompom weed	Category 1b	Herb
<i>Canna indica</i>	Indian shot	Category 1b	Herb
<i>Celtis africanus</i>	White Stinkwood		Tree
<i>Chironia palustris</i>	Cerise Stars		Herb
<i>Cirsium vulgare</i>	Scotch thistle	Category 1b	Herb
<i>Conyza bonariensis</i>		Weed	Herb
<i>Crotalaria agatiflora</i>	Canary bird bush	Category 1a	Herb
<i>Ctenium concinnum</i>	Sickle grass	Increaser 1	Grass
<i>Cymbopogon excavatus</i>	Broad-Leaved Turpentine Grass	Increaser 1	Grass
<i>Cynodon dactylon</i>	Couch Grass	Increaser 2	Grass
<i>Cyperus eragrostis</i>	Tall Flatsedge		Sedge
<i>Datura stramonium</i>	Jimson weed	Category 1b	Herb
<i>Datura ferox</i>	Long Spined Thorn Apple	Category 1b	Herb
<i>Dichrostachys cinerea</i>	Sicklebush		Shrub
<i>Digitaria eriantha</i>	Common Finger Grass	Decreaser	Grass
<i>Elephantorrhiza elephantina</i>	Elephant's root	Medicinal	Shrub
<i>Eragrostis gummiflua</i>	Gum Grass	Increaser 2	Grass
<i>Eriobotrya japonica</i>	Loquat	Invader 3	Tree
<i>Eucalyptus camaldulensis</i>	River Red Gum	Invader 2	Tree
<i>Eucalyptus cinerea</i>	Argyle apple		Tree
<i>Flaveria bidentis</i>	Smelter's bush	Category 1b	Herb

Scientific Name	Common name	Ecological status	Form
<i>Gleditsia triacanthos</i>	Honey locust	Invader 2	Tree
<i>Gomphocarpus physocarpus</i>	Balloon milkweed	Medicinal	Shrub
<i>Hibiscus trionum</i>	Bladder Hibiscus	Medicinal	Herb
<i>Harpochloa falx</i>	Caterpillar grass	Increaser 1	Grass
<i>Hilliardiella oligocephala</i> (= <i>Vernonia oligocephala</i>)	Bicoloured-leaved vernonia	Medicinal	Herb
<i>Hyparrhenia hirta</i>	Common Thatching Grass	Increaser 1	Grass
<i>Hypochaeris radicata</i>	Hairy wild lettuce	Weed	Herb
<i>Hypoxis hemerocallidea</i>	Star-Flower/African Potato	Medicinal	Herb
<i>Hypoxis rigidula</i>	Silver-Leaved Star-flower	Medicinal	Herb
<i>Ipomoea purpurea</i>	Common morning-glory	Category 1b	Herb
<i>Lantana camara</i>	Big sage/lantana	Category 1b	Shrub
<i>Ledebouria ovatifolia</i>		Medicinal	Herb
<i>Ledebouria marginata</i>			Herb
<i>Ledebouria revoluta</i>	Common Squill		Herb
<i>Leonotis leonurus</i>	Wild Dagga	Medicinal	Herb
<i>Ligustrum lucidum</i>	Chinese privet	Invader 3	Shrub
<i>Lippia javanica</i>	Lemon Bush	Medicinal	Herb
<i>Medicago sativa</i>	Lucerne	Alien	Herb
<i>Melia azedarach</i>	Persian Lilac/Syringa	Category 1b	Tree
<i>Melinis repens</i>	Natal Red Top	Increaser 2	Grass
<i>Mirabilis jalapa</i>	Four o'clock flower	Category 1b	Shrub
<i>Morus alba</i>	White mulberry	Category 3	Tree
<i>Nicotiana glauca</i>	Wild tobacco	Category 1b	Tree
<i>Nidorella hottentotica</i>	Hairy Nidorella		Herb
<i>Olea europaea</i>	Wild olive	Medicinal	Tree
<i>Ornithogalum tenuifolium</i>	Star-of-Bethlehem		Herb
<i>Pachycarpus schinzianus</i>	Cream cups	Medicinal	Shrub
<i>Panicum maximum</i>	Guinea Grass	Decreaser	Grass
<i>Peltophorum africanum</i>	Weeping wattle		Tree
<i>Persicaria lapathifolia</i>	Spotted knotweed	Exotic	Herb
<i>Pinus patula</i>	Patula Pine	Invader 2	Tree
<i>Plantago major</i>	Broadleaved Ribwort	Weed/Medicinal	Herb
<i>Phragmites australis</i>	Common reed	Decreaser	Reed
<i>Prunus persica</i>	Peach tree	Exotic	Tree
<i>Pogonarthria squarrosa</i>	Herringbone Grass	Increaser 2	Grass
<i>Populus deltoides</i>	Match poplar	Invader 3	Tree
<i>Populus nigra</i>	Lombrady poplar	Invader 2	Tree
<i>Pseudognaphalium luteo-album</i>	Jersey Cudweed	Medicinal	Herb
<i>Ricinus communis</i>	Caster-oil plant	Category 1b	Shrub
<i>Richardia brasiliensis</i>	Brazilian calla-lily	Weed	Herb
<i>Robinia pseudoacacia</i>	Black Locust	Category 1b	Shrub
<i>Salix babylonica</i>	Weeping Willow	Invader 2	Tree

Scientific Name	Common name	Ecological status	Form
<i>Scirpoides burkei</i>			Sedge
<i>Schotia brachypetala</i>	Weeping boer-bean		Tree
<i>Schoenoplectus corymbosus</i>			Sedge
<i>Searsia lancea</i>	Karee		Tree
<i>Searsia pyroides</i>	Common wild currant		Tree
<i>Senecio inornatus</i>	Tall marsh senecio		Herb
<i>Sesbania sesban</i>	Egyptian riverhemp	Weed	Shrub
<i>Senecio venosus</i>	Besembos		Herb
<i>Setaria sphacelata</i> var. <i>sphacelata</i>	Common Bristle Grass	Decreaser	Grass
<i>Sida cordifolia</i>		Medicinal	Herb
<i>Sporobolus africanus</i>	Ratstail Dropseed	Increaser 3	Grass
<i>Sonchus asper</i>	Spiny sowthistle	Weed	Shrub
<i>Solanum mauritianum</i>	Bugweed	Category 1b	Shrub
<i>Solanum panduriforme</i>	Poison Apple		Herb
<i>Solanum sisymbriifolium</i>	Sticky nightshade	Category 1b	Shrub
<i>Tagetes minuta</i>	Tall Khaki Weed	Weed	Herb
<i>Talinum cafferum</i>	Porcupine Root		Herb
<i>Tecoma stans</i>	Yellow bells	Category 1b	Tree
<i>Tipuana tipu</i>	Tipuana tree	Invader 3	Tree
<i>Themeda triandra</i>	Red Grass	Decreaser	Grass
<i>Typha capensis</i>	Bulrush		Aquatic herb
<i>Verbena bonariensis</i>	Tall Verbena	Weed	Shrub
<i>Verbena brasiliensis</i>		Weed	Herb
<i>Zinnia peruviana</i>	Redstar zinnia	Exotic	Herb
<i>Xanthium strumarium</i>	Large Cocklebur	Category 1b	Herb
<i>Xysmalobium undulatum</i> var. <i>undulatum</i>	Milkwort		Herb
<i>Zea mays</i>	Corn or maize		Herb
<i>Ziziphus mucronata</i>	Buffalo thorn		Shrub

