CONFINEMENT OF MONTANASPRUIT

REVIEW
ECOLOGICAL ASSESSMENT

Review of Existing Ecological (Fauna & Flora) Assessment Reports for the Proposed Confinement of the 1:100 Year Floodplain of the Montanaspruit on Portions 28 to 42, 137 & 138 of Doornpoort 295 JR, City of Tshwane, Gauteng Province

Compiled by

Flori Scientific Services

JUNE 2019

1 REPORT INFORMATION

PROJECT TITLE: Confinement of Montanaspruit

STUDY NAME: Review Ecological Assessment

COMPILED BY: Flori Scientific Services cc

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DATE OF REPORT: 20 June 2019

REPORT STATUS: Final Draft

REPORT NUMBER: MS/EA _01

2 EXECUTIVE SUMMARY

Background

The City of Tshwane Municipality has over the years received numerous complaints regarding the flooding of the Montanaspruit (Montana Stream) in the Pretoria area since the mid 1990s. The proposed project of remedial action involves the confinement the 1:100 year floodline, widening and flattening of the floodplain and canalisation of the mainstream channel, where necessary. The proposed project activities and actions cover an approximate area of 22.45 hectares on portions 28 to 42, 137 and 138 of Doornpoort 295-JR, City of Tshwane, Gauteng Province.

Most of the specialist studies were conducted a few years ago and need to be reviewed and updated where necessary. Flori Scientific Services cc was appointed as the independent consultancy to conduct the review of the studies.
Field investigations were conducted in March 2019.

Location of the study area

The study site is a section of the Montanaspruit, which is situated on Portions 28 to 42, 137 and 138 of Doornpoort 295-JR, City of Tshwane, Gauteng Province. The site is north of Sefako Makgatho Drive (Zambezi Drive, R513); west of the N1, and south of the N4 (Rustenburg highway).

Reports reviewed

Only ecological (Fauna & Flora) studies (reports) were reviewed and are as follows:

- Vegetation and floral assessment of the Montana Spruit for the proposed confinement of the 1:100 year floodplain, portions 28 – 42, 137, 138 of Doornpoort 295 JR, Gauteng. June 2007. Strategic Environmental Focus (Pty) Ltd.
- Vegetation and flora survey on portions 44, 45 and 46 of the Farm Doornpoort 295 JR, Tshwane, Gauteng Province. 7 July 2008. David Hoare Consulting cc.
- Montana Spruit channel upgrade, Gauteng. Red data scan. May 2008. Strategic Environmental Focus (Pty) Ltd.

Summary of review

The following is a summary of the review of the relevant ecological reports:

- Overall the ecology of the study area itself has altered little over the last few years, especially in terms of the floral component and the reports can be taken as still being relevant.
- Marikana Thornveld, which includes the study area and open thornveld to the north, is a threatened ecosystem with a status of vulnerable (VU) and not endangered (EN) as stated in some of the reviewed reports.
- The faunal component was not assessed in any of the previous studies. A mammal assessment was conducted with focus on the potential presence of priority species. The red data sensitivity index score (RDSIS) showed a 'low' score for the potential presence of priority mammal species.
- It is unlikely that any priority faunal species are resident, with the possible exception of bullfrogs, but these more in the open thornveld area north of the study site. Although no known colonies are present in the area.
- No RDL fauna or flora species were observed in the study site, or within a 200m radius of the study site. The 200m radius relates to regulations within the urban edge.
- Maps and information were also updated to include the latest delineation of CBAs and ESAs as determined by the latest Gauteng Conservation Plan (C-Plan v.3.3).
- An updated sensitivity map of the study site is included, which is missing in the previous reports.
- The high sensitivity area of the study site is the Montanaspruit (stream); associated floodplain; and existing 100-year floodline. There are built up areas (houses) within the existing 100-year floodline along the east of the stream. These built up areas are totally transformed and are delineated as having a low sensitivity.
- The GPEMF zones, which were formalised after the relevant reports, were included in the review. The study area is situated within Zone 1.
- No additional significant information or hidden 'fatal flaws' were uncovered during the review process, which included site investigations.

3 REVIEW & APPROVAL

Name	Title & Company	Signature	Date
Johannes Maree	Ecologist & Author (Flori Scientific Services)		24/06/2019
Delia De Lange	Lead EAP (TGM Environmental Services)		

4 ACKNOWLEDGEMENTS

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOGRAPHS

5 ACRONYMS

CBA	Critical Biodiversity Areas
CMA	Catchment Management Agencies
DEA	Department of Environment Affairs
DWA	Department of Water Affairs (Old name for DWS)
DWS	Department Water and Sanitation
EAP	Environmental Authorised Practioner
EIS	Ecological Importance & Sensitivity
EMC	Environmental Management Class
HGM	Hydrogeomorphic
IBA	Important Bird Area(s)
IUCN	International Union for Conservation of Nature
MAP	Mean Annual Precipitation
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
PES	Present Ecological State
PDA	Primary Drainage Area
QDA	Quaternary Drainage Area
REC	Recommended Ecological Category (or Class)
REMC	Recommended Ecological Management Category (or Class)
RVI	Riparian Vegetation Index
SANBI	South African National Biodiversity Institute
SWSA	Strategic Water areas of South Africa
WMA	Water Management Areas
WUL	Water Use Licence
WULA	Water Use Licence Application

6 BACKGROUND

6.1 Project overview

The City of Tshwane Municipality has over the years received numerous complaints regarding the flooding of the Montanaspruit (Montana Stream) in the Pretoria area since the mid 1990s. The proposed project of remedial action involves the confinement the 1:100 year floodline, widening and flattening of the floodplain and canalisation of the mainstream channel, where necessary. The proposed project activities and actions cover an approximate area of 22.45 hectares on portions 28 to 42, 137 and 138 of Doornpoort 295-JR, City of Tshwane, Gauteng Province.

