

Final Environmental Impact Assessment Report for Olievenhoutbosch Road

GAUT: 002/11-12/E0135

June 2015



LEBOMBO GARDEN BUILDING 36 LEBOMBO ROAD
ASHLEA GARDENS
0081
P.O. BOX 11375
MAROELANA
Tel: (012) 346 3810
Fax: 086 570 5659
E-mail: lizelleg@mweb.co.za



Annexure F

Biodiversity Information Received by
GDARD



Thabang Hlongwane

From: Stephan Barkhuizen
Sent: 03 October 2011 02:36 PM
To: Thabang Hlongwane
Subject: FW: Olievenhoutbosch Road from road to K54

From: Ontvangs
Sent: 03 October 2011 02:36 PM
To: Stephan Barkhuizen; Karlien Van Zyl
Subject: FW: Olievenhoutbosch Road from road to K54

From: SETSIBA, ALBERTINA (GDARD) [mailto:ALBERTINA.SETSIBA@gauteng.gov.za]
Sent: 03 October 2011 12:47 PM
To: lizelleg@mweb.co.za
Subject: Olievenhoutbosch Road from road to K54

Dear Lizelle

With regard to the above project, specialist biodiversity studies are required to investigate the following aspects:

* Plants, with specific reference to

- *Cheilanthes deltoidea*. ✓
- *Brachycorythis conica*. ✓
- *Habenaria mossii*. ✓
- *Gnaphalium nelsonii*. ✓
- *Habenaria kraenzliniana*. ✓
- *Trachyandra erythrorrhiza*. ✓
- *Lithops Lesliei*.

* Mammals, with specific reference to *Atelerix frontalis* (South African hedge).

* Birds, with specific reference to *Eupodotis senegalensis* (White-bellied korhaan).

* Vegetation.

* Wetlands.

* Ridges.

* Caves.

Please note that this information is relevant solely for the study site specified in your request. Red/Orange Listed plant species information relevant to a wider geographic area can be obtained from Lorraine Mills (Lorraine.Mills@gauteng.gov.za).

All specialist studies must comply with GDARD Requirements for Biodiversity Assessments. The most recent version of this document (currently version 2) can be obtained by e-mailing GDACE BiodiversityInfo@gauteng.gov.za.

Should the environmental assessment practitioner be of the opinion that any of the above specialist studies are unnecessary for the site/activity in question, then an ecologically-based motivation justifying why the studies are deemed unnecessary must be submitted to GDARD as part of the application. This submission will be evaluated and either accepted or returned to the applicant for the completion of the necessary studies.

Please do not send follow up inquiries to this message as they will not be processed. For further queries please contact Phuti Matlamela (phuti.matlamela@gauteng.gov.za).

Yours Sincerely
Bioregional Planning: EIAs
Nature Conservation

Ramokone Albertina Setsiba
Nature Conservation Scientist (EIAs)
GDARD
tel: 011 355 1743
website: <http://www.gdard.org.gov.za>
73 Market St, 14th floor Glencairn Building, JOHANNESBURG

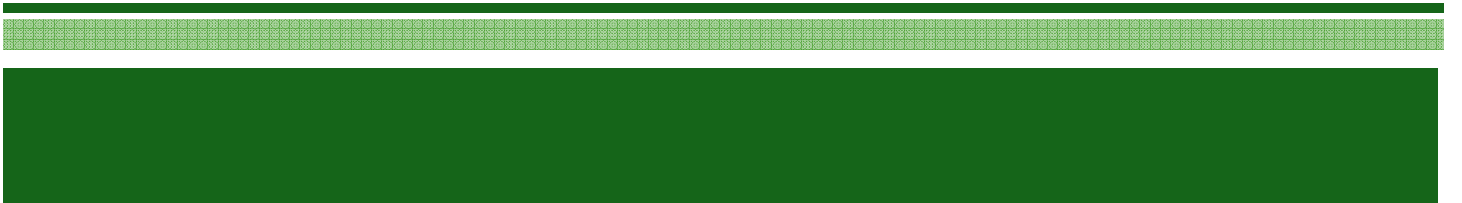
"Vibrant, equitable, sustainable rural communities, food security for all, protected and enhanced environmental assets and natural resources"



**agriculture and
rural development**
Department of Agriculture and Rural Development
GAUTENG PROVINCE

Annexure G

Specialist Reports



Annexure G1

Fauna and Flora Survey Report



GALAGO ENVIRONMENTAL



Biodiversity & Aquatic Specialists

638 Turf St

Wingate Park, 0181

Tel: 012-345 4891

Fax: 086 675 6136

Email: Vanessam@lantic.net

Biodiversity Assessment

of

A section of the proposed Olievenhoutbosch Road from Main Road to K54 on Portion 5 of the farm Doornkloof 391-JR

May 2012

GDARD reference number: Gaut: 002/11-12/E0135

Report Compiled and edited by:
Report authors:

Ms. Vanessa Marais of Galago Environmental
Dr. I.L. Rautenbach (Pri. Sci. Nat: Ph.D, T.H.E.D.),
Mr. R. Terblanche (Pr.Sci.Nat: M.Sc)
Mrs. P. Lemmer (Cert. Sci. Nat: B.Sc.)
Mr. J.C.P. van Wyk (Pri. Sci. Nat: M.Sc),
Mr. R.F. Geyser

Avifauna Report verified by:
Botany Report verified by:

Dr. Alan C. Kemp (Pri.Sci. Nat.)
Dr L.A. Coetzer (D.Sc., Pri. Sci. Nat.)

TABLE OF CONTENTS

| | | |
|--|---------------------------------------|----|
| 1. | Introduction: | 3 |
| 2. | Location of the study site: | 3 |
| 3. | Participating Specialists | 4 |
| 5. | Vegetation assessment:..... | 4 |
| 6. | Fauna assessment:..... | 5 |
| 7. | Mitigation:..... | 6 |
| 8. | Environmental sensitivity:..... | 7 |
| 9. | Conclusion: | 8 |
| 10. | GDARD biodiversity requirements | 8 |
| APPENDIX A: FLORA REPORT | | 9 |
| APPENDIX B: MAMMAL REPORT..... | | 10 |
| APPENDIX C: AVIFAUNA REPORT | | 11 |
| APPENDIX D: HERPETOFAUNA REPORT | | 12 |
| APPENDIX E: REPORT ON ECOLOGICAL CONDITIONS OF THE RIDGE | | 13 |

FIGURES:

| | |
|---|---|
| Figure 1: Locality map of the study area | 3 |
| Figure 2: Combined environmental sensitivity map..... | 7 |

1. Introduction:

Galago Environmental CC was appointed to conduct a mammal, bird, reptile, amphibian and plant survey as well as a study on the ecological conditions of the ridge for the Olievenhoutbosch Road from Main Road to K54 on Portion 5 of the farm Doornkloof 391-JR, scheduled for construction.

2. Location of the study site:

The proposed route for the westbound lane of Olievenhoutbosch Road starts on the open ground between Road M57 and the Rietvlei Nature Reserve. This small part of the route falls within the Rand Highveld Grassland vegetation unit. The route, now entering the Carltonville Dolomite Grassland vegetation unit, then crosses highway R21 and runs west through the corridor between Cornwall Hill and Nellmapius Road. The proposed route then crosses Nellmapius Road to run parallel to the partly constructed eastbound lane of Olievenhoutbosch Road, ending at various proposed alternative joining points on the route of the eastbound lane. Alternative route 3 continues parallel to the eastbound lane until it ends at Main Road, Irene, opposite the present Alexandra Road.

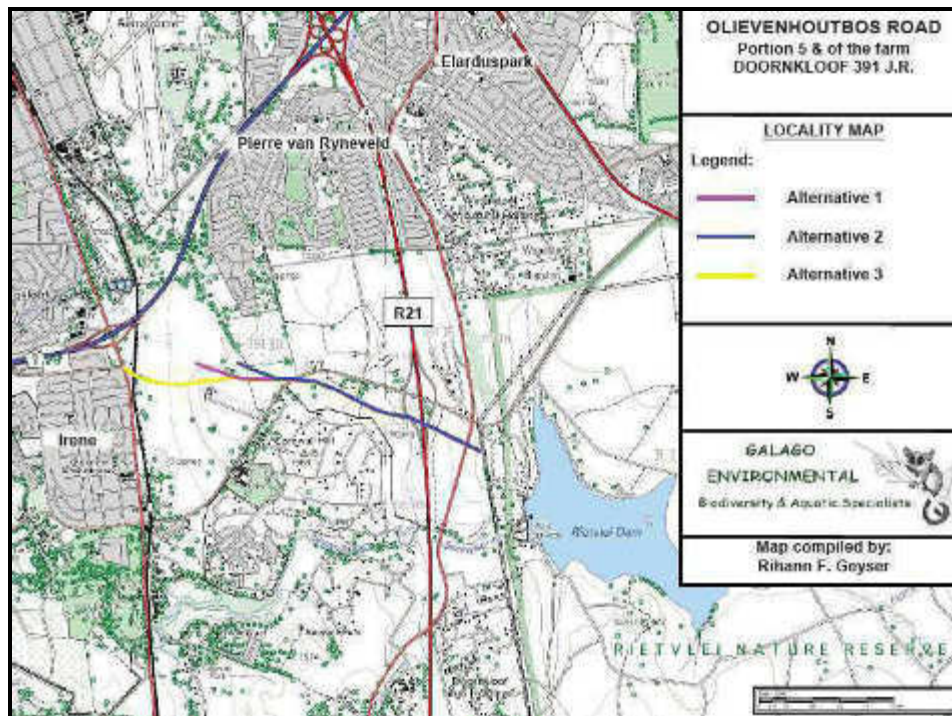


Figure 1: Locality map of the study area

3. Participating Specialists

This investigation was conducted by the following specialists:

| Specialists | Aspect Investigated | Qualifications | Prof. Registration | Date of Field Survey |
|------------------|--------------------------------|---------------------------|--------------------|----------------------|
| Rautenbach, I.L. | Mammalogy | Ph.D., T.H.E.D. | Pr. Nat. Sci. | 5 April 2012 |
| Terblanche, R. | Ecology & herpetology | M.Sc. | Pr. Nat. Sci. | 1 April 2012 |
| Van Wyk, J.C.P. | Herpetology | M.Sc. (Zoology) | Pr. Nat. Sci. | 9 April 2012 |
| Geyser, R. | Avifauna | | Pending | 5 April 2012 |
| Lemmer, P. | Botany | B.Sc. | Cert. Sci. Nat | 4 April 2012 |
| Coetzer, L.A. | Botany Review | D.Sc. | Pr. Nat. Sci. | |
| Kemp, A.C. | Avifauna review | Ph.D. | Pr. Nat. Sci. | |
| Marais, V. | Environmental Impacts and maps | BL Landscape Architecture | | 5 April 2012 |

5. Vegetation assessment:

According to Mucina & Rutherford (2006) most of the route falls within the vegetation unit Carltonville Dolomite Grassland, with the easternmost part of the route for only a short distance in Rand Highveld Grassland. The former is a species-rich grassland with shallow soil and slightly undulating plains on dolomite dissected by prominent rocky chert ridges. The Rand Highveld Grassland is according to the authors a highly variable landscape with extensive sloping plains and a series of slightly elevated ridges.

The Carltonville Dolomite Grassland is considered vulnerable. Its conservation target is 24%. The Rand Highveld Grassland is considered endangered. Its conservation target is 24%.

Six vegetation study units were identified:

- *Eragrostis – Hyparrhenia* grassland;
- *Tristachya – Monocymbium* Chert – Quartz outcrop;
- Mixed alien and indigenous vegetation;
- Quartz slope vegetation;
- *Acacia karroo* woodland; and
- Mixed grassland on shallow dolomite.

The **vegetation study** stated that the Red List *Melolobium subspicatum* was found in the Mixed grassland on shallow dolomite study unit within 200 meters of the proposed route. A 200-meter buffer should be maintained around the Red List species. The *Tristachya – Monocymbium* Chert – Quartz outcrop, the Quartz slope vegetation and the Mixed grassland on shallow dolomite study units were considered sensitive and construction activities within these areas should be kept strictly within the pipeline reserve. All Declared Weeds and invaders and other alien species in the vicinity of the proposed pipeline must be removed and a management plan for the continuing control of the aliens be implemented. Alternative route 2 will have the least negative impact on the grassland of the study site and is the preferred route. See Appendix A for the Flora report.

6. Fauna assessment:

The **mammal** study found that the alternative routes will not affect any significant mammal habitats warranting special consideration, or ecologically sensitive areas. The road along the suggested route, together with other roads under construction and suburbs under consideration will further partition the area into smaller and ecologically less viable units.

Even during historical times the three alternative routes together with their adjacent 500 meters extended study areas were depauperate of mammals, considering the absence of arboreal, rupicolous and wetland habitats providing 'lebensraum' for discerning species. With the advent of civilization and escalating land-use practices not conducive to nature conservation, natural biota declined dramatically and is continuing to do so.

It is recommended that Alternative 2 is selected since it is shorter (and thus more cost-effective), and since it will not affect the isolated koppie. See Appendix B for the Mammal report.

The **avifaunal** study found that although the natural open grassland area offers habitat for Red Data avifaunal species (Lesser Kestrels), they are only likely to move through the area on rare occasions. This is attributed to disturbance of the area on and surrounding the study site due to human presence and human related activities and also development surrounding the study site and the fragmented state of the natural grassland. This alternative is recommended since this will have a minimum impact on the natural vegetation on the study site and the avifaunal species recorded on or that are likely to occur on the study site. See Appendix C for the Avifauna report.

The **herpetological** study found that the proposed development routes are relatively small, but there is a chance that at least one of the three Red Data herpetofaunal species of the Gauteng Province may occur on the site.

The man-made dam/wetland adjacent to the study site is a potential breeding site for the giant bullfrog and there is a good possibility that giant bullfrogs may use the study site as a dispersal area, which combines feeding and aestivation.

If the proposed development should go ahead, an important indirect effect would be the likely impact that the proposed development might have on the surface water runoff and water quality of the catchment area. This could have a negative impact on the herpetofauna. This is especially true for the drainage line which flows into the Sesmyl Spruit. The effects could be ameliorated by the construction of retention ponds, which would retard discharge into the catchment area and improve the water quality of the discharge. See Appendix D for the herpetological report.

The study on the **ecological conditions of the ridge** found that:

- Transformation of vegetation owing to present excavations, scraping or other disturbances are clear at the site. Exotic weeds and annual pioneer grass species invade such disturbed patches.
- Overall Alternative 2 appears to be ecologically the least sensitive strip.
- Alternative 3 is not preferred. This proposed alternative 3 passes the quartzite ridge and the lower dolomitic slopes near areas where a Threatened plant species,

Melolobium subspicatum are present. Furthermore alternative 3 crosses sensitive ecosystems notably the *Acacia robusta* – *Panicum maximum* as well as the *Sporobolus festivus* – *Hyparrhenia hirta* assemblages. The slopes of the quartzite koppie as well as the intersection between the dolomite and chert approaches a habitat which may be suitable for the rare and threatened fruit chafer beetle, *Ichnestoma stobbiai*.

- *Ichnestoma stobbiai* is an endangered fruit chafer (Scarabaeidae: Cetoniinae) that occurs in small habitat fragments of South Africa (Kryger & Scholtz, 2008). The adults of this species are short-lived and the females are flightless. Thus, the vagility of these beetles is extremely low (Kryger & Scholtz, 2008). The species *I. stobbiai* (Holm, 1992) is thought to occur in a very restricted area in and around Gauteng Province and all habitat patches should be protected (Kryger & Scholtz, 2008; Deschodt, Scholtz & Kryger, 2009). Unlike most cetoniine larvae, the larvae of this species usually occur in dolomitic to cherty, well-drained soils (Deschodt, Scholtz & Kryger, 2009).
- A Class 3 rocky ridge is present at all the intersections of rocky ridges with the proposed strip allocated for the development.
- Fire and frost probably play an important role in maintaining the grassland at the ridge and therefore a burning programme is desirable.
- In an increasingly urbanised area, the possible conservation importance value of rocky ridges is underlined at the site both in terms of remarkable diversity and as refuge for threatened species.
- Though a class 3 rocky ridge is present it is believed that near pristine patches of rocky ridge may still be conserved at the site.
- Proper ecological planning and actions are urgent and include:
 - The eradication of invasive exotic plant species at the site.
 - Development of conservation infrastructure that would avoid the continuous trampling, excavations and informal dumping which are present in the area.
 - The zoning of habitats where threatened species occur as a no-go area for any developments.
- It appears that Alternative 3 will have an undesirable impact on an ecosystem of high conservation priority and that Alternative 2 in terms of biodiversity and ecosystem functioning is the preferable option.
- See Appendix E for the report on the Ecological Conditions of the ridge.

7. Mitigation:

Mitigation proposed is:

- The appropriate agency should implement an ongoing monitoring and eradication program for all invasive and weedy plant species growing within the servitude.
- Rehabilitation of natural vegetation should proceed in accordance with a rehabilitation plan compiled by a specialist registered in terms of the Natural Scientific Professions Act (No. 27 of 2003) in the field of Ecological Science.
- Any post-development re-vegetation or landscaping exercise should use species indigenous to South Africa. Plant species locally indigenous to the area are preferred. As far as possible, indigenous plants naturally growing along the proposed route, but would otherwise be destroyed during construction, should be used for re-vegetation / landscaping purposes.
- Should hedgehogs be encountered during the construction phase, these should be relocated to natural grassland areas in the vicinity.

- Should Bullfrogs or any herpetological species be encountered during the construction phase of the proposed development, these should be relocated to natural grassland areas in the vicinity or the Rietvlei Nature Reserve nearby.
- The contractor must ensure that no herpetofaunal species are disturbed, trapped, hunted or killed during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliance.
- Alien and invasive plants must be removed.
- All storm water structures should be designed so as to block amphibian and reptile access to the road surface.
- A comprehensive surface runoff and storm water management plan should be compiled, indicating how all surface runoff generated as a result of the road development (during both the construction and operational phases) will be managed (e.g. artificial wetlands / storm water and flood retention ponds) prior to entering any natural drainage system or wetland and how surface runoff will be retained outside of any demarcated buffer/flood zones and subsequently released to simulate natural hydrological conditions. This plan should form part of the EMP.
- Where the roads traverse the drainage line, an underpass should provide for the movement of aquatic as well as terrestrial species.
- A barrier (either prefab concrete wall or galvanized sheeting that extends as a continuous sheet above ground for at least 40cm and below ground for at least 30cm) that will physically block animals from accessing the road surface should be constructed for a distance of 200m on either side of all aquatic and terrestrial underpasses. Holes under barriers should be routinely filled in and areas directly adjacent to the barrier should be kept free of vegetation.

8. Environmental sensitivity:

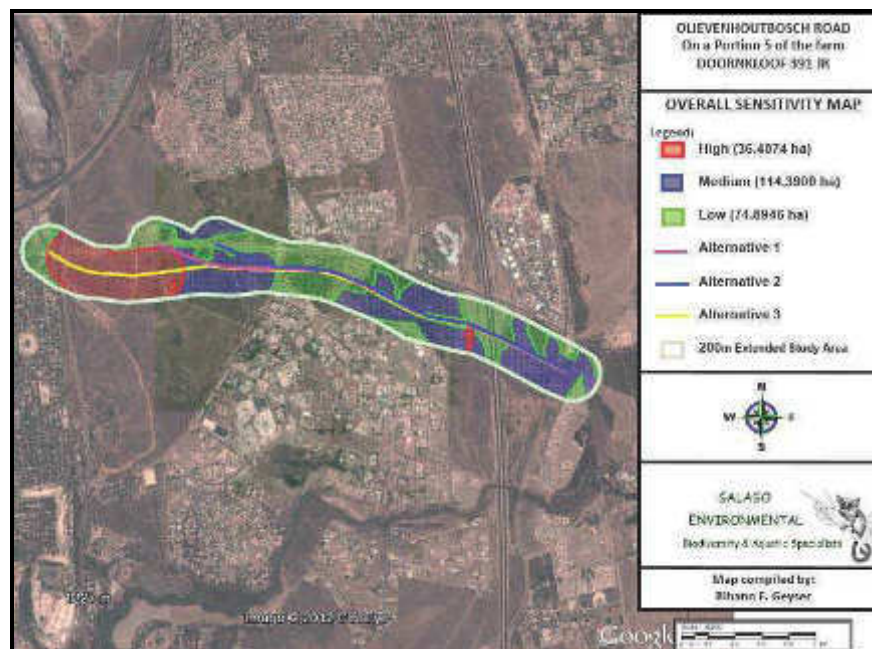


Figure 2: Combined environmental sensitivity map

Sensitivity mapping rules:

| BIODIVERSITY ELEMENT | SENSITIVITY MAPPING RULE |
|-----------------------------|---------------------------------|
| Flora communities | Sensitive flora communities |
| Fauna habitat | Sensitive fauna habitat |
| Class 3 ridge | Sensitive ridge areas |

9. Conclusion:

From all the biodiversity studies undertaken it is clear that the north-eastern section, which mostly covers Alternative 3 of the route is highly sensitive.

It is recommended that Alternative 2, which is the least sensitive of the three alternatives be implemented.

10. GDARD biodiversity requirements

From: GDARD Biodiversity Information (GDARD)

[GDACE_BiodiversityInfo@gauteng.gov.za]

Sent: 30 March 2012 09:14 AM

To: Madeleen Van Schalkwyk

Subject: RE: SUSPECT: Biodiversity request for Olievenhoutbosch road + alternatives

Dear Madeleen

With regard to the above project, specialist biodiversity studies are required to investigate the following aspects:

- Plants, with specific reference to
 - *Habenaria mossii*
 - *Cheilanthes deltoidea*
 - *Habenaria barbetoni*
 - *Habenaria kraenzliana*
 - *Holothrix randii*
- Mammals, with specific reference to *Atelerix frontaris* (Southern African hedgehog)
- Vegetation.
- Wetlands.
- Ridges.

APPENDIX A: FLORA REPORT

APPENDIX B: MAMMAL REPORT

APPENDIX C: AVIFAUNA REPORT

APPENDIX D: HERPETOFAUNA REPORT

APPENDIX E: REPORT ON ECOLOGICAL CONDITIONS OF THE RIDGE

GALAGO ENVIRONMENTAL



Biodiversity & Aquatic Specialists

638 Turf Street

Wingate Park, 0181

Tel: 012-345 4891

Fax: 086 675 6136

Email: Vanessam@lantic.net

Flora Assessment

of

**A section of the proposed Olievenhoutbosch Road
from Main Road to K54 on Portion 5 of the farm
Doornkloof 391-JR**

May 2012

Report author: Mrs. P. Lemmer (Cert. Sci. Nat: B.Sc.)

Report verified/reviewed by: Dr. L.A. Coetzer (D.Sc., Prof. Nat. Sci.)

VERIFICATION STATEMENT

Petro Lemmer is a Certified Natural Scientist with the S.A. Council for Natural Scientific Professions. This communication serves to verify that the flora report compiled by Petro Lemmer has been prepared under my supervision, and I have verified the contents thereof.

Declaration of Independence: I, Dr. L.A. Coetzer (421009 5029 089) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of botany
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed Olievenhoutbosch Road from Main Road to K54 described in this report
- have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to the Galago Environmental CC and its client as well as the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations, 2006.

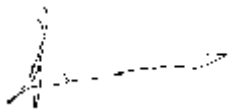


Dr. L.A. Coetzer

DECLARATION OF INDEPENDENCE

I, Petro Lemmer (440129 0025 085) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of botany
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed Olievenhoutbosch Road from Main Road to K54 described in this report
- have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to the Galago Environmental CC and its client as well as the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations, 2006.



Petro Lemmer

TABLE OF CONTENTS

| | | |
|------|---|----|
| 1. | INTRODUCTION..... | 5 |
| 2. | OBJECTIVES OF THE STUDY..... | 5 |
| 3. | SCOPE OF STUDY..... | 5 |
| 4. | STUDY AREA | 5 |
| 5. | METHOD..... | 7 |
| 6. | RESULTS..... | 7 |
| 6.1 | Vegetation Study units | 7 |
| 6.2 | Medicinal plants..... | 7 |
| 6.3 | Alien plants..... | 9 |
| 6.4 | Orange List species..... | 10 |
| 6.5 | Red List species | 10 |
| 6.6 | <i>Eragrostis – Hyparrhenia</i> grassland | 10 |
| 6.7 | <i>Tristachya – Monocymbium</i> Chert – Quartz outcrop | 14 |
| 6.8 | Mixed alien and indigenous vegetation | 16 |
| 6.9 | Quartz slope vegetation | 19 |
| 6.10 | <i>Acacia karroo</i> woodland | 21 |
| 6.11 | Mixed grassland on shallow dolomite..... | 23 |
| 7. | FINDINGS AND POTENTIAL IMPLICATIONS..... | 26 |
| 8. | LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE..... | 26 |
| 9. | RECOMMENDED MITIGATION MEASURES..... | 26 |
| 10. | CONCLUSION | 27 |
| 11. | LITERATURE SOURCES | 27 |
| | ANNEXURE A: Red– and Orange List* plants of the 2528CC q.d.g.c..... | 29 |

FIGURES:

| | | |
|------------|--|----|
| Figure 1: | Locality map of the study area..... | 6 |
| Figure 2: | Vegetation study units of the entire Olievenhoutbosch Road | 8 |
| Figure 3: | The vegetation study units for eastern section of the Olievenhoutbosch Road .. | 8 |
| Figure 4: | Vegetation study units for western section of the Olievenhoutbosch Road | 9 |
| Figure 5: | <i>Eragrostis – Hyparrhenia</i> grassland east of highway R21..... | 11 |
| Figure 6: | <i>Tristachya – Monocymbium</i> Chert – Quartz outcrop | 15 |
| Figure 7: | Mixed alien and indigenous vegetation..... | 17 |
| Figure 8: | Alien species invading along newly cleared route. | 17 |
| Figure 9: | Quartz slope vegetation on reservoir koppie. | 20 |
| Figure 10: | Copse of trees in the <i>Acacia karroo</i> woodland. | 21 |
| Figure 11: | Mixed grassland on shallow dolomite. | 24 |
| Figure 12: | Vegetation sensitivity map..... | 27 |

TABLES:

| | | |
|----------|--|----|
| Table 1: | Number of medicinal species in the various study units | 8 |
| Table 2: | Number of Alien species in each study unit..... | 9 |
| Table 3: | Plants recorded in the <i>Eragrostis – Hyparrhenia</i> grassland..... | 11 |
| Table 4: | Plants recorded in the <i>Tristachya – Monocymbium</i> Chert – Quartz outcrop | 15 |
| Table 5: | Plants recorded in the Mixed alien and indigenous vegetation | 18 |
| Table 6: | Plants recorded in the Quartz slope vegetation | 20 |
| Table 7: | Plants recorded in the <i>Acacia karroo</i> woodland..... | 22 |
| Table 8: | Plants recorded in the Mixed grassland on shallow dolomite | 24 |

1. INTRODUCTION

Galago Environmental was appointed to conduct a vegetation survey along the proposed route for the Olievenhoutbosch Road from Main Road to K54 on Portion 5 of the farm Doornkloof 391-JR, scheduled for construction. The objective was to determine which species might still occur in the vicinity of the proposed route. Special attention had to be given to the habitat requirements of all the Red Data species that may occur in the area. This survey focuses on the current status of threatened plant species occurring, or which are likely to occur in the vicinity of the proposed route, and a description of the available and sensitive habitats in the vicinity of the proposed route.

2. OBJECTIVES OF THE STUDY

- To assess the current status of the habitat component and current general conservation status of the area;
- To list the perceptible flora in the vicinity of the proposed route and to recommend steps to be taken should endangered, vulnerable or rare species be found;
- To highlight potential impacts of the proposed route on the flora in the vicinity of the route; and
- To provide management recommendations to mitigate negative and enhance positive impacts should the proposed route be approved.

3. SCOPE OF STUDY

This report:

- Lists the more noticeable trees, shrubs, herbs, geophytes and grasses observed during the study and offers recommendations about the protection of the sensitive areas along the proposed route;
- Indicates medicinal plants recorded and lists alien species;
- Comments on connectivity with natural vegetation on adjacent sites;
- Comments on ecological sensitive areas;
- Evaluates the conservation importance and significance of the area along the proposed route with special emphasis on the current status of resident threatened species; and
- Offers recommendations to reduce or minimise impacts, should the proposed route be approved.

4. STUDY AREA

4.1 Regional vegetation

The proposed route lies in the quarter degree grid cells 2528CC (Centurion) and 2528CD (Rietvlei Dam). According to Mucina & Rutherford (2006) most of the route falls within the vegetation unit Carltonville Dolomite Grassland, with the easternmost part of the route for only a short distance in Rand Highveld Grassland. The former is a species-rich grassland with shallow soil and slightly undulating plains on dolomite dissected by prominent rocky chert ridges.

The Carltonville Dolomite Grassland is considered vulnerable. Its conservation target is 24%. Small parts of this unit are conserved in statutory reserves and a few private conservation areas. Cultivation, urbanization, mining and the building of two dams already transform almost a quarter of the unit.

The Rand Highveld Grassland is according to the authors a highly variable landscape with extensive sloping plains and a series of slightly elevated ridges. The vegetation is species-rich,

wiry, sour grassland, characterized by *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*, alternating with low sour scrubland on rocky outcrops and steeper slopes. Typical herbs mostly belong to the Asteraceae and rocky ridges carry sparse woodlands with *Acacia caffra* and *Celtis africana* accompanied by a rich suite of shrubs with the genus *Searsia* most prominent. The area comprises quartzite ridges supporting shallow soils on rocky ridges and soils of various qualities elsewhere.