10.1.3 Alien invasive species recorded on the proposed housing development site

Alien invader plants are species that are of exotic, non-native or of foreign origin that typically invade undeveloped or disturbed areas. Invaders are a threat to our ecosystem because by nature they grow fast, reproduce quickly and have high dispersal ability (Henderson, 2001). This means that invader plants and seeds spread rapidly and compete for the growing space of our own indigenous plants. If these invader plants out-compete indigenous plants there is a shift in the species composition of the area and the changing our plant communities causes a decline in species richness and biodiversity (Henderson, 2001). Many factors allow alien invasive plants to succeed, particularly the absence of their natural enemies. This makes it difficult to control invasive plants without bringing in natural enemies and eliminating the high competition they have over the indigenous vegetation (Bromilow, 2010). Alien invasive plant

species within the study area were observed to occur in clumps, scattered distributions or as single individuals on site. Invader and weed species must be controlled to prevent further infestation and it is recommended that all individuals of invader species (Especially Category 1b) must be removed and eradicated (Henderson, 2001). Species such as *Crotalaria agatiflora* (**Figure 9**) (Category 1a), *Flaveria bidentis* (**Figure 10**), *Solanum mauritianum* (**Figure 11**) and *Robinia pseudoacacia* (**Figure 12**) and *Campuloclinium macrocephalum* (**Figure 13**) (Category 1b) were common in the study area.



Figure 9. Alien plant species *Crotalaria agatiflora* recorded on site



Figure 10. Alien plant species *Flaveria bidentis* recorded on site



Figure 11. Alien plant species *Solanum mauritianum* recorded on site



Figure 12. Alien plant species *Robinia pseudoacacia* recorded on site



Figure 13. Alien plant *Campuloclinium macrocephalum* recorded on site

Due to several alien plant species recorded on site, an Alien Plant Eradication Programme must be developed in order to ensure that the Applicant/Contractor implements suitable methods during the construction phase to limit the introduction and spread of alien invasive plant species. Alien plants should be continued to be removed and managed, preferably mechanically and not chemically so as to have minimal ecological and biological impacts.

10.1.4 Threatened Species, Species of Conservation Concern and Medicinal Plants recorded on the proposed development site

According to the National Environmental Management Biodiversity Act 2004 (Act No. 10 of 2004 as amended), there is a dire need to conserve biodiversity in each Province and as such, all natural and/or indigenous resources must be utilised sustainably. At the project area, there are a number of plants that are used to provide medicinal products (**Table 4**). In some cases there is merit in protecting or translocating them before the proposed development commences. While many of these plants are indigenous or exotic weeds that have medicinal value (and for which no action is necessary with respect to conservation), their economic value means that they are considered to be in need of protection.

According to the South African Red Data list categories done by SANBI (**Figure 14**), **threatened species** are species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered, Endangered or Vulnerable is a threatened species whereas **Species of conservation concern** are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the

Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD).

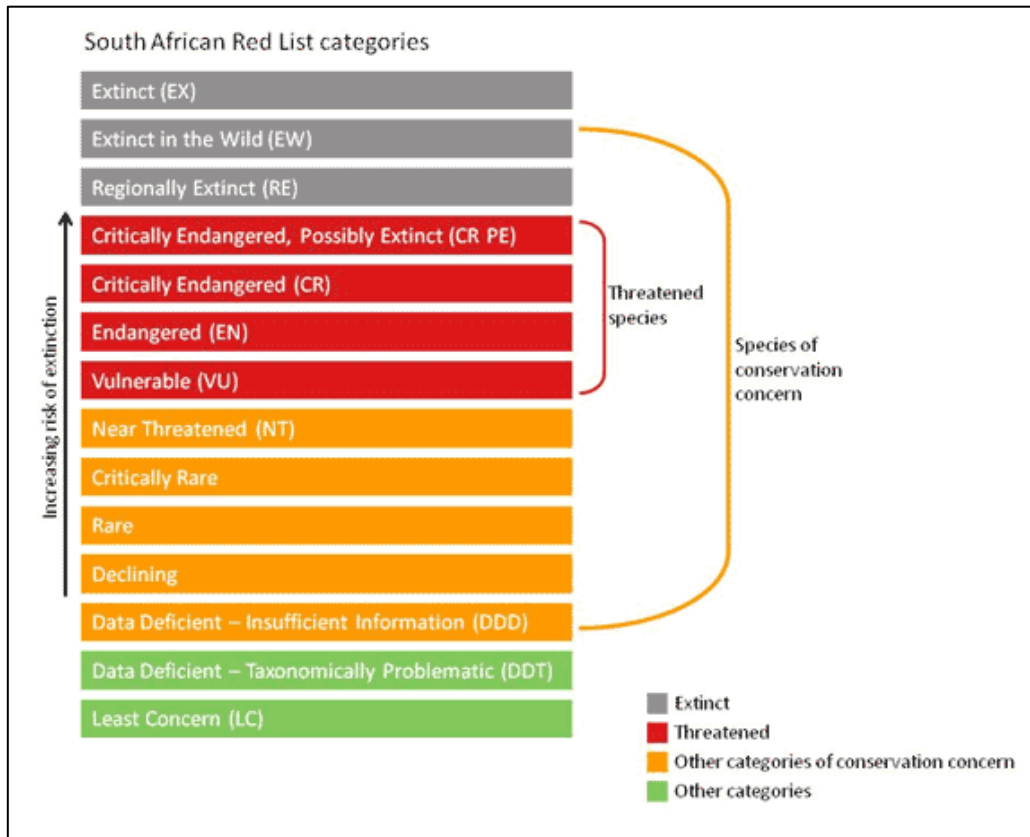


Figure 14. South African Red data list categories (SANBI)

During the field surveys, only one plant species of conservation concern was observed in the study area, namely *Hypoxis hemerocallidea* (Star flower/African potato). According to Raimondo *et al.* (2009), this plant species is listed as *Declining*.

Hypoxis hemerocallidea (Figure 15) occurs in open grassland and woodland and is widespread in South Africa in the eastern summer rainfall provinces (Eastern Cape, Free State, KZN, Mpumalanga, Gauteng and Limpopo). It is used to treat headaches, dizziness, mental disorders, cancers, inflammation and HIV (Pooley, 1998). The distribution of this species on site is indicated in Figure 16 below. The number of each individual on each point are shown in brackets.