Most of the specialist studies were conducted a few years ago and need to be reviewed and updated where necessary. Flori Scientific Services cc was appointed as the independent consultancy to conduct the review of the studies.
Field investigations were conducted in March 2019.

6.2 Reports reviewed

Only ecological (Fauna & Flora) studies (reports) were reviewed in this report and are as follows:

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- Vegetation and flora survey on portions 44, 45 and 46 of the Farm Doornpoort 295 JR, Tshwane, Gauteng Province. 7 July 2008. David Hoare Consulting cc.
- Montana Spruit channel upgrade, Gauteng. Red data scan. May 2008. Strategic Environmental Focus (Pty) Ltd.

6.3 Study Site Location

The study site is a section of the Montanaspruit, which is situated on Portions 28 to 42, 137 and 138 of Doornpoort 295-JR, City of Tshwane, Gauteng Province. The site is north of Sefako Makgatho Drive (Zambezi Drive, R513); west of the N1 Highway, and south of the N4 (Rustenburg Highway) (Figure 1). However, the larger Montanaspruit system, as shown in Figure 2 below, was also investigated and needs to be taken into consideration as well.

Figure 1: Study Site

Figure 2: Area investigated

6.4 GPS Coordinates of the Main Landmarks

The GPS coordinates of the main landmarks within the project area are as follows:

- North end of site (Montanaspruit): 25°38'37.07"S; 28°15'35.13"E.
- South end of site area (Montanaspruit): 25°40'50.19"S; 28°15'42.34"E.
- Erasmia: 25°48'23.80"S; 28°05'31.69"E.
- 1:50 000 Topo Map reference (QDS): 2528CB (Silverton).
- Quaternary Drainage Area (QDA): A21B.

6.5 Purpose of the study

The study is a review and update of existing specialist studies and reports. The initial studies were conducted a few years ago and it is deemed pertinent that they be reviewed and updated were necessary. The project involves the proposed confinement of the Montanaspruit in the area of Montana Park, Mondustria and Doornpoort. Project activities trigger numerous environmental requirements, including the need for certain specialist studies.

6.6 Quality and age of base data

The latest data sets were used for the report in terms of background information for veld types, ecosystems, threatened ecosystems, red data listed (RDL) fauna and flora species, priority areas (including protected areas, strategic expansion areas, wetlands, watercourses, etc. The data used was sourced from the same data sets that are nationally used and approved by all consultants and governmental organisations.

The source and age of data used included the following:

- Threatened ecosystems: Latest datasets were obtained from the SANBI website (www.bgis.sanbi.org).
- RDL species: Red List of South Africa Plants (latest update) – (www.redlist.sanbi.org).
- Veld types and ecosystems: Mucina & Rutherford, 2006, 2010. Updated in 2012 (National vegetation maps 2012 beta 2).
- SANBI data sets – latest updated website data (www.bgis.sanbi.org).
- Plants of Southern Africa: 2012 - (www.posa.sanbi.org).
- National environmental screening tool (Dept. Environmental Affairs) - (www.environment.gov.za).
- Gauteng Conservation Plan (C-Plan) version 3.3.

6.7 Update of environmental plans and frameworks

During the last few years important environmental conservation plans and frameworks have been updated as shown below.

- The latest conservation plan (v3.3) for the Gauteng Province came out in 2011. The CBAs and ESAs have been updated according to this C-Plan v3.3.
- The latest GPEMF was adopted in 2018 (Gazette 41473: Notice 164 of 2 March 2018). Publication of the GPEMF Standard for Implementation. Adoption of the GPEMF Standard and exclusion of associated activities from the requirement to obtain environmental authorisation in terms of section 24(2)(d) and 24(10)(a), read with section 24(10)(d), of the National Environmental Management Act, 1998.

6.8 Assumptions and limitations

The assumptions and limitations for the assessment are as follows:

- All information regarding the proposed project and related activities as provided by the Client are taken to be accurate;
- Field investigations were conducted on 28 March 2019.
- Precise buffer zones, regulated zones, etc. or exact GPS positions cannot be made using generalised corridors or kml files on Google Earth. However, the buffer zones drawn are accurate to within 2-3m;
- Standard and acceptable methodologies as required and used in South Africa were used.
- The latest data sets were used in terms of obtaining and establishing background information and desktop reviews for the project. The data sets were taken to be accurate, but were verified and refined during field investigations.

7 METHODOLOGY

7.1 Desktop assessment

A literature review was conducted regarding the existing specialist studies (reports) and compated to the latest existing base data such shown above in Section 6.5, as some of these have changed and been updated during the last few years. Various online environmental screening tools were also used to assess the latest data available, such as the DEA national environmental screening tool.

7.2 Field surveys

A site investigation was conducted for the purpose of ground-truthing and to determine to what extent the study area has changed during the last few years. During the field surveys, cognisance was taken of the following environmental features and attributes:

- Biophysical environment, including terrestrial and aquatic ecosystems;
- Regional and site specific vegetation;
- Habitats ideal for potential red data fauna and flora species;
- Sensitive faunal and floral habitats; and
- Red data and orange data fauna and flora species.

Digital photographs and GPS reference points of importance where recorded and used throughout the report when and where necessary.