The Rand Highveld Grassland is considered endangered. Its conservation target is 24%. Poorly conserved (only 1%) in statutory reserves and a few private nature reserves. Almost 50% of the unit is already been transformed by cultivation, plantations, urbanization and dam-building.

Both vegetation units fall within a warm-temperate summer-rainfall region with high summer temperatures and severe frequent winter frosts

4.2 Portion 5 of the farm Doornkloof

The proposed route for the westbound lane of Olievenhoutbosch Road starts on the open ground between Road M57 and the Rietvlei Nature Reserve. This small part of the route falls within the Rand Highveld Grassland vegetation unit. The route, now entering the Carltonville Dolomite Grassland vegetation unit, then crosses highway R21 and runs west through the corridor between Cornwall Hill and Nellmapius Road. The proposed route then crosses Nellmapius Road to run parallel to the partly constructed eastbound lane of Olievenhoutbosch Road, ending at various proposed alternative joining points on the route of the eastbound lane. Alternative route 3 continues parallel to the eastbound lane until it ends at Main Road, Irene, opposite the present Alexandra Road.

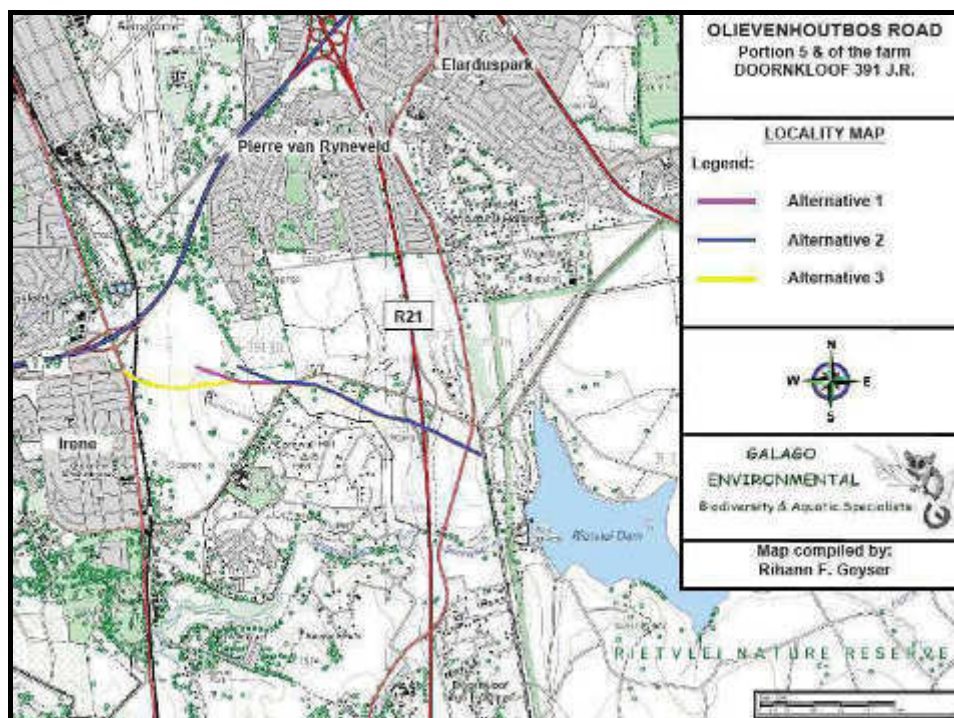


Figure 1: Locality map of the study area

5. METHOD

Information about the Red List and Orange List plant species that occur in the area was obtained from GDARD (GDACE). The Guidelines issued by GDARD (GDACE) to plant specialists were consulted to ascertain the habitat of the Red- and Orange List species concerned.

Information about the Red List species that occur in the area was obtained from SANBI. The various publications (see Section 11) as well as the Pretoria herbarium were consulted about the habitat preferences of the Red List species concerned.

The lists of plants recorded in the 2528CC and 2528CD quarter degree grid cells were obtained from SANBI and consulted to verify the record of occurrence of the plant species seen along the proposed route. The vegetation map published in Mucina and Rutherford (2006) was consulted about the composition of Rand Highveld Grassland and Carltonville Dolomite Grassland. A desktop study of the habitats of the Red List and Orange List species known to occur in the area was done before the site visit.

The area in the vicinity of the proposed route was first examined during surveys unrelated to the present study on 26 April 2004, 26 November and 8, 9 and 13 December 2004, 19 April 2006, 24 March 2009 and 16 November 2010, and the proposed route itself on 4 April 2012 to determine whether suitable habitat for the Red List species known to occur in the quarter degree grid cell existed and to survey the flora present within 200 meters of the proposed route.

The various study units within 200 meters of the proposed route were identified (see Figure 2) and inspected in a random zigzag fashion, paying particular attention to areas that at first sight appeared to be sensitive. These areas were meticulously searched for the presence of Red List species.

6. RESULTS

6.1 Vegetation Study units

Six vegetation study units were identified:

- *Eragrostis* – *Hyparrhenia* grassland;
- *Tristachya* – *Monocymbium* Chert – Quartz outcrop;
- Mixed alien and indigenous vegetation;
- Quartz slope vegetation;
- *Acacia karroo* woodland; and
- Mixed grassland on shallow dolomite.

Tables 3 to 8 list the trees, shrubs, geophytes, herbs and grasses actually found on each of the surveyed areas in the vicinity of the proposed route. See figure 2 for the study units

6.2 Medicinal plants

The names of known medicinal plants are marked with numbers to footnotes in Tables 3 to 8 and the footnotes themselves appear at the end of the last table. Of the 239 plant species recorded within 200 m of the proposed route, 43 species with medicinal properties were found. Their distribution in the five study units is as follows:

Table 1: Number of medicinal species in the various study units

| STUDY UNIT | TOTAL NO OF SPECIES IN STUDY UNIT | NO OF MEDICINAL SPECIES IN STUDY UNIT |
|--|-----------------------------------|---------------------------------------|
| <i>Eragrostis – Hyparrhenia</i> grassland | 138 | 28 |
| <i>Tristachya – Monocymbium</i> Chert – Quartz outcrop | 61 | 9 |
| Mixed alien and indigenous vegetation | 52 | 7 |
| Quartz slope vegetation | 34 | 15 |
| <i>Acacia karoo</i> woodland | 81 | 20 |
| Mixed grassland on shallow dolomite | 89 | 17 |

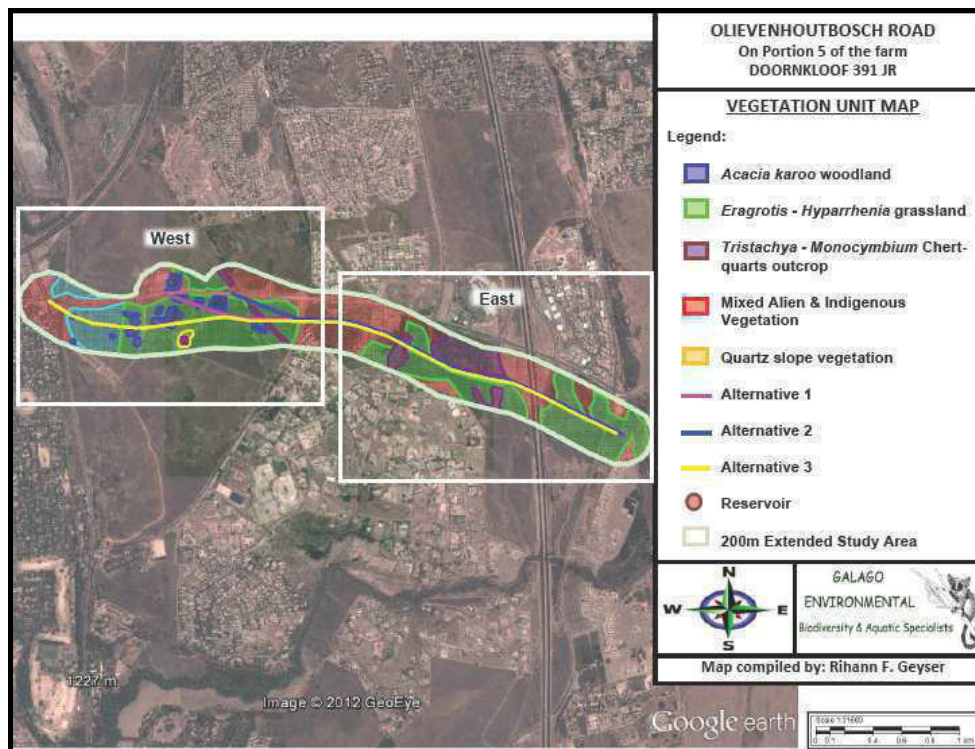


Figure 2: Vegetation study units of the entire Olievenhoutbosch Road

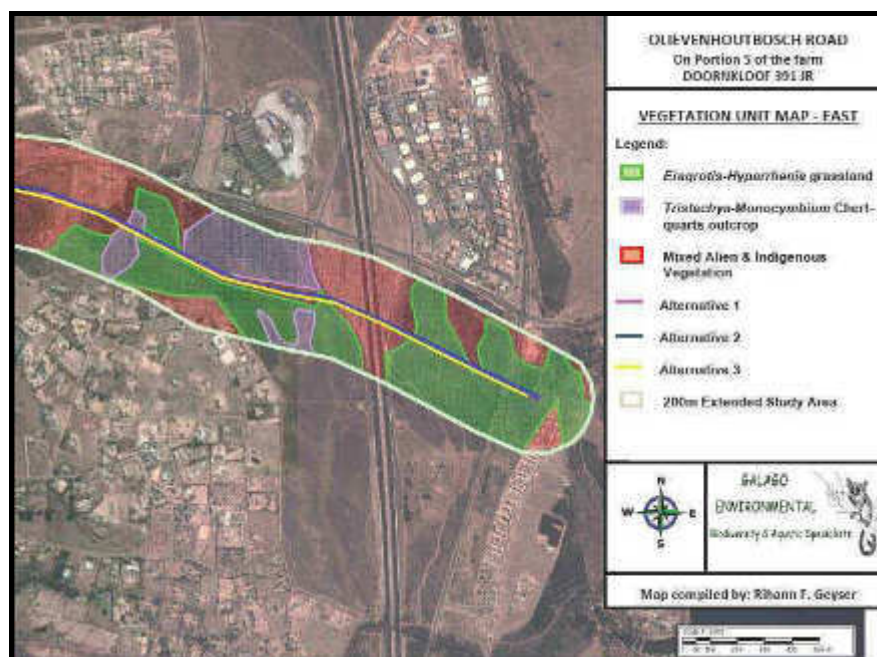


Figure 3: The vegetation study units in detail for the eastern section of the Olievenhoutbosch Road

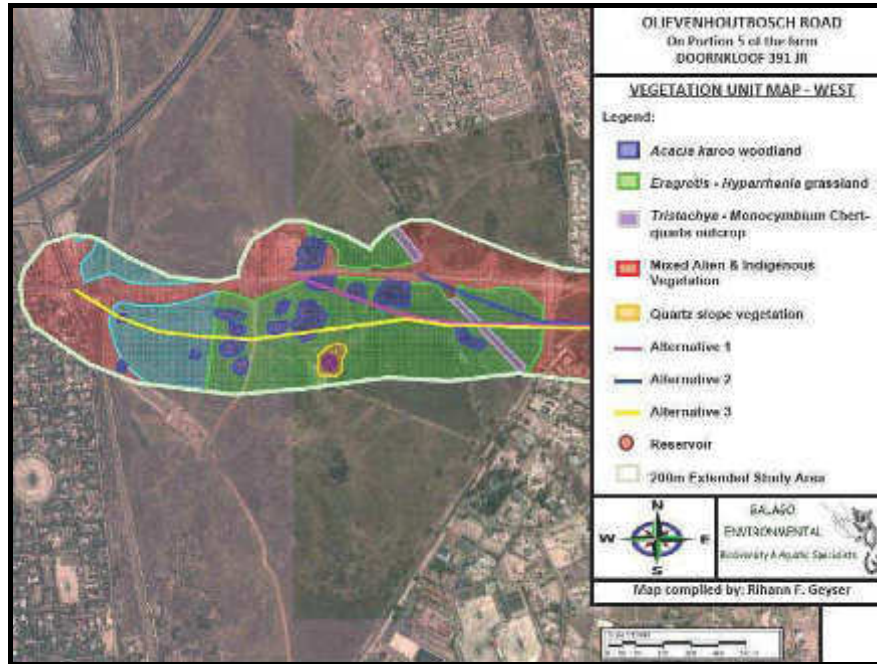


Figure 4: Vegetation study units in detail for the western section of the Olievenhoutbosch Road

6.3 Alien plants

Alien plants are not listed separately, but are included in the lists as they form part of each particular study unit. Their names are marked with an asterisk in Tables 3 to 8. Twenty-three alien plant species, of which five species were Category 1 Declared weeds, two were Category 2 Declared invaders and two were Category 3 Declared invaders, were recorded within 200 m of the proposed route. The number of alien species in each study unit is reflected in table 2.

Table 2: Number of Alien species in each study unit

| STUDY UNIT | NO. OF ALIEN SPECIES | CAT 1 | CAT 2 | CAT 3 | NOT DECLARED |
|--|----------------------|-------|-------|-------|--------------|
| <i>Eragrostis – Hyparrhenia</i> grassland | 7 | 1 | 0 | 0 | 6 |
| <i>Tristachya – Monocymbium</i> Chert – Quartz outcrop | 2 | 1 | 0 | 0 | 1 |
| Mixed alien and indigenous vegetation | 20 | 4 | 2 | 2 | 12 |
| Quartz slope vegetation | 1 | 0 | 0 | 0 | 1 |
| <i>Acacia karoo</i> woodland | 6 | 1 | 0 | 0 | 5 |
| Mixed grassland on shallow dolomite | 2 | 1 | 0 | 0 | 1 |

The alien plant names printed in **bold** in the plant tables are those of Category 1 Declared Weeds and the removal of these plants is **compulsory** in terms of the regulations formulated under “The Conservation of Agricultural Resources Act” (Act No. 43 of 1983), as amended.

In terms of these regulations, Category 2 Declared invaders may not occur on any land other than a demarcated area and should likewise be removed.

Although the regulations under the above Act require that Category 3 Declared invader plants may not occur on any land or inland water surface other than in a biological control reserve, these provisions shall not apply in respect of category 3 plants already in existence at the time of the commencement of said regulations. If this is the case, a land user must take all reasonable steps to curtail the spreading of propagating material of Category 3 plants.

6.4 Orange List species

The habitat was suitable for four of the seven Orange List plant species known to occur in the 2528CC quarter degree grid cell. Three of these species were found. (See Annexure A for a list of the Orange- and Red List species known to occur in the quarter degree grid cell and subsections 6.6.2, 6.9.2 and 6.11.2 for Orange List species found in the various study units.).

6.5 Red List species

6.5.1 Species known to occur in the q.d.g.c.

Thirteen Red List plant species are known to occur in the 2528CC quarter degree grid cell, nine of these within 5 km of the proposed route and three of the nine species within a short distance from the route. The habitat along the proposed route was suitable for five Red List species, one of which was found during the present survey (see Annexure A.)

6.5.2 Flowering times

The site visits referred to in Section 5 covered the flowering times of all the species for which suitable habitat existed along the proposed route. One Red List species, *Melolobium subspicatum* was found in the Mixed grassland on shallow dolomite study unit. The fern *Cheilanthes deltoidea* subsp *silicicola* was found in the chert outcrop just outside the 200 meter extended area northwest of the endpoint of Alternative route 2.

6.6 *Eragrostis* – *Hyparrhenia* grassland

6.6.1 Compositional aspects and Connectivity

This study unit comprised dense natural grassland that straddled the R21 highway. Connectivity with natural grassland existed to the south, but was limited by various roads and the Sesmyl Spruit. The species diversity of this study unit was high with 58% of all species recorded along the proposed route found in this unit. Of the 239 plant species recorded along the proposed route 138 were recorded in the *Eragrostis* – *Hyparrhenia* grassland. Of these, 131 were indigenous species. The following number of species in each life form was noted:

| LIFE FORM | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 74 |
| Tree species | 4 |
| Shrubs and dwarf shrubs | 14 |
| Grasses | 22 |
| Geophytes | 19 |
| Sedges | 2 |
| Succulents | 3 |
| Total No of species | 138 |

6.6.2 Red– and Orange List species

The habitat of this study unit was suitable for two of the Red List species known to occur in the quarter degree grid cell. None were, however, found in this study unit within 200 metres of the proposed route during the present site visit or during the November and December 2004 and the November 2010 site visits.

A few specimens of the Orange List *Boophone disticha*, *Eucomis autumnalis* and *Hypoxis hemerocallidea* were found in this study unit within 200 metres of the proposed route.

6.6.3 Medicinal and alien species

Twenty-eight of the 43 medicinal species and seven of the 23 alien species recorded within 200 meters of the proposed route were found in the *Eragrostis* – *Hyparrhenia* grassland study unit. Of the alien species, one was a Category 1 Declared weed.

6.6.4 Sensitivity

This study unit was not considered sensitive.



Figure 5: *Eragrostis* – *Hyparrhenia* grassland east of highway R21.

Table 3: Plants recorded in the *Eragrostis* – *Hyparrhenia* grassland

| SCIENTIFIC NAME | COMMON NAMES |
|---|--|
| <i>Abildgaardia ovata</i> | |
| <i>Acacia caffra</i> | Common hook thorn / Gewone haakdoring |
| <i>Acacia karroo</i> ^{1,2} | Sweet thorn / Soetdoring |
| <i>Acacia tortilis</i> subsp <i>heteracantha</i> | Umbrella thorn / Haak-en-steek |
| <i>Acalypha angustata</i> | Copper leaf / Katpisbossie |
| <i>Afroscidium magalismontanum</i> | Wild parsley / Wildepietersielie |
| <i>Albuca setosa</i> | Slymuintjie |
| <i>Aloe greatheadii</i> var <i>davyana</i> ^{1,2} | Kleinaalwyn |
| <i>Aloe zebrina</i> | |
| <i>Andropogon schirensis</i> | Stab grass / Tweevingergras |
| <i>Anthospermum rigidum</i> subsp <i>rigidum</i> | |
| <i>Aristida congesta</i> subsp <i>barbicollis</i> | Spreading three-awn grass / Witsteekgras |
| <i>Artemisia afra</i> ^{1,2} | Wild wormwood / Wildeals |
| <i>Asparagus flavicaulis</i> subsp <i>flavicaulis</i> | |
| <i>Asparagus laricinus</i> | Wild asparagus / Katbos |
| <i>Asparagus suaveolens</i> | Wild asparagus / Katdoring |
| <i>Babiana bainesii</i> | Bobbejaanuintjie |
| <i>Bidens pilosa</i> * | Blackjack / Knapsekêrel |
| <i>Bonatea antennifera</i> | Terrestrial orchid / Grondorgidie |
| <i>Boophone disticha</i> ^{1,2,3} | Cape poison bulb / Seeroogblom, gifbol |
| <i>Brachiaria brizantha</i> | Common signal grass / Broodgras |
| <i>Brachiaria serrata</i> | Velvet grass / Fluweelgras |
| <i>Brachystelma burchellii</i> var <i>burchellii</i> | |
| <i>Campuloclinium macrocephalum</i>* | Pom pom weed /Pompombossie |
| <i>Chaetacanthus costatus</i> | |
| <i>Chamaecrista comosa</i> var <i>capricornia</i> | |
| <i>Chascanum hederaceum</i> var <i>hederaceum</i> | |

| SCIENTIFIC NAME | COMMON NAMES |
|---|--|
| <i>Chlorophytum cooperi</i> | |
| <i>Chlorophytum fasciculatum</i> | |
| <i>Chlorophytum trichophlebium</i> | |
| <i>Commelina africana</i> var. <i>lancispatha</i> | |
| <i>Conyza podocephala</i> | |
| <i>Crabbea angustifolia</i> ² | |
| <i>Crabbea hirsuta</i> ^{2,3} | Prickle head |
| <i>Crassula capitella</i> subsp. <i>nodulosa</i> | |
| <i>Cucumis hirsutus</i> | Wild cucumber / Suurkomkommer |
| <i>Cucumis zeyheri</i> | Wild cucumber / Wilde agurkie |
| <i>Cyanotis speciosa</i> | Doll's powder puff / Bloupoelierkwassie |
| <i>Cymbopogon excavatus</i> | Broadleaved turpentine grass / Breëblaar terpentyngras |
| <i>Cynodon dactylon</i> | Couch grass / Kweek |
| <i>Cynoglossum lanceolatum</i> | Forget-me-not |
| <i>Digitaria diagonalis</i> var. <i>diagonalis</i> | Brown-seed finger grass / Bruinsaadvingergras |
| <i>Digitaria monodactyla</i> | One-finger grass / Eenvingergras |
| <i>Diheteropogon amplexans</i> var. <i>amplexans</i> | Broadleaved bluestem / Breëblaar blougras |
| <i>Diospyros lycioides</i> subsp. <i>guerkei</i> | Bushveld bluebush / Bosveldbloubos |
| <i>Elephantorrhiza elephantina</i> ^{1,2,3} | Elephant's root / Elandsboontjie |
| <i>Elionurus muticus</i> | Wire grass / Draadgras |
| <i>Eragrostis chloromelas</i> | Curly leaf / Krulblaar |
| <i>Eragrostis curvula</i> | Weeping love grass / Oulandsgras |
| <i>Eragrostis plana</i> | Tough love grass / Taaipoleragrostis |
| <i>Eragrostis racemosa</i> | Narrow heart love grass / Smalhartjiesgras |
| <i>Eriosema burkei</i> var. <i>burkei</i> | |
| <i>Eriosema cordatum</i> | |
| <i>Eucomis autumnalis</i> ^{1,2,3} | Pineapple flower / Wilde pynappel |
| <i>Eulophia hians</i> var. <i>hians</i> | |
| <i>Felicia muricata</i> subsp. <i>muricata</i> ^{1,2,3} | White felicia |
| <i>Gerbera viridifolia</i> | |
| <i>Gladiolus crassifolius</i> | |
| <i>Gnidia microcephala</i> | Besembossie |
| <i>Helichrysum caespititium</i> | Speelwonderboom |
| <i>Helichrysum rugulosum</i> ^{2,3} | |
| <i>Hermannia depressa</i> ^{2,3} | Creeping red Hermannia / Rooiopslag |
| <i>Heteropogon contortus</i> | Spear grass / Assegaaigras |
| <i>Hibiscus trionum</i> * | Bladder hibiscus / Terblansbossie |
| <i>Hyparrhenia hirta</i> | Common thatching grass / Dekgras |
| <i>Hypoxis argentea</i> var. <i>argentea</i> | Small yellow star flower |
| <i>Hypoxis hemerocallidea</i> ^{1,2,3} | African potato / Gifbol |
| <i>Hypoxis interjecta</i> | |
| <i>Hypoxis iridifolia</i> | |
| <i>Hypoxis obtusa</i> | |
| <i>Hypoxis rigidula</i> var. <i>rigidula</i> | Silverleaved star flower / Wilde tulp |
| <i>Indigastrum burkeanum</i> | |
| <i>Indigofera hedyantha</i> | |
| <i>Indigofera oxytropis</i> | |
| <i>Indigofera zeyheri</i> | |
| <i>Ipomoea crassipes</i> var. <i>crassipes</i> ^{2,3} | Leafy-flowered Ipomoea / Wildewinde |
| <i>Ipomoea oblongata</i> ² | |
| <i>Ipomoea ommaneyi</i> ² | Beespatat |
| <i>Jamesbrittenia burkeana</i> | Bruinblommetjie |
| <i>Justicia anagalloides</i> | |
| <i>Lantana rugosa</i> ^{2,3} | Bird's brandy / Voëlbrandewyn |
| <i>Ledebouria marginata</i> | |
| <i>Ledebouria revoluta</i> ³ | Common ledebouria |
| <i>Lippia javanica</i> ^{1,2,3} | Fever tea / Koorsbossie |
| <i>Macladium zeyheri</i> subsp. <i>zeyheri</i> | Doll's protea |
| <i>Mariscus uitenhagensis</i> | |

| SCIENTIFIC NAME | COMMON NAMES |
|---|---|
| <i>Melinis nerviglumis</i> | Bristle leaf red top / Steekblaarblinkgras |
| <i>Melinis repens</i> subsp <i>repens</i> | Red top grass |
| <i>Monsonia angustifolia</i> | Crane's bill / Angelbossie |
| <i>Nidorella hottentotica</i> | |
| <i>Nolletia rarifolia</i> | |
| <i>Ocimum obovatum</i> subsp <i>obovatum</i> var <i>obovatum</i> ^{2,3} | Cat's whiskers / Katsnor |
| <i>Oenothera rosea</i> * | Pink evening primrose / Pienk aandblom |
| <i>Osteospermum muricatum</i> subsp <i>muricatum</i> | |
| <i>Oxalis obliquifolia</i> | Sorrel / Suring |
| <i>Parinari capensis</i> subsp <i>capensis</i> | Dwarf mobola / Grysappeltjie |
| <i>Pearsonia sessilifolia</i> subsp <i>sessilifolia</i> | Silwerertjietee |
| <i>Pennisetum thunbergii</i> | |
| <i>Pentanisia angustifolia</i> | Wild verbena / Sooibrandbossie |
| <i>Phyllanthus</i> sp. | |
| <i>Pollichia campestris</i> | Waxberry / Teesuikerbossie |
| <i>Polygala rehmannii</i> | |
| <i>Protea caffra</i> subsp <i>caffra</i> ^{1,2,4} | Common sugarbush / Gewone suikerbos |
| <i>Pygmaeothamnus chamaedendrum</i> var <i>chamaedendrum</i> | Sand apple / Goorappel |
| <i>Raphionacme hirsuta</i> ² | Khadi root / Khadiwortel |
| <i>Rhynchosia monophylla</i> | |
| <i>Rothea hirsuta</i> | Small violet bush |
| <i>Scabiosa columbaria</i> ^{1,2,3} | Wild scabiosa / Bitterbos |
| <i>Schizachyrium sanguineum</i> | Red autumn grass / Rooi herfsgras |
| <i>Searsia pyroides</i> var <i>pyroides</i> ⁴ | Common wild currant / Taaibos |
| <i>Selago densiflora</i> | |
| <i>Senecio affinis</i> | |
| <i>Senecio erubescens</i> var <i>crepidifolius</i> | |
| <i>Senecio inornatus</i> | |
| <i>Senecio lydenburgensis</i> | |
| <i>Seriphium plumosum</i> | Bankrupt bush / Bankrotbos |
| <i>Setaria sphacelata</i> var <i>sphacelata</i> | Small creeping foxtail / Kleinkruipmannagras |
| <i>Sida dregei</i> | Spider-leg |
| <i>Sida rhombifolia</i> subsp <i>rhombifolia</i> | Arrow leaf Sida / Taaiman |
| <i>Solanum panduriforme</i> | Poison apple / Gifappel |
| <i>Sonchus dregeanus</i> | |
| <i>Sonchus wilmsii</i> | Milk thistle / Melkdissel |
| <i>Sphenostylis angustifolia</i> | Wild sweetpea bush / Wilde ertjie |
| <i>Striga elegans</i> | Rooibloom |
| <i>Tagetes minuta</i> * | Khaki weed / Kakiebos |
| <i>Talinum caffrum</i> ² | Porcupine root / Ystervarkwortel |
| <i>Tephrosia semiglabra</i> | |
| <i>Teucrium trifidum</i> | Koorsbossie |
| <i>Themeda triandra</i> | Red grass / Rooigras |
| <i>Triaspis hypericoides</i> subsp <i>nelsonii</i> | Klapperbossie |
| <i>Tulbaghia acutiloba</i> | |
| <i>Verbena bonariensis</i> * | Purple top / Blouwaterbossie |
| <i>Verbena brasiliensis</i> * | |
| <i>Vernonia natalensis</i> ^{1,2} | Silver vernonia / Silwervernonia |
| <i>Vernonia oligocephala</i> ^{1,2} | Cape vernonia / Blounaaldetee bossie |
| <i>Vigna vexillata</i> var <i>vexillata</i> ³ | Narrowleaved wild pea / Wildeertjie |
| <i>Xenostegia tridentata</i> subsp <i>angustifolia</i> var <i>angustifolia</i> | |
| <i>Ziziphus zeyheriana</i> ² | Dwarf buffalothorn / Dwergblinkblaar-wag-'n-bietjie |

6.7 *Tristachya* – *Monocymbium* Chert – Quartz outcrop

6.7.1 Compositional aspects and Connectivity

This study unit comprised natural primary grassland on outcrops of chert and quartz. Large areas of the study unit were disturbed by roadworks, especially south of Nellmapius Road. Areas where alien species have invaded as a result of introduced soil and areas where the ground was cleared and road construction have started were designated “Mixed alien and indigenous vegetation” and are discussed under subsection 6.8.

Roads and township development limited connectivity with natural grassland. Of the 239 plant species recorded along the proposed route 61 were recorded in the *Tristachya* – *Monocymbium* Chert – Quartz outcrop study unit. Of these, 59 were indigenous species. The following number of species in each life form was noted:

| LIFE FORM | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 23 |
| Shrubs and dwarf shrubs | 7 |
| Grasses | 23 |
| Geophytes | 4 |
| Sedges | 2 |
| Succulents | 2 |
| Total No of species | 61 |

6.7.2 Red– and Orange List species

The habitat of this study unit was suitable for the Red List fern *Cheilanthes deltoidea* subsp *silicicola* known to occur in the quarter degree grid cell. A few specimens of this species were found in the chert outcrop just *outside* the 200 meter extended area northwest of the endpoint of Alternative route 2. None were found in those parts of the *Tristachya* – *Monocymbium* Chert – Quartz outcrop study unit east and south of Nellmapius Road.

The habitat of this study unit was suitable for the Orange List *Callilepis leptophylla* but none were found within 200 metres of the proposed route during any of the site visits.