Figure 15. *Hypoxis hemerocallidea* recorded in the study area

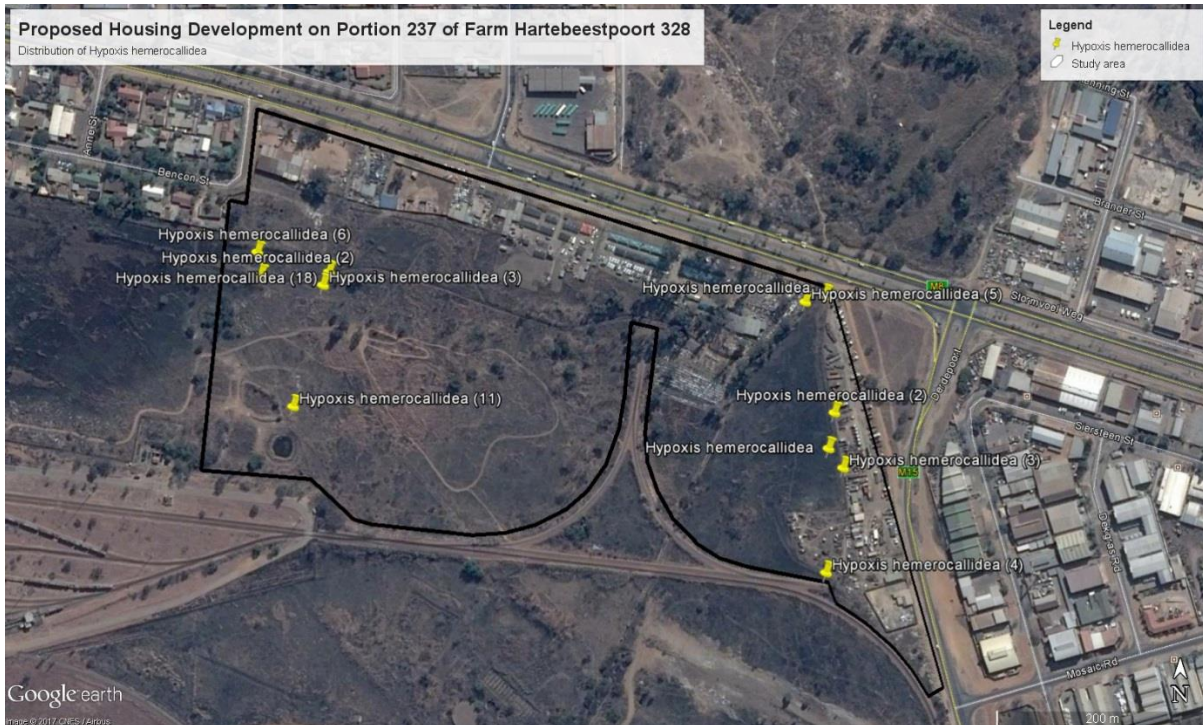


Figure 16. The distribution of *Hypoxis hemerocallidea* on the proposed development site

10.1.5 Habitat available for species of conservation importance

Data sourced from SANBI website indicates there are plant species on the Red Data List that are known to occur in or surrounding the project area. These species and their probability of occurrence are indicated in **Table 5** below. The probability of occurrence is based on the suitable habit where the species is likely to occur.

Table 5. Red Listed plant species which are known to occur in the general vicinity of the project area (Pfab and Victor, 2002).

Species	Threat status	Suitable habitat	Probability of Occurrence
<i>Boophone disticha</i> (L.f.) Herb.	Declining	Occurs in dry grassland and rocky areas	Low
<i>Crinum macowanii</i> Baker	Declining	Grassland, along rivers, in gravelly soil or on sandy flats.	Low
<i>Searsia gracillima</i> (Engl.) Moffett var. <i>gracillima</i>	NT	Rocky quartzitic outcrops in bushveld.	Low
<i>Stenostelma umbelluliferum</i> (Schltr.) S.P.Bester & Nicholas	NT	Deep black turf in open woodland mainly in the vicinity of drainage lines.	Low
<i>Ilex mitis</i> (L.) Radlk. var. <i>mitis</i>	Declining	River banks, stream beds, evergreen forests.	Low
<i>Trachyandra erythrorrhiza</i> (Conrath) Oberm.	NT	Marshy areas, grassland, usually in black turf marshes.	Low
<i>Callilepis leptophylla</i> Harv.	Declining	Grassland or open woodland, often on rocky outcrops or rocky hillslopes	Low
<i>Adromischus umbraticola</i> C.A.Sm. subsp. <i>umbraticola</i>	NT	Rock crevices on rocky ridges, usually south-facing, or in shallow gravel on top of rocks, but often in shade of other vegetation.	Low
<i>Kalanchoe longiflora</i> Schltr. ex J.M.Wood	VU	A cliff-dweller (cremnohyte), found on rock faces and shale slopes, at 800-1700m altitude	Low
<i>Erica nematophylla</i> Guthrie & Bolus	VU	Stony slopes in fynbos.	Very Low
<i>Acacia erioloba</i> E.Mey.	Declining	Savanna, semi-desert and desert areas with deep, sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops	Very Low
<i>Argyrobium campicola</i> Harms	NT	Highveld grassland.	Medium
<i>Argyrobium megarrhizum</i> Bolus	NT	Mixed bushveld.	Low
<i>Gunnera perpensa</i> L.	Declining	In cold or cool, continually moist localities, mainly along upland streambanks.	Low
<i>Bowiea volubilis</i> Harv. ex Hook.f. subsp. <i>volubilis</i>	VU	Shady places, steep rocky slopes and in open woodland, under large boulders in bush or low forest.	Low
<i>Hypoxis hemerocallidea</i> Fisch., C.A.Mey. & Avé-Lall.	Declining	Occurs in a wide range of habitats, from sandy hills on the margins of dune forests to open rocky grassland	FOUND
<i>Lithops lesliei</i> (N.E.Br.) N.E.Br. subsp. <i>lesliei</i>	NT	Primarily in arid grasslands, usually in rocky places, growing under the protection of forbs and grasses.	Low
<i>Habenaria kraenzliniana</i> Schltr.	NT	Terrestrial in stony, grassy hillsides, recorded from 1000 to 1400m.	Low
<i>Leucadendron cinereum</i> (Sol. ex Aiton) R.Br.	VU	Sand fynbos on flats.	Very Low

10.2 Fauna

The assessment of faunal presence is based on the presence / absence of mammals, birds, and reptiles at the proposed development area. The assessments determined the current status of threatened animal species occurring, or likely to occur within the proposed areas, describing the available and sensitive habitats. Faunal data was obtained during a field survey of the proposed development, which was carried out on foot. The data was supplemented by previous surveys conducted in similar habitats, literature investigations, and historic data. Different habitats were explored to identify any sensitive or endangered species. Mammal nomenclature is referred to using Stuart and Stuart (1998), Skinner and Chimimba (2005), Friedman and Daly (2004); bird names by Hockey *et al.* (2005), Taylor *et al.* (2015); reptile names by Branch (1988), Branch (2001), Bates *et al.* (2014)

10.2.1 Mammals

10.2.1.1 Desktop survey results

The potential Red Data mammal species that could be found on the proposed development site are those which have been recorded in the grid cell 2528CB (ADU, 2017) and are listed in **Table 6** below. Due to the habitat disturbance, the list is likely to overestimate the occurrence of mammal species in the area and thus should be viewed with a degree of caution. The data sourced from GDARD indicates that there are no Red Data mammals recorded in the area.