8 REVIEW OF REPORTS

8.1 Assessment of the study site

The study site is situated within the original extent of Marikana Thornveld. The veld type is part of the Central Bushveld Bioregion, which is part of the Savanna Biome of South Africa. Marikana Thornveld is a threatened veld type with a threat status of vulnerable (VU) and not of endangered (EN) as stated in the reports.[1]

Over the past 11 to 12 years (2007 – 2019) the areas to the south (in particular) and to the east of the study site have increased in terms of urbanisation, while areas in the north of the site and to north of the site itself have not altered much as can be seen in satellite images from the various years (see appendices). Although the study area itself has not altered much in terms of existing, open thornveld, grassland and watercourses, the increase in urban development along the boundaries can lead to a change in ecosystem characteristics and functions. This due to, for example, an increase in channelled stormwater run-off from new hard surfaces; and an increase in anthropogenic negative impacts on the open thornveld and Montanaspruit, including and increase in the frequency of veldfires.

The natural environment of the study site is moderately transformed to largely transformed. The area in the study site west of the Montanaspruit (Montana Steam) is moderately transformed with characteristics of Marikana Thornveld still present, while urban dwellings and gardens largely transform the study site east of the stream. The open thornveld area north of the study site and south of the N4 Rustenburg Highway is representative of Marikana Thornveld, which is moderately degraded with some patches of fairly pristine veld.

In general, the ecology of the study area itself has remained quite constant and altered little over the last few years, especially in terms of the floral component. The faunal component was not assessed in the previous ecological studies, but it is fairly certain that due to the increase in urbanisation the wild fauna of the area would have been negatively impacted to some extent and a bit more than the floral component. The overall ecological and floral assessments of the previous reports are still deemed to be valid and sketch the upper end of the spectrum. In other words, the species listed as occurring in the area can be taken to still occur, even if not observed in the last field investigations undertaken in March 2019.

[1] Reports refers to the reports under review as listed in Section

The figure below shows the three main watercourses (small streams) that are part of the larger ecosystem of the area, which are the Montanaspruit, Blinkblaarspruit, and Katdoringspruit (Figure 3). The Katdoring and Blinkblaar are very small highly ephemeral and seasonal small streams (drainage lines) that are tributaries of the larger Montanaspruit.

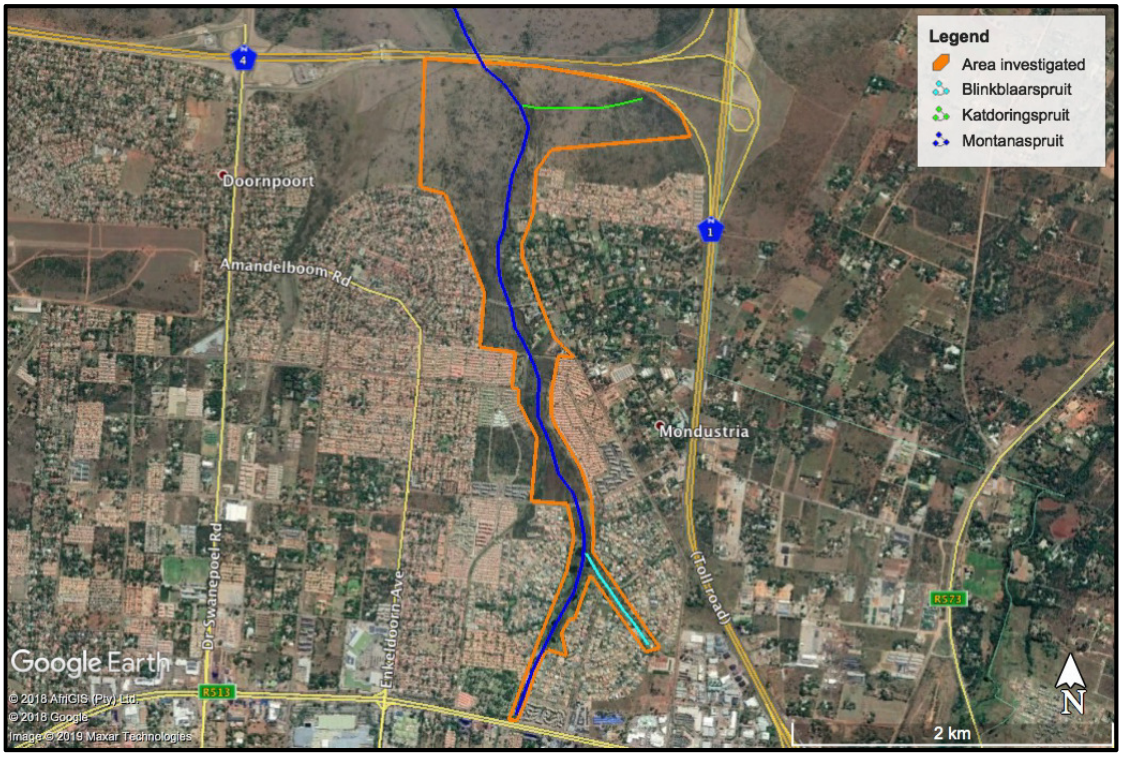

Figure 3: Main watercourses in the study site and greater area

8.2 Faunal assessment of the site

Due to the fact that a faunal assessment was not conducted in any of the previous studies, one was conducted for mammals using the methodologies as found in the appendices and in general for species of conservation concern. The results of the faunal assessment for mammals are shown in the RDSIS section below. The full calculation sheet can be found in the appendices.

8.2.1 Faunal species of conservation concern

During field investigations no faunal species of conservation concern (priority species) were encountered. The general habitats present in the study area are not ideal for most priority species. The chance that a few priority species may be encountered in the study area during project activities is always a possibility, but fairy unlikely. Table 1, below, is a summary of the red data status of species in the

Gauteng Province. Table 2, below, list some of the national threatened species and their likelihood to occur in the study area. Although giant bullfrog is not a listed threatened species anymore it is still, like most frogs a very important priority species requiring protection.