6.7.3 Medicinal and alien species

Nine medicinal species and two alien species were recorded in this study unit within 200 metres of the proposed route. Of the alien species one was a Category 1 Declared weed.

6.7.4 Sensitivity

This study unit was considered sensitive.



Figure 6: *Tristachya* – *Monocymbium* Chert – Quartz outcrop south of Nellmapius Road.

Table 4: Plants recorded in the *Tristachya* – *Monocymbium* Chert – Quartz outcrop

| SCIENTIFIC NAME | COMMON NAMES |
|--|--|
| <i>Acalypha angustata</i> | Copper leaf / Katpisbossie |
| <i>Andropogon chinensis</i> | Hairy blue grass / Harige blougras |
| <i>Andropogon schirensis</i> | Stab grass / Tweevingergras |
| <i>Asparagus suaveolens</i> | Wild asparagus / Katdoring |
| <i>Brachiaria serrata</i> | Velvet grass / Fluweelgras |
| <i>Bulbostylis burchellii</i> | Biesie |
| <i>Bulbostylis contexta</i> | Biesie |
| <i>Campuloclinium macrocephalum</i> * | Pom pom weed /Pompombossie |
| <i>Chaetacanthus costatus</i> | |
| <i>Chaetacanthus setiger</i> | |
| <i>Crassula capitella</i> subsp <i>nodulosa</i> | |
| <i>Cymbopogon excavatus</i> | Broadleaved turpentine grass / Breëblaar terpentyngras |
| <i>Cymbopogon pospischilii</i> * | Turpentine grass / Terpentyngras |
| <i>Dianthus mooiensis</i> subsp <i>mooiensis</i> var <i>mooiensis</i> ^{2,3} | Wild pink / Wilde angelier |
| <i>Digitaria monodactyla</i> | One-finger grass / Eenvingergras |
| <i>Diheteropogon amplexens</i> var. <i>amplexens</i> | Broadleaved bluestem / Breëblaar blougras |
| <i>Elionurus muticus</i> | Wire grass / Draadgras |
| <i>Eragrostis chloromelas</i> | Curly leaf / Krulblaar |
| <i>Eragrostis inamoena</i> | Tite grass |
| <i>Eragrostis nindensis</i> | Wether love grass / Hamelgras |
| <i>Eragrostis racemosa</i> | Narrow heart love grass / Smalhartjiesgras |
| <i>Eulophia tuberculata</i> | |
| <i>Gladiolus crassifolius</i> | |
| <i>Helichrysum caespititium</i> | Speelwonderboom |
| <i>Helichrysum rugulosum</i> ^{2,3} | |
| <i>Hypoxis rigidula</i> var <i>rigidula</i> | Silverleaved star flower / Wilde tulp |
| <i>Indigastrium burkeanum</i> | |
| <i>Jamesbrittenia burkeana</i> | Bruinblommetjie |
| <i>Justicia anagalloides</i> | |
| <i>Kohautia amatymbica</i> ² | |
| <i>Kohautia caespitosa</i> subsp <i>brachyloba</i> | |
| <i>Ledebouria ovatifolia</i> | |
| <i>Lippia javanica</i> ^{1,2,3} | Fever tea / Koorsbossie |

| SCIENTIFIC NAME | COMMON NAMES |
|---|---|
| <i>Loudetia simplex</i> | Russet grass / Stingelgras |
| <i>Melinis nerviglumis</i> | Bristle leaf red top / Steekblaarblinkgras |
| <i>Melinis repens subsp repens</i> | Red top grass |
| <i>Monocymbium cerasiiforme</i> | Boat grass / Bootjiegras |
| <i>Nidorella hottentotica</i> | |
| <i>Ocimum obovatum subsp obovatum var obovatum</i> ^{2,3} | Cat's whiskers / Katsnor |
| <i>Oldenlandia herbacea var herbacea</i> | |
| <i>Panicum natalense</i> | Natal panicum / Suurbuffelsgras |
| <i>Parinari capensis subsp capensis</i> | Dwarf mobola / Grysappeltjie |
| <i>Pearsonia sessilifolia subsp sessilifolia</i> | Silwerertjietee |
| <i>Pellaea calomelanos var calomelanos</i> ^{1,2} | Black cliff brake / Swart kransruigtevaring |
| <i>Pentanisia angustifolia</i> | Wild verbena / Sooi-brandbossie |
| <i>Pollichia campestris</i> | Waxberry / Teesuikerbossie |
| <i>Protea welwitschii subsp welwitschii</i> | |
| <i>Schizachyrium sanguineum</i> | Red autumn grass / Rooi herfsgras |
| <i>Sebaea junodii</i> | |
| <i>Senecio oxyriifolius</i> ² | |
| <i>Seriphium plumosum</i> | Bankrupt bush / Bankrotbos |
| <i>Sphenostylis angustifolia</i> | Wild sweetpea bush / Wilde ertjie |
| <i>Sporobolus pectinatus</i> | Fringed dropseed / Kammetjiesgras |
| <i>Syncolostemon pretoriae subsp pretoriae</i> | Dwarf sage bush |
| <i>Themeda triandra</i> | Red grass / Rooigras |
| <i>Trachypogon spicatus</i> | Giant spear grass / Bokbaardgras |
| <i>Tristachya biseriata</i> | Trident grass / Drieblomgras |
| <i>Urelytrum agropyroides</i> | quinine grass / varkstertgras |
| <i>Vernonia galpinii</i> | Kwasbossie |
| <i>Vernonia oligocephala</i> ^{1,2} | Cape vernonia / Blounaaldetee bossie |
| <i>Xerophyta retinervis</i> ^{1,2} | Monkey's tail / Bobbejaanstert |

6.8 Mixed alien and indigenous vegetation

6.8.1 Compositional aspects

Areas along the proposed route where alien species have invaded as a result of introduced soil and areas where the ground was cleared and road construction have started were included in this study unit together with thickets of Black wattle and *Eucalyptus* sp. The species diversity of this study unit was low. Of the 239 plant species recorded along the proposed route 52 were recorded in the Mixed alien and indigenous vegetation study unit within 200 meters of the proposed route. Of these, 32 were indigenous species. The following number of species in each life form was noted:

| LIFE FORM | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 28 |
| Tree species | 6 |
| Shrubs and dwarf shrubs | 4 |
| Grasses | 12 |
| Geophytes | 1 |
| Succulents | 1 |
| Total No of species | 52 |

6.8.2 Red- and Orange List species

The habitat of this study unit was not suitable for any of the Red List or Orange List species known to occur in the quarter degree grid cell.

6.8.3 Medicinal and alien species

Seven medicinal species were recorded in this study unit within 200 meters of the proposed route. Twenty of the 23 alien species recorded within 200 meters of the proposed route were found in this study unit. Of the alien species four were Category 1 Declared weeds, two were Category 2 Declared invaders and two were Category 3 Declared invaders.

6.8.4 Sensitivity

This study unit was not considered sensitive.



Figure 7: Mixed alien and indigenous vegetation.



Figure 8: Alien species invading along newly cleared route.

Table 5: Plants recorded in the Mixed alien and indigenous vegetation

| SCIENTIFIC NAME | INV CAT | COMMON NAMES |
|--|---------|--|
| <i>Acacia caffra</i> | | Common hook thorn / Gewone haakdoring |
| <i>Acacia karroo</i> ^{1,2} | | Sweet thorn / Soetdoring |
| <i>Acacia mearnsii</i> * | 2 | Black wattle / Swartwattel |
| <i>Acanthospermum australe</i> * | | |
| <i>Achyranthus aspera</i>* | 1 | Chaff flower / Langklits |
| <i>Aloe greatheadii</i> var <i>davyana</i> ^{1,2} | | Kleinaalwyn |
| <i>Amaranthus hybridus</i> subsp <i>hybridus</i> var <i>hybridus</i> * | | Common pigweed / Kaapse misbredie |
| <i>Aristida congesta</i> subsp <i>barbicollis</i> | | Spreading three-awn grass / Witsteekgras |
| <i>Artemisia afra</i> ^{1,2} | | Wild wormwood / Wildeals |
| <i>Asparagus laricin</i> | | Wild asparagus / Katbos |
| <i>Bidens pilosa</i> * | | Blackjack / Knapsekêrel |
| <i>Chaetacanthus costatus</i> | | |
| <i>Chamaecrista comosa</i> var <i>capricornia</i> | | |
| <i>Chlorophytum fasciculatum</i> | | |
| <i>Commelina</i> sp. | | |
| <i>Conyza albida</i> * | | Tall fleabane / Vaalskraalhans |
| <i>Conyza podocephala</i> | | |
| <i>Cymbopogon nardus</i> | | Giant turpentine grass / Reuse terpentyngras |
| <i>Cymbopogon pospischilii</i> * | | Turpentine grass / Terpentyngras |
| <i>Cynodon dactylon</i> | | Couch grass / Kweek |
| <i>Datura ferox</i>* | 1 | Large thorn apple / Groot stinkblaar |
| <i>Datura stramonium</i>* | 1 | Common thorn apple / Olieboom |
| <i>Eleusine coracana</i> subsp <i>africana</i> | | Goose grass / Osgras |
| <i>Eragrostis curvula</i> | | Weeping love grass / Oulandsgras |
| <i>Eragrostis plana</i> | | Tough love grass / Taaipoleragrostis |
| <i>Eucalyptus</i> sp* | 2 | |
| <i>Felicia muricata</i> subsp <i>muricata</i> ^{1,2,3} | | White felicia |
| <i>Flaveria bidentis</i> * | | Smelter's bush / Smelterbossie |
| <i>Helichrysum rugulosum</i> ^{2,3} | | |
| <i>Hibiscus trionum</i> * | | Bladder hibiscus / Terblansbossie |
| <i>Hyparrhenia hirta</i> | | Common thatching grass / Dekgras |
| <i>Hypoxis rigidula</i> var <i>rigidula</i> | | Silverleaved star flower / Wilde tulp |
| <i>Indigofera zeyheri</i> | | |
| <i>Ipomoea purpurea</i> * | 3 | |
| <i>Lippia javanica</i> ^{1,2,3} | | Fever tea / Koorsbossie |
| <i>Melia azedarach</i> * | 3 | Syringa / Sering |
| <i>Melinis repens</i> subsp <i>repens</i> | | Red top grass |
| <i>Mirabilis jalapa</i> * | | Four o'clock / Vieruurtjie |
| <i>Monsonia angustifolia</i> | | Crane's bill / Angelbossie |
| <i>Nidorella hottentotica</i> | | |
| <i>Paspalum urvillei</i> * | | Giant paspalum / Langbeen-paspalum |
| <i>Pennisetum clandestinum</i> * | | Kikuyu / Kikoejoe |
| <i>Pentarrhinum insipidum</i> | | Donkieperske |
| <i>Searsia lancea</i> | | Karee / Karee |
| <i>Searsia pyroides</i> var <i>pyroides</i> ⁴ | | Common wild currant / Taaibos |
| <i>Selago densiflora</i> | | |
| <i>Seriphium plumosum</i> | | Bankrupt bush / Bankrotbos |
| <i>Sporobolus africanus</i> | | Rat's tail dropseed / Taaipol |
| <i>Tagetes minuta</i> * | | Khaki weed / Kakiebos |
| <i>Teucrium trifidum</i> | | Koorsbossie |
| <i>Verbena bonariensis</i> * | | Purple top / Blouwaterbossie |
| <i>Xanthium strumarium</i>* | 1 | Large cocklebur / Boetebos |

6.9 Quartz slope vegetation

6.9.1 Compositional aspects and Connectivity

Although this study unit is not situated on the proposed route, it occurs within 200 meters of the route. It comprised a quartz koppie with a large water reservoir in its centre. Access and service roads for the reservoir disturbed the natural vegetation. Connectivity with natural grassland existed in all directions. Of the 239 plant species recorded along the proposed route 34 were recorded in the Quartz slope vegetation study unit. Of these, 33 were indigenous species. The following number of species in each life form was noted:

| LIFE FORM | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 4 |
| Tree species | 7 |
| Shrubs and dwarf shrubs | 13 |
| Grasses | 2 |
| Geophytes | 6 |
| Succulents | 2 |
| Total No of species | 34 |

6.9.2 Red– and Orange List species

The habitat of this study unit was suitable for the Red List species *Holothrix randii* known to occur in the quarter degree grid cell. Officials of GDARD recorded this species a few years ago on the southern slope of the koppie, but the plant specialist found none during any of the site visits.

The habitat was suitable for three Orange List species. Two of these species, *Boophone disticha* and *Hypoxis hemerocallidea* were found in the Quartz slope vegetation study unit.

6.9.3 Medicinal and alien species

Fifteen of the 43 medicinal species recorded within 200 meters of the proposed route were found in the Quartz slope vegetation study unit. One alien species that was not a declared invader was recorded in this study unit.

6.9.4 Sensitivity

As the habitat was suitable for the presence of the Red List *Holothrix randii* and no declared invaders were present, this study unit was considered sensitive.



Figure 9: Quartz slope vegetation on reservoir koppie.

Table 6: Plants recorded in the Quartz slope vegetation

| SCIENTIFIC NAME | COMMON NAMES |
|--|--|
| <i>Acacia caffra</i> | Common hook thorn / Gewone haakdoring |
| <i>Acacia karroo</i> ^{1,2} | Sweet thorn / Soetdoring |
| <i>Acacia robusta subsp robusta</i> | Broad-pod robust thorn / Enkeldoring |
| <i>Afrocanthium mundianum</i> | Rock alder / Klipels |
| <i>Aloe greatheadii var davyana</i> ^{1,2} | Kleinaalwyn |
| <i>Bonatea antennifera</i> | Terrestrial orchid / Grondorgidie |
| <i>Boophone disticha</i> ^{1,2,3} | Cape poison bulb / Seeroogblom, gifbol |
| <i>Combretum molle</i> ⁴ | Velvet bushwillow / Fluweel boswilg |
| <i>Crassula capitella subsp nodulosa</i> | |
| <i>Dovyalis zeyheri</i> | |
| <i>Ehretia rigida subsp nervifolia</i> ^{2,4} | Puzzle bush / Deurmekaarbos |
| <i>Eulophia ovalis var bainesii</i> | |
| <i>Eulophia tuberculata</i> | |
| <i>Freesia grandiflora</i> | |
| <i>Hypoxis hemerocallidea</i> ^{1,2,3} | African potato / Gifbol |
| <i>Jamesbrittenia burkeana</i> | Bruinblommetjie |
| <i>Lannea edulis var edulis</i> ^{1,2} | Wild grape / Wildedruif |
| <i>Lippia javanica</i> ^{1,2,3} | Fever tea / Koorsbossie |
| <i>Loudetia simplex</i> | Russet grass / Stingelgras |
| <i>Melinis repens subsp repens</i> | Red top grass |
| <i>Pearsonia sessilifolia subsp sessilifolia</i> | Silwerertjietee |
| <i>Pellaea calomelanos var calomelanos</i> ^{1,2} | Black cliff brake / Swart kransruigtevaring |
| <i>Protea welwitschii</i> | Cluster-head sugarbush / Troshofie-suikerbos |
| <i>Scolopia zeyheri</i> | Thorn pear / Doringpeer |
| <i>Searsia pyroides var pyroides</i> ⁴ | Common wild currant / Taaibos |
| <i>Sphedamnocarpus pruriens subsp galphimiifolius</i> | |
| <i>Stachys caffra</i> | |
| <i>Strychnos pungens</i> ^{1,2} | |
| <i>Triaspis hypericoides subsp nelsonii</i> | Klapperbossie |
| <i>Verbena brasiliensis</i> * | |
| <i>Vernonia natalensis</i> ^{1,2} | Silver vernonia / Silwervernonia |
| <i>Xerophyta retinervis</i> ^{1,2} | Monkey's tail / Bobbejaanstert |
| <i>Zanthoxylum capense</i> ^{1,2} | Small knobwood / Klein perdepram |
| <i>Ziziphus mucronata subsp mucronata</i> ^{1,2,4} | Buffalo-thorn / Blinkblaar-wag-'n-bietjie |

6.10 *Acacia karroo* woodland

6.10.1 Compositional aspects and Connectivity

This study unit comprised copses of indigenous trees and shrubs in natural grassland. Connectivity with natural grassland existed to the south. The species diversity of this study unit was high. Of the 239 plant species recorded along the proposed route 81 were recorded in the *Acacia karroo* woodland study unit. Of these, 75 were indigenous species. The following number of species in each life form was noted:

| LIFE FORM | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 33 |
| Tree species | 8 |
| Shrubs and dwarf shrubs | 15 |
| Grasses | 19 |
| Geophytes | 4 |
| Sedges | 1 |
| Succulents | 1 |
| Total No of species | 81 |

6.10.2 Red– and Orange List species

The habitat of this study unit within 200 metres of the proposed route was not suitable for any of the Red List species known to occur in the quarter degree grid cell, but was suitable for the Orange List species *Hypoxis hemerocallidea*, but none was found in this study unit.

6.10.3 Medicinal and alien species

Twenty of the 43 medicinal species recorded along the proposed route were found in the *Acacia karroo* woodland study unit. Six alien species of which one was a Category 1 Declared weed were recorded this study unit.

6.10.4 Sensitivity

This study unit was not considered sensitive.



Figure 10: Copse of trees in the *Acacia karroo* woodland.

Table 7: Plants recorded in the Acacia karroo woodland

| SCIENTIFIC NAME | COMMON NAMES |
|--|--|
| <i>Acacia caffra</i> | Common hook thorn / Gewone haakdoring |
| <i>Acacia karroo</i> ^{1,2} | Sweet thorn / Soetdoring |
| <i>Acacia robusta</i> subsp <i>robusta</i> | Broad-pod robust thorn / Enkeldoring |
| <i>Acacia tortilis</i> subsp <i>heteracantha</i> | Umbrella thorn / Haak-en-steek |
| <i>Acalypha villicaulis</i> | |
| <i>Achyranthus aspera</i>* | Chaff flower / Langklits |
| <i>Aloe greatheadii</i> var <i>davyana</i> ^{1,2} | Kleinaalwyn |
| <i>Amaranthus hybridus</i> subsp <i>hybridus</i> var <i>hybridus</i> * | Common pigweed / Kaapse misbredie |
| <i>Andropogon schirensis</i> | Stab grass / Tweevingergras |
| <i>Anthospermum rigidum</i> subsp <i>rigidum</i> | |
| <i>Aristida congesta</i> subsp <i>barbicollis</i> | Spreading three-awn grass / Witsteekgras |
| <i>Asparagus laricinus</i> | Wild asparagus / Katbos |
| <i>Asparagus suaveolens</i> | Wild asparagus / Katdoring |
| <i>Bidens pilosa</i> * | Blackjack / Knapsekêrel |
| <i>Bonatea antennifera</i> | Terrestrial orchid / Grondorgidie |
| <i>Brachiaria serrata</i> | Velvet grass / Fluweelgras |
| <i>Chaetacanthus costatus</i> | |
| <i>Chamaecrista comosa</i> var <i>capricornia</i> | |
| <i>Chlorophytum fasciculatum</i> | |
| <i>Combretum molle</i> ⁴ | Velvet bushwillow / Fluweel boswilg |
| <i>Conyza albida</i> * | Tall fleabane / Vaalskraalhans |
| <i>Conyza podocephala</i> | |
| <i>Crabbea angustifolia</i> ² | |
| <i>Cymbopogon excavatus</i> | Broadleaved turpentine grass / Breëblaar terpentyngras |
| <i>Cymbopogon pospischilii</i> * | Turpentine grass / Terpentyngras |
| <i>Cynodon dactylon</i> | Couch grass / Kweek |
| <i>Dichapetalum cymosum</i> | |
| <i>Digitaria diagonalis</i> var. <i>diagonalis</i> | Brown-seed finger grass / Bruinsaadvingergras |
| <i>Digitaria monodactyla</i> | One-finger grass / Eenvingergras |
| <i>Diospyros lycioides</i> subsp <i>guerkei</i> | Bushveld bluebush / Bosveldbloubos |
| <i>Dovyalis zeyheri</i> | |
| <i>Ehretia rigida</i> subsp <i>nervifolia</i> ^{2,4} | Puzzle bush / Deurmekaarbos |
| <i>Elionurus muticus</i> | Wire grass / Draadgras |
| <i>Eragrostis chloromelas</i> | Curly leaf / Krulblaar |
| <i>Eragrostis nindensis</i> | Wether love grass / Hamelgras |
| <i>Eragrostis plana</i> | Tough love grass / Taaipoleragrostis |
| <i>Eragrostis racemosa</i> | Narrow heart love grass / Smalhartjiesgras |
| <i>Eriosema burkei</i> var <i>burkei</i> | |
| <i>Euclea crispa</i> subsp <i>crispa</i> ⁴ | |
| <i>Eulophia ovalis</i> var <i>bainesii</i> | |
| <i>Felicia muricata</i> subsp <i>muricata</i> ^{1,2,3} | White felicia |
| <i>Helichrysum rugulosum</i> ^{2,3} | |
| <i>Heteropogon contortus</i> | Spear grass / Assegaaigras |
| <i>Hibiscus trionum</i> * | Bladder hibiscus / Terblansbossie |
| <i>Hyparrhenia hirta</i> | Common thatching grass / Dekgras |
| <i>Hypoxis obtusa</i> | |
| <i>Hypoxis rigidula</i> var <i>rigidula</i> | Silverleaved star flower / Wilde tulp |
| <i>Indigofera hedyantha</i> | |
| <i>Indigofera oxytropis</i> | |
| <i>Ipomoea crassipes</i> var. <i>crassipes</i> ^{2,3} | Leafy-flowered Ipomoea / Wildewinde |
| <i>Ipomoea oblongata</i> ² | |
| <i>Lannea edulis</i> var <i>edulis</i> ^{1,2} | Wild grape / Wildedruif |
| <i>Lantana rugosa</i> ^{2,3} | Bird's brandy / Voëlbrandewyn |
| <i>Lippia javanica</i> ^{1,2,3} | Fever tea / Koorsbossie |
| <i>Mariscus uitenhagensis</i> | |
| <i>Melinis repens</i> subsp <i>repens</i> | Red top grass |
| <i>Monsonia angustifolia</i> | Crane's bill / Angelbossie |
| <i>Nidorella hottentotica</i> | |

| SCIENTIFIC NAME | COMMON NAMES |
|---|--|
| <i>Ocimum obovatum</i> subsp <i>obovatum</i> var <i>obovatum</i> ^{2,3} | Cat's whiskers / Katsnor |
| <i>Parinari capensis</i> subsp <i>capensis</i> | Dwarf mobola / Grysappeltjie |
| <i>Pavetta gardeniifolia</i> var <i>gardeniifolia</i> | Common bride's bush / Gewone bruidsbos |
| <i>Pavonia burchellii</i> | |
| <i>Pentarrhinum insipidum</i> | Donkieperske |
| <i>Pollichia campestris</i> | Waxberry / Teesuikerbossie |
| <i>Rhynchosia monophylla</i> | |
| <i>Searsia lancea</i> | Karee / Karee |
| <i>Searsia pyroides</i> var <i>pyroides</i> ⁴ | Common wild currant / Taaibos |
| <i>Selago densiflora</i> | |
| <i>Senecio lydenburgensis</i> | |
| <i>Setaria sphacelata</i> var <i>sphacelata</i> | Small creeping foxtail / Kleinkruipmannagras |
| <i>Sida rhombifolia</i> subsp <i>rhombifolia</i> | Arrow leaf Sida / Taaiman |
| <i>Sphenostylis angustifolia</i> | Wild sweetpea bush / Wilde ertjie |
| <i>Sporobolus africanus</i> | Rat's tail dropseed / Taaipol |
| <i>Stachys caffra</i> | |
| <i>Talinum cafferum</i> ² | Porcupine root / Ystervarkwortel |
| <i>Teucrium trifidum</i> | Koorsbossie |
| <i>Themeda triandra</i> | Red grass / Rooigras |
| <i>Vigna vexillata</i> var <i>vexillata</i> ³ | Narrowleaved wild pea / Wildeertjie |
| <i>Withania somnifera</i> ^{1,2} | Winter cherry / Geneesblaarbossie |
| <i>Zanthoxylum capense</i> ^{1,2} | Small knobwood / Klein perdepram |
| <i>Ziziphus mucronata</i> subsp <i>mucronata</i> ^{1,2,4} | Buffalo-thorn / Blinkblaar-wag-'n-bietjie |

6.11 Mixed grassland on shallow dolomite

6.11.1 Compositional aspects and Connectivity

This study unit comprised natural primary grassland that was severely disturbed by roadworks. Connectivity with natural grassland was limited by roadworks. The species diversity of the Mixed grassland on shallow dolomite study unit within 200 meters of the proposed route was much lower than that recorded during earlier unrelated surveys. Of the 239 plant species recorded along the proposed route 89 were recorded in the Mixed grassland on shallow dolomite study unit. Of these, 87 were indigenous species. The following number of species in each life form was noted:

| LIFE FORM | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 50 |
| Shrubs and dwarf shrubs | 7 |
| Grasses | 16 |
| Geophytes | 12 |
| Sedges | 1 |
| Succulents | 3 |
| Total No of species | 89 |

6.11.2 Red- and Orange List species

The habitat of this study unit was suitable for two of the Red List species known to occur in the quarter degree grid cell. A specimen of the Red List *Melolobium subspicatum* and a few specimens of the Orange List *Hypoxis hemerocallidea* were found in this study unit within 200 metres of the proposed route

6.11.3 Medicinal and alien species

Seventeen of the 43 medicinal species recorded along the proposed route were found in the Mixed grassland on shallow dolomite study unit within 200 meters of the proposed route. Two alien species, of which one was a Category 1 Declared weed, was found in this study unit.

6.11.4 Sensitivity

Owing to the presence of the Red List species, the Mixed grassland on shallow dolomite study unit was considered sensitive. A 200-meter buffer should be maintained around the Red List species.



Figure 11: Mixed grassland on shallow dolomite.

Table 8: Plants recorded in the Mixed grassland on shallow dolomite

| SCIENTIFIC NAME | COMMON NAMES |
|---|---|
| <i>Acalypha villicaulis</i> | |
| <i>Aristida stipitata</i> subsp <i>graciliflora</i> | Long awned three-awn / Langnaaldsteekgras |
| <i>Asparagus flavicaulis</i> subsp <i>flavicaulis</i> | |
| <i>Barleria macrostegia</i> | |
| <i>Brachiaria serrata</i> | Velvet grass / Fluweelgras |
| <i>Brachystelma barberae</i> | Platvoetaasblom |
| <i>Bulbine capitata</i> | |
| <i>Campuloclinium macrocephalum</i>* | Pom pom weed /Pompombossie |
| <i>Chaetacanthus costatus</i> | |
| <i>Chamaecrista comosa</i> var <i>capricornia</i> | |
| <i>Chascanum hederaceum</i> var <i>hederaceum</i> | |
| <i>Chascanum pinnatifidum</i> var <i>pinnatifidum</i> | |
| <i>Chlorophytum fasciculatum</i> | |
| <i>Commelina</i> sp. | |
| <i>Conyza podocephala</i> | |
| <i>Crabbea angustifolia</i> ² | |
| <i>Crassula capitella</i> subsp <i>nodulosa</i> | |
| <i>Cucumis hirsutus</i> | Wild cucumber / Suurkomkommer |
| <i>Cyanotis speciosa</i> | Doll's powder puff / Bloupoeierkwassie |
| <i>Cynodon dactylon</i> | Couch grass / Kweek |
| <i>Cyperus obtusiflorus</i> var. <i>obtusiflorus</i> | Witbiesie |

| SCIENTIFIC NAME | COMMON NAMES |
|---|--|
| <i>Digitaria monodactyla</i> | One-finger grass / Eenvingergras |
| <i>Dipcadi rigidifolium</i> | Skaamblommetjie |
| <i>Elephantorrhiza elephantina</i> ^{1,2,3} | Elephant's root / Elandsboontjie |
| <i>Elionurus muticus</i> | Wire grass / Draadgras |
| <i>Eragrostis chloromelas</i> | Curly leaf / Krulblaar |
| <i>Eragrostis plana</i> | Tough love grass / Taaipoleragrostis |
| <i>Eragrostis racemosa</i> | Narrow heart love grass / Smalhartjiesgras |
| <i>Eragrostis superba</i> | Sawtooth love grass / Weeluisgras |
| <i>Eriospermum porphyrovalve</i> | |
| <i>Euphorbia trichadenia</i> var <i>trichadenia</i> | Melkbol |
| <i>Felicia muricata</i> subsp <i>muricata</i> ^{1,2,3} | White felicia |
| <i>Geigeria burkei</i> subsp <i>burkei</i> var <i>intermedia</i> | |
| <i>Gnidia microcephala</i> | Besembossie |
| <i>Gnidia sericocephala</i> | |
| <i>Grewia flava</i> ² | Velvet raisin bush / Fluweelrosyntjebos |
| <i>Helichrysum caespititium</i> | Speelwonderboom |
| <i>Helichrysum callicomum</i> | |
| <i>Hermannia cordata</i> | |
| <i>Hermannia depressa</i> ^{2,3} | Creeping red Hermannia / Rooiopslag |
| <i>Heteropogon contortus</i> | Spear grass / Assegaaigras |
| <i>Hyparrhenia hirta</i> | Common thatching grass / Dekgras |
| <i>Hypoxis hemerocallidea</i> ^{1,2,3} | African potato / Gifbol |
| <i>Hypoxis obtusa</i> | |
| <i>Hypoxis rigidula</i> var <i>rigidula</i> | Silverleaved star flower / Wilde tulp |
| <i>Indigofera hedyantha</i> | |
| <i>Ipomoea bolusiana</i> | |
| <i>Ipomoea crassipes</i> var. <i>crassipes</i> ^{2,3} | Leafy-flowered Ipomoea / Wildewinde |
| <i>Ipomoea oblongata</i> ² | |
| <i>Jatropha lagarinthoides</i> | |
| <i>Ledebouria revoluta</i> ³ | Common ledebouria |
| <i>Lippia javanica</i> ^{1,2,3} | Fever tea / Koorsbossie |
| <i>Lotononis calycina</i> | Hairy lotononis |
| <i>Lotononis laxa</i> var <i>laxa</i> | |
| <i>Melinis repens</i> subsp <i>repens</i> | Red top grass |
| <i>Melolobium subspicatum</i> | |
| <i>Neorautanenia ficifolius</i> | |
| <i>Nidorella hottentotica</i> | |
| <i>Ocimum obovatum</i> subsp <i>obovatum</i> var <i>obovatum</i> ^{2,3} | Cat's whiskers / Katsnor |
| <i>Ophioglossum polyphyllum</i> | |
| <i>Parinari capensis</i> subsp <i>capensis</i> | Dwarf mobola / Grysappeltjie |
| <i>Pelargonium luridum</i> ^{1,2} | Stalkflowered pelargonium / Wildemalva |
| <i>Pentanisia angustifolia</i> | Wild verbena / Sooi-brandbossie |
| <i>Pollichia campestris</i> | Waxberry / Teesuikerbossie |
| <i>Raphionacme hirsuta</i> ² | Khadi root / Khadiwortel |
| <i>Raphionacme velutina</i> | |
| <i>Rhynchosia monophylla</i> | |
| <i>Scabiosa columbaria</i> ^{1,2,3} | Wild scabiosa / Bitterbos |
| <i>Schizoglossum</i> sp | |
| <i>Searsia pyroides</i> var <i>pyroides</i> ⁴ | Common wild currant / Taaibos |
| <i>Selago densiflora</i> | |
| <i>Senecio coronatus</i> | |
| <i>Seriphium plumosum</i> | Bankrupt bush / Bankrotbos |
| <i>Setaria sphacelata</i> var <i>sphacelata</i> | Small creeping foxtail / Kleinkruijmannagras |
| <i>Solanum panduriforme</i> | Poison apple / Gifappel |
| <i>Sphenostylis angustifolia</i> | Wild sweetpea bush / Wilde ertjie |
| <i>Sporobolus festivus</i> | Red dropseed / Rooifynsaad |
| <i>Striga bilabiata</i> subsp <i>bilabiata</i> | Small witch weed |
| <i>Talinum cafferum</i> ² | Porcupine root / Ystervarkwortel |
| <i>Tephrosia semiglabra</i> | |

| SCIENTIFIC NAME | COMMON NAMES |
|---|--------------------------------------|
| <i>Thesium sp. 2</i> | |
| <i>Thesium sp. 3</i> | |
| <i>Triraphis andropogonoides</i> | |
| <i>Urelytrum agropyroides</i> | quinine grass / varkstertgras |
| <i>Verbena brasiliensis</i> * | |
| <i>Vernonia galpinii</i> | Kwasbossie |
| <i>Vernonia oligocephala</i> ^{1,2} | Cape vernonia / Blounaaldetee bossie |
| <i>Vigna unguiculata subsp stenophylla</i> | |
| <i>Xysmalobium brownianum</i> | |

¹⁾ Van Wyk, B-E., Van Oudtshoorn, B. & Gericke, N. 2002.