Table 6. Red Data mammal species recorded in the grid cell 2528CB (ADU, 2017), which could potentially occur on the proposed development site

Family	Genus	Species	Common name	Red list category
Erinaceidae	<i>Atelerix</i>	<i>frontalis</i>	Southern African Hedgehog	Near Threatened
Muridae	<i>Dasymys</i>	<i>incomtus</i>	Common Dasymys	Near Threatened
Muridae	<i>Lemniscomys</i>	<i>rosalia</i>	Single-Striped Lemniscomys	Data Deficient
Soricidae	<i>Crocidura</i>	<i>hirta</i>	Lesser Red Musk Shrew	Data Deficient
Soricidae	<i>Crocidura</i>	<i>maquassiensis</i>	Makwassie Musk Shrew	Vulnerable
Soricidae	<i>Crocidura</i>	<i>mariquensis</i>	Swamp Musk Shrew	Data Deficient
Soricidae	<i>Suncus</i>	<i>lixus</i>	Greater Dwarf Shrew	Data Deficient

10.2.1.2 Mammals recorded on the proposed housing development site

Most sections of the proposed development site have been transformed, largely due to study area being in an urban complex environment and also due to with existing businesses and industries, railway line and building rubbles remaining on site. The transformation of natural habitats on site habitat and also human presence have negatively impacted on large mammal occurrence, particularly ungulates and predators. **Table 7** lists three animals recorded during the survey. Mammals recorded were common and are of no conservation importance in the area.

Table 7. Mammals recorded in the study area

Scientific name	English name	Status
<i>Rattus rattus</i>	House rat	Least concern
<i>Rhabdomys pumilio</i>	Four-striped Grass Mouse	Least concern
<i>Lepus saxatilis</i>	Scrub Hare	Least concern

10.2.1.3 Habitat available for species of conservation importance

Data sourced from SANBI (ADU, 2017) indicates that the mammal species such as White-tailed rat and Honey Badger are known to occur in the general vicinity of the site but it was not observed during the site visit. **Table 8** below indicates the suitable habitat (Taylor *et al.* 2015) together with the probability of occurrence. The probability of occurrence is based on the presence of suitable habit where the species is likely to occur.

Table 8. Red Data Listed mammal species which could potentially occur in the proposed development site with suitable habitats and their probability of occurrence (Skinner and Chimimba, 2005; Taylor *et al.* 2015).

Common name	Red list category	Suitable habitat	Probability of occurrence
Southern African Hedgehog	Near Threatened	Prefers grass and Bushveld that is not too damp and with a good covering of leaves and other debris. They have generally been recorded from scrub brush, western Karoo, grassland and suburban gardens	Low
Common Dasymys	Near Threatened	This species has been recorded from a wide range of habitats, including forest and savanna, swampland and grasslands, but rely on intact wetlands.	Low
Single-Striped Lemniscomys	Data Deficient	This species tolerates a wide range of savanna habitats, including savanna woodland, dry grassland at the ecotone between vleis and woodland	Low
Lesser Red Musk Shrew	Data Deficient	This species is found in a wide range of habitats, such as grassland, savanna, scrubland and compost heaps in gardens.	Medium
Makwassie Musk Shrew	Vulnerable	This species can be found in rocky or montane grassland but little is known about the habitats and ecology of this species.	Low
Swamp Musk Shrew	Data Deficient	This species has a highly specific habitat requirements, occurring only close to open water with intact riverine and semi-aquatic vegetation such as reeds, wetlands and thick grass along river banks.	Low
Greater Dwarf Shrew	Data Deficient	This species has generally been recorded from dry savanna and dry woodland habitats, also in riverine	Medium

Common name	Red list category	Suitable habitat	Probability of occurrence
		forest, open dry scrub, open grassland, coastal lowland forest, <i>Acacia</i> woodland and suburban gardens.	

10.2.2 Avifauna

10.2.2.1 Desktop survey results

The Important Bird and Biodiversity Areas (IBA) Programme is a BirdLife International initiative to conserve important bird species and their habitats. It also identifies and works to conserve a network of sites critical for the long-term survival of bird species that are globally threatened, have a restricted range and are restricted to specific biomes/vegetation types. 847 bird species occur in South Africa, with over 15% of South African bird species threatened with extinction, mainly due to loss of suitable habitat. It is therefore important to manage a network of South African 112 IBAs to conserve threatened, endemic, biome restricted and congregatory birds. 36 of the IBAs are found in KwaZulu-Natal province. Several Conservation and planning tools were consulted for relevancy of this the project and the project area does not fall within any of the IBAs (**Figure 17**).