Table 1: Summary of Red Data Status of species in Gauteng

Group	Tot. Sp. in SA	No. & % in Gauteng	% & No. Threatened in Gauteng	IUCN Red Data Category				
				CR	EN	VU	NT	DD
Plants	20 457	2 160 (11%)	1,1% (23)	0	8	13	20	1
Mammals	296	130 (44%)	7,7% (10)	3	3	6	12	10
Birds	694	473 (68%)	3,6% (17)	1	0	16	22	0
Reptiles	363	92 (25%)	0	0	0	0	0	0
Amphibians	111	22 (20%)	0	0	0	0	1	0
Butterflies	820	211 (26%)	0	0	1	4	1	0

Table 2: Priority Faunal Species most likely to occur in the area

Species	Common Name	Red Data Status	Preferred Habitat	Habitat Restrictions	Present in Study area
Frogs					
Pyxicephalus adspersus	Giant bullfrog	Threatened	Grassland; savanna	Temporary floodplains, pans	Likely
Mammals					
Atelerix frontalis	SA hedgehog	Near threatened	Most, broad	Broad	Unlikely
Manis temmincki	Pangolin (Scaly anteater)	Vulnerable	Grassland, savanna	Woody savanna, ants, termites	No
Mellivora capensis	Honey badger (Ratel)	Near threatened	Most, broad	Broad	No
Cloeotis percivali	Short-eared trident bat	Critically endangered	Savanna	Caves and subterranean habitat	No
Pipistrellus rusticus	Rusty bat	Near threatened	Most, broad	Woody savanna, large trees	No
Snakes					
Python	Southern	Vulnerable	Ridges,	Rocky areas;	No

natalensis	African python		wetlands	open water	

8.2.2 RDSIS for mammals in the study area

The Red Data Sensitivity Index Score (RDSIS) was calculated for the study area using the methodology described and found in the appendices. The Red Data List (RDL) of Mammal species for the Gauteng Province is shown in the table below, along with their IUCN threat status (Table 3). The IUCN Red List of Threatened Species was consulted via the official website (www.iucnredlist.org).

Table 3: RDL Mammal Species for the Gauteng Province

Scientific Name	Common Name	GDARD Status	IUCN Status
Neamblysomus julianae	Juliana's Golden Mole	VU	EN
Mystromys albicaudatus	White-tailed Mouse	EN	EN
Atelerix frontalis	SA Hedgehog	NT	LC
Lutra maculicollis	Spotted-necked otter	NT	NT
Miniopterus schreibersii	Schreiber's long-fingered bat	NT	NT
Myotis tricolor	Temminck's hairy bat	NT	LC
Rhinolophus blasii	Peak-Saddle Horseshoe Bat	VU	LC
Rhinolophus clivosus	Wing-gland bat	NT	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	NT	LC
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	NT	LC

VU = Vulnerable, EN = Endangered, NT = Near Threatened, LC = Least Concern

The Probability of Occurrence (POC) is the probability of the animal/s occurring in the study area. The calculated POC of the mammal species is calculated by taking the animal's historical distribution, present habitat availability and present food source into account. The calculated POC for the priority mammal species are shown in the table below (Table 4).

Table 4: Probability of Occurrence (POC)

Scientific Name	Common Name	IUCN Status	POC (%)	POC Value
Atelerix frontalis	Hedgehog	NT	53	Medium
Lutra macuicollis	Spotted-necked otter	NT	50	Medium
Miniopteris schreibersi	Schreibers's long-fingered bat	NT	57	Medium
Myotis tricolor	Temminck's hairy bat	LC	50	Medium
Mystomys albicaudatus	White tailed mouse	EN	55	Medium

Neamblysomus julianae	Juliana's Golden Mole	EN	40	Medium
Rhinolophus blasii	Peak-Saddle Horseshoe Bat	LC	37	Low/Medium
Rhinolophus clivosus	Geoffroy's Horseshoe bat	NT	57	Medium
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	37	Low/Medium
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	LC	53	Medium

The Red Data Sensitivity Index Score (RDSIS) for the study area's potential Red Data Listed (RDL) mammals yielded an average score of 12,4%, indicating a 'Low' index score of importance or occurrence with regards to RDL mammal species within the general vicinity of the study area. All species with a Probability of Occurrence (POC) of 60% or more have an increased probability of either permanently or occasionally inhabiting the study area. The species with a POC of 100% are those species that were observed during field investigations. Table 5, below, is a summary of the main calculated indices for the RDSIS for the study area in terms of Red Data Listed Mammal Species. The spreadsheet showing the more detailed calculations in determining the RDSIS can be found in the appendices. The rating levels and descriptions are found in the appendices and in the table below (Table 6).