²⁾ Watt, J.M. & Breyer-Brandwijk, M.G. 1962.

³⁾ Pooley, E. 1998.

⁴⁾ Van Wyk, B. & Van Wyk P. 1997.

7. FINDINGS AND POTENTIAL IMPLICATIONS

The proposed road runs mostly through *Eragrostis* – *Hyparrhenia* grassland and Mixed alien and indigenous vegetation. A single specimen of the Red List *Melolobium subspicatum* was found in the Mixed grassland on shallow dolomite study unit within 200 meters of the proposed route. Compared to the number of plants found during earlier unrelated surveys, the current construction of another road and infrastructure had a negative impact on this population, and any further road construction might destroy the entire population of this species within 200 meters of the proposed route.

8. LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The study site was examined during surveys unrelated to the present study during the flowering seasons of all the Red List species known to occur in the quarter degree grid cell and, for the present commission, during the flowering season of all but four of the Red List species.

9. RECOMMENDED MITIGATION MEASURES

The following mitigation measures were developed by GDACE (Directorate of Nature Conservation, GDACE, 2008 and 2009) and are applicable to the study route. Where appropriate, Galago Environmental's specific elaborations are given in brackets.

- The appropriate agency should implement an ongoing monitoring and eradication program for all invasive and weedy plant species growing within the servitude.
- Rehabilitation of natural vegetation should proceed in accordance with a rehabilitation plan compiled by a specialist registered in terms of the Natural Scientific Professions Act (No. 27 of 2003) in the field of Ecological Science.
- Any post-development re-vegetation or landscaping exercise should use species indigenous to South Africa. Plant species locally indigenous to the area are preferred. As far as possible, indigenous plants naturally growing along the proposed route, but would otherwise be destroyed during construction, should be used for re-vegetation / landscaping purposes.
- Prior to construction, fences should be erected in such a manner to prevent access and damage to any sensitive areas identified in a sensitivity mapping exercise.

10. CONCLUSION

The Red List *Melolobium subspicatum* was found in the Mixed grassland on shallow dolomite study unit within 200 meters of the proposed route. A 200-meter buffer should be maintained around the Red List species. The *Tristachya* – *Monocymbium* Chert – Quartz outcrop, the Quartz slope vegetation and the Mixed grassland on shallow dolomite study units were considered sensitive and construction activities within these areas should be kept strictly within the pipeline reserve. All Declared Weeds and invaders and other alien species in the vicinity of the proposed pipeline must be removed and a management plan for the continuing control of the aliens be implemented. Alternative route 2 will have the least negative impact on the grassland of the study site and is the preferred route.

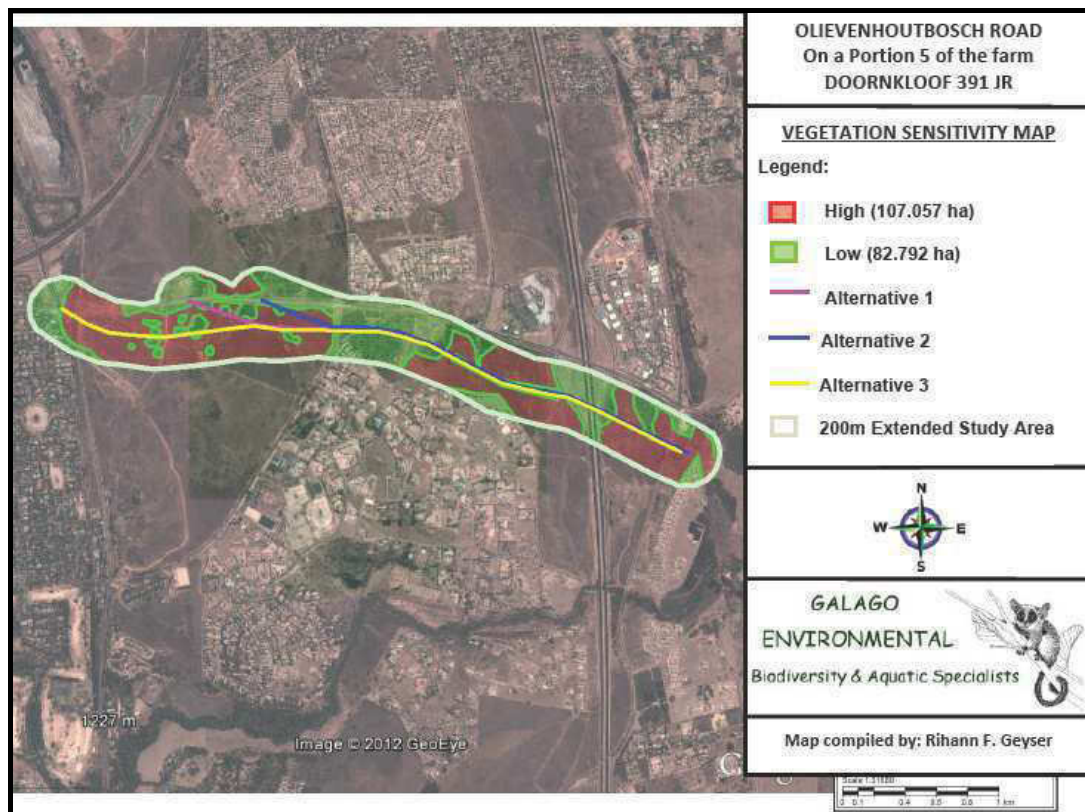


Figure 12: Vegetation sensitivity map

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ANNEXURE A: Red- and Orange List* plants of the 2528CC q.d.g.c.

| Species | Flower season | Suitable habitat | Priority grouping | Conserv status | PRESENCE ON SITE |
|--|--------------------|---|-------------------|------------------------------|-------------------------|
| <i>Adromischus umbraticola</i> subsp <i>umbraticola</i> | Sep-Jan | Rock crevices on rocky ridges, usually south-facing, or in shallow gravel on top of rocks, but often in shade of other vegetation. | A2 | Near threatened ¹ | Habitat not suitable |
| <i>Boophone disticha</i> | Oct-Jan | Dry grassland and rocky areas. | N/A | Declining ² | FOUND |
| <i>Bowiea volubilis</i> subsp <i>volubilis</i> | Sep-Apr | Shady places, steep rocky slopes and in open woodland, under large boulders in bush or low forest. | B | Vulnerable ² | Habitat not suitable |
| ▲ <i>Brachycorythis conica</i> subsp <i>transvaalensis</i> | Jan-Mrt | Short grassland, hillsides, on sandy gravel overlying dolomite, sometimes also on quartzites, occasionally open woodland, 1000 – 1705m | A3 | Vulnerable ¹ | Habitat not suitable |
| <i>Callilepis leptophylla</i> | Aug-Jan & May | Grassland or open woodland, often on rocky outcrops or rocky hillslopes. | N/A | Declining ² | Habitat suitable |
| <i>Ceropegia decidua</i> subsp. <i>pretoriensis</i> | Nov-Apr | Direct sunshine or shaded situations, rocky outcrops of the quartzitic Magaliesberg mountain series, in pockets of soil among rocks, in shade of shrubs and low trees, can be seen twining around grass spikes. | A1 | Vulnerable ¹ | Habitat not suitable |
| ▲ <i>Cheilanthes deltoidea</i> subsp <i>silicicola</i> | Nov-Jun | Southwest-facing soil pockets and rock crevices in chert rocks. | A2 | Vulnerable ¹ | Habitat suitable |
| ▲ <i>Cleome conrathii</i> | Dec-Jan Mar-May | Stony quartzite slopes, usually in red sandy soil, grassland or open to closed deciduous woodland, all aspects. | A3 | Near Threatened ¹ | Habitat suitable |
| <i>Crinum macowanii</i> | Oct-Jan | Grassland along rivers in gravelly soil or on sandy flats | N/A | Declining ² | Habitat not suitable |
| <i>Drimia sanguinea</i> | Aug-Dec | Open veld and scrubby woodland in a variety of soil types | B | Near threatened ² | Habitat suitable |
| <i>Eucomis autumnalis</i> | Nov-Apr | Damp open grassland and sheltered places. | N/A | Declining ² | FOUND |
| <i>Gunnera perpensa</i> | Oct-Mar | In cold or cool continually moist localities, mainly along upland streambanks. | N/A | Declining ² | Habitat not suitable |
| ▲ <i>Habenaria barbertonii</i> | Feb-Mar | In grassland on rocky hillsides. | A2 | Near threatened ¹ | Habitat not suitable |
| ▲ <i>Habenaria kraenzliniana</i> | Feb-Apr | Terrestrial in stony, grassy hillsides, recorded from 1000 to 1400m. | A3 | Near Threatened ¹ | Habitat not suitable |
| ▲ <i>Habenaria mossii</i> | Mar-Apr | Open grassland on dolomite or in black sandy soil. | A1 | Endangered ¹ | Habitat not suitable |
| ▲ <i>Holothrix randii</i> | Sep-Jan | Grassy slopes & rock ledges, usually southern aspects. | B | Near Threatened ² | Habitat suitable |
| <i>Hypoxis hemerocallidea</i> | Sep-Mar | Occurs in a wide range of habitats. Grassland and mixed woodland. | N/A | Declining ² | FOUND |
| <i>Ilex mitis</i> var <i>mitis</i> | Oct-Dec | River banks, stream beds, evergreen forests. | N/A | Declining ² | Habitat not suitable |
| ▲ <i>Lithops lesliei</i> subsp. <i>lesliei</i> | Mar-Jun | Primary habitat the arid grasslands in the interior of SA where it usually occurs in rocky places, growing under the protection of surrounding herbs and grasses. | B | Near threatened ² | Habitat not suitable |
| ▲ <i>Melolobium subspicatum</i> | Sep-May | Grassland. | A1 | Vulnerable ¹ | FOUND |

¹) global status

²) national status

* Orange listed plants have no priority grouping and are designated 'N/A'

▲ Has been recorded from the farm on which the study site is situated / within 5km of the study site. Should suitable habitat be present, it is highly likely that this species occur on the study site.

GALAGO ENVIRONMENTAL



Biodiversity & Aquatic Specialists

638 Turf Street

Wingate Park, 0181

Tel: 012-345 4891

Fax: 086 675 6136

Email: Vanessam@lantic.net

Mammal Habitat Assessment

of

**A section of the proposed Olievenhoutbosch
Road from Main Road to K54 on Portion 5 of the
farm Doornkloof 391-JR**

May 2012

Report author: I.L. Rautenbach Pr.Sci.Nat., Ph.D, T.H.E.D.

TABLE OF CONTENTS

| | |
|---|----|
| 1. INTRODUCTION | 4 |
| 2. SCOPE AND OBJECTIVES OF THE STUDY | 4 |
| 3. STUDY AREA..... | 4 |
| 4. METHODS..... | 5 |
| 5. RESULTS | 6 |
| 6. FINDINGS AND POTENTIAL IMPLICATIONS | 13 |
| 7. LIMITATIONS, ASSUMPTIONS AND GAPS IN INFORMATION | 13 |
| 8. RECOMMENDED MITIGATION MEASURES | 14 |
| 9. CONCLUSIONS | 14 |
| 10. LITERATURE SOURCES | 14 |

FIGURES:

| | |
|--|----|
| FIGURE 1: LOCALITY MAP OF THE STUDY AREA | 5 |
| FIGURE 2: PHOTO OF WHERE THE ROUTE ORIGINATES ON THE M57 | 7 |
| FIGURE 3: THE COMBINED ROUTES IN AN UNDEVELOPED AREA WEST OF THE R21 ... | 8 |
| FIGURE 4: THE POINT NORTH-WEST OF NELLMAPIUS ROAD | 8 |
| FIGURE 5: THE POINT WHERE ALTERNATIVE ROUTE 2 ORIGINATES | 9 |
| FIGURE 6: THE POINT WHERE ALTERNATIVE 1 ORIGINATES..... | 9 |
| FIGURE 7: THE SOLITARY KOPPIE CLOSE TO ALTERNATIVE 3. | 10 |
| FIGURE 8: WHERE ALTERNATIVE 3 ORIGINATES. | 10 |
| FIGURE 9: MAMMAL SENSITIVITY MAP | 14 |

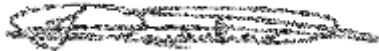
TABLES:

| | |
|--|----|
| TABLE 1: MAMMALS WHICH WERE OBSERVED OR DEDUCED TO OCCUPY THE SITE ... | 12 |
| TABLE 2: MAMMAL SPECIES POSITIVELY CONFIRMED FROM THE STUDY SITE..... | 12 |

DECLARATION OF INDEPENDENCE:

I, Ignatius Lourens Rautenbach (421201 5012 08 8) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of zoology
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed Olievenhoutbosch Road from Main Road to K54 described in this report
- have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to the Galago Environmental CC and its client as well as the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations 2006
- My intellectual property in this report will only be transferred to the client (the party/ company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, I recognise that written consent of the client will be required for release of any part of this report to third parties.



I.L. Rautenbach

1. INTRODUCTION

Galago Environmental CC. was appointed to undertake a mammal habitat survey for the Olievenhoutbosch Road from Main Road to K54 on Portion 5 of the farm Doornkloof 391-JR, along three alternative routes and if possible, suggest which route will cause least ecological damage.

This report focuses on the reigning status of threatened and sensitive mammals likely to occur on the proposed development site. Special attention was paid to the qualitative and quantitative habitat conditions for Red Data species deemed present on the site, and mitigation measures to ameliorate the effect of the development that is suggested. The secondary objective of the investigation was to gauge which mammals might still reside on the site and compile a complete list of mammal diversity of the study area.

This assignment is in accordance with the 2010 EIA Regulations (No. R. 543-546, Department of Environmental Affairs and Tourism, 18 June 2010) emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

2. SCOPE AND OBJECTIVES OF THE STUDY

- To qualitatively and quantitatively assess the significance of the mammal habitat components and current general conservation status along the three routes;
- Comments on ecological sensitive areas;
- Comments on connectivity with natural vegetation and habitats on adjacent sites;
- To provide a list of mammals which occur or might occur, and to identify species of conservation importance;
- To highlight potential impacts of the proposed development on the mammals of the study site, and
- To provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved.

3. STUDY AREA

Presently the three alternative routes traverse disturbed natural grassland although it is known that some adjoining properties are earmarked for urban development in the near future.

The routes fall in the Carleton Dolomite Grassland & Rand Highveld Grassland vegetation units as defined by Mucina and Rutherford (2006). During the site visit the veld conditions appeared healthy, but an unqualified measure of ecological damage has been caused by regular fires, casual damage and land abuse. However, the dense and high stand of grass provides ample refuge and nourishment for small mammals. The topography of the terrain is typical undulating grassy plains typical of the Highveld grassland biome. For most of the routes the substrate consists of reddish soil imbedded with gravel and at places even rocks. There are no natural or manmade structures suitable to meet the demanding daytime roosting requirements for cave-dwelling bats.

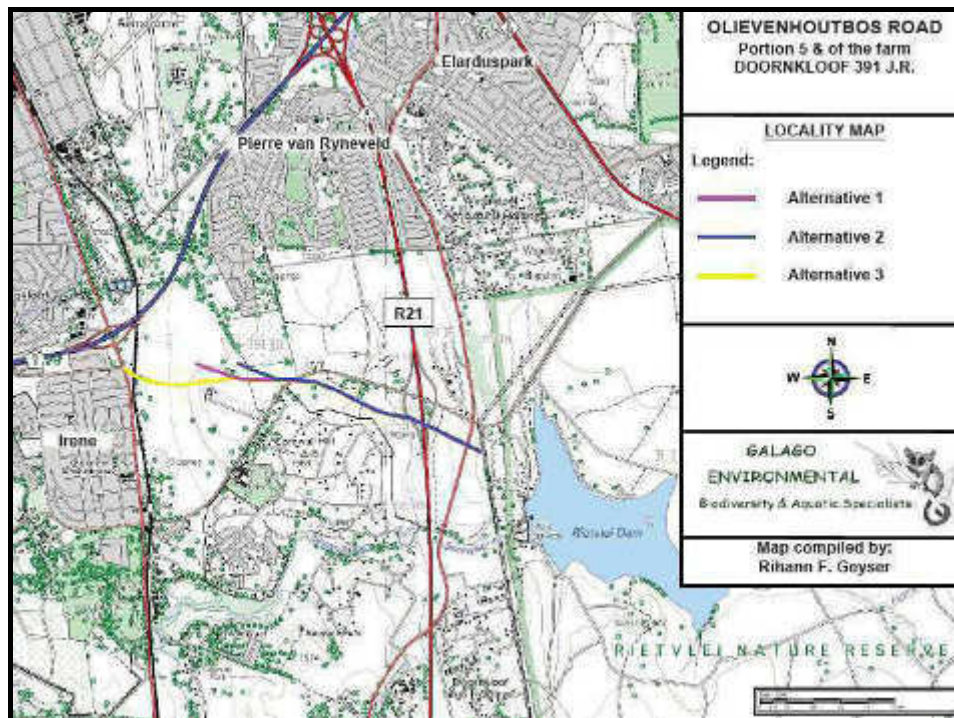


Figure 1: Locality map of the study area

4. METHODS

A six hour site visit was conducted on 5 April 2012. During this visit the observed and derived presence of mammals associated with the recognized habitat types of the study site, were recorded. This was done with due regard to the well recorded global distributions of Southern African mammals, coupled to the qualitative and quantitative nature of recognized habitats.

The 500 meters of adjoining properties was scanned for important fauna habitats.

5.1 Field Surveys

During the site visit mammals were identified by visual sightings through random transect walks. No trapping or mist netting was conducted, as the terms of reference did not require such intensive work. In addition, mammals were also identified by means of spoor, droppings, burrows or roosting sites.

Three criteria were used to gauge the probability of occurrence of mammals on the study site. These include known distribution range, habitat preference and the qualitative and quantitative presence of suitable habitat.

5.2 Desktop Surveys

As the majority of mammals are secretive, nocturnal, hibernators and/or seasonal, distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of these species based on authoritative tomes, scientific literature, field guides, atlases and databases. This can be done irrespective of season. During the field work phase of the project, this derived list of occurrences is audited.

The probability of occurrences of **mammal** species was based on their respective geographical distributional ranges and the suitability of on-site habitat. In other words, *high* probability would be applicable to a species with a distributional range overlying the study site as well as the presence of prime habitat occurring on the study site. Another consideration for inclusion in this category is the inclination of a species to be common, i.e. normally occurring at high population densities.

Medium probability pertains to a mammal species with its distributional range peripherally overlapping the study site, or required habitat on the site being sub-optimal. The size of the site as it relates to its likelihood to sustain a viable breeding population, as well as its geographical isolation is also taken into consideration. Species categorised as *medium* normally do not occur at high population numbers, but cannot be deemed as rare. A *low* probability of occurrence will mean that the species' distributional range is peripheral to the study site and habitat is sub-optimal. Furthermore, some mammals categorised as *low* are generally deemed rare.

5.3 Specific Requirements

During the visit the site was surveyed and assessed for the potential occurrence of Red Data and/or wetland-associated species such as:

Juliana's golden mole (*Neamblosomus juliana*), Highveld golden mole (*Amblysomus septentrionalis*), Rough-haired golden mole (*Chrysospalax villosus*), African marsh rat (*Dasymys incomtus*), Angoni vlei rat (*Otomys angoniensis*), Vlei rat (*Otomys irroratus*), White-tailed rat (*Mystromys albicaudatus*), a number of shrews such as the Forest shrew (*Myosorex varius*), Southern African hedgehog (*Atelerix frontalis*), a number of bats such as the Short-eared trident bat (*Cloetis percivali*), African clawless otter (*Aonyx capensis*), Spotted-necked otter (*Lutra maculicollis*), Marsh mongoose (*Atilax paludinosus*), Brown hyena (*Parahyaena brunnea*), etc.

5. RESULTS

Acocks (1988), Mucina and Rutherford (2006), Low & Rebelo (1996), Knobel and Bredenkamp (2006), SANBI & DEAT (2009) discuss the peculiar natural plant associations of the study area in broad terms. It should be noted that botanical geographers have made immense strides in defining plant associations (particularly assemblages denoted as veld types), whereas this cannot be said of zoologists. The reason is that vertebrate distributions are not very dependent on the minutiae of plant associations. Rautenbach (1978 & 1982) found that mammal assemblages can at best be correlated with botanically defined biomes, such as those by Low and Rebelo (1996 & 1998), and latterly by Mucina and Rutherford (2006) as well Knobel and Bredenkamp (2006). Hence, although the former's work has been superseded by the work of the latter two, the definitions of biomes are similar and both remain valid for mammals and are therefore recognized as a reasonable determinant of mammal distribution.

The local occurrences of mammals are, on the other hand, closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of mammal species by evaluating the habitat types within the context of global distribution ranges. Sight records and information from residents or knowledgeable locals audit such deductions.

Mammal Habitat Assessment

Terrestrial habitat dominates along the combined and individual alternative routes. Generally the basal cover consisted of mature stands of indigenous grass, which judged by detritus on the ground are regularly subjected to winter fires. During the end of summer the grass cover provides ample cover and nourishment to small mammals.

Within the 500 meters extended study area of Alternative 3 is a solitary wooded koppie. Considering the isolated nature of this habitat type only very robust rupicolous species can be expected such as the Namaqua rock rat and rock elephant shrew. No Red Data species can be expected such as the rock dormouse.

There are no significant wetlands and/or permanent streams. Exotic trees predominate, whereas indigenous trees are solitary and geographically too isolated to allow for the occurrence of arboreal mammals.

There are no bat caves requiring special consideration.

Presently connectivity is good, but the general area will in the foreseeable future be subjected to fragmentation caused by more roads and urban development, which will curb connectivity.



Figure 2: Photo of where the route originates on the M57 near the Rietvlei Nature Reserve turnoff.

Note the mature stand of tall grass, exotic trees and in the distance the suburban character of the area.



Figure 3: The combined routes in an undeveloped area west of the R21 and south of Nellmapius road.

Note the suburb towards the south, the wattle trees and rubble in the foreground. The blacktop road is now in disuse.



Figure 4: The point north-west of Nellmapius Road where the three alternative routes split.

Each of the routes is planned to link with another road under construction and to link with Alexander Road in Irene.



Figure 5: The point where Alternative route 2 will meet the road under construction.



Figure 6: The point where Alternative 1 will meet the road under construction.



Figure 7: The solitary koppie close to Alternative 3.



Figure 8: Where Alternative 3 will join the road under construction and cross the railway line in the foreground and link with the double lane Alexander Road visible in the distance.

Expected and Observed Mammal Species Richness

All large mammals have more than a century ago been exterminated to make way for farming activities. More recently increased urbanization and human population densities with concomitant land-use practices (leisure, traditional hunting, etc.) have also extirpated medium-sized mammals (viz. black-backed jackal, aardvark, duiker, steenbok).

Of mammals extant thus close to Pretoria, all those narrowly reliant on arboreal and wetland habitats have been omitted from the list of potential occurrences (Table 1). However, the S.A. galago is included as this arboreal species has extended its natural range by utilizing the artificial forests created in the gardens of Gauteng.

It should be noted that potential occurrences is interpreted as to be possible over a period of time as result of expansion and contractions of population densities and ranges in response to environmental fluctuating conditions and which stimulate migration.

Only 18 mammals are recorded as potential occupants along the various routes and within the 500 meters extended study area which include the rupicolous habitat of the koppie near Alternative 3 (Table 1, Figure 7). All these are robust generalists with the ability to capitalize on disturbed environments. Many of these species are often found in suburban gardens and in fact may even invade residences to become a problem.

All feral mammal species expected to occur on the study site (e.g. house mice, house rats, dogs and cats) were omitted from the assessment since these species normally associate with human settlements.

The small carnivores and the scrub hare listed are reticent in character and often persist on small holdings in the peri-urban zone. The bats listed are common and widespread in town and extended their natural ranges by capitalization on the various daytime roosting sites offered by manmade structures such as roofs. The listed rodents are equally common and inclined to persist in gardens and disturbed environments. The lesser red musk shrew may not be regarded as to be particularly common, but is nevertheless often found in rural settings.

Low mammal diversity is due to the presence of predominantly a terrestrial habitat restricting mammal diversity to those adapted to that habitat type, limited site size and adjoining areas, a suboptimal quality of conservation and fragmentation of the area.

Threatened and Red Listed Mammal Species

The listed shrew is not necessarily endangered. Although the lesser red musk shrew commonly occur in gardens it has not been adequately studied to provide quantitative field data to accurately assign a conservation ranking, and are thus as a precaution considered as 'Data Deficient'. Shrews operate at the apex of the food pyramid, which means that their population numbers are significantly lower than that of their prey species or of similar-sized herbivores/gramnivores. Because of their diet they are furthermore not readily trapped with conventional bait or traps, which may mean that their numbers are under-estimated compared to the use of the drift-fence technique of capturing.

Hedgehogs ('Near Threatened') are capable to withstand natural predation with their passive defence mechanisms. They became endangered directly as result of

predation by humans and their pets; considering the semi-urban nature of the natural areas of the routes, its continued presence is possible.

Both the above mentioned species are widespread and capable to persist given healthy ecosystems.

No other Red Data or sensitive species are deemed present on the site, either since the site is too disturbed, falls outside the distributional ranges of some species, or does not offer suitable habitat(s).

Table 1: The mammals which were observed or deduced to occupy the site

(Systematics and taxonomy as proposed by Bronner et.al [2003] and Skinner and Chimimba [2005])

| | SCIENTIFIC NAME | ENGLISH NAME |
|------------|------------------------------|-----------------------------|
| ? | <i>Elephantulus myurus</i> | Eastern rock elephant shrew |
| √ | <i>Lepus saxatilis</i> | Scrub hare |
| * | <i>Cryptomys hottentotus</i> | African mole rat |
| √ | <i>Rhodomys pumilio</i> | Four-striped grass mouse |
| * | <i>Mus minutoides</i> | Pygmy mouse |
| √ | <i>Mastomys natalensis</i> | Natal multimammate mouse |
| √ | <i>Mastomys coucha</i> | Southern multimammate mouse |
| * | <i>Aethomys namaquensis</i> | Namaqua rock mouse |
| ? | <i>Galago moholi</i> | South African galago |
| DD* | <i>Crocidura hirta</i> | Lesser red musk shrew |
| NT* | <i>Atelerix frontalis</i> | Southern African hedgehog |
| √ | <i>Neoromicia capensis</i> | Cape serotine bat |
| √ | <i>Scotophilus dinganii</i> | African yellow house bat |
| √ | <i>Scotophilus viridis</i> | Greenish yellow house bat |
| * | <i>Genetta genetta</i> | Small-spotted genet |
| * | <i>Genetta tigrina</i> | SA large-spotted genet |
| √ | <i>Cynictis penicillata</i> | Yellow mongoose |
| √ | <i>Galerella sanguinea</i> | Slender mongoose |

√ Definitely present or have a *high* probability to occur;

* *Medium* probability to occur based on ecological and distributional parameters;

? *Low* probability to occur based on ecological and distributional parameters.