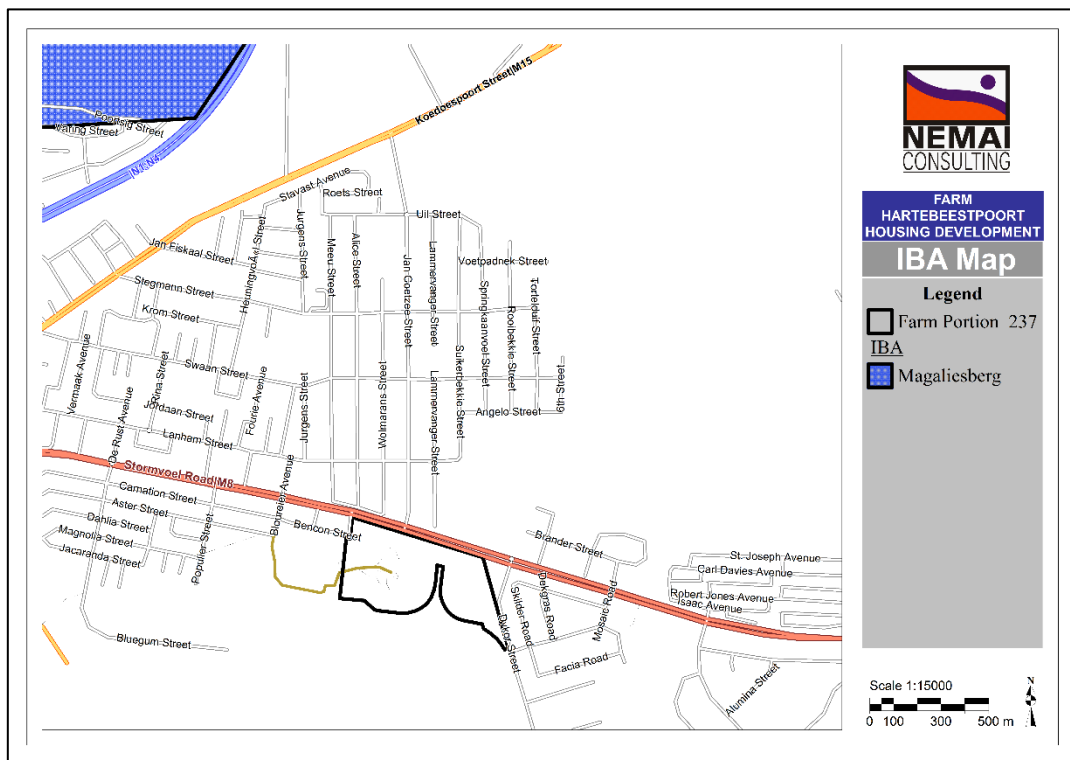


Figure 17. IBA

According to the Southern African Bird Atlas Project 2 (SABAP 2), a list of threatened bird species occur in 2528CB grid cell (**Table 9**).

Table 9. Red Data Bird species recorded in cell 2528CB which could occur in the study area (Taylor *et al.* 2015);

Common Name	Genus	Species	Red List Category
Half-collared Kingfisher	<i>Alcedo</i>	<i>semitorquata</i>	Near Threatened
African Grass-Owl	<i>Tyto</i>	<i>capensis</i>	Vulnerable
White-bellied Korhaan	<i>Eupodotis</i>	<i>senegalensis</i>	Vulnerable
Blue Crane	<i>Anthropoides</i>	<i>paradiseus</i>	Near Threatened
Black-winged Pratincole	<i>Glareola</i>	<i>nordmanni</i>	Near Threatened
Cape Vulture	<i>Gyps</i>	<i>coprotheres</i>	Endangered
African Marsh-Harrier	<i>Circus</i>	<i>ranivorus</i>	Endangered
Martial Eagle	<i>Polemaetus</i>	<i>bellicosus</i>	Endangered
Secretarybird	<i>Sagittarius</i>	<i>serpentarius</i>	Vulnerable
Lanner Falcon	<i>Falco</i>	<i>biarmicus</i>	Vulnerable
Yellow-billed Stork	<i>Mycteria</i>	<i>ibis</i>	Endangered

10.2.2.2 Field work results

A numbers of bird species in South Africa have declined mainly due to massive habitat transformation and degradation as well as increased levels of human disturbances, extensive habitat transformation due to mining, industrial and commercial and agricultural activities. Human activities have transformed grasslands in South Africa to a point where few pristine examples exist (Low and Rebelo, 1996). Factors such as increased pasture management (overgrazing), decrease in grassland management due to frequent fires and land-use alteration (urbanisation) also contribute in the decline of species. More intensive surveys conducted over longer periods over several seasons are required in order to ascertain the current status of the above-mentioned threatened bird species on and surrounding the site. Many avifaunal species are adaptable as they are habitat generalists and can therefore accommodate a certain degree of habitat degradation and transformation (Harrison *et al.* 1997). Other species are extremely habitat specific and have to rely on certain habitat units for breeding, hunting or foraging and roosting. Habitat-specific species are sensitive to environmental change, with destruction of habitat being the leading cause of species decline worldwide (Barnes, 2000). Due to high levels of human disturbances; the site offers limited suitable habitat for any larger terrestrial birds as well as certain smaller raptor species.

Within the vegetation type found in the study area and immediate surrounding areas, three bird habitat systems were identified. A short description of each habitat type follows below:

Exotic trees

Exotic trees often provide roosting and nesting substrate for various bird species, and as such their importance for avifauna should not be underestimated. This habitat will mostly be

important to physically smaller bird species. Several such stands of trees exist in the study area and could provide refuge for amongst other species: Exotic trees provide perching, roosting and nesting habitat for various raptor species, as well as larger birds such as francolins, Guineafowl, Herons and Hadedda Ibises. Black Sparrowhawk *Accipiter melanoleucus*, Rufous-chested Sparrowhawk *Accipiter rufiventris*, Long-crested Eagle *Lophaetus occipitalis* and Forest Buzzard *Buteo trizonatus*. Although stands of *Eucalyptus* (**Figure 18**) are invader species, these stands have become important refuges for certain species of raptors including Long Crested Eagle and Steppe Buzzard. Large *Eucalyptus* trees are also used by the migratory Lesser Kestrels for roosting purposes.



Figure 18. Large stands on *Eucalyptus* trees on site could be used by the migratory Lesser Kestrels for roosting purposes.

Artificial depressions/concrete canal/ponds: This habitat type was dominated by stands of *Phragmites australis* (**Figure 19**) and *Typha capensis* and was heavily infested by invader species such as *Morus alba*, *Verbena bonariensis*, *Populus deltoids*, *Canna indica*. However, areas with reeds, sedges or grassy tangles are suitable for Common Waxbills, Bishops and various warblers (Marais and Peacock, 2008).



Figure 19. Common Reed provides nesting and roosting sites for Bishops.

Grassland: These grassland areas (**Figure 20**) represent a significant feeding area for many bird species in the area. Several typical Red Data grassland species were recorded in the square grid by SABAP2, as indicated in **Table 9**. It is therefore highly unlikely that these species could occur in the grassland remaining on the site due to human settlements and disturbances. Frequent burning of habitat can cause major impacts due to reduced or affected foraging, roosting, and nesting sites. Non-threatened species that may from time to time frequent the grassland habitat in the study area are Swainson's Spurfowl (*Pternistis swainsonii*), African Pipit (*Anthus cinnamomeus*), Cape Longclaw (*Macronyx capensis*), several cisticola species, Long-tailed Widowbird (*Euplectes progne*), Rufous-naped Lark (*Mirafra africana*), and Black-shouldered Kite (*Elanus caeruleus*) (Harrison *et al.* 1997).



Figure 20. Natural grasslands on site.

Eighteen (18) bird species (**Table 10**) were recorded during the field survey. Species recorded were common and widespread and typical of savanna environment. No Red Data bird species associated with the proposed development site were recorded within the study area. Bird species such as Hadedea Ibis (**Figure 21**), Blacksmith Lapwing (Plover) (**Figure 22**), Common Fiscal (Fiscal Shrike) (**Figure 23**) and Common (Indian) Myna (**Figure 24**) were recorded in abundance on the proposed development site.