Table 5: RDSIS for Mammals for the study area

RED DATA SENSITIVITY INDEX SCORE (RDSIS)	
Average Total Species Score (TSS)	49,5%
Average Threatened Taxa Score (TT)	0%
Average of the combined TSS & TT Scores	24,75%
% Of Species with a Probability of Occurrence of >60%	0%
RDSIS for the Study Site	**12, 4%**
RDSIS Category for Study Site	**LOW**

Table 6: RDSIS Rating & Description (Mammals)

RDSIS Rating	Description
0-20	Low
21-40	Low/Medium
41-60	Medium
61-80	Medium/High
81-100	High

8.3 Sensitivity of the study site

One of the major desired outcomes from an ecological assessment is to determine and delineate the sensitivities of the area, including any potential 'no-go' areas. The sensitivity mapping of the site, as per the specialist reports has remained the same in terms of actual ecological sensitivity and can be taken as accurate and relevant. However, the focus of the report is mainly vegetation. Taking the larger aquatic ecosystem into account, buffer areas and the threat status of veld type, it is recommended that the entire study area be viewed and approached as sensitive (high sensitivity), with the exception of the urban plots and houses on the east side that fall within the original floodplain. The 'high sensitive' delineated area must include all of the area up to the existing 1:100 flood line, as well as the 32m buffer zone. The sensitive area must also include the entire delineated areas of the CBA and ESA. All watercourses are, by default, viewed as sensitive and should be approached as such.

According to environmental regulations any rare or endangered flora or fauna species present within a 200m radius of the study site (if within an urban area) must be reported. In terms of the study site, no rare or endangered flora or fauna species were reported or observed within a 200m radius.

Two Gauteng orange listed species (ODL) have been observed on site, namely *Crinum bulbispernum* and *Hypoxis hemerocallidea.* Both are nationally listed as least concern (LT) (www.redlist.sanbi.org), but are declining. Crinum is typically found in the wetter, clay soils and floodplains, while Hypoxis prefers drier soils.

Below is a summary of the main criteria or factors taken into consideration when determining the sensitivity of the study area (Table 7). The more of these factors that are present the higher the sensitivity of the study area is.

Table 7: Factors influencing sensitivity of the study area

Factors influencing sensitivity	Description	Present in Study Area
Critical Biodiversity Area		Yes (in north) CBA: Important Area
Ecological Support Area		Yes (most of site)
Threatened veld type	Status of CR, EN or VU	Yes (VU)
Pristine vegetation present	Veld in site in pristine condition	Some areas (mainly in north)
Streams or rivers	Perennial or semi-perennial	Yes (Montanaspruit)
Wetlands	Wetlands incl. pans	No & None within 500m

National Priority Areas	PAs, IBAs, NFEPA, NPEAS	No
Distinct drainage lines	Significant presence	No
RDL plant species	Status of CR, EN & VU species	Possible (in area north of study site) But none in study site
ODL plant species	As per province schedule	Yes
RDL animal species	Status of CR, EN & VU species	Unlikely
Ridges		No
Rocky outcrops		No
Land capability (Agriculture)	GAPA, etc.	Small Holdings; Land capability; Very high/15.
Other special features		No

8.3.1 Gauteng Conservation Plan (C-Plan v.3.3)

The latest conservation plant (v3.3) for the Gauteng Province (GDARD) came out in 2011. The CBAs and ESAs have been updated according to this C-Plan v.3.3. According to the C-Plan v.3.3 (2011) most of the site is within a designated ESA, with a small section in the north in a CBA (Important Area) (Figure 4).

Figure 4: CBAs & ESAs of study area and region

8.3.2 Gauteng Provincial Environmental Management Framework

The Gauteng Provincial Environmental Management Framework (GPEMF) is a legal instrument in terms of the Environmental Management Regulations Framework (2010). One of the objectives of the GPEMF is to protect Critical Biodiversity Areas (CBAs) and properly integrate Ecological Support Areas (ESAs) as defined in the conservation plan of Gauteng Province (C-Plan), within urban and rural areas. The study area was assessed in terms of the EMF (2014 & 2018), with focus on biodiversity, current land use, hydrology and other environmental factors. An environmental sensitivity assessment was conducted and sensitivity delineations done in terms of Conservation status, Conservation priorities, Ridges, Surface hydrological features and current land use.

According the to GPEMF the study site is situated within Zone 1.

GPEMF Zone 1: Urban development zone Intention

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.

8.3.3 Gauteng Agriculture Potential Atlas

According to the Gauteng Agricultural Potential Atlas (GAPA 4), as accessed on the DEA screening tool website (www.environment.gov.za), the study area is within an area of very high land capability. However, site investigations dispute this fact and see the area as having a low agricultural or land capability rating. The study site is essentially the Montanaspruit and floodplain, which has low agricultural potential in terms of cultivation and grazing. The main area of the study site is situated within a narrow strip of land between suburbs of Pretoria.