Red Data species rankings as defined in Friedmann and Daly's S.A. Red Data Book / IUCN (World Conservation Union) (2004) are indicated in the first column: **CR**= Critically Endangered, **En** = Endangered, **Vu** = Vulnerable, **LR/cd** = Lower risk conservation dependent, **LR/nt** = Lower Risk near threatened, **DD** = Data Deficient. All other species are deemed of **Least Concern**.

Table 2: Mammal species positively confirmed from the study site, observed indicators and habitat.

| SCIENTIFIC NAME | ENGLISH NAME | OBSERVATION INDICATOR | HABITAT |
|------------------------|--------------|-----------------------|---------------------|
| <i>Lepus saxatilis</i> | Scrub hare | Faecal pellets | Disturbed grassland |

Scrub hares are exceptionally common, widespread, and with its reticent and nocturnal lifestyle capable of persisting in disturbed environments near human settlements.

6. FINDINGS AND POTENTIAL IMPLICATIONS

The alternative routes will not affect any significant mammal habitats warranting special consideration, or ecologically sensitive areas. Its value as an environmental conservation locality is virtually non-existent. The road along the suggested route, together with other roads under construction and suburbs under consideration will further partition the area into smaller and ecologically less viable units.

Even during historical times the three alternative routes together with their adjacent 500 meters extended study areas were depauperate of mammals, considering the absence of arboreal, rupicolous and wetland habitats providing 'lebensraum' for discerning species. With the advent of civilization and escalating land-use practices not conducive to nature conservation, natural biota declined dramatically and is continuing to do so.

Considering the high level of ongoing biologically destructive land-use practices, the proposed development will be part of a larger development process and on its own will not result in a loss of ecological sensitive and important habitat units, ecosystem function (e.g. reduction in water quality, soil pollution), further loss of mammal habitat, nor of loss/displacement of threatened or protected species. Presently connectivity is rated as high but a new road will hamper connectivity. Over time other related developments not covered by this report will further impede connectivity.

It is recommended that Alternative 2 is selected since it is shorter (and thus more cost-effective), and since it will not affect the isolated koppie.

7. LIMITATIONS, ASSUMPTIONS AND GAPS IN INFORMATION

The Galago Environmental team has sufficient experience and ample access to information sources to confidently compile lists of biota such as presented herein to support conclusions and suggested mitigation measures based on a site visit. In instances where doubt exists, a species is assumed to be a possible occupant; -this approach renders the conclusions to be robust. In instances where the possible occurrence has significant ecological implications, an intensive survey is recommended. In view of the latter, it is highly unlikely whether an intensive survey to augment this site visit will add significantly to the data base, and the additional costs are unlikely to warrant the effort.

Even though every care is taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time and budget. Discussions and proposed mitigations are to some extent made on reasonable and informed assumptions built on *bone fide* information sources, as well as deductive reasoning. Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage. Galago Environmental can thus not accept responsibility for conclusions and mitigation measures made in good faith based on own databases or on the information provided at the time of the directive. This report should therefore be viewed and acted upon with these limitations in mind.

8. RECOMMENDED MITIGATION MEASURES

- Should hedgehogs be encountered during the construction phase, these should be relocated to natural grassland areas in the vicinity.
- The contractor must ensure that no fauna species are disturbed, trapped, hunted or killed during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliance.

No other mitigation measures are deemed necessary other than those normal taken with road construction. There are no ecologically sensitive areas or threatened habitats along the recommended route. The conservation status of the two Red Data species is dubious and here considered as not credible. These species are widespread and the methodology used to ascertain their quantitative status is inappropriate for insectivores (trapping versus drift-fence assessment).

9. CONCLUSIONS

Although the study area is not sensitive in terms of mammals, the Alternative 2 route is recommended since it is shorter and thus more cost-efficient, and it is furthest from the solitary koppie (which although not deemed sensitive has aesthetic value).

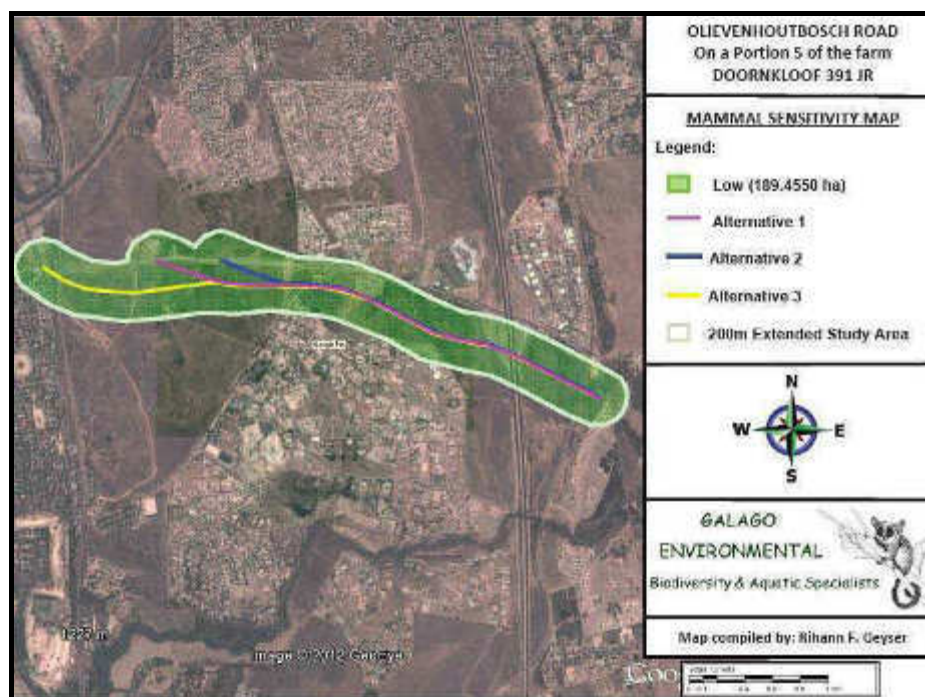


Figure 9: Mammal sensitivity map

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GALAGO ENVIRONMENTAL



Biodiversity and Aquatic Specialists

638 Turf Street

Wingate Park, 0181

Tel: 012-345 4891

Fax: 086 675 6136

Email: Vanessam@lantic.net

Avifaunal Habitat Assessment

of

**A section of the proposed Olievenhoutbosch
Road from Main Road to K54 on Portion 5 of the
farm Doornkloof 391-JR**

May 2012

Report author: Mr. R.F. Geysler

Report verified/reviewed by: Dr. A.C. Kemp (Ph.D., Pr.Sci. Nat. (Zoology & Ecology))

VERIFICATION STATEMENT

Mr R. Geysler is not registered as a Professional Natural Scientist with the S.A. Council for Natural Scientific Professions. This communication serves to verify that the bird report compiled by Mr R.F. Geysler has been prepared under my supervision, and I have verified the contents thereof.

Declaration of Independence: I, Alan Charles Kemp (4405075033081), declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of zoology
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed Olievenhoutbosch Road from Main Road to K54 described in this report
- have no financial interest in the proposed development other than remuneration for work performed
- neither have nor will have any vested or conflicting interests in the proposed development
- undertake to disclose to Galago Environmental CC and its client, and the competent authority, any material information that has or may have the potential to influence decisions by the competent authority as required in terms of the Environmental Impact Assessment Regulations 2006



Dr. A.C. Kemp

DECLARATION OF INDEPENDENCE:

I, Rihann F. Geysler (690304 5248 084), declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
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Rihann F. Geysler

TABLE OF CONTENTS

| | |
|---|----|
| 1. INTRODUCTION | 5 |
| 2. SCOPE AND OBJECTIVES OF THE STUDY | 5 |
| 3. STUDY AREA..... | 5 |
| 4. METHODS..... | 7 |
| 5. RESULTS | 9 |
| 6. FINDINGS AND POTENTIAL IMPLICATIONS | 24 |
| 7. LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE | 25 |
| 8. RECOMMENDED MITIGATION MEASURES | 26 |
| 9. CONCLUSIONS | 26 |
| 10. LITERATURE SOURCES | 27 |

FIGURES:

| | |
|---|----|
| Figure 1: Locality map of the study area | 6 |
| Figure 2: Bird habitat systems identified from the study site..... | 9 |
| Figure 3: Open grassland with scattered trees and rocky outcrops | 10 |
| Figure 4: Road already graded east of Nellmapius Road | 11 |
| Figure 5: Road in construction | 11 |
| Figure 6: Quarry area..... | 11 |
| Figure 7: An area with alien <i>Eucalyptus</i> trees on the study route | 12 |
| Figure 8: An area with wattle trees on the study route | 12 |
| Figure 9: Habitat map for the Lesser Kestrels..... | 25 |
| Figure 10: Avifaunal sensitivity map..... | 27 |

TABLES:

| | |
|--|----|
| Table 1: Bird species observed and that are likely to occur on the study site. | 13 |
| Table 2: Red Data bird species recorded for the 2528CC & 2528CD q.d.g.c. with SABAP1 data..... | 17 |
| Table 3: Red Data bird species recorded for the 2528CC & 2528CD q.d.g.c. with SABAP2 data..... | 18 |
| Table 4: Red Data bird species assessment for the 2528CC & 2528CD q.d.g.c.19 | |

1. INTRODUCTION

Galago Environmental CC. was appointed to undertake an avifaunal habitat survey for the Olievenhoutbosch Road from Main Road to K54 on Portion 5 of the farm Doornkloof 391-JR (hereafter referred to as the study route), which is scheduled for the construction of a road. This is in accordance with the 2010 EIA Regulations (No. R. 543-546, Department of Environmental Affairs and Tourism, 18 June 2010) emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

The primary objective was to determine the presence of Red Data avifaunal species and to identify suitable habitat for these species. Direct observations and published data apart, qualitative and quantitative habitat assessments were used to derive the presence / absence of Red Data avifaunal species. A list of avifaunal species likely to be affected by the new development is compiled.

2. SCOPE AND OBJECTIVES OF THE STUDY

- To qualitatively and quantitatively assess the significance of the avifaunal habitat components, and current general conservation status of the property;
- To comment on ecologically sensitive areas;
- To comment on connectivity with natural vegetation and habitats on adjacent sites;
- To provide a list of avifauna that occur or that are likely to occur, and to identify species of conservation importance;
- To highlight potential impacts of the proposed development on the avifauna of the study site, and
- To provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved.

3. STUDY AREA

3.1 Locality

The proposed road and alternative routes, ± 4 km in length, is situated within the 2528CC and 2528CD quarter degree grid cell (q.d.g.c.) and 2550_2810 and 2550_2815 pentads respectively (SABAP2 protocol) and runs from the Goede Hoop Road (M57) just west of Rietvlei Nature Reserve (east end) to the Alexandra/Main Road (M18) intersection north of Irene (west end) within the Gauteng Province. The site is situated at an altitude of about 1 500 metres above sea level (m.a.s.l.).

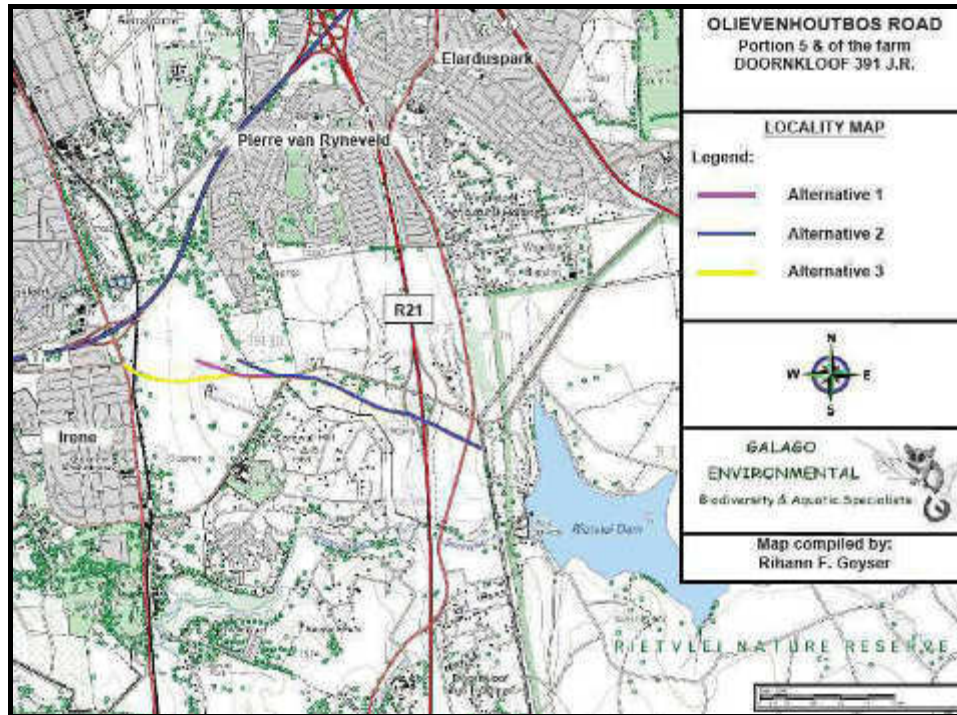


Figure 1: Locality map of the study area

3.2 Land Use

The largest portion of the study site consists of open grassland that has largely been disturbed by past and present human related activities and is not used for a specific purpose. This area used to consist of pristine grassland but has been degraded in a period of time. Human presence on site is high as a result of squatters that find temporally housing with the vegetation on the study site. Wetland habitat is limited to a small drainage line (see avifaunal habitat assessment, open grassland hereunder).

3.3 Biophysical Information

3.3.1 *Vegetation type and landscape*

The largest portion of the study site is situated within the Dry Highveld Grassland Bioregion of the Grassland Biome and more specifically within the Carletonville Dolomite Grassland vegetation type according to Mucina and Rutherford (2006).

The landscape is highly variable with extensive sloping plains and rocky ridges that are elevated slightly above the undulating surrounding plains. The plants within this vegetation type are species-rich, wiry, sour grassland with small shrubs growing on the rocky ridges and outcrops that occur in isolated areas within this vegetation type. Dominant grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. Another typical feature of this vegetation type is the high diversity of herbs, many of which belong to the Asteraceae, that grow between the grasses on the open plains. The open plains and rocky outcrops and ridges carry small pockets of sparse woodlands with *Protea caffra* and *P. welwitschii*, *Acacia caffra* and *Celtis Africana* trees, and with shrubs such as the genus *Rhus* that grow between these trees.

3.3.2 **Climate**

Summer-rainfall ranging between 570 mm to 730 mm per annum with warm summers and very cold winter temperatures.

3.3.3 **Geology**

3.3.4 **Conservation status of habitat**

This vegetation type is considered as endangered with a target of 24% and poorly conserved (1%). Small conservation areas can be found within this vegetation type such as Rietvlei Nature Reserve, Bronkhorstspuit NR, Boskop Dam NR and some small conservation areas such as Doornkop, Ezemvelo and Renosterpoort. Almost half of this vegetation type has been transformed mostly by agricultural croplands, plantations such as wattle, urbanisation and dam-building.

4. **METHODS**

An eight hour site visit was conducted on 5 April 2012 to record the presence of bird species associated with the habitat systems on the study site and to identify possible sensitive areas. During this visit the observed and derived presence of avifaunal species associated with the recognized habitat types of the study site, were recorded. This was done with due regard to the well recorded global distributions of Southern African avifauna, coupled to the qualitative and quantitative nature of recognized habitats.

4.1 **Field Surveys**

Birds were identified visually, using 10X42 Bushnell Legend binoculars and a 20X-60X Pentax spotting scope, and by call, and where necessary were verified from Sasol Birds of Southern Africa (Sinclair *et al.*, 2011) and Southern African Bird Sounds (Gibbon, 1991).

The 500 m of adjoining properties was scanned for important avifaunal species and habitats.

During the site visit, birds were identified by visual sightings or aural records along random transect walks. No trapping or mist netting was conducted, since the terms of reference did not require such intensive work. In addition, birds were also identified by means of feathers, nests, signs, droppings, burrows or roosting sites. Locals were interviewed to confirm occurrences or absences of species.

4.2 **Desktop Surveys**

The presence of suitable habitats was used to deduce the likelihood of presence or absence of avifaunal species, based on authoritative tomes, scientific literature, field guides, atlases and databases. This can be done irrespective of season.

The likely occurrence of key avifaunal species was verified according to distribution records obtained during the Southern African Bird Atlas Project 1 (SABAP1) period from 1981 to 1993 (Harrison *et al.* 1997). Earlier records of only Red Data avifaunal species were obtained from the period between 1974 and 1987 according to Tarboton *et al.* (1987). The most recent avifaunal distribution data were obtained from the current SABAP2 project which commenced on 1 July 2007.

The occurrence and historic distribution of likely avifaunal species, especially all Red Data avifaunal species recorded for the q.d.g.c. 2528CC and 2528CD q.d.g.c., were verified from SABAP1 (southern Africa Bird Atlas Project 1) data (Harrison *et al.* 1997), Tarboton *et al.* (1987) and the current SABAP2 project (SABAP2 data for the 2528CC and 2528CD q.d.g.c and for the 2550_2810 and 2550_2815 pentads). The reporting rate for each avifaunal species likely to occur on the study site, based on Harrison *et al.* (1997), was scored between 0 – 100% and was calculated as follows: Total number of cards on which a species was reported during the Southern African Bird Atlas SABAP1 and, Red Data species only, the current SABAP2 project period X 100 ÷ total number of cards for the particular q.d.g.c. (Harrison *et al.*, 1997) and pentad(s) (SABAP2). It is important to note that a q.d.g.c. (SABAP1 Protocol) covers a large area: for example, q.d.g.c. 2528CD covers an area of ±27 X 25 km (±693 km²) (15 minutes of latitude by 15 minutes of longitude, 15' x 15') and a pentad (SABAP2 Protocol) and area of ±8 X 7.6 km (5 minutes of latitude by 5 minutes of longitude, 5' x 5') and it is possible that suitable habitat will exist for a certain Red Data avifaunal species within this wider area surrounding the study site. However, the specific habitat(s) found on site may not suit the particular Red Data species, even though it has been recorded for the q.d.g.c or pentad. For example, the Cape Vulture occurs along the Magaliesberg but will not favour the habitat found within the Pretoria CBD, both of which are in the same q.d.g.c. Red Data bird species were selected and categorised according to Barnes (2000).

An avifaunal diversity index, that gives an indication of which habitat system on the study site will hold the richest avifaunal species diversity, was calculated as the sum of the probability of occurrence of bird species within a specific habitat system on site. For each species and habitat, the probability of occurrence was ranked as: 5 = present on site, 4 = not observed on site but has a high probability of occurring there, 3 = medium probability, 2 = low probability, 1 = very low probability and 0 = not likely to occur.

4.3 Specific Requirements

During the site visit, the study site was surveyed visually and its habitats assessed for the potential occurrence of priority Red Data avifauna, according to GDACE's requirement for Biodiversity Assessments, Version 2 (2009), as well as for any other Red Data bird species: The priority Red Data bird species for Gauteng are (in Roberts VII order and nomenclature, Hockey *et al.* 2005):

- Half-collared Kingfisher (*Alcedo semitorquata*)
- African Grass-Owl (*Tyto capensis*)
- White-bellied Korhaan (*Eupodotis senegalensis*)
- Blue Crane (*Anthropoides paradiseus*)
- African Finfoot (*Podica senegalensis*)
- Cape Vulture (*Gyps coprotheres*)
- African Marsh-Harrier (*Circus ranivorus*)
- Martial Eagle (*Polemaetus bellicosus*)
- Secretarybird (*Sagittarius serpentarius*)
- Lesser Kestrel (*Falco naumanni*)
- Greater Flamingo (*Phoenicopterus ruber*)
- Lesser Flamingo (*Phoenicopterus minor*)
- White-backed Night-Heron (*Gorsachius leuconotus*)
- Black Stork (*Ciconia nigra*)

No particular reference was made for the occurrence any Red Data avifaunal species on or surrounding the study site.

5. RESULTS

Avifaunal Habitat Assessment:

Two major avifaunal habitat systems were identified on the study site which is small remainders of natural woodland, with garden habitat that surrounds the buildings on the study site. In general the entire habitat has been disturbed by past and present human activities and the study site is entirely surrounded urbanisation. Avifaunal species that are likely to occur within the natural woodland are also expected to occur within the garden habitat and vice versa and thus the species diversity will not differ significantly from these two habitat systems. For the purposes of this report the two habitat systems are grouped together as mixed exotic (including alien vegetation) and indigenous vegetation. A short description of this habitat system is as follows (refer to figure 2):

Figure 2 illustrates the major habitat systems identified as likely to be used by bird species expected to occur on the study site.

A short description of each habitat type follows, ranked from most to least important (refer to Figure 2):

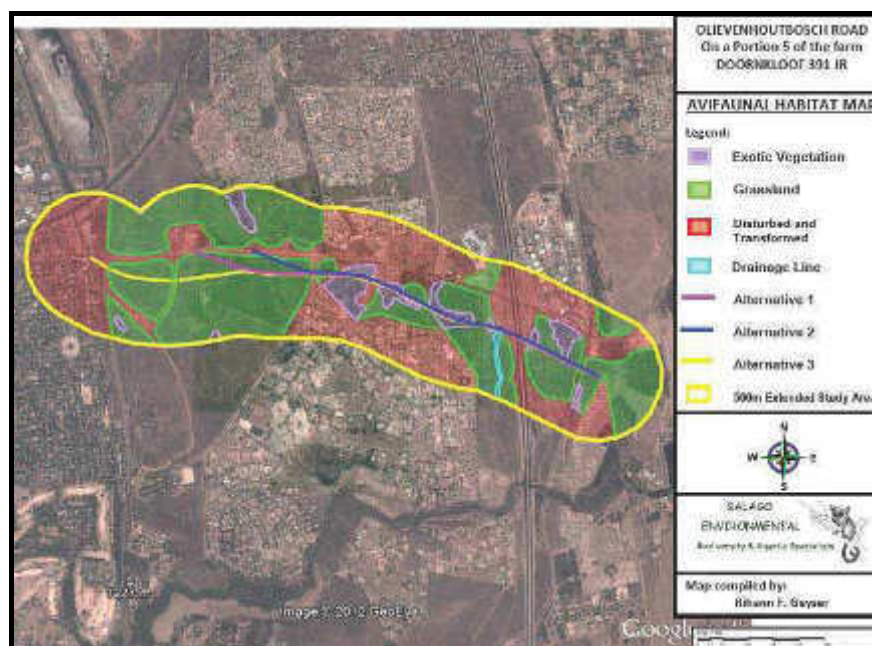


Figure 2: Bird habitat systems identified from the study site.

Open grassland:

The largest portion of the study site consists of a mixture of disturbed and undisturbed grassland with scattered trees and rocky outcrops (Figure 3) with hardy woody vegetation.



Figure 3: Open grassland with scattered trees and rocky outcrops

Open grassland is the most important habitat type for South Africa's threatened bird species in the region with a proportional importance of 27%. The highest diversity of threatened bird species occurs within this grassland habitat, many of which are under the highest categories of threat (Barnes 2000).

The presence and abundance of bird species in this habitat will vary from season to season - lush and green in summer after summer rains and dry, brown, frosted or burnt during winter. The habitat favours ground-living bird species, such as lapwings, francolins, pipits, longclaws, larks and chats. These birds hunt for insects and/or breed on the ground, in burrows in the ground, or between the grasses. Weavers and widowbirds make use of such habitat for feeding on ripe seeds during late summer and early winter when the grass is not burnt, and widowbirds and cisticolas will also breed in the tall grass during summer. Species such as weavers and bishops that breed in the wetland habitat during summer will also make use of the open grassland habitat for feeding during winter after the grasses have seeded. Aerial feeding birds such as martins, swifts and swallows will also hunt for insects over the grasslands.

This habitat system includes vegetation growing on the rocky outcrops that give the typical impression of rocky highveld grassland, and they also protect some low woody plants from fire. The habitat will favour birds associated with rocky habitats, such as chats, wheatears, rock-thrushes and cisticolas, which favour the rocky nature of the area for breeding and to perch on to hunt for insects and detect predators. The trees and shrubs growing between these rocks will also provide food in the form of seeds and fruits to various bird species, and shelter and nesting sites for many birds, especially passerines.

Sections of the proposed route have already been graded and the natural vegetation has already been destroyed by these activities (Figure 4). In addition another road in which the various alternatives run into has already been constructed but looks abandoned and left uncompleted (Figure 5). These are also areas that have been disturbed by an open quarry (Figure 6).



Figure 4: Road already graded east of Nellmapius Road



Figure 5: Road in construction



Figure 6: Quarry area

The drainage lines on the study site consist of Palustrine wetlands consisting of dry drainage lines with vegetation that does not differ significantly from the surrounding grassland. The avifaunal species diversity will not differ significantly from the surrounding grassland since there are no places where water can accumulate to form wetlands with standing water due the fast down flow of rain water during the rain season except for a small impoundment that was built within the drainage line that mainly remain dry and where aquatic vegetation are absent. For purposes of this report the drainage line habitat is grouped together with the grassland habitat system.

Exotic vegetation

Exotic alien tree species has taken over an area with open natural grassland vegetation. These alien tree species largely consists of *Eucalyptus* sp. trees (Figure 7) and exotic wattle tree species (Figure 8).



Figure 7: An area with alien *Eucalyptus* trees on the study route



Figure 8: An area with wattle trees on the study route

This exotic and alien vegetation usually does not offer a large variation in plant communities and these trees are mostly unpalatable in their live stage for insect and game species. As a result, few insect-eating bird species will occur within these plantations. A number of nectar feeding species, such as white-eyes and sunbirds, will

feed on the nectar produced by the flowers of these trees, and some birds also make nests in these trees.

A few species of bird of prey, which require tall trees for nest building have adapted to these trees and have increased their ranges due to the presence of these trees. These include species such as Black and Ovambo Sparrowhawks.

No or little grass growth takes place on the ground where these trees grow and seed-eating bird species are few. The roots of these trees are known to extract large volumes of water daily and the surrounding ground is normally hard and dry.

The growth of exotic and alien *Acacia* sp. (wattle) on site varies from single standing trees to large clumps. In general, wattle trees create a sterile environment and are not utilised by many bird species. Some of the most common species have however adapted to wattle plantations, such as Cape White-eye, White-bellied Sunbird, Southern Boubou, Neddicky, Black-crowned Tchagra and Cape Robin. These birds either make use of the flowers for nectar-feeding or the trees for nest building or shelter.

Other habitat systems outside the boundaries of the study site but within the 500m extended study area are mainly disturbed by past and present human activities consists of the following:

Observed and Expected Species Richness

Of the 359 bird species recorded for the 2528CC q.d.g.c., 140 (39 %) are likely to occur on the study site and 48 (34.3 %) of these bird species were actually observed on site.

The avifaunal biodiversity index (ABI) indicates that the largest bird species diversity is likely to occur within the open grassland vegetation habitat system on and within 500m surrounding the study site, with a avifauna biodiversity index (ABI) of 465, followed by the exotic vegetation and (ABI 259).

The avifaunal species listed in Table 1 are in the species order according to *Roberts - Birds of Southern Africa* VIIIth edition (Hockey *et al.*, 2005). These comprise the 140 species actually observed on (**in bold**) or that are likely to occur within the specific habitat systems on and within 500m surrounding the study site. This does not include overflying birds or rare vagrants. The reporting rate for each species is the percentage for the q.d.g.c. according to the SABAP 1 atlas (Harrison *et al.* 1997) and is represented by colour codes as follows: Yellow = Very Low, Light Orange = Low, Dark Orange = Medium and Red = High. Our habitat preference scores for each species are shown under the recognised habitat types on site: **OG = Open Grassland** and **EX = Exotic Vegetation** with their possibility of occurrence in these specific habitats rated as 5 = present, 4 = High, 3 = Medium, 2 = Low, 1 = Very low and 0 = Not likely to occur.