Table 10. Bird species recorded along the proposed development site

Species number	Common name	Scientific name
63	Black-headed heron	<i>Ardea melanocephala</i>
71	Cattle Egret	<i>Bubulcus ibis</i>
91	African Sacred Ibis	<i>Threskiornis aethiopicus</i>
94	Hadedea Ibis	<i>Bostrychia hagedash</i>
203	Helmeted Guineafowl	<i>Numida meleagris</i>
255	Crowned Lapwing (Plover)	<i>Vanellus coronatus</i>
258	Blacksmith Lapwing (Plover)	<i>Vanellus armatus</i>
349	Rock Pigeon	<i>Columba guinea</i>
352	Red-eyed Dove	<i>Streptopelia semitorquata</i>
355	Laughing Dove	<i>Streptopelia senegalensis</i>
548	Pied Crow	<i>Corvus albus</i>
568	Red-eyed Bulbul	<i>Pycnonotus nigricans</i>
596	African (Common) Stonechat	<i>Saxicola torquatus</i>
732	Common Fiscal (Fiscal Shrike)	<i>Lanius collaris</i>
758	Common (Indian) Myna	<i>Acridotheres zeylonus</i>
801	House Sparrow	<i>Passer domesticus</i>
814	Southern Masked-Weaver	<i>Ploceus velatus</i>
824	Southern Red Bishop	<i>Euplectes orix</i>



Figure 21. Hadedda Ibis on site



Figure 22. Blacksmith Lapwing (Plover) on site



Figure 23. Common Fiscal (Fiscal Shrike) on site



Figure 24. Common (Indian) Myna on site

10.2.2.3 Habitat requirements for Red Data bird species

Data sourced from SABAP 1, Harrison *et al.* 1997, Barnes (2000), SABAP2 and Tarboton *et al.* 1987 indicated bird species on the Red Data List that are known to occur on grid cell 2628AA; as well as their probability of occurrence (indicated in **Table 11**). The probability of occurrence is based on the presence of suitable habit where the species is likely to occur. In this case few of the potential species are likely to occur at the site due to a lack of suitable microhabitats.

Table 11. Red Data Bird species recorded in grid 2628AA which could potentially occur in the study area (SABAP 1) (Harrison *et al.* (1997), Barnes (2000), SABAP2, and Tarboton *et al.* (1987).

Common Name	Species	Red List Category		
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	Near Threatened	Fast-flowing streams with clear water and well-wooded banks	Very Low
African Grass-Owl	<i>Tyto capensis</i>	Vulnerable	This species occurs predominately in rank grass, typically but not always at fairly high altitudes. It breeds mainly in permanent and seasonal vleis, which it vacates while hunting or during post-breeding. Prefers permanent or seasonal vleis and vacates the latter when these dried up or are burnt.	Very Low
White-bellied Korhaan	<i>Eupodotis senegalensis</i>	Vulnerable	It prefers fairly tall, dense grassland, especially sour and mixed grassland, in open or lightly wooded, undulating to hilly country. In winter, occasionally on modified pastures and burnt ground.	Very Low
Blue Crane	<i>Anthropoides paradiseus</i>	Near Threatened	This crane breeds in dry grasslands at high elevations where there is less disturbance. They may roost and breed in wetlands if available and some individuals prefer to nest in arable and pastureland.	Very Low
Black-winged Pratincole	<i>Glareola nordmanni</i>	Near Threatened	Agricultural landscapes, ploughed lands	Medium
Cape Vulture	<i>Gyps coprotheres</i>	Endangered	Inhabits open grassland, savanna and shrubland, and is often found roosting on crags in mountainous regions	Very Low
African Marsh-Harrier	<i>Circus ranivorus</i>	Endangered	This species breeds and forages in wetland habitats including marshes, floodplains, reed beds and lake margins	Very Low
Martial Eagle	<i>Polemaetus bellicosus</i>	Endangered	The Martial Eagle is to be found in the savannah and thornbush areas of Africa south of the Sahara, from Senegal to Somalia and south to the Cape. It is also found in open plains and semi-desert country, but not frequenting forest, although it occasionally breeds in forests on the edge of open country	Very Low

Common Name	Species	Red List Category		
Secretarybird	<i>Sagittarius serpentarius</i>	Vulnerable	Prefers open grassland with scattered trees, shrubland, open <i>Acacia</i> and <i>Combretum</i> savannah. Restricted to large conservation areas in the region. Avoids densely wooded areas, rocky hills and mountainous areas.	Very Low
Lanner Falcon	<i>Falco biarmicus</i>	Vulnerable	Usually inhabiting open country, the Lanner Falcon can be found in a wide range of habitats ranging from extreme desert to wet, forested mountains up to elevations of 5,000 metres. The species can be found in <i>Eucalyptus</i> stands in southern Africa and even in urban areas, as long as there are open or lightly wooded areas nearby for hunting, though it tends to avoid heavily forested or very wet areas	Medium
Yellow-billed Stork	<i>Mycteria ibis</i>	Endangered	Associated with water – dams, wetlands, rivers, marshes, even small pools.	Very Low

10.2.3 Reptiles

The surrounding buildings, grasslands, old building rubbles and trees on site provide suitable habitats and foraging for reptile species recorded on site. Reptiles are extremely secretive and difficult to observe during field survey.

10.2.3.1 Desktop survey results

The Field Guide to the Snakes and other Reptiles of Southern Africa (Branch, 2001) and South African Red Data Book Reptiles (Branch, 1988) were books used during the field survey. According to the data sourced from the South African Reptile Conservation Assessment (accessed at <http://sarca.adu.org.za>), no Red Data reptile species is known to occur in the 2528CB grid cell.

10.2.3.2 Reptiles recorded on site

Only one reptile species was noted on site, this being the Montane Speckled Skink (*Trachylepis punctatissima*). This species is found in a variety of habitats, wet and dry, from grassland and savanna to shrubland, including rock outcrops (Branch, 1998). It is not considered to be of significant importance from a conservation perspective.

From the field results, it is evident that increased human presence and associated disturbances, habitat destruction, habitat modification and transformation were responsible for the low number of observations.

11 TERRSTRIAL ECOLOGICAL SENSITIVITY ANALYSIS OF THE STUDY AREA

The ecological function describes the intactness of the structure and function of the vegetation communities which in turn support faunal communities. It also refers to the degree of ecological connectivity between the identified vegetation communities and other systems within the landscape. Therefore, systems with a high degree of landscape connectivity among each other are perceived to be more sensitive.

High – Sensitive vegetation communities with either low inherent resistance or resilience towards disturbance factors or vegetation that are considered important for the maintenance of ecosystem integrity. Most of these vegetation communities represent late succession ecosystems with high connectivity with other important ecological systems.

Medium – Vegetation communities that occur at disturbances of low-medium intensity and representative of secondary succession stages with some degree of connectivity with other ecological systems.

Low – Degraded and highly disturbed vegetation with little ecological function.