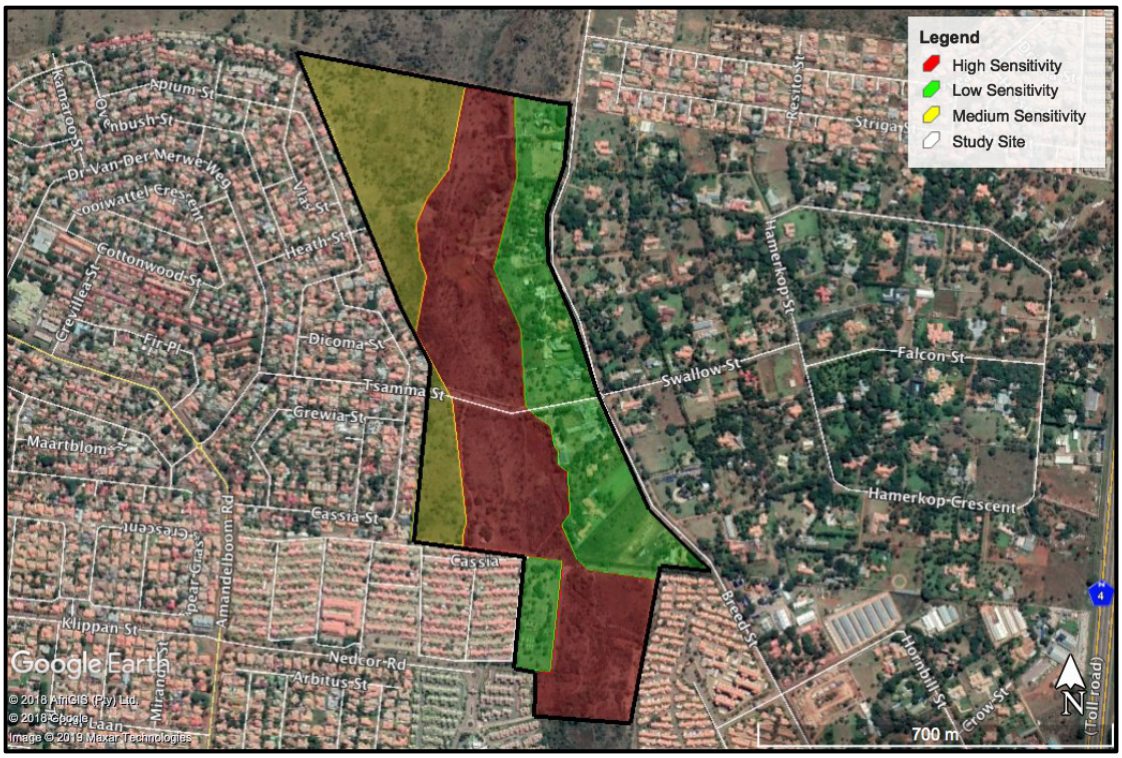

Figure 5: Sensitivity map

8.4 Summary of review

The following is a summary of the review of the relevant ecological reports:

- Overall the ecology of the study area itself has altered little over the last few years, especially in terms of the floral component and the reports can be taken as still being relevant.
- Marikana Thornveld, which includes the study area and open thornveld to the north, is a threatened ecosystem with a status of vulnerable (VU) and not endangered (EN) as stated in some of the reviewed reports.
- The faunal component was not assessed in any of the previous studies. A mammal assessment was conducted with focus on the potential presence of priority species. The red data sensitivity index score (RDSIS) showed a 'low' score for the potential presence of priority mammal species.
- It is unlikely that any priority faunal species are resident, with the possible exception of bullfrogs, but these more in the open thornveld area north of the study site. Although no known colonies are present in the area.
- No RDL fauna or flora species were observed in the study site, or within a 200m radius of the study site. The 200m radius relates to regulations within the urban edge.

- Maps and information were also updated to include the latest delineation of CBAs and ESAs as determined by the latest Gauteng Conservation Plan (C-Plan v.3.3).
- An updated sensitivity map of the study site is included, which is missing in the previous reports.
- The high sensitivity area of the study site is the Montanaspruit (stream); associated floodplain; and existing 100-year floodline. There are built up areas (houses) within the existing 100-year floodline along the east of the stream. These built up areas are totally transformed and are delineated as having a low sensitivity.
- The GPEMF zones, which were formalised after the relevant reports, were included in the review. The study area is situated within Zone 1.
- No additional significant information or hidden 'fatal flaws' were uncovered during the review process, which included site investigations.

9 APPENDICES

9.1 Terrestrial ecosystems in the City of Tswane

Below is the list of ecosystems and veld types found in the City of Tswane Metro Municipality area and their status (SANBI website). Marikana Thornveld is a threatened ecosystem (veld type) with a threat status of vulnerable (VU).

Biomes

Name	Size (ha)	Size (%)
Grassland Biome	54048,5 ha	24,85%
Savanna Biome	163408,3 ha	75,15%
2 biomes in the municipality covering 217456,8 ha (100 %)		

Vegetation Types

Name	Size (ha)	Size (%)
Andesite Mountain Bushveld	4331,5 ha	1,99%
Carletonville Dolomite Grassland	33428,3 ha	15,37%
Central Sandy Bushveld	60921,7 ha	28,02%
Egoli Granite Grassland	14666,8 ha	6,74%
Gauteng Shale Mountain Bushveld	7756,1 ha	3,57%
Gold Reef Mountain Bushveld	9467,2 ha	4,35%
Marikana Thornveld	57581,3 ha	26,48%
Moot Plains Bushveld	9338,9 ha	4,29%
Norite Koppies Bushveld	4011,5 ha	1,84%
Rand Highveld Grassland	6103,9 ha	2,81%
Springbokvlakte Thornveld	9840,9 ha	4,53%
Subtropical Salt Pans	8,8 ha	0%
12 vegetation types in the municipality covering 217456,8 ha (100 %)		

Threatened EcoSystems (Critically Endangered)

Name	Size (ha)	Size (%)
Bronberg Mountain Bushveld	185,9 ha	0,09%
Magaliesberg Pretoria Mountain Bushveld	2302,1 ha	1,06%
Rietvleiriver Highveld Grassland	3951 ha	1,82%
Witwatersberg Pretoria Mountain Bushveld	10384,4 ha	4,78%
4 Critically Endangered Threatened EcoSystems in the municipality covering 16823,3 ha (7,74 %)		

Threatened EcoSystems (Endangered)

Name	Size (ha)	Size (%)
Egoli Granite Grassland	9169,1 ha	4,22%
Witwatersberg Skeerpoort Mountain Bushveld	175,4 ha	0,08%
2 Endangered Threatened EcoSystems in the municipality covering 9344,6 ha (4,3 %)		

Threatened EcoSystems (Vulnerable)

Name	Size (ha)	Size (%)
Marikana Thornveld	13363,9 ha	6,15%
Rand Highveld Grassland	701,9 ha	0,32%
Springbokvlakte Thornveld	3643,6 ha	1,68%
3 Vulnerable Threatened EcoSystems in the municipality covering 17709,4 ha (8,14 %)		

Source: SANBI website (www.bgis.sanbi.org).