Table 1: Bird species observed and that are likely to occur on the study site.

| SCIENTIFIC NAMES | COMMON NAMES | Reporting rate (%) [*] | | Habitat preference | |
|-------------------------------------|----------------------------|---------------------------------|--------|--------------------|----|
| | | 2528CC | 2528CD | OG | EX |
| <i>Peliperdix coqui</i> | Coqui Francolin | 4 | 6 | 4 | 2 |
| <i>Pternistis swainsonii</i> | Swainson's Spurfowl | 21 | 19 | 5 | 2 |
| <i>Coturnix coturnix</i> | Common Quail | 1 | <1 | 2 | 0 |
| <i>Numida meleagris</i> | Helmeted Guinea fowl | 53 | 52 | 4 | 4 |
| <i>Indicator indicator</i> | Greater Honeyguide | 1 | 4 | 0 | 4 |
| <i>Indicator minor</i> | Lesser Honeyguide | 4 | 8 | 0 | 4 |
| <i>Prodotiscus regulus</i> | Brown-backed Honeybird | 1 | 1 | 3 | 2 |

| SCIENTIFIC NAMES | COMMON NAMES | Reporting rate (%) [*] | | Habitat preference | |
|---|--------------------------------|---------------------------------|-----------|--------------------|----|
| | | 2528CC | 2528CD | OG | EX |
| <i>Jynx ruficollis</i> | Red-throated Wryneck | 20 | 32 | 4 | 4 |
| <i>Campethera abingoni</i> | Golden-tailed Woodpecker | 11 | 9 | 1 | 1 |
| <i>Dendropicos fuscescens</i> | Cardinal Woodpecker | 9 | 18 | 2 | 1 |
| <i>Tricholaema leucomelas</i> | Acacia Pied Barbet | 5 | 20 | 2 | 1 |
| <i>Lybius torquatus</i> | Black-collared Barbet | 55 | 74 | 2 | 2 |
| <i>Trachyphonus vaillantii</i> | Crested Barbet | 79 | 91 | 5 | 2 |
| <i>Tockus nasutus</i> | African Grey Hornbill | 3 | 4 | 3 | 2 |
| <i>Upupa africana</i> | African Hoopoe | 76 | 80 | 3 | 1 |
| <i>Phoeniculus purpureus</i> | Green Wood-Hoopoe | 48 | 62 | 2 | 3 |
| <i>Halcyon albiventris</i> | Brown-hooded Kingfisher | 6 | 22 | 3 | 3 |
| <i>Merops bullockoides</i> | White-fronted Bee-eater | 4 | 12 | 3 | 2 |
| <i>Merops apiaster</i> | European Bee-eater | 12 | 18 | 5 | 3 |
| <i>Colius striatus</i> | Speckled Mousebird | 72 | 79 | 5 | 2 |
| <i>Urocolius indicus</i> | Red-faced Mousebird | 38 | 38 | 5 | 3 |
| <i>Cuculus solitarius</i> | Red-chested Cuckoo | 15 | 25 | 3 | 4 |
| <i>Cuculus clamosus</i> | Black Cuckoo | 3 | 9 | 1 | 1 |
| <i>Chrysococcyx klaas</i> | Klaas's Cuckoo | 1 | 6 | 1 | 1 |
| <i>Chrysococcyx caprius</i> | Diderick Cuckoo | 26 | 33 | 5 | 3 |
| <i>Cypsiurus parvus</i> | African Palm-Swift | 23 | 22 | 5 | 2 |
| <i>Apus barbatus</i> | African Black Swift | 1 | 3 | 2 | 0 |
| <i>Apus affinis</i> | Little Swift | 39 | 33 | 5 | 0 |
| <i>Apus caffer</i> | White-rumped Swift | 19 | 24 | 5 | 0 |
| <i>Corythaixoides concolor</i> | Grey Go-away-bird | 44 | 55 | 4 | 2 |
| <i>Tyto alba</i> | Barn Owl | 6 | 7 | 4 | 4 |
| <i>Bubo africanus</i> | Spotted Eagle-Owl | 4 | 12 | 4 | 3 |
| <i>Caprimulgus rufigena</i> | Rufous-cheeked Nightjar | <1 | <1 | 2 | 0 |
| <i>Columba livia</i> | Rock Dove | 27 | 31 | 2 | 1 |
| <i>Columba guinea</i> | Speckled Pigeon | 42 | 57 | 3 | 1 |
| <i>Streptopelia senegalensis</i> | Laughing Dove | 94 | 96 | 4 | 4 |
| <i>Streptopelia capicola</i> | Cape Turtle-Dove | 81 | 81 | 4 | 4 |
| <i>Streptopelia semitorquata</i> | Red-eyed Dove | 32 | 22 | 4 | 4 |
| <i>Burhinus capensis</i> | Spotted Thick-knee | 36 | 40 | 4 | 3 |
| <i>Vanellus armatus</i> | Blacksmith Lapwing | 39 | 39 | 2 | 0 |
| <i>Vanellus senegallus</i> | African Wattled Lapwing | 16 | 15 | 5 | 0 |
| <i>Vanellus coronatus</i> | Crowned Lapwing | 74 | 80 | 5 | 2 |
| <i>Cursorius temminckii</i> | Temminck's Courser | <1 | <1 | 2 | 0 |
| <i>Elanus caeruleus</i> | Black-shouldered Kite | 47 | 48 | 4 | 3 |
| <i>Milvus migrans</i> | Black Kite | 4 | 14 | 2 | 1 |
| <i>Accipiter minullus</i> | Little Sparrowhawk | 1 | 1 | 1 | 4 |
| <i>Accipiter ovampensis</i> | Ovambo Sparrowhawk | 2 | 2 | 0 | 4 |
| <i>Accipiter melanoleucus</i> | Black Sparrowhawk | 2 | 1 | 0 | 2 |
| <i>Buteo vulpinus</i> | Steppe Buzzard | 5 | 4 | 2 | 3 |
| <i>Falco naumanni</i> | Lesser Kestrel (VU) | 1 | 1 | 1 | 0 |
| <i>Falco rupicoloides</i> | Greater Kestrel | 5 | 3 | 2 | 0 |
| <i>Falco amurensis</i> | Amur Falcon | 1 | 1 | 2 | 1 |
| <i>Ardea melanocephala</i> | Black-headed Heron | 40 | 33 | 4 | 0 |
| <i>Bubulcus ibis</i> | Cattle Egret | 71 | 75 | 4 | 2 |
| <i>Bostrychia hagedash</i> | Hadeda Ibis | 86 | 91 | 2 | 4 |

| SCIENTIFIC NAMES | COMMON NAMES | Reporting rate (%) [*] | | Habitat preference | |
|-------------------------------------|--------------------------------|---------------------------------|--------|--------------------|----|
| | | 2528CC | 2528CD | OG | EX |
| <i>Oriolus larvatus</i> | Black-headed Oriole | 12 | 20 | 4 | 3 |
| <i>Dicrurus adsimilis</i> | Fork-tailed Drongo | 13 | 35 | 2 | 3 |
| <i>Terpsiphone viridis</i> | African Paradise-Flycatcher | 16 | 18 | 2 | 1 |
| <i>Dryoscopus cubla</i> | Black-backed Puffback | 14 | 18 | 3 | 1 |
| <i>Tchagra senegalus</i> | Black-crowned Tchagra | 3 | 25 | 5 | 1 |
| <i>Laniarius ferrugineus</i> | Southern Boubou | 28 | 36 | 5 | 1 |
| <i>Laniarius atrococcineus</i> | Crimson-breasted Shrike | 5 | 8 | 2 | 2 |
| <i>Telophorus zeylonus</i> | Bokmakierie | 64 | 68 | 5 | 2 |
| <i>Batis molitor</i> | Chinspot Batis | 3 | 23 | 2 | 0 |
| <i>Corvus albus</i> | Pied Crow | 64 | 56 | 5 | 4 |
| <i>Lanius collurio</i> | Red-backed Shrike | 1 | 2 | 4 | 2 |
| <i>Lanius minor</i> | Lesser Grey Shrike | 1 | 1 | 3 | 1 |
| <i>Lanius collaris</i> | Common Fiscal | 90 | 93 | 5 | 4 |
| <i>Riparia paludicola</i> | Brown-throated Martin | 3 | 7 | 2 | 0 |
| <i>Riparia cincta</i> | Banded Martin | 1 | 4 | 3 | 0 |
| <i>Hirundo rustica</i> | Barn Swallow | 28 | 23 | 5 | 4 |
| <i>Hirundo albigularis</i> | White-throated Swallow | 22 | 24 | 4 | 1 |
| <i>Hirundo dimidiata</i> | Pearl-breasted Swallow | 1 | 2 | 2 | 1 |
| <i>Hirundo cucullata</i> | Greater Striped Swallow | 34 | 41 | 5 | 2 |
| <i>Hirundo abyssinica</i> | Lesser Striped Swallow | 20 | 33 | 4 | 2 |
| <i>Hirundo spilodera</i> | South African Cliff-Swallow | 10 | 10 | 3 | 0 |
| <i>Hirundo fuligula</i> | Rock Martin | 18 | 13 | 4 | 2 |
| <i>Delichon urbicum</i> | Common House-Martin | 5 | 4 | 3 | 2 |
| <i>Pycnonotus tricolor</i> | Dark-capped Bulbul | 89 | 94 | 5 | 4 |
| <i>Stenostira scita</i> | Fairy Flycatcher | 2 | 5 | 3 | 0 |
| <i>Sylvietta rufescens</i> | Long-billed Crombec | 2 | 13 | 2 | 0 |
| <i>Phylloscopus trochilus</i> | Willow Warbler | 6 | 9 | 4 | 4 |
| <i>Turdoides jardineii</i> | Arrow-marked Babbler | 8 | 18 | 2 | 1 |
| <i>Parisoma subcaeruleum</i> | Chestnut-vented Tit-Babbler | 8 | 24 | 1 | 0 |
| <i>Zosterops virens</i> | Cape White-eye | 69 | 78 | 5 | 4 |
| <i>Cisticola aberrans</i> | Lazy Cisticola | 1 | 4 | 3 | 0 |
| <i>Cisticola chiniana</i> | Rattling Cisticola | 2 | 7 | 3 | 0 |
| <i>Cisticola lais</i> | Wailing Cisticola | <1 | 2 | 5 | 0 |
| <i>Cisticola tinniens</i> | Levaillant's Cisticola | 10 | 12 | 2 | 0 |
| <i>Cisticola fulvicapilla</i> | Neddicky | 16 | 28 | 4 | 4 |
| <i>Cisticola juncidis</i> | Zitting Cisticola | 11 | 12 | 5 | 0 |
| <i>Cisticola aridulus</i> | Desert Cisticola | 3 | 4 | 3 | 0 |
| <i>Cisticola textrix</i> | Cloud Cisticola | 3 | 2 | 3 | 0 |
| <i>Prinia subflava</i> | Tawny-flanked Prinia | 22 | 32 | 4 | 4 |
| <i>Prinia flavicans</i> | Black-chested Prinia | 22 | 37 | 5 | 3 |
| <i>Mirafrā africana</i> | Rufous-naped Lark | 21 | 16 | 5 | 0 |
| <i>Chersomanes albofasciata</i> | Spike-heeled Lark | 2 | 1 | 3 | 0 |
| <i>Psophocichla litsitsirupa</i> | Groundscraper Thrush | 2 | 8 | 2 | 0 |
| <i>Turdus libonyanus</i> | Kurriehane Thrush | 7 | 14 | 2 | 3 |
| <i>Turdus smithi</i> | Karoo Thrush | 76 | 84 | 3 | 3 |
| <i>Sigelus silens</i> | Fiscal Flycatcher | 39 | 46 | 2 | 2 |
| <i>Muscicapa striata</i> | Spotted Flycatcher | 2 | 7 | 5 | 4 |
| <i>Cossypha caffra</i> | Cape Robin-Chat | 66 | 78 | 5 | 4 |

| SCIENTIFIC NAMES | COMMON NAMES | Reporting rate (%) [*] | | Habitat preference | |
|--|-------------------------------------|---------------------------------|--------|--------------------|-----|
| | | 2528CC | 2528CD | OG | EX |
| <i>Saxicola torquatus</i> | African Stonechat | 15 | 20 | 4 | 0 |
| <i>Oenanthe monticola</i> | Mountain Wheatear | 7 | 24 | 3 | 0 |
| <i>Oenanthe pileata</i> | Capped Wheatear | 3 | 1 | 2 | 0 |
| <i>Cercomela familiaris</i> | Familiar Chat | 2 | 5 | 3 | 1 |
| <i>Onychognathus morio</i> | Red-winged Starling | 23 | 10 | 2 | 1 |
| <i>Lamprotornis nitens</i> | Cape Glossy Starling | 46 | 33 | 5 | 4 |
| <i>Spreo bicolor</i> | Pied Starling | 9 | 8 | 3 | 1 |
| <i>Creatophora cinerea</i> | Wattled Starling | 1 | <1 | 2 | 1 |
| <i>Acridotheres tristis</i> | Common Myna (INT) | 46 | 7 | 5 | 5 |
| <i>Chalcomitra amethystina</i> | Amethyst Sunbird | 32 | 51 | 5 | 5 |
| <i>Cinnyris talatala</i> | White-bellied Sunbird | 37 | 59 | 4 | 3 |
| <i>Ploceus capensis</i> | Cape Weaver | 22 | 33 | 3 | 1 |
| <i>Ploceus velatus</i> | Southern Masked-Weaver | 73 | 84 | 5 | 4 |
| <i>Quelea quelea</i> | Red-billed Quelea | 5 | 4 | 3 | 3 |
| <i>Euplectes afer</i> | Yellow-crowned Bishop | 5 | 3 | 3 | 0 |
| <i>Euplectes orix</i> | Southern Red Bishop | 38 | 44 | 5 | 3 |
| <i>Euplectes albonotatus</i> | White-winged Widowbird | 10 | 27 | 4 | 2 |
| <i>Euplectes ardens</i> | Red-collared Widowbird | 9 | 28 | 4 | 0 |
| <i>Euplectes progne</i> | Long-tailed Widowbird | 25 | 18 | 5 | 0 |
| <i>Sporaeginthus subflavus</i> | Orange-breasted Waxbill | 4 | 7 | 5 | 0 |
| <i>Ortygospiza atricollis</i> | African Quailfinch | 1 | 4 | 5 | 0 |
| <i>Amadina erythrocephala</i> | Red-headed Finch | 3 | 1 | 4 | 2 |
| <i>Estrilda astrild</i> | Common Waxbill | 10 | 20 | 4 | 2 |
| <i>Uraeginthus angolensis</i> | Blue Waxbill | 3 | 4 | 2 | 1 |
| <i>Lagonosticta rhodopareia</i> | Jameson's Firefinch | 3 | 3 | 2 | 5 |
| <i>Spermestes cucullatus</i> | Bronze Mannikin | 9 | 30 | 4 | 3 |
| <i>Vidua macroura</i> | Pin-tailed Whydah | 18 | 24 | 4 | 3 |
| <i>Passer melanurus</i> | Cape Sparrow | 91 | 93 | 4 | 4 |
| <i>Passer diffusus</i> | Southern Grey-headed Sparrow | 24 | 28 | 4 | 5 |
| <i>Motacilla capensis</i> | Cape Wagtail | 70 | 70 | 3 | 0 |
| <i>Macronyx capensis</i> | Cape Longclaw | 19 | 20 | 4 | 0 |
| <i>Anthus cinnamomeus</i> | African Pipit | 14 | 8 | 4 | 0 |
| <i>Crithagra mozambicus</i> | Yellow-fronted Canary | 7 | 15 | 2 | 1 |
| <i>Crithagra atrogularis</i> | Black-throated Canary | 28 | 30 | 5 | 4 |
| <i>Crithagra gularis</i> | Streaky-headed Seedeater | 13 | 23 | 5 | 4 |
| <i>Emberiza tahapisi</i> | Cinnamon-breasted Bunting | 3 | 7 | 3 | 1 |
| Avifaunal diversity index: | | | | 465 | 259 |

*The reporting rate is calculated as follows: Total number of cards on which a species was reported X 100 ÷ total number of cards for a particular quarter degree grid cell. **INT** = Introduced or alien birds species to Southern Africa.

Red Data Species Categories for the birds (Barnes, 2000)

RE = Regionally extinct, **CR** = Critically Endangered **EN** = Endangered, **VU** = Vulnerable, **NT** = Near-threatened.

The biodiversity index gives an indication of which habitat will hold the richest bird diversity on site. The colour codes for each species are represented as follows: The colour codes for each species are represented as follows: Yellow = Very Low, Light Orange = Low, Dark Orange = Medium and Red = High. The likelihood of occurrence of each species in the specific habitat systems on the study site are as follow: 5 = present, 4 = High, 3 = Medium, 2 = Low, 1 = very low, and 0 = Not likely to occur.

Threatened and Red Listed Bird Species

The following Red Data avifaunal species were recorded for the 2528CC and 2528CD q.d.g.c during SABAP1 (Harrison *et al.* 1997) and prior to the SABAP1 project (Tarboton *et al.* 1987) (Table 2).

Table 2: Red Data bird species recorded for the 2528CC & 2528CD q.d.g.c. with SABAP1 data

| SCIENTIFIC NAME | ENGLISH NAME | REPORTING RATE (%)* | |
|---|-------------------------------|---------------------|-----------------|
| | | 2528CC Centurion | 2528CD Rietvlei |
| <i>Nettapus auritus</i> | African Pygmy-Goose (NT) | (T) | |
| <i>Alcedo semitorquata</i> | Half-collared Kingfisher (NT) | 1(T) | <1(T) |
| <i>Tyto capensis</i> | African Grass-Owl (VU) | 2(Tb) | 1(Tb) |
| <i>Neotis denhami</i> | Denham's Bustard (VU) | (T) | (T) |
| <i>Eupodotis caerulescens</i> | Blue Korhaan (NT) | (Tb) | <1(T) |
| <i>Eupodotis senegalensis</i> | White-bellied Korhaan (VU) | <1(T) | <1(T) |
| <i>Anthropoides paradiseus</i> | Blue Crane (VU) | 3(Tb) | 3(Tb) |
| <i>Podica senegalensis</i> | African Finfoot (VU) | <1(T) | (T) |
| <i>Crex crex</i> | Corn Crane (VU) | (T) | <1 |
| <i>Rostratula benghalensis</i> | Greater Painted-snipe (NT) | (T) | <1 |
| <i>Glareola nordmanni</i> | Black-winged Pratincole (NT) | (T) | <1(T) |
| <i>Sterna caspia</i> | Caspian Tern (NT) | | <1 |
| <i>Gyps coprotheres</i> | Cape Vulture (VU) | <1(T) | (T) |
| <i>Aegypius tracheliotus</i> | Lappet-faced Vulture (VU) | (T) | (T) |
| <i>Terathopius ecaudatus</i> | Bateleur (VU) | | (T) |
| <i>Circus ranivorus</i> | African Marsh-Harrier (VU) | <1(Tb) | (T) |
| <i>Aquila rapax</i> | Tawny Eagle (VU) | | <1 |
| <i>Aquila ayresii</i> | Ayres's Hawk-Eagle (NT) | <1(T) | <1 |
| <i>Polemaetus bellicosus</i> | Martial Eagle (VU) | <1(T) | (Tb) |
| <i>Sagittarius serpentarius</i> | Secretarybird (NT) | (Tb) | 2(T) |
| <i>Falco naumanni</i> | Lesser Kestrel (VU) | 1(T) | 1(T) |
| <i>Falco biarmicus</i> | Lanner Falcon (NT) | 1(Tb) | 1(Tb) |
| <i>Falco peregrinus</i> | Peregrine Falcon (NT) | | <1 |
| <i>Phoenicopterus ruber</i> | Greater Flamingo (NT) | | <1(T) |
| <i>Mycteria ibis</i> | Yellow-billed Stork (NT) | <1(T) | (T) |
| <i>Ciconia nigra</i> | Black Stork (NT) | <1(T) | <1 |
| <i>Mirafra cheniana</i> | Melodious Lark (NT) | <1(T) | (Tb) |
| SABAP1 Very Low : | | 12 | 15 |
| SABAP1 Low : | | 2 | 2 |
| SABAP1 Medium : | | 0 | 0 |
| SABAP1 High : | | 0 | 0 |
| SABAP1 TOTAL : | | 14 | 17 |
| Tarboton <i>et al</i> (1987) : | | 20 | 14 |
| Tarboton <i>et al</i> (1987) breeding: | | 6 | 5 |
| TOTAL : | | 26 | 19 |

*The reporting rate is calculated as follows: Total number of cards on which a species was reported X 100 ÷ total number of cards for a particular quarter degree grid cell. T = Bird species recorded as present (light blue) and Tb = bird species recording as breeding (dark blue) for the q.d.g.c. according to Tarboton (1987). Bird species with both reporting rates and T or Tb were recorded for the q.d.g.c. according to both Harrison *et al.* (1997) and Tarboton *et al.* (1987). The colour

codes for each species are represented as follows: yellow = very low, light orange = low, dark orange = medium and red = high with reference to the specific habitat systems found on site.

Red Data Species Categories for the birds (Barnes, 2000)

RE = Regionally extinct, **CR** = Critically Endangered **EN** = Endangered, **VU** = Vulnerable, **NT** = Near-threatened.

The following avifaunal species were recorded for 2528CC and 2528CD q.d.g.c. and for the 2550_2810 and 2550_2815 pentad respectively according to the current SABAP2 project.

Table 3: Red Data bird species recorded for the 2528CC & 2528CD q.d.g.c. with SABAP2 data

| SCIENTIFIC NAMES | ENGLISH NAMES | 2528CC | | 2528CD | |
|---------------------------------|---|----------|----------|-----------|-----------|
| | | SABAP2 | Pentad | SABAP2 | Pentad |
| <i>Nettapus auritus</i> | African Pygmy-Goose (NT) | 0 | 0 | 0 | 0 |
| <i>Alcedo semitorquata</i> | Half-collared Kingfisher (NT) | 1.7 | 0.4 | 1.1 | 0.3 |
| <i>Tyto capensis</i> | African Grass-Owl (VU) | 0.3 | 0.4 | 0.8 | 0.9 |
| <i>Neotis denhami</i> | Denham's Bustard (VU) | 0 | 0 | 0 | 0 |
| <i>Eupodotis caerulescens</i> | Blue Korhaan (NT) | 0 | 0 | 0 | 0 |
| <i>Eupodotis senegalensis</i> | White-bellied Korhaan (VU) | 0 | 0 | 0.8 | 2.0 |
| <i>Anthropoides paradiseus</i> | Blue Crane (VU) | 0 | 0 | Inst | 0 |
| <i>Podica senegalensis</i> | African Finfoot (VU) | 0.1 | 0 | 0 | 0 |
| <i>Crex crex</i> | Corn Crake (VU) | 0 | 0 | 0 | 0 |
| <i>Rostratula benghalensis</i> | Greater Painted-snipe (NT) | 0 | 0 | 0 | 0.9 |
| <i>Glareola nordmanni</i> | Black-winged Pratincole (NT) | 0 | 0 | 0 | 0 |
| <i>Gyps coprotheres</i> | Cape Vulture (VU) | 0 | 0 | 0 | 0 |
| <i>Aegypius tracheliotus</i> | Lappet-faced Vulture (VU) | 0 | 0 | 0 | 0 |
| <i>Circus ranivorus</i> | African Marsh-Harrier (VU) | 0 | 0 | 0.2 | 0.3 |
| <i>Circus macrourus</i> | Pallid Harrier (NT) | 0 | 0 | 0 | 0 |
| <i>Aquila ayresii</i> | Ayres's Hawk-Eagle (NT) | 0 | 0 | 0.1 | 0 |
| <i>Polemaetus bellicosus</i> | Martial Eagle (VU) | 0 | 0 | 0 | 0 |
| <i>Sagittarius serpentarius</i> | Secretarybird (NT) | 0.1 | 0 | 3.5 | 8.6 |
| <i>Falco naumanni</i> | Lesser Kestrel (VU) | 0.3 | 0 | 0.6 | 0.9 |
| <i>Falco biarmicus</i> | Lanner Falcon (NT) | 0.9 | 0.4 | 1.9 | 4.0 |
| <i>Falco peregrinus</i> | Perigrine Falcon (NT) | 0.3 | 0.4 | 0.6 | 1.1 |
| <i>Phoenicopterus ruber</i> | Greater Flamingo (NT) | 0 | 0 | 0.7 | 0.3 |
| <i>Mycteria ibis</i> | Yellow-billed Stork (NT) | 0 | 0.4 | 0.1 | 0.3 |
| <i>Ciconia nigra</i> | Black Stork (NT) | 0 | 0 | 0 | 0 |
| <i>Mirafra cheniana</i> | Melodious Lark (NT) | 4.5 | 0.8 | 1.1 | 1.4 |
| TOTAL: | | 8 | 6 | 13 | 12 |

A total of 27 Red Data bird species have been recorded within the 2528CC & 2528CD q.d.g.c. (Table 2) according to Harrison *et al.* (1997) and Tarboton *et al.* (1987). Four of these species appear to have disappeared from the area or were not subsequently recorded for this quarter degree grid cell during the time of the southern African Bird Atlas project (SABAP1). It is unlikely that they will ever recur in this region again except maybe on rare occasions or in protected areas. None of the species that have

subsequently disappeared from the region used to breed within the said q.d.g.c. (Tarboton, 1987). None of the species have a high or medium reporting rate and all indicate a low (3 species) to very low (21 species) reporting rate. The 2528CC q.d.g.c. indicates a drastic decline in the number of Red Data bird species (12) from 26 species to 14 species. This is probably as a result of the high level of development that has taken place and the lack of conservation areas within the 2528CC q.d.g.c. The 2528CD q.d.g.c. on the other hand indicates a decline of only 2 species. The low drop in Red Data bird species could be due to a large conservation area, the Rietvlei Nature Reserve, to the east of the study site where suitable habitat can be found for most of the Red Data bird species mentioned above.

According to the latest SABAP2 data, eight of the twenty-six Red Data avifaunal species were recorded for the entire 2528CC q.d.g.c. but only six were recorded for the 2550_2810 pentad and thirteen of the nineteen Red Data avifaunal species were recorded for the entire 2528CD q.d.g.c. and 12 were recorded for the 2550_2815 pentad. These records for the 2528CD q.d.g.c. are all mainly from the Rietvlei Nature Reserve east of the study site.

Summary of the Red Data bird species

Table 3 provides a list of the Red Data bird species recorded for the 2528CC and 2528CD q.d.g.c. according to Harrison *et al.* (1997) and an indication of their likelihood of occurrence on the study site based on habitat and food availability.

Table 4: Red Data bird species assessment for the 2528CC and 2528CD q.d.g.c.

| SCIENTIFIC NAME | PRESENCE OF SUITABLE HABITAT AND HABITAT REQUIREMENTS | LIKELIHOOD OF OCCURRENCE ON STUDY SITE |
|--|--|---|
| <p><i>Alcedo semitorquata</i>* (Half-collared Kingfisher) (NT)</p> | <p>None on site: Requires fast-flowing streams, rivers and estuaries, usually with dense marginal vegetation (Maclean, 1993), especially perennial streams and smaller rivers with overhanging riparian vegetation on their banks. Nests in sand/earth banks (Tarboton <i>et al.</i> 1987) and requires riverbanks in which to excavate nest tunnels (Harrison <i>et al.</i> 1997a). Most typically occurs along fast-flowing streams with clear water and well-wooded riparian growth, often near rapids. It most frequently favours broken escarpment terrain and requires at least 1 km up and down stream of undisturbed river and riparian vegetation while breeding. It occurs from sea-level to 2000 m.a.s.l. in southern Africa. Usually perches low down on the banks of rivers and streams, often on exposed roots, as well as exposed rock and low overhanging tree branches.</p> | <p><u>Likely</u> Due to a lack of suitable habitat.</p> |
| <p><i>Tyto capensis</i>* (African Grass-Owl) (VU)</p> | <p>None on site: Occurs predominately in rank grass, typically but not always at fairly high altitudes. Breeds mainly in permanent and seasonal vleis, which it vacates while hunting or during post-breeding although it will sometimes breed in any area of long grass, sedges or even weeds (Van Rooyen, pers comm.) and not necessarily associated with wetlands (Tarboton <i>et al.</i> 1987) although this is more the exception than the rule. Foraging mainly confined to tall grassland next to their wetland vegetation and rarely hunts in short grassland, wetlands or croplands nearby (Barnes, 2000). Mainly restricted to wet areas (marshes and vleis) where tall dense grass and/or sedges occur. Prefers permanent or seasonal vleis and vacates the</p> | <p><u>Highly unlikely</u> No suitable breeding, roosting and foraging habitat were identified on and surrounding the study site</p> |

| SCIENTIFIC NAME | PRESENCE OF SUITABLE HABITAT AND HABITAT REQUIREMENTS | LIKELIHOOD OF OCCURRENCE ON STUDY SITE |
|---|--|---|
| | latter when these dried up or are burnt. Roosts and breeds in vleis but often hunt elsewhere e.g. old lands and disturbed grassland although this is suboptimal habitat conditions (Tarboton <i>et al.</i> 1987). May rarely occur in sparse <i>Acacia</i> woodland where patches of dense grass cover are present (Harrison <i>et al.</i> 1997a). | |
| <i>Eupodotis caerulescens</i> (Blue Korhaan) (VU) | None on site: Occurs in flat undulating terrain in grassland and Nama Karoo, where rainfall 300-1 000 mm /a. Often on damp ground; sometimes attracted to burnt areas. Favours short vegetation; 61 % of 141 groups where vegetation \leq belly height. At Wakkerstroom, Mpumalanga, abundance positively correlated with altitude, flat topography and burnt grassland. In Nama Karoo, 96% of 88 groups in natural vegetation, 2% in fallow fields, 1% in cultivated grass and pastures and 1% in lucerne pastures. At De Aar, Northern Cape, near western edge of range, only found close to large lucern fields. Remains < 1 km from water (Hockey <i>et al.</i> , 2005). | <u>Highly unlikely</u> Due to unsuitable habitat, high human presence on site and disturbance surrounding the study site. Localised in SE Gauteng were common. Occasional visitor to most other areas in Gauteng. (Marais & Peacock, 2008) |
| <i>Anthropoides paradiseus*</i> (Blue Crane) (VU) | None on site: Midlands and highland grassland, edge of karoo, cultivated land and edges of vleis (Maclean, 1993). Nests in both moist situations in vleis which have short grass cover and in dry sites far from water, usually exposed places such as on hillsides; forages in grassland and cultivated and fallow lands; roosts communally in the shallow water of pans and dams (Tarboton <i>et al.</i> 1987). Short dry grassland, being more abundant and evenly disturbed in the eastern "sour" grassland, where natural grazing of livestock is the predominant land use. Prefers to nest in areas of open grassland (Barnes, 2000) In the fynbos biome it inhabit cereal croplands and cultivated pastures and avoids natural vegetation. By contrast, it is found in natural vegetation in the Karoo and grassland biomes, but it also feeds in crop fields (Harrison <i>et al.</i> 1997a). | <u>Highly unlikely</u> Due to the small extent of the grassland, disturbance surrounding the study site and high human presence on the study site. Localised but common in the south-eastern Gauteng (Marais & Peacock, 2008) |
| <i>Podica senegalensis*</i> (African Finfoot) (VU) | None on site: Occurs mostly along quiet, wooded streams and rivers flanked by thick riparian vegetation and overhanging trees. Also dam verges, especially where there is sufficient overhanging vegetation and reed cover. Avoids both stagnant and very fast-flowing watercourses, with a preference for clear, rather than silted water (Hockey <i>et al.</i> , 2005). | <u>Highly unlikely</u> Due to high human presence on site and disturbance surrounding the study site. Scarce in Gauteng and secretive resident; widespread (Marais & Peacock, 2008) |
| <i>Crex crex</i> (Corn Crane) (VU) | None on site: Rank grassland and savanna, dry grassland bordering marshes and streams, including long grass areas of seasonally flooded grassland and, occasionally, wet clay patches and soft mud fringing ponds. In <i>Acacia</i> savanna, occurs mostly where trees are small and scattered, and grass dense often tussocky, 0.7 – 1.5 m tall (Hockey <i>et al.</i> 2005). | <u>Highly unlikely</u> Due to a lack of suitable habitat. Rare summer visitor. Widespread but elusive (Marais & Peacock, 2008). |