A terrestrial ecological field assessment was carried out to determine the most sensitive areas on the proposed development site. All the areas denoted as *high* in terms of terrestrial

ecological sensitivity must be taken into account when the final layout is designed (**Figure 25**). The natural and near natural areas on the proposed site contain plants species of conservation concern and it is advisable that the infrastructure development should be placed in areas which are already disturbed (indicated as Low) (shown in Light Brown colour). A pre-construction survey should be undertaken by a qualified ecologist and must identify all conservation important species and a detailed Search, Rescue and Relocation Plan needs to be developed.

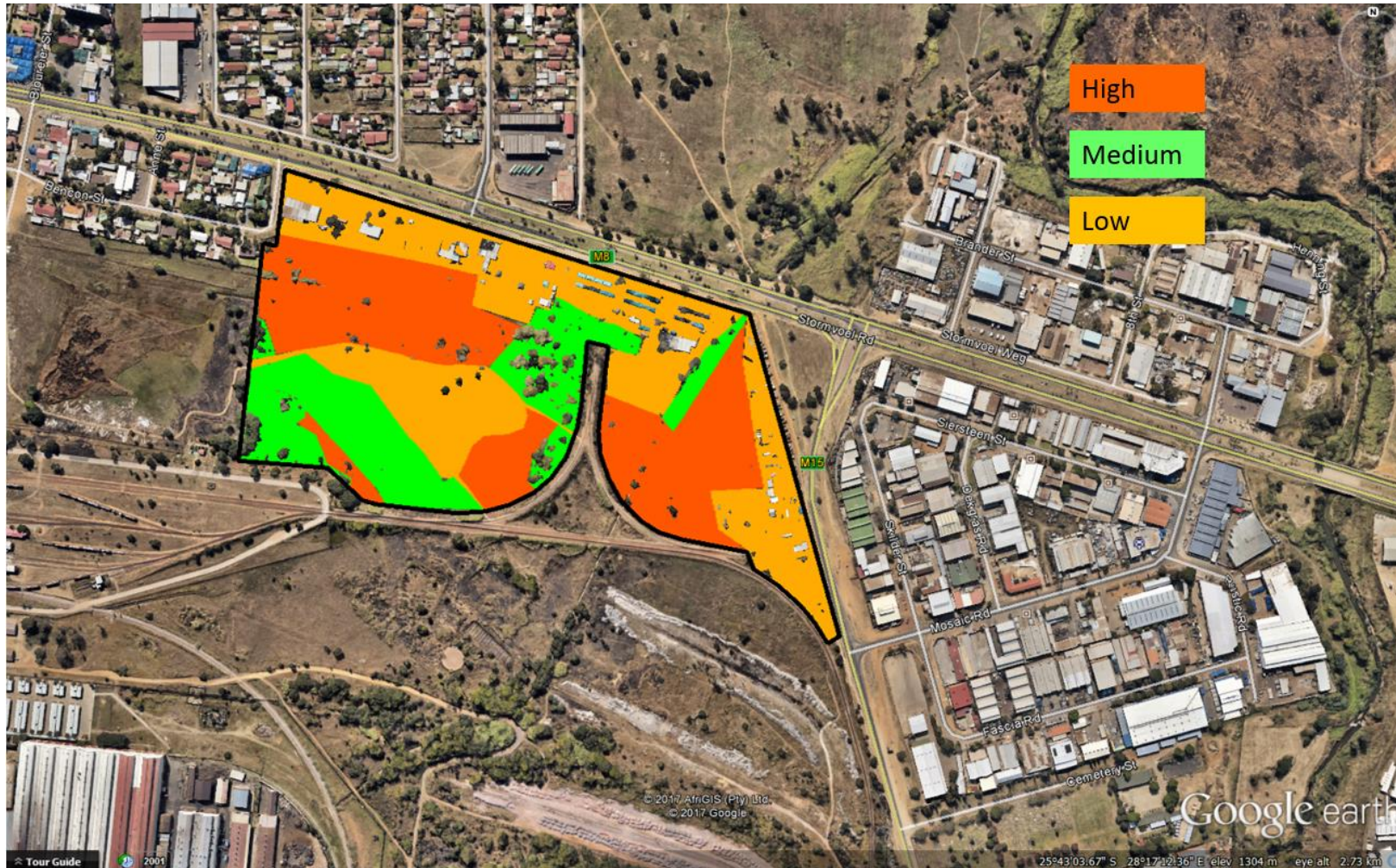


Figure 25. Terrestrial ecological sensitivity map of the proposed housing development site

12 ENVIRONMENTAL IMPACT ASSESSMENT

12.1 Methodology

All impacts are analysed in the section to follow (**Table 12**) with regard to their nature, extent, magnitude, duration, probability and significance. The following definitions apply:

Nature (/Status)

The project could have a positive, negative or neutral impact on the environment.

Extent

- Local – extend to the site and its immediate surroundings.
- Regional – impact on the region but within the province.
- National – impact on an interprovincial scale.
- International – impact outside of South Africa.

Magnitude

Degree to which impact may cause irreplaceable loss of resources.

- Low – natural and social functions and processes are not affected or minimally affected.
- Medium – affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High – natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration

- Short term – 0-5 years.
- Medium term – 5-11 years.
- Long term – impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent – mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability

- Almost certain – the event is expected to occur in most circumstances.
- Likely – the event will probably occur in most circumstances.
- Moderate – the event should occur at some time.
- Unlikely – the event could occur at some time.
- Rare/Remote – the event may occur only in exceptional circumstances.

Significance

Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-

- 0 – Impact will not affect the environment. No mitigation necessary.
- 1 – No impact after mitigation.
- 2 – Residual impact after mitigation.
- 3 – Impact cannot be mitigated.

12.2 Assessment of Environmental Impacts and Suggested Mitigation Measures

Only the environmental issues identified during the appraisal of the receiving environment and potential impacts are assessed (**Table 12**). Mitigation measures are provided to prevent (first priority), reduce or remediate adverse environmental impacts.