9.2 Summary of Marikana Thornveld

The study area is situated within the original extent of Marikana Thornveld. Below is a summary of Marikana Thornveld (CVcb6) (Mucina & Rutherford, 2006, 2010 ed).

Marikana Thornveld is also known as:

- VT 19 Sourish Mixed Bushveld (VT 19) (Acocks, 1953).
- Other Turf Thornveld (VT 13) (Acocks, 1953).
- Clay Thorn Bushveld (LR 14) (Low & Rebelo 1996).

Distribution: North-West and Gauteng Provinces. Occurs on plains from the Rustenburg area in the west, through Marikana and Brits to the Pretoria area in the east. Approximate altitude at about 1 050 to 1 450 m.

Vegetation & Landscape Features: Open *Acacia karroo* woodland, occurring in valleys; slightly undulating plains; and some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops and in other habitats protected from fire.

Conservation: Less than 1% statutorily conserved. Found in the Magaliesberg Nature Area and De Onderstepoort Nature Reserve. Considerably impacted on already, with about 48% transformed, mainly cultivated and urban or built-up areas. Most agricultural development of this vegetation unit is in the western regions towards Rustenburg, while in the east (near Pretoria) industrial development and urban sprawl are greater threats of land transformation. Erosion is very low to moderate. Alien invasive plants occur localised in high densities, especially along the drainage lines.

Geology & Soils: Most of the area is underlain by the mafic intrusive rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex. Rocks include gabbro, norite, pyroxenite and anorthosite. The shales and quartzites of the Pretoria Group (Transvaal Supergroup) also contribute. Mainly vertic melanic clays with some dystrophic or mesotrophic plinthic catenas and some freely drained, deep soils. Land types mainly Ea, Ba and Ae.

9.3 List of floral species

Below is a list of dominant floral species found in Marikana Thornveld, according to Mucina & Rutherford (2006).

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

9.4 Photographs

Photo 1: Montanaspruit (Stream)

Photo 2: Built up suburbs and gardens along Montanaspruit

Photo 3: Stream showing dense grasses and rushes along the banks and in the riparian zone

Photo 4: Low level bridge and road crossing over stream (Tsamma St)

Photo 5: Dense rushes in steam and floodplain. Also notice alien invasive weeds (morning glory and zinnia)

9.5 Historical satellite images of area

Figure 6: 2008

Figure 7: 2015

Figure 8: 2017

Figure 9: 2019

9.6 Methodology for faunal assessment

9.6.1 Faunal Assessment – Species of Conservation Concern

Literature was reviewed and some experts contacted to determine which faunal species of conservation concern (which include all Red Data species) might potentially be present, or likely to be present, in the study area and general region. A snapshot investigation of an area presents limitations in terms of locating and identifying Red Data Listed (RDL) faunal species. Particular emphasis was therefore placed on the identification of habitat deemed suitable for the potential presence of Red Data fauna species by associating available habitat to known habitat types of Red Data species. The verification of the presence or absence of these species from the study area is not perceived as part of this investigation as a result of project limitations.

9.6.2 Fauna Red Data Sensitivity Index Score (RDSIS)

Field investigations limited to a few days can seldom, if ever, be comprehensive in terms of identifying all faunal species, let alone Red Data Listed (RDL) Species and/or priority species. Included is the reality that many faunal species are highly mobile and might be moving in and out of an area, which makes observing these species sometimes incidental and fortunate, depending largely on time and chance. Added to this are the species that are primarily nocturnal in nature.

For the above reasons, the Red Data Sensitivity Index Scoring (RDSIS) method for fauna is widely used by specialists involved in EIAs, specialist studies, etc. The RDSIS methodology provides a calculated indication for the potential of certain red data or priority species occurring in the study area. The index is based on historical data, present presence of ideal habitat and food sources, general inferences on the landuses of the region and the Specialist's knowledge and experience.

9.6.3 Probability of Occurrence (POC)

Known distribution range (D), habitat suitability of the site (H) and availability of food sources (F) on site is determined for each of the species. Each of these variables is expressed a percentage (where 100% is a perfect score). The average of these scores provides a POC score for each species.

The POC is calculated as follows:

POC = (D+H+F) / 3

The POC value is then categorised as follows:

- 0-20% = Low

- 21-40% = Low / Medium
- 41-60% = Medium
- 60-80% = Medium/High
- 81-100% = High

9.6.4 Total Species Score (TSS)

Species with a POC score of more than 60% (Medium/High) are considered when applying the RDSIS. A weighting factor is assigned to the different IUCN categories providing species with a higher conservation status, a higher score. This weighting factor is then multiplied with the POC to calculate the total species score (TSS) for each species.

The weighting assigned to each category rating is as follows:

Status Category	Abbreviation	Weighting
Data deficient	DD	0,2
Rare	RA	0,5
Near Threatened	NT	0,7
Vulnerable	VU	1,2
Endangered	EN	1,7
Critically Endangered	CR	2,0

The TSS is calculated as follows:

TSS = (IUCN weighting x POC) where POC is > 60%.

9.6.5 Average Total Species & Average Threatened Taxa Score

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

The average is calculated as follows:

Average = (Av.TSS [TSS / Total Species] + Av.TT [TT TTS / No. of species]) / 2.

9.6.6 Red Data Sensitivity Index Score (RDSIS)

The average score obtained above and the sum of the percentage of species with a POC of >60% of the total number of Red Data Listed species listed for the area is then calculated. The average of these two scores, expressed as a percentage, gives the RDSIS for the area investigated.