| SCIENTIFIC NAME | PRESENCE OF SUITABLE HABITAT AND HABITAT REQUIREMENTS | LIKELIHOOD OF OCCURRENCE ON STUDY SITE |
|---|---|--|
| <i>Rostratula benghalensis</i> (Greater Painted-snipe) (NT) | None on site: Dams, pans and marshy river flood plains. Favours waterside habitat with substantial cover and receding water levels with exposed mud among vegetation, departing when water recedes beyond the fringes of vegetation. Rare in seasonally flooded grassland and palm savanna (Hockey <i>et al.</i> 2005). | <u>Highly unlikely</u> Due to a lack of suitable habitat Uncommon visitor and resident (Marais & Peacock, 2008) |
| <i>Glareola nordmanni</i> (Black-winged Pratincole) (NT) | None on site: A non-breeding overland migrant to southern Africa. In southern Africa winter quarters, prefers open grassland, edges of pans and cultivated fields, but most common in seasonally wet grasslands and pan systems. Attracted to damp ground after rains, also to agricultural activities, including mowing and ploughing, and to newly flooded grassland (Hockey <i>et al.</i> 2005). | <u>Highly unlikely</u> Might only pass through the area on rare occasions. Erratic summer migrant sometimes in large flocks (Marais & Peacock, 2008) |
| <i>Sterna caspia</i> (Caspian Tern) (NT) | None on site: Occurs along coast, mostly in sheltered bays and estuaries. Inland, at large water bodies, both natural and man-made, with preference for saline pans and large impoundments. Coastal breeding habitat primarily offshore islands, but with increasing use of sandy beaches and islands in saltworks, where protection is offered. Inland, breeds on small, low islets in pans and dams (Hockey <i>et al.</i> 2005). | <u>Highly unlikely</u> Due to a lack of suitable foraging and breeding habitat. Non-breeding winter visitor to large water bodies in Gauteng (Marais & Peacock, 2008) |
| <i>Gyps coprotheres</i> * (Cape Vulture) (VU) | They mostly occur in mountainous country, or open county with inselbergs and escarpments; less commonly as visitors to savannah or desert (Macleane, 1993). Forage over open grassland, woodland and agricultural areas; usually roosts on cliffs, but will also roost on trees and pylons (Barnes, 2000). It is reliant on tall cliffs for breeding but it wanders widely away from these when foraging. It occurs and breeds from sea level to 3 100 m.a.s.l. Current distribution is closely associated with subsistence communal grazing areas characterised by high stock losses and low use of poisons and, to a lesser extent, with protected areas (Harrison <i>et al.</i> 1997a), but their presence is ultimately dependent on the availability of food. | <u>Highly unlikely</u> Due to a lack of suitable foraging and breeding habitat. Breeds in Magaliesberg; uncommon wanderer elsewhere; mostly SW & NW Gauteng (Marais & Peacock, 2008) |
| <i>Circus ranivorus</i> * (African Marsh-Harrier) (VU) | None on site: Almost exclusively inland and coastal wetlands (Hockey <i>et al.</i> 2005). Wetland and surrounding grasslands. Most highveld wetlands > 100 ha support a breeding pair (Tarboton & Allan 1984). Nests in extensive reed beds often high above water. Forages over reeds, lake margins, floodplains and occasionally even woodland. Almost entirely absent from areas below 300 mm of rainfall (Harrison <i>et al.</i> , 1997a). Marsh, vlei, grassland (usually near water); may hunt over grassland, cultivated lands and open savanna (Macleane, 1993). Dependant on wetlands, particularly permanent wetlands for breeding, roosting and feeding. May utilise small wetlands 1-2 ha in extent for foraging, but larger wetlands are required for breeding (Barnes, 2000). | <u>Highly unlikely</u> There are no suitable foraging, breeding or roosting habitat for this species on the study site. Declining resident of large vleis, occurs mainly in south-eastern Gauteng (Marais & Peacock, 2008) |

| SCIENTIFIC NAME | PRESENCE OF SUITABLE HABITAT AND HABITAT REQUIREMENTS | LIKELIHOOD OF OCCURRENCE ON STUDY SITE |
|---|--|---|
| <i>Aquila rapax</i> (Tawney Eagle) (VU) | None on site: Occurs in lightly wooded savanna; absent from dense forests and highlands. Able to colonise Nama Karoo and treeless grasslands by breeding on pylons and alien trees (Hockey <i>et al.</i> 2005). | <u>Highly unlikely</u> There are no suitable foraging, breeding or roosting habitat for this species on the study site. Uncommon. NW & NE Gauteng (Marais & Peacock, 2008) |
| <i>Aquila ayresii</i> (Ayres's Hawk-Eagle) (NT) | None on site: Non-breeding summer visitor to South Africa, favouring dense woodland and forest edge, often in hilly country. Regular in larger northern cities and towns (Johannesburg, Pretoria, Mokopane/Pietersburg), where it often roosts in <i>Eucalyptus</i> stands or other tall trees within its prime distribution range (Hockey <i>et al.</i> 2005). | <u>Highly unlikely</u> There is no suitable habitat for this species on the study site. Rare in Gauteng (Marais & Peacock, 2008) |
| <i>Polemaetus bellicosus</i> * (Martial Eagle) (VU) | None on site: Tolerates a wide range of vegetation types, being found in open grassland, scrub, Karoo, agricultural lands and woodland. It relies on large trees (or electricity pylons) to provide nest sites (Barnes, 2000) as well as windmills and even cliffs in treeless areas. It occurs mainly in flat country and is rarer in mountains, and it also avoids extreme desert, and densely wooded and forested areas (Harrison <i>et al.</i> 1997a & Barnes, 2000). | <u>Highly unlikely</u> Due to a lack of suitable habitat and disturbance caused by the large scale development surrounding the study site. Uncommon local resident (Marais & Peacock, 2008) |
| <i>Sagittarius serpentarius</i> * (Secretarybird) (NT) | None on site: Open grassland with scattered trees, shrubland, open <i>Acacia</i> and <i>Combretum</i> savanna (Hockey <i>et al.</i> 2005). Restricted to large conservation areas in the region. Avoids densely wooded areas, rocky hills and mountainous areas (Hockey <i>et al.</i> 2005 & Barnes, 2000). Requires small to medium-sized trees with a flat crown for nesting, and often roosts in similar locations. Nesting density only about 150 km ² /pair (n = 4, Kemp, 1995). | <u>Highly unlikely</u> Due to the small extent of the study site and the disturbance surrounding it. Uncommon in open areas within Gauteng (Marais & Peacock, 2008) |
| <i>Falco naumanni</i> * (Lesser Kestrel) (VU) | None on site: Non-breeding Palaearctic migrant. Forages preferentially in pristine open grassland but also hunts in converted grassland such as small scale pastures provided the conversion is not as total as in plantation forestry or in areas of consolidated agricultural monoculture (Barnes, 2000; Hockey <i>et al.</i> 2005) such as maize, sorghum, peanuts, wheat, beans and other crops (Tarboton & Allan 1984) where they hunt for large insects and small rodents, but avoid wooded areas except on migration. They roost communally in tall trees, mainly <i>Eucalyptus</i> , in urban areas (Barnes, 2000), often in towns or villages, but also in farm lands (pers. obs). Favour a warm, dry, open or lightly wooded environment, and are concentrated in the grassy Karoo, western fringes of the grassland biome and southeast Kalahari. Generally avoids foraging in transformed habitats but occurs in some agricultural areas, including croplands, in fynbos and | <u>Unlikely</u> Only on rare occasions Localised summer migrant (Marais & Peacock, 2008) |

| SCIENTIFIC NAME | PRESENCE OF SUITABLE HABITAT AND HABITAT REQUIREMENTS | LIKELIHOOD OF OCCURRENCE ON STUDY SITE |
|--|--|--|
| | renosterveld of the Western Cape (Hockey <i>et al.</i> 2005). Large numbers congregate in sweet and mixed grasslands of the highveld regions. | |
| <i>Falco biarmicus</i> * (Lanner Falcon) (NT) | None on site: Most frequent in open grassland, open or cleared woodland, and agricultural areas. Breeding pairs generally favour habitats where cliffs are available as nest and roost sites, but will use alternative sites such as trees, electricity pylons and building ledges if cliffs are absent (Hockey <i>et al.</i> 2005). Mountains or open country, from semi desert to woodland and agricultural land, also cities (Maclean, 1993), even on forest-grassland ecotones. Generally a cliff nesting species and its wider distribution is closely associated with mountains with suitable cliffs. Able to breed on lower rock faces than Peregrine Falcon <i>Falco peregrinus</i> and also utilises the disused nests of other species, such as crows, other raptors and storks, on cliffs, in trees and on power pylons, and also quarry walls (Tarboton <i>et al.</i> 1987). Generally prefers open habitats e.g. alpine grassland and the Kalahari, but exploits a wide range of habitats – grassland, open savanna, agricultural lands, suburban and urban areas, rural settlements – in both flat and hilly or mountainous country. Also breeds in wooded and forested areas where cliffs occur (Harrison <i>et al.</i> 1997a). | <u>Highly unlikely</u> Due to a lack of suitable breeding habitat. Uncommon resident in open areas in Gauteng (Marais & Peacock, 2008) |
| <i>Falco peregrinus</i> (Peregrine Falcon) (NT) | None on site: Resident <i>F. p. minor</i> mostly restricted to mountainous riparian or coastal habitats, where high cliffs provides breeding and roosting sites. Breeding pairs prefer habitats that favour specialised, high speed, aerial hunting, e.g. high cliffs overhanging vegetation with raised and/or discontinuous canopy (eg forest, fynbos, woodland), or expanses of open water. Also uses quarries and dam walls, and frequents city centres, e.g. Cape Town, where tall buildings substitute for rock faces. Migrant <i>F. p. calidus</i> in more open country, often coastal, even roosting on ground on almost unvegetated salt flats. | <u>Highly unlikely</u> Due to a lack of suitable breeding habitat. Could move through the area or rare occasions. Uncommon resident and summer migrant in Gauteng (Marais & Peacock, 2008) |
| <i>Phoenicopterus ruber</i> * (Greater Flamingo) (NT) | None on site: Breeds at recently flooded, large, eutrophic wetlands (favoured foraging habitat), shallow salt pans; at other times, at coastal mudflats, inland dams, sewage treatments works, small ephemeral pans and river mouths (Hockey <i>et al.</i> 2005). Usually breeds colonially on mudflats in large pans (Harrison <i>et al.</i> 1997a). Shallow pans, especially saline pans when they have water; also occasionally on other bodies of shallow water such as dams and vleis (Tarboton <i>et al.</i> 1987). Large bodies of shallow water, both inland and coastal; prefers saline and brackish water (Maclean 1993). Occasionally forages along sandy coasts. | <u>Highly unlikely</u> Due to a lack of suitable foraging and breeding habitat. Mainly restricted to the south-eastern Gauteng (Marais & Peacock, 2008) |
| <i>Mycteria ibis</i> (Yellow-billed Stork) (NT) | None on site: Utilises diverse wetlands and permanent and seasonal habitats, including alkaline and freshwater lakes, river, dams, pans, flood plains, large marshes, swamps, estuaries, margins of lakes or rivers, flooded grassland and small pools or streams where there are areas of shallow water free of emergent vegetation (Tarboton <i>et al.</i> , 1987); less | <u>Highly unlikely</u> Due to a lack of suitable habitat Common at large wetlands within Gauteng; erratic elsewhere (Marais & |

| SCIENTIFIC NAME | PRESENCE OF SUITABLE HABITAT AND HABITAT REQUIREMENTS | LIKELIHOOD OF OCCURRENCE ON STUDY SITE |
|--|---|---|
| | often marine mudflats and estuaries (Hockey <i>et al.</i> , 2005). Nests colonially on large trees adjacent to productive wetlands, but only locally and erratically during ideal conditions. | Peacock, 2008) |
| <i>Ciconia nigra</i> * (Black Stork) (NT) | None on site: Dams, pans, flood plains, shallows of rivers, pools in dry riverbeds, estuaries and sometimes on marshland and flooded grassland; uncommon at seasonal pans lacking fish. Associated with mountainous regions (Hockey <i>et al.</i> , 2005) where they nest (Maclean, 1993) on cliffs (Harrison <i>et al.</i> 1997a). Feeds in shallow water, but occasionally on dry land, in streams and rivers, marshes, floodplains, coastal estuaries and large and small dams; it is typically seen at pools in large rivers. | <u>Highly unlikely</u> Due to a lack of suitable breeding and foraging habitat |
| <i>Mirafra cheniana</i> (Melodious Lark) (NT) | None on site: Occurs in grassland dominated by <i>Themeda triandra</i> grass in South Africa. Occasionally in planted pastures of <i>Eragrostis curvula</i> and <i>E. tef</i> . Avoids wet lowlands, favouring fairly short grassland (< 0.5 m), with open spaces between tussocks, at 550 – 1 750 m.a.s.l. with annual rainfall of between 400 – 800 mm p/a (Hockey <i>et al.</i> , 2005). | <u>Unlikely</u> Due to a lack of suitable habitat Localised resident in Gauteng (Marais & Peacock, 2008) where suitable habitat occur |

*Priority Red Data bird species according to GDAE.

6. FINDINGS AND POTENTIAL IMPLICATIONS

6.1 Red Data avifaunal species confirmed from the study site including the 500m extended study area for which suitable foraging, breeding and roosting habitat was confirmed:

None

6.2 Red Data avifaunal species confirmed within the 500m extended study site for which suitable foraging, breeding and roosting habitat was confirmed:

None

6.4 Red Data avifaunal species for which suitable breeding, foraging and/or roosting habitat was confirmed from the study site and within the 500m extended study site:

Lesser Kestrel (*Falco naumanni*):

Criteria for IUCN threatened category: A1a,c,e. Status: Vulnerable.

Habitat: Lesser Kestrels frequents open grassland areas of the Highveld. The area on which the development is to take place might favour this species but falls outside its core distribution range of this species within southern Africa.

Threat: The Lesser Kestrel is sensitive to dense human populations and disturbance and will more than likely not use the area despite the presence of suitable hunting habitat found on site. Future development of adjacent undisturbed grassland will result in fragmentation of its preferred open grassland habitat, which is one of the main threats to

this species (Barnes 2000) as well as the human disturbance that comes with development. The primary threat to this species is however based in the Palaearctic breeding grounds and will most likely find suitable habitat for foraging purposes elsewhere within its southern African core distribution range.

On site conclusion: Lesser Kestrel might on rare occasion move through the area during migration and might use the area for hunting purposes.

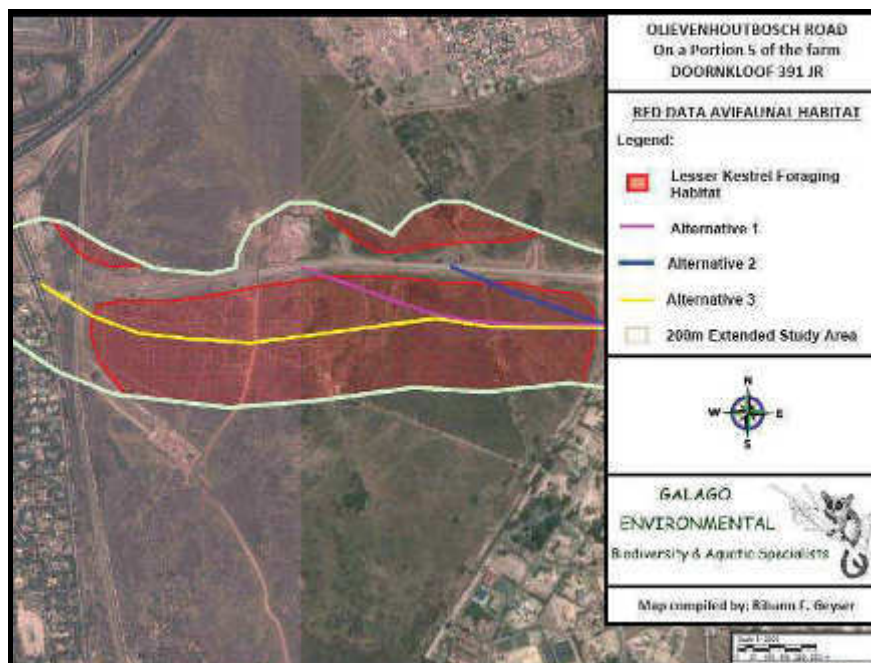


Figure 9: Habitat map for the Lesser Kestrels

7. LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The Galago Environmental team has appropriate training and registration, as well as extensive practical experience and access to wide-ranging data bases to consider the derived species lists with high limits of accuracy. In this instance the biodiversity of all Alignments has to a greater or lesser extent been jeopardized, which renders the need for field surveys unnecessary. In instances where uncertainty exists regarding the presence of a species it is listed as a potential occupant, which renders the suggested mitigation measures and conclusions more robust.

Even though every care is taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time and budget. Discussions and proposed mitigations are to some extent made on reasonable and informed assumptions built on *bone fide* information sources, as well as deductive reasoning. Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage. Galago Environmental can thus not accept responsibility for conclusions and mitigation measures made in good faith based on own databases or on the information provided at the time of the directive. This report should therefore be viewed and acted upon with these limitations in mind.

The general assessment of species rests mainly on the 1987 atlas for birds of the then-Transvaal (Tarboton *et al.* 1987) and comparison with the 1997 SABAP atlas (Harrison

et al. 1997), so any limitations in either of those studies will by implication also affect this survey and conclusions.

8. RECOMMENDED MITIGATION MEASURES

The following mitigation measures are proposed by the specialist:

- The Alternative 2 route is recommended since this will have the least impact on the natural vegetation and the avifaunal species recorded on or that are likely to occur on the study site.
- Where possible, **work should be restricted to one area at a time**, as this will give the smaller birds, mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.
- **No vehicles should be allowed to move in or across the wet areas or drainage lines and possibly get stuck.** This leaves visible scars and destroys habitat, and it is important to conserve areas where there are tall reeds or grass, or areas where there is short grass and mud.
- The contractor must ensure that no fauna is disturbed, trapped, hunted or killed during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliance.
- During the construction phase, noise must be kept to a minimum to reduce the impact of the development on the fauna residing on the site.
- Alien and invasive plants must be removed.

9. CONCLUSIONS

Although the natural open grassland area offers habitat for Red Data avifaunal species (Lesser Kestrels), they are only likely to move through the area on rare occasions. This is attributed to disturbance of the area on and surrounding the study site due to human presence and human related activities and also development surrounding the study site and the fragmented state of the natural grassland. This alternative is recommended since this will have a minimum impact on the natural vegetation on the study site and the avifaunal species recorded on or that are likely to occur on the study site.

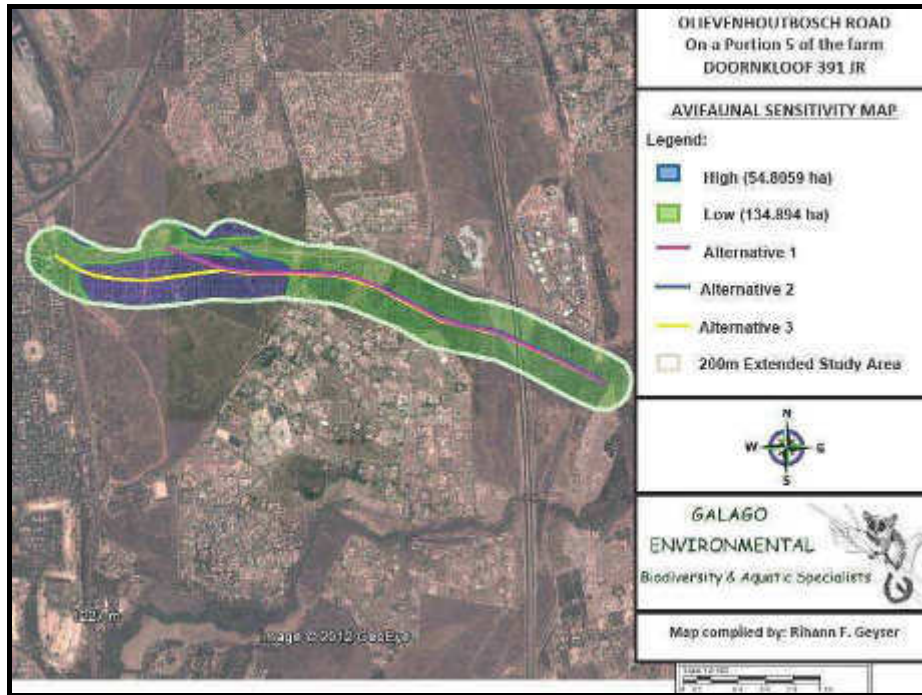


Figure 10: Avifaunal sensitivity map

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GALAGO ENVIRONMENTAL



Biodiversity & Aquatic Specialists

638 Turf Street

Wingate Park, 0181

Tel: 012-345 4891

Fax: 086 675 6136

Email: Vanessam@lantic.net

Herpetofauna Habitat Assessment

of

**A section of the proposed Olievenhoutbosch
Road from Main Road to K54 on Portion 5 of the
farm Doornkloof 391-JR**

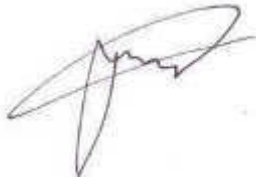
May 2012

Report author: Mr. J.C.P van Wyk (Pri. Sci. Nat: M.Sc)

DECLARATION OF INDEPENDENCE:

I, Jacobus, Casparus Petrus van Wyk (6808045041084) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of zoology
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed Olievenhoutbosch Road from Main Road to K54 described in this report have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to the Galago Environmental CC and its client as well as the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations 2006
- Our intellectual property in this report will only be transferred to the client (the party/ company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, we recognise that written consent of the client will be required for release of any part of this report to third parties.



J.C.P. van Wyk

TABLE OF CONTENTS

| | | |
|------|---|----|
| 1. | INTRODUCTION | 4 |
| 2. | SCOPE AND OBJECTIVES OF THE STUDY | 4 |
| 3. | STUDY AREA..... | 4 |
| 4. | METHOD | 5 |
| 5. | RESULTS..... | 7 |
| 5.1. | HERPETOFAUNA HABITAT ASSESSMENT | 7 |
| 5.2. | OBSERVED AND EXPECTED HERPETOFAUNA SPECIES RICHNESS | 10 |
| 5.3 | RED DATA LISTED REPTILES..... | 10 |
| 5.4 | RED DATA LISTED AMPHIBIANS..... | 10 |
| 7. | FINDINGS AND POTENTIAL IMPLICATIONS | 13 |
| 8. | LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE | 14 |
| 9. | RECOMMENDED MITIGATION MEASURES | 15 |
| 10. | CONCLUSION | 16 |
| 11. | LITERATURE SOURCES..... | 16 |

FIGURES

| | | |
|-----------|--|----|
| FIGURE 1: | LOCALITY MAP OF THE STUDY AREA | 5 |
| FIGURE 2: | THE COMBINED THREE ALTERNATIVE ROUTES END/ORIGINATE ON THE M57 ROAD. 7 | |
| FIGURE 3: | SOME OF THE RUPICULOUS HABITAT IN THE FOREGROUND. | 8 |
| FIGURE 4: | THE COMBINED ROUTE IN AN UNDEVELOPED AREA WEST OF THE R21 | 8 |
| FIGURE 5: | THE TEMPORARY MAN-MADE DAM..... | 9 |
| FIGURE 6: | THE AREA NORTH-WEST OF NELLMAPIUS ROAD WHERE THE THREE ROUTES SPLIT.9 | |
| FIGURE 7: | HERPETOFAUNAL SENSITIVITY MAP..... | 14 |
| FIGURE 8: | HERPETOLOGICAL SENSITIVITY MAP..... | 16 |

TABLES:

| | | |
|----------|---|----|
| TABLE 1: | REPTILE AND AMPHIBIAN DIVERSITY. | 11 |
| TABLE 2: | REPTILE AND AMPHIBIAN SPECIES POSITIVELY CONFIRMED ON THE STUDY SITE | 13 |

1. INTRODUCTION

Galago Environmental CC. was appointed to undertake a Herpetofauna habitat Assessment of the proposed Olievenhoutbosch Road from Main Road to K54 on Portion 5 of the farm Doornkloof 391-JR, scheduled for construction.

This report focuses on the reigning status of threatened and sensitive reptiles and amphibians (herpetofauna) likely to occur on the proposed development site. Special attention was paid to the qualitative and quantitative habitat conditions for Red Data species deemed present on the site, and mitigation measures to ameliorate the effect of the development that is suggested. The secondary objective of the investigation was to gauge which herpetofauna might still reside on the site and compile a complete list of herpetofauna diversity of the study area.

This assignment is in accordance with the 2010 EIA Regulations (No. R. 543-546, Department of Environmental Affairs and Tourism, 18 June 2010) emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

2. SCOPE AND OBJECTIVES OF THE STUDY

This report:

- Is a survey of reptile and amphibian habitats, with comments on preferred habitats;
- Comments on ecologically sensitive areas;
- Evaluates the conservation importance and significance of the site with special emphasis on the current status of resident threatened species;
- Offers recommendations to reduce or minimise impacts, should the proposed development be approved

3. STUDY AREA

This study routes lies in the quarter degree grid cells 2528 CC & 2528CD, mostly south of the M31 Road (Nellmapius Drive), in Centurion, Gauteng Province. The study site crosses the M57 on the eastern border of the study site, the R21 road and the M31 Road towards the western side of the study site. The Cornwall Hill Estate is situated near the southern border of part of the study site. Presently the three alternative routes traverse the mostly undeveloped area west of the M31 Road.

A manmade dam was constructed just to the west of the R21 off-ramp between the new proposed road and the M31. This manmade dam forms an artificial wetland. Between this manmade dam and the Sesmyl Spruit there is an overflow of water during the rainy season. The new proposed road crosses this overflow area.

During the site visit it appeared that ecological damage has been caused by regular fires, casual damage and land abuse. However, the dense and high stand of grass provides ample refuge and nourishment for small herpetofauna. The topography of the

terrain is undulating grassy plains typical of the Highveld grassland biome. For most of the routes the substrate consists of reddish soil imbedded with gravel and even rocks in some places. West of the R21 there are a few very small exposed natural ridges.

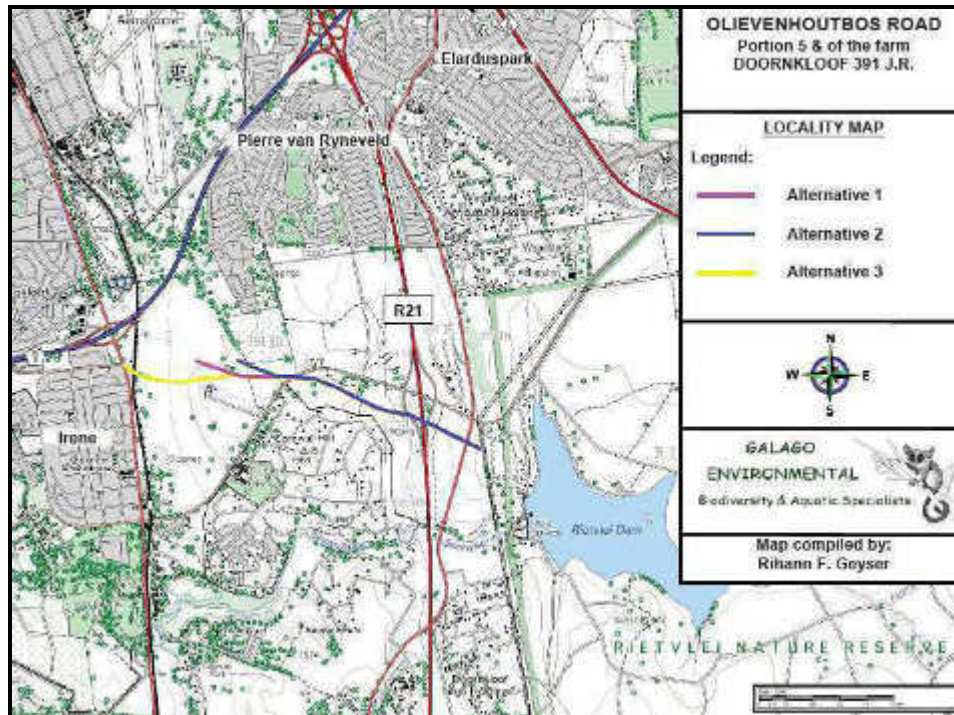


Figure 1: Locality map of the study area

4. METHOD

A site visit was conducted on 9 April 2012. During this visit the observed and derived presence of reptiles and amphibians associated with the recognised habitat types of the study site were recorded. This was done with due regard to the well-recorded global distributions of Southern African herpetofauna, coupled with the qualitative and quantitative nature of recognised habitats.