Table 12. Proposed impacts and the recommended mitigation measures for the proposed housing development site

FLORA PRE – CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Loss of plant species of conservation concern on site			<ul style="list-style-type: none"> It is recommended that prior to construction, the <i>Hypoxis hemerocallidea</i> plant species recorded must be searched and rescued and then following construction activities, they can be re-established at the site. Given that the species of conservation importance were observed, it is important that a walk-down survey be conducted for plant species of conservation importance and threatened species which may occur on the project area and are addressed through a search and rescue plan. 			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FLORA PRE – CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Destruction of indigenous flora			<p>Indigenous plants naturally growing on the development site, but that would be otherwise destroyed during clearing for development purposes should be incorporated into landscaped areas.</p> <p>Vegetation clearing should be kept to a minimum, and this should only occur where it is absolutely necessary and the use of a brush-cutter is highly preferable to the use of earth-moving equipment.</p> <p>Rehabilitate all disturbed areas as soon as the construction is completed within the proposed development area.</p> <p>Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm and this can be achieved through provision of appropriate awareness to all personnel.</p>			
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of animals on site		<p>Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily.</p> <p>During site preparation special care must be taken during the clearing of the works area in order to minimise damage or disturbance of roosting and nesting sites.</p> <p>The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase.</p> <p>Vehicles must adhere to a speed limit, 30-40 km/h is recommended for light vehicles and a lower speed for heavy vehicles.</p> <p>All construction and maintenance vehicles must stick to properly demarcated and prepared roads. Off-road driving should be strictly prohibited.</p> <p>No fires should be allowed at the site</p> <p>No dogs or other pets should be allowed at the site</p>				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FLORA AND FAUNA PRE – CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of Habitat & Habitat Fragmentation		<p>The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining.</p> <p>No structures should be built outside the area demarcated for the development.</p> <p>Although it is unavoidable that the proposed development will need to traverse areas of potential sensitivity, the housing development should be constructed in such cases so as to avoid further impact to these areas.</p>				
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Soil contamination, vegetation loss and vegetation disturbance due to fuel and chemical spills				<p>Appropriate measures should be implemented in order to prevent potential soil pollution through fuel and oil leaks and spills and then compliance monitored by an appropriate person.</p> <p>Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks.</p> <p>Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under vehicles and equipment when not in use.</p> <p>Implement suitable erosion control measures</p>		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Vegetation and habitat disturbance due to the accidental introduction of alien species				<p>The Contractor implements suitable methods during the construction phase to limit the introduction and spread of alien invasive plant species</p> <p>Promote awareness of all personnel.</p> <p>The establishment of pioneer species should be considered with the natural cycle of rehabilitation of disturbed areas, which assists with erosion control, dust and establishment of more permanent species. This can be controlled during construction phase and thereafter more stringent measures should be implemented during the rehabilitation and post rehabilitation.</p> <p>Larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes</p>		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Vegetation and habitat disturbance due to pollution and littering during construction phase				The Contractor should employ personnel on site responsible for preventing and controlling of litter. Promote good housekeeping with daily clean-ups on site. During construction, refresher training can be conducted to construction workers with regards to littering, <i>ad hoc</i> veld fires, and dumping. No fires are allowed on site.		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Loss of habitat of the Marikana thornveld and CBA region				Vehicles and construction workers should under no circumstances be allowed outside the site boundaries to prevent impact on the surrounding vegetation. Where possible, natural vegetation must not be cleared and encouraged to grow. All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. Disturbance of vegetation must be limited only to areas of construction. Prevent contamination of natural grasslands by any pollution. Areas cleared of vegetation must be re-vegetated prior to contractor leaving the site		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Damage to plant life outside of the proposed development site				Construction activities should be restricted to the development footprint area and then the compliance in terms of footprint can be monitored by Environmental Control Officer (ECO). Areas which could be deemed as no go should be clearly marked.		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FAUNA CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Disturbance to animals				Animals residing within the designated area shall not be unnecessarily disturbed. During construction, refresher training can be conducted to construction workers with regards to littering and poaching. The Contractor and his/her employees shall not bring any domestic animals onto site. Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding snakes.		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FAUNA CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Animal passage out of construction site				Allow for safe animal passage through and specifically out of the construction site.		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA OPERATIONAL PHASE						
Potential Impact				Mitigation		
The proposed construction activities may affect biodiversity through the encroachment of exotic vegetation following soil disturbance, in addition the maintenance of the area would disturb naturalised species within the area				Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there should be an on-going monitoring program to control and/or eradicate newly emerging invasives.		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

FLORA POST CONSTRUCTION PHASE						
Potential Impact				Mitigation		
Rehabilitation of the site				<p>All areas to be affected by the proposed project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site.</p> <p>As much vegetation growth as possible should be promoted within the proposed development site in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping. The plant material to be used for rehabilitation should be similar to what is found in the surrounding area.</p>		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

FAUNA OPERATIONAL PHASE						
Potential Impact				Mitigation		
Disturbance of faunal species				<p>The disturbance of fauna should be minimized.</p> <p>Animals residing within the designated area shall not be unnecessarily disturbed.</p>		
Without Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Positive	Local	Low	Short-term	Likely	1

13 CONCLUSION AND RECOMMENDATIONS

The proposed housing development site falls within the Savanna Biome and this Biome is the largest Biome in South Africa and occupies over one third of the whole area. It is characterized by a grassy ground layer and distinct upper layer of woody plants. The study area falls within the *Endangered* Marikana Thornveld and this vegetation type on site has undergone major transformation mostly by serious alien plant infestation, footpaths, railway lines, building of roads and human settlements with little remnants of this vegetation type remaining on site. The proposed site falls within the *Vulnerable* Marikana Thornveld terrestrial threatened ecosystem. The Gauteng Conservation Plan 3.3 indicated that the study area falls within Critical Biodiversity Area (namely, *Important Area*) and not in an Ecological Support Areas.

Due to habitat fragmentation and human settlements on site, alien vegetation were recorded in abundance. Alien invasive plant species such as *Campuloclinium macrocephalum*, *Cirsium vulgare*, *Lantana camara* and *Solanum mauritianum* were dominant of site. During the field survey, no threatened plant species were observed on site, however only one species of conservation concern was noted, namely *Hypoxis hemerocallidea*, and this species has a conservation status of *Declining*. It is thus recommended that prior to construction, this species must be searched and rescued and then following construction activities, it must be re-established at the site. The major concerns on site are alien invasives, weeds and potential invasives. Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there should be an on-going monitoring program to control and/or eradicate newly emerging invasives. The rehabilitation of disturbed areas should receive high priority and must be included in the Environmental Management Programme and recommendations regarding the specific plant species used during rehabilitation should be site specific and according to the surrounding vegetation composition.

No fauna of conservation concern were recorded on site. The human presence and associated disturbances taking place usually have a detrimental impact on fauna species (especially mammals and snakes) in the area.

From a broad and preliminary evaluation of the site in question, it is evident that the proposed development activities will have low to medium impacts on the receiving environment. The development activities proposed within the survey area will therefore not have a significant impact on biodiversity conservation within the region. Generally, the negative impacts to the receiving environment resulting from the proposed development are probably of an acceptable significance and magnitude if appropriate mitigations measures are implemented and construction is implemented in a sensitive manner. The proposed development will cause disruption during the construction phase, but as long as mitigation measures are implemented, these disruptions should have minimal lasting effects on the ecosystems of the proposed development. It is recommended that the larger exotic species that are not included in the Category 1b list of invasive species could also be allowed to remain for aesthetic purposes.

After conclusion of this Terrestrial Ecology Report, it is the opinion of the ecologist that the proposed development be considered favourably provided that the sensitivity map be considered during the planning and construction phases of the proposed development activities in order to aid in the conservation of ecology within the study area.

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