The RDSIS is calculated as follows:

RDSIS = (Average + [Spp. with POC >60% / Total No. of Spp*100]) / 2

The RDSIS Category ratings are categorised as follows:

RDSIS Score	Category Rating
0 – 20%	LOW
21 – 40%	LOW / MEDIUM
41 – 60%	MEDIUM
61 – 80%	MEDIUM / HIGH
81 – 100%	HIGH

9.7 Score sheet for RDSIS Mammal assessment

RED DATA SENSITIVITY INDEX SCORE (RDSIS): MAMMALS
Project: Montanaspruit Confinement Project

1. Red Data Listed Species potentially occuring in the study area

Scientific Name	Common Name	IUCN Status	Distribution Range (D)	Habitat (H)	Availability of Food (F)	POC (%)	POC Value
Atelerix frontalis	Hedgehog	NT	50	50	60	53	Medium
Lutra macuicollis	Spotted-necked otter	NT	80	35	35	50	Medium
Miniopteris schreibersi	Schreibers's long-fingered bat	NT	100	20	50	57	Medium
Myotis tricolor	Temminck's hariy bat	LC	50	40	60	50	Medium
Mystromys albicaudatus	White tailed mouse	EN	30	60	75	55	Medium
Neamblysomus julianae	Juliana's Golden Mole	EN	80	20	20	40	Medium
Rhinolophus blasii	Blasius's/Peak-Saddle Horseshoe Bat	LC	50	10	50	37	Low/Medium
Rhinolophus clivosus	Geoffroy's Horshoe bat	NT	100	20	50	57	Medium
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	50	10	50	37	Low/Medium
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	LC	80	30	50	53	Medium
					Average TSS	**49,5**	

Total Species Score (Only use species with a POC >60%)

Scientific Name	Common Name	IUCN Status	POC	TSS
-	-	-	0	0
-	-	-	0	0
			Average TT Score	**0**

Status Category	TSS Weighting
DDT	0,2
R	0,5
NT	0,7
VU	1,2
EN	1,7
CR	2

Average Total Species Score

Average TSS Score	49,5
Average TT Score	0
Average Score	24,8

RED DATA SENSITIVITY INDEX SCORE (RDSIS)

Average Total Species Score (TSS)		49,50%
Average Threatened Taxa Score (TT)		0,00%
Average (TSS + TT)		24,75%
% Speices >60% POC		0%
RDSIS for Study area		**12,4**

POC range	Description
0-20	Low
21-40	Low/Medium
41-60	Medium
61-80	Medium/High
81-100	High

RDSIS Rating	Description
0-20	Low
21-40	Low/Medium
41-60	Medium
61-80	Medium/High
81-100	High

Status Category	Abbreviation	Weighting
Data deficient	DDT	0,2
Rare	R	0,5
Near Threatened	NT	0,7
Vulnerable	VU	1,2
Endangered	EN	1,7
Critically Endangered	CR	2

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11 DECLARATION

DECLARATION OF INDEPENDENCE

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

- Act as an independent ecologist, wetland specialist and environmental specialist in compiling this report;
- Do not have any financial interests, or stand to gain in any way whatsoever in the undertaking of this activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- Do not have, nor will have, any vested interest in the proposed activity proceeding;
- Have no, neither will engage in, conflicting interests in the undertaking of this activity;
- Undertake to disclose, to the competent authority, any material information that has, or may have, the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2014; and
- Will provide the competent authority with access to all information at my disposal regarding the investigations, studies and application, whether such information is favourable to the applicant or not.

The South African Council for Natural Scientific Profession (SACNASP) certifies that in terms of Section 20(3)(a) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003), that Mr. J.O. Maree is registered as a Professional Natural Scientist.
Reg. No: 400077/91

Private Bag X5401; Silverton; Pretoria; 0127
Tel: (012) 841 - 1057

SIGNATURE: _____

NAME OF COMPANY: **Flori Scientific Services cc**

DATE: ___20 January 2019 ____

Delia de Lange

From: Johannes Maree [johannes@flori.co.za]
Sent: Monday, 07 October 2019 3:58 PM
To: Delia de Lange
Subject: Re: Montana Spruit - Argyrolobium megarrhizum (Liquorice Bean)

Hello,

Argyrolobium megarrhizum (Liquorice Bean) is a near threatened (NT) legume herbaceous plant that is found on the Orange Data Listed (ODL) plant species list of Gauteng Province.
The plant was not observed during field investigations at Montanaspruit and is highly unlikely to occur in the study area itself due to the lack of ideal habitat.
A. *megarrhizum* grows in rocky grassland / grassland and requires veld fires to initiate gemination of seeds. The study site is a stream with riparian area and heavy soils, which is not typical habitat.
The plant has limited and isolated distribution and is more likely to occur further north of the site as well as further east towards Bronkhorstspruit.

However, thank you for the feedback and good that we check anyway.

Regards,

Johannes Maree, MSc, MBA, *Pr.Sci.Nat.*

SACNASP Reg. No.: 400077/91

t: 082 564 1211

e: johannes@flori.co.za

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Specialist Studies: Terrestrial & Aquatic Ecology, Wetland Assessments, Avifaunal Studies and Monitoring, Risk Matrices for GAs

Environmental Services: Full EIAs, Basic Assessments, ECO services, WULAs, GAs, GIS & Mapping

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From: Delia de Lange <delia@lokisa.co.za>
Date: Monday, 07 October 2019 at 15:24
To: Johannes Maree <johannes@flori.co.za>
Subject: Montana Spruit