The 500 metres of adjoining properties were scanned for important fauna habitats.

4.1 Field Surveys

During the site visits, reptiles and amphibians were identified by visual sightings through random transect walks. Amphibian diversity was also established by means of acoustic identification. No trapping was conducted, as the terms of reference did not require such intensive work.

4.2 Desktop Surveys

As the majority of reptiles and amphibians are secretive, nocturnal and/or poikilothermic or seasonal, distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of these species based on authoritative tomes,

scientific literature, field guides, atlases and databases. This can be done irrespective of season.

The probability of the occurrence of **reptile and amphibian** species was based on their respective geographical distributional ranges and the suitability of on-site habitats. In other words, *high* probability would be applicable to a species with a distributional range overlying the study site as well as the presence of prime habitat occurring on the study site. Another consideration for inclusion in this category is the inclination of a species to be common to the area, i.e. normally occurring at high population densities.

Medium probability pertains to a herpetofaunal species with its distributional range peripherally overlapping the study site, or required habitat on the site being sub-optimal. The size of the site as it relates to its likelihood to sustain a viable breeding population, as well as its geographical isolation is taken into consideration. Species categorised as *medium* normally do not occur at high population numbers, but cannot be deemed as rare.

A *low* probability of occurrence would imply that the species' distributional range is peripheral to the study site and habitat is sub-optimal. Furthermore, some reptiles and amphibians categorised as *low* are generally deemed to be rare.

Based on the impressions gathered during the site visit, as well as publications, such as FitzSimons' Snakes of Southern Africa (Broadley, 1990), Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998), A Guide to the Reptiles of Southern Africa (Alexander and Marais, 2007), Amphibians of Central and Southern Africa (Channing 2001), Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (Minter, *et al*, 2004) and A Complete Guide to the Frogs of Southern Africa (Du Preez & Carruthers, 2009), a list of species which may occur on the site was compiled. The latest taxonomic nomenclature was used. The vegetation type was defined according to the standard handbook by Mucina and Rutherford (eds) (2006).

4.3 Specific Requirements

During the visit the site was surveyed and assessed for the potential occurrence of Red Data species such as:

- Giant Bullfrogs (*Pyxicephalus adspersus*);
- The Striped Harlequin Snake (*Homoroselaps dorsalis*); and
- The Southern African Python (*Python natalensis*).

5. RESULTS

The three alternative routes fall within the Carleton Dolomite Grassland & Rand Highveld Grassland vegetation units as defined by Mucina and Rutherford (2006).

5.1. Herpetofauna Habitat Assessment

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the context of global distribution ranges.

From a herpetological habitat perspective, it was established that one of the four major habitats is naturally present on the study site, namely terrestrial. The three other habitat types are present on a very small scale on parts of the study site.

Terrestrial habitat dominates along the combined and individual alternative routes. Most of the grassland has been transformed and is thus ecologically disturbed. The grassland has been severely altered, mostly by annual fires and secondarily by previous agricultural activities. The natural vegetation of the study site is currently not utilised as grazing and during the end of summer at the time of the site visit the basal cover was lush and would provide adequate cover for small terrestrial herpetofauna.



Figure 2: Near where the combined three alternative routes end/originate on the M57 Road.

Note the transformed vegetation in the foreground and exotic trees in the distance.

Termitaria, especially dead termitaria, which normally provide ideal retreats for small reptiles and amphibians, are present in reasonable numbers. There are also small stands of indigenous trees. A few dead logs of mainly exotic tree species occur on the study site, which provide habitat for small herpetofauna. Exotic trees predominate, whereas indigenous trees are solitary and geographically too isolated to allow for the

occurrence of arboreal reptiles. There are a few small rocky outcrops on the study site, west of the R21.



Figure 3: Some of the rupicolous habitat in the foreground, which the new intended Road will cross. Note the R21 in the background.

On the north-western side of the study site, near the M31, there is one very large and quite a few small areas covered in building rubble. Building rubble provides excellent habitat for rupicolous reptiles. Part of the study site was used as a dumping ground in the past.



Figure 4: The combined route in an undeveloped area west of the R21 and south of Nellmapius road. Note the wattle trees and rubble in the foreground.

A manmade dam wall was constructed just to the west of the R21 off-ramp. This manmade dam forms an artificial wetland. Between this manmade dam and the Sesmyl Spruit there is an overflow of water during the rainy season, but the few small pools are too shallow and do not contain enough water to make successful breeding possible even for the most explosive breeders of amphibian species. But these temporary water pools and drainage line to the south of the man-made dam and the Sesmyl Spruit can support

some moisture-reliant herpetofauna during the rainy season and is an important dispersal corridor between these two water bodies.



Figure 5: The temporary man-made dam which is a potential breeding place for giant bullfrogs and other temporary water breeding amphibians.

The few natural areas of the 500 metres of adjoining properties mirror the ecological conditions described for the study site.



Figure 6: The area north-west of Nellmapius Road where the three routes split.

Formidable barriers such as the R21 Road and M57 to the east, the M31 Road and the solid fence along part of the south, make migration almost impossible. Presently, connectivity as a whole is fair and the only real opportunities for migration exist between the man-made dam and the Sesmyl Spruit and areas to the west of the study site. In the foreseeable future, the general area will be subjected to fragmentation caused by more roads and urban development, which will curb connectivity even more.

It is clear that migration is only suitable for mostly common herpetofauna with the capacity to capitalize on fluctuating environmental conditions of suboptimal quality.

5.2. Observed and Expected Herpetofauna Species Richness

Of the 43 reptile species which may occur on the study site (Table 1), one was confirmed during the site visit (Table 2) and of the possible 15 amphibian species which may occur on the study site (Table 1); none was confirmed during the site visit (Table 2).

The 58 herpetofaunal species are recorded as potential occupants along the various routes and within the 500 metres zones which include the rupicolous habitat of the koppie near Alternative 3, the few small rocky outcrops on the study site west of the R21 and the drainage line to the south of the man-made dam. Most of these herpetofaunal species are robust generalists with the ability to capitalize on disturbed environments. Many of these species are often found in suburban gardens.

The American red-eared terrapin (*Trachemys scripta elegans*) is the only feral reptile or amphibian that has been known to occur in South Africa (De Moor and Bruton, 1988), but with only a few populations and no open water on the study site, it is not expected to occur on this particular site.

The species assemblage is typical of what can be expected in extensive natural areas with sufficient habitat to sustain populations. Most of the species of the resident diversity (Table 1) are fairly common and widespread (viz. brown house snake, mole snake, common egg eater, rinkhals, eastern striped skink, guttural toad, raucous toad and red toad, common river frog and Boettger's caco).

The relatively high species richness is due to the size of the study site, habitat diversity and the fairly large manmade temporary pond/wetland with its drainage line.

5.3 Red Data Listed Reptiles

The study site falls outside the natural range of the Southern African python.

The striped harlequin snake has not been recorded on this quarter degree cell (Ditsong Museum of Natural History or TVL Museum Records), although a few moribund termitaria, where this species are most likely to be found, are present on the study site. It is very difficult to confirm whether this cryptic snake is present on the study site, but it is quite unlikely.

5.4 Red Data Listed Amphibians

The findings concerning giant bullfrog habitat are based on the presence of a potential breeding site (25°52'06"S; 28°15'13"E) on the north-eastern side of the study site near the R21 Road. A temporary manmade dam with its surrounding wetland has been created by run-off water where the R21 and M31 roads meet.

This temporary dam is ideal breeding area for giant bullfrogs. Bullfrogs prefer these temporary pans in order to avoid predation from fish and for tadpoles to swim in schools and stay in the warm, shallow water during the day for rapid development (Van Wyk *et al.*, 1992).

Although some of the terrain around this wetland includes rocky outcrops, other areas appear to be fairly suitable as a dispersal area, which combines feeding and aestivation. It is essential that the soil must be suitable for burrowing on a daily basis during the short activity period at the beginning of the rainy season and for deeper retreats during the resting periods.

This potential breeding site on the study site currently has three barriers, which might hinder giant bullfrog movement. Very close to the eastern side there is the very busy R21 Road, which would result in many road mortalities during the breeding season. Just to the north of the study site, there is the M31 Road and to the west is the solid wall of the Cornwall Hill Estate, which would obstruct the movement of giant bullfrogs. There is a good chance that bullfrogs may occur on the study site as observed by this specialist near the M57 (Goede Hoop Avenue). People have also donated bullfrogs from the Pierre van Ryneveld suburb, which is less than two kilometres north of the potential breeding site.

It is important to note that in the latest literature (Measey (ed.) 2011 and Carruthers & Du Preez, 2011); the giant bullfrog's status has changed officially from Near Threatened (Minter *et al*, 2004) to Least Concern in South Africa.

Table 1: Reptile and Amphibian diversity.

The species observed on or deduced to occupy the site. Systematic arrangement and nomenclature according to Branch (1998), Alexander and Marais (2007), Minter, *et.al* (2004) & Du Preez and Carruthers (2009).

| | SCIENTIFIC NAME | ENGLISH NAME |
|---|----------------------------------|---|
| | CLASS: REPTILIA | REPTILES |
| | Order: TESTUDINES | TORTOISES & TERRAPINS |
| | Family: Pelomedusidae | Side-necked Terrapins |
| * | <i>Pelomedusa subrufa</i> | Marsh or Helmeted Terrapin |
| | Order: Squamata | SCALE-BEARING REPTILES |
| | Suborder: Lacertilia | LIZARDS |
| | Family: Gekkonidae | Geckos |
| √ | <i>Lygodactylus capensis</i> | Cape Dwarf Gecko |
| √ | <i>Pachydactylus affinis</i> | Transvaal Thick-toed or Transvaal Gecko |
| * | <i>Pachydactylus capensis</i> | Cape Thick-toed of Cape Gecko |
| | Family: Agamidae | Agamas |
| * | <i>Agama aculeate</i> | Ground Agama |
| ? | <i>Agama atra</i> | Southern Rock Agama |
| | Family: Scincidae | Skinks |
| √ | <i>Trachylepis capensis</i> | Cape Skink |
| √ | <i>Trachylepis punctatissima</i> | Montane Speckled Skink |
| √ | <i>Trachylepis varia</i> | Variable Skink |
| ? | <i>Panaspis wahlbergii</i> | Wahlberg's Snake-eyed Skink |
| | Family: Lacertidae | Old World Lizards or Lacertids |
| ? | <i>Pedioplanis lineocellata</i> | Spotted Sand Lizard |
| ? | <i>Ichnotropis squamulosa</i> | Common Rough-scaled Lizard |
| | Family: Gerrhosauridae | Plated Lizards |
| ? | <i>Gerhosaurus flavigularis</i> | Yellow-throated Plated lizard |
| | Family: Cordyidae | |
| ? | <i>Chamaesaura aenea</i> | Coppery Grass Lizard |

| | SCIENTIFIC NAME | ENGLISH NAME |
|---|----------------------------------|--------------------------------------|
| ? | <i>Cordylus vittifer</i> | Transvaal Girdled Lizard |
| | Family: Varanidae | Monitors |
| ? | <i>Varanus albigularis</i> | Rock Monitor |
| * | <i>Varanus niloticus</i> | Water Monitor |
| | Family: Chamaeleonidae | Chameleons |
| ? | <i>Chamaeleo dilepis</i> | Flap-neck Chameleon |
| | Suborder: SERPENTES | SNAKES |
| | Family: Typhlopidae | Blind Snakes |
| ? | <i>Typhlops bibronii</i> | Bibron's Blind Snake |
| ? | <i>Rhinotyphlops lalandei</i> | Delalande's Beaked Blind Snake |
| | Family: Leptotyphlopidae | Thread Snakes |
| * | <i>Leptotyphlops conjunctus</i> | Cape Thread or Worm Snakes |
| * | <i>Leptotyphlops scutifrons</i> | Peter's Thread or Worm Snake |
| | Family: Atractaspididae | African burrowing Snakes |
| ? | <i>Aparallactus capensis</i> | Cape or Black-headed Centipede Eater |
| | Family: Colubridae | Typical Snakes |
| * | <i>Lycodonomorphus rufulus</i> | Common Brown Water Snake |
| √ | <i>Boaedon capensis</i> | Brown House Snake |
| * | <i>Lamprophis inornatus</i> | Olive House Snake |
| ? | <i>Lamprophis aurora</i> | Aurora House Snake |
| √ | <i>Lycophidion capense</i> | Cape or Common Wolf Snake |
| ? | <i>Duberria lutrix</i> | Common Slug Eater |
| √ | <i>Pseudaspis cana</i> | Mole Snake |
| ? | <i>Prosymna sundevallii</i> | Sundevall's Shovel-snout |
| * | <i>Psammophylax rhombeatus</i> | Spotted Skaapsteker |
| ? | <i>Psammophylax tritaeniatus</i> | Striped Skaapsteker |
| √ | <i>Psammophis brevirostris</i> | Short-snouted Grass or Sand Snake |
| ? | <i>Psammophis mossambicus</i> | Olive Grass Snake |
| √ | <i>Psammophis crucifer</i> | Crossed Whip Snake |
| ? | <i>Philothamnus hoplogaster</i> | Green water snake |
| √ | <i>Dasypeltis scabra</i> | Common or Rhombic Egg Eater |
| * | <i>Crotaphopeltis hotamboeia</i> | Herald Snake |
| | Family: Elapidae | Cobras, Mambas and Others |
| ? | <i>Elapsoidea sundevallii</i> | Sundevall's Garter Snake |
| √ | <i>Hemachatus haemachatus</i> | Rinkhals |
| | Family: Viperidae | Adders |
| √ | <i>Causus rhombeatus</i> | Rhombic Night Adder |
| √ | <i>Bitis arietans</i> | Puff Adder |
| | | |
| | Class: AMPHIBIA | AMPHIBIANS |
| | Order: ANURA | FROGS |
| | Family: Pipidae | Clawed Frogs |
| √ | <i>Xenopus laevis</i> | Common Platanna |
| | Family: Bufonidae | Toads |
| ? | <i>Amietaophrynus garmani</i> | Eastern Olive Toad |
| √ | <i>Amietaophrynus gutturalis</i> | Guttural Toad |
| √ | <i>Amietaophrynus rangeri</i> | Raucous Toad |
| √ | <i>Schismaderma carens</i> | Red Toad |

| | SCIENTIFIC NAME | ENGLISH NAME |
|-----|-----------------------------------|--------------------------------|
| | Family: Hyperoliidae | Reed frogs |
| √ | <i>Kassina senegalesis</i> | Bubbling Kassina |
| ? | <i>Semnodactylus weali</i> | Rattling Frog |
| | Family: Phrynobatrachidae | Puddle Frogs |
| * | <i>Phrynobatrachus natalensis</i> | Snoring Puddle Frog |
| | Family: Pyxicephalidae | |
| √ | <i>Cocosternum boettgeri</i> | Boettger's Caco or Common Caco |
| * | <i>Amietia angolensis</i> | Common River Frog |
| ? | <i>Amietia fuscigula</i> | Cape River Frog |
| NT? | <i>Pyxicephalus adspersus</i> | Giant Bullfrog |
| ? | <i>Strongylopus fasciatus</i> | Stripe Stream Frog |
| √ | <i>Tomopterna cryptotis</i> | Tremolo Sand Frog |
| √ | <i>Tomopterna natalensis</i> | Natal Sand Frog |

√ Definitely there or have a *high* probability of occurring;

* *Medium* probability of occurring based on ecological and distributional parameters;

? *Low* probability of occurring based on ecological and distributional parameters.

Red Data species rankings as defined in Branch, The Conservation Status of South Africa's threatened Reptiles': 89 – 103..In:- G.H.Verdoorn & J. le Roux (editors), 'The State of Southern Africa's Species (2002) and Minter, *et.al*, Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (2004) are indicated in the first column: **CR**= Critically Endangered, **En** = Endangered, **Vu** = Vulnerable, **NT** = Near Threatened, **DD** = Data Deficient. All other species are deemed of **Least Concern**.

Table 2: Reptile and Amphibian species positively confirmed on the study site, observed indicators and habitat.

| SCIENTIFIC NAME | ENGLISH NAME | OBSERVATION INDICATOR | HABITAT |
|----------------------------------|------------------------|-----------------------|-----------------------------|
| <i>Trachylepis punctatissima</i> | Montane Speckled Skink | Sight record | Man-made rupicolous habitat |

The Montane Speckled Skink listed in Table 2 should be very common on the study site and elsewhere in its range.

7. FINDINGS AND POTENTIAL IMPLICATIONS

Generally the proposed new tarred access road will not result in a loss of ecologically sensitive habitat (given application of the mitigation measures suggested below), but it will result in a loss of an important habitat unit with ecosystem function and the loss of critical faunal habitat. For the final section of the road, there are three alternative routes through the undeveloped terrain.

However, maintaining (and even improving) the conservation integrity of the south-flowing seasonal drainage line, which the new road crosses near the R21, is imperative. The drainage line flows into the Sesmyl Spruit. These water sources should be regarded as sensitive (see suggested mitigation measures cited below), as such providing indispensable habitat for Red Listed and sensitive species as well as serving as a dispersal corridor in places. The previously Red-Data-listed giant bullfrog has a chance of occurring on the study site.



Figure 7: Herpetofaunal sensitivity map

An important indirect effect of the proposed development would be the likely impact that the proposed development might have on the surface water runoff and water quality of the catchment area. This could have a negative impact on the herpetofauna but the effects could be ameliorated by the construction of retention ponds, which would retard discharge into the manmade dam and adjacent wetland and improve the water quality of the discharge.

The loss/displacement of some fauna is a foregone conclusion, particularly that of terrestrial species, but considering the small scale of the proposed road construction, it will be minimal in the overall picture of the affected species.

It is recommended that Alternative 2 is selected since it is shorter (and thus more cost-effective) and since it will not affect the isolated koppie.

8. LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The Galago Environmental specialists are amply qualified and experienced to gauge absences or presences of species on a location such as this. The team has access to ample data bases and information resources, and has earlier conducted numerous intensive field surveys allowing the extrapolation of habitat diversity and quality into species occurrences. In this instance an intensive survey will be lucrative for the specialists, but it is deemed an expensive and fruitless experience with no or little chance of altering the opinion presented here.

Even though every care is taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time and budget. To some extent, discussions

and proposed mitigations are made on reasonable and informed assumptions based on *bone fide* information sources, as well as deductive reasoning. Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage. Galago Environmental Fauna and Flora Specialists can therefore not accept responsibility for conclusions and mitigation measures made in good faith based on own databases or on the information provided at the time of the directive. This report should therefore be viewed and acted upon with these limitations in mind.

9. RECOMMENDED MITIGATION MEASURES

The following mitigation measures are proposed by the specialist.

- Should Bullfrogs or any herpetological species be encountered during the construction phase of the proposed development, these should be relocated to natural grassland areas in the vicinity or the Rietvlei Nature Reserve nearby.
- The contractor must ensure that no herpetofaunal species are disturbed, trapped, hunted or killed during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliance.
- Alien and invasive plants must be removed.
- All storm water structures should be designed so as to block amphibian and reptile access to the road surface.
- A comprehensive surface runoff and storm water management plan should be compiled, indicating how all surface runoff generated as a result of the road development (during both the construction and operational phases) will be managed (e.g. artificial wetlands / storm water and flood retention ponds) prior to entering any natural drainage system or wetland and how surface runoff will be retained outside of any demarcated buffer/flood zones and subsequently released to simulate natural hydrological conditions. This plan should form part of the EMP.
- Where the roads traverse the drainage line, an underpass should provide for the movement of aquatic as well as terrestrial species.
- A barrier (either prefabricated concrete wall or galvanized sheeting that extends as a continuous sheet above ground for at least 40cm and below ground for at least 30cm) that will physically block animals from accessing the road surface should be constructed for a distance of 200m on either side of all aquatic and terrestrial underpasses. Holes under barriers should be routinely filled in and areas directly adjacent to the barrier should be kept free of vegetation.

10. CONCLUSION

The proposed development routes are relatively small, but there is a chance that at least one of the three Red Data herpetofaunal species of the Gauteng Province may occur on the site.

The man-made dam/wetland adjacent to the study site is a potential breeding site for the giant bullfrog and there is a good possibility that giant bullfrogs may use the study site as a dispersal area, which combines feeding and aestivation.

If the proposed development should go ahead, an important indirect effect would be the likely impact that the proposed development might have on the surface water runoff and water quality of the catchment area. This could have a negative impact on the herpetofauna. This is especially true for the drainage line which flows into the Sesmyl Spruit. The effects could be ameliorated by the construction of retention ponds, which would retard discharge into the catchment area and improve the water quality of the discharge.



Figure 8: Herpetological sensitivity map

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GALAGO ENVIRONMENTAL



Biodiversity & Aquatic Specialists

638 Turf Street

Wingate Park, 0181

Tel: 012-345 4891

Fax: 086 675 6136

Email: Vanessam@lantic.net

VAT No: 4080227657

Ecological conditions of the ridge

of

**A section of the proposed Olievenhoutbosch Road
from Main Road to K54 on Portion 5 of the farm
Doornkloof 391-JR**

May 2012

Report author: Reinier Terblanche (M.Sc, Pr.Sci.Nat)

Declaration of Independence:

I, Reinier F. Terblanche (670409 5201 084) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of Ecology
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed Olievenhoutbosch Road from Main Road to K54 described in this report
- have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to the Galago Environmental CC and its client as well as the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations, 2006.



Reinier F. Terblanche

CONTENTS PAGE

| | | |
|-----------|--|-----------|
| 1. | INTRODUCTION..... | 4 |
| 1.1 | Objectives of the habitat study | 4 |
| 1.2 | Scope of study | 4 |
| 2. | STUDY AREA..... | 4 |
| 3.1 | Habitat characteristics..... | 5 |
| 3.2 | Vegetation assemblages (communities) | 5 |
| 3.3 | Ecological conditions..... | 6 |
| 4. | RESULTS AND DISCUSSION | 7 |
| 5. | CONCLUSION | 12 |
| 6. | REFERENCES..... | 13 |

FIGURES:

| | |
|---|----|
| FIGURE 1: LOCALITY MAP OF THE STUDY AREA | 5 |
| FIGURE 2: VEGETATION ASSEMBLAGES AT RIDGE IN TERMS OF ECOLOGICAL CONDITIONS.... | 7 |
| FIGURE 3: SENSITIVITY MAP OF THE RIDGES ON SITE | 13 |

TABLES:

| | |
|---|----|
| TABLE 1: LIST OF RIDGE VEGETATION ASSEMBLAGES AT THE SITE | 8 |
| TABLE 2: SUMMARY OF CHARACTERISTIC SPECIES OF MAIN VEGETATION ASSEMBLAGES | 9 |
| TABLE 3: SUMMARY OF ECOLOGICAL CONDITIONS OF MAIN VEGETATION ASSEMBLAGES ... | 10 |

1. INTRODUCTION

A survey of the ecological conditions was required for the ridges along the proposed route for the Olievenhoutbosch Road from Main Road to K54 on Portion 5 of the farm Doornkloof 391-JR, scheduled for construction. The survey focused on ecological conditions of the ridge that should be taken into account in the impact study.

1.1 Objectives of the habitat study

The objectives of the habitat study on ecological conditions are to provide:

- An outline of the habitats that are present;
- An outline of vegetation assemblages (communities) present with an estimate of the dominant species that are present at rocky ridges;
- An estimate of the degradation;
- An outline of compositional aspects of exotic species, indigenous pioneer species and indigenous plant species of higher ecological status based on broad subjective observations and quantitative surveys;
- Estimates of degradation and impacts of disturbances on the vegetation; and
- Functional aspects of ecosystems at the site.

1.2 Scope of study

- A survey consisting of a visit of key elements of habitats on the site and surveys of vegetation composition.
- Integration of literature and field observations to evaluate the ecological conditions on the ridge.

2. STUDY AREA

The study site is situated in the Grassland Biome (Mucina & Rutherford 2006). Grassland Biome is represented by Carletonville Dolomite Grassland and Rand Highveld Grassland vegetation types (Mucina & Rutherford, 2006). The site is part of the summer-rainfall region with dry winters. Frost is frequent in the winter (Mucina & Rutherford, 2006). Mean annual precipitation varies from 540 mm to 730mm a year. The alternatives of the proposed road cross Class 3 rocky ridges at three places with the exception of Alternative 2 that only crosses rocky ridges at two places. An eastern rocky ridge section, a central rocky ridge section and a western rocky ridge section could be distinguished. The eastern rocky ridge section consists of the rocky ridge slope adjacent residential developments between the M57 and the Rietvlei Nature Reserve and crosses all three alternatives. The central rocky ridge section is between Cornwall Hill and Nellmapius Road and crosses all three alternatives as well. The western rocky ridge section consists of a rocky quartzite hill with a reservoir on top and lower dolomitic slopes of the rocky hill. The quartzite hill and lower dolomitic slopes cross alternative 3 whilst lower slopes cross alternative 1.

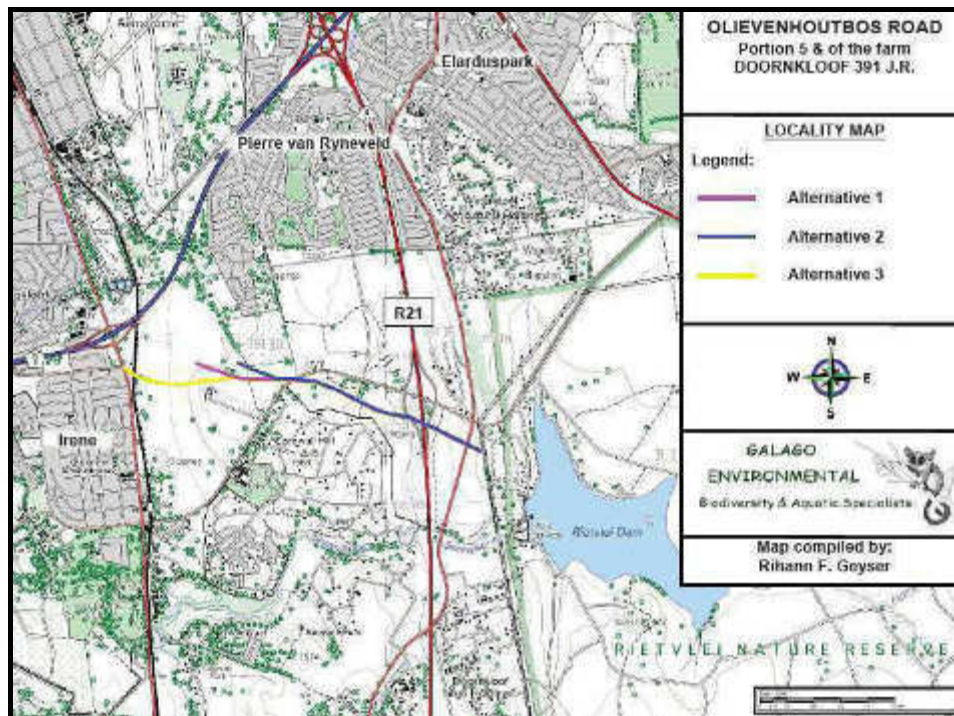


Figure 1: Locality map of the study area

3. METHODS

Surveys were conducted on 1 April 2012.

3.1 Habitat characteristics

The habitat was investigated by noting habitat structure (rockiness, slope, plant structure/physiognomy).

3.2 Vegetation assemblages (communities)

Relatively homogenous vegetation assemblages (communities) were identified based on overall appearance (mainly physiognomy) and composition (conspicuous dominant species). Transects consisting of 30 points each, at each consecutive metre along a 30m steel measuring tape, was applied in apparent representative parts of the relatively homogenous vegetation assemblages to establish dominant plant species in the grassland.

Identification of plant species during the species composition surveys were based on various literature resources, or where deemed necessary, by experts on certain taxonomic groups. Field guides such as those by Manning (2003), Smit (2008), Van Oudtshoorn (1999), Van Wyk and Malan (1998), Van Wyk and Van Wyk (1997), Van Wyk and Smith (2003), Germishuizen (2003) and Pooley (1998) were used to identify plant species and find additional information about plant species. Retief and Herman (1997) were consulted to find information about diagnostic characteristics and the broad distribution of species. Main sources to obtain information about the status, origin and identification of problem plants and alien invasive plant species were Bromilow (2001) and Henderson (2001). Pfab (2002) as well as Pfab and Victor (2002) were used as the guideline for threatened, data deficient and near threatened plant species of the Gauteng Province. Updated information from GDARD was also consulted. For the most recent treatise of scientific names and broad distributions, Germishuizen, Meyer & Steenkamp (2006) were followed to compile the lists of species.

3.3 Ecological conditions

At the time of the present survey, the terms of reference for ecological conditions are not available in as much detail as the requirements for biodiversity studies. Here an approach has been followed to describe ecological conditions that are relevant to potential development or to note possible exclusion of any development.

The veld condition is often an important aspect of overall ecological conditions at a chosen site. The veld condition can be determined in various ways. Two techniques that are commonly used are the ecological index, which yields a veld condition index, and the occurrence or absence of key grass species (Bothma, 2002; Van Rooyen, 2002). Different veld condition assessment methods that have an ecological base have been proposed by various researchers in South Africa including Dyksterhuis (1949), Foran, Tainton & Booysen (1978), Hardy & Hurt (1989), Mentis (1983), Tainton (1988), Tainton, Edwards & Mentis (1980). These methods use key grass species or grass species with allocated ecological status to determine veld condition. Degradation models (Bosch & Gauch, 1991) can also be used to assess veld condition. Directly or indirectly, these methods are based more on responses of grass species to mega-herbivores and in addition at the higher rainfall areas also based on responses of grass species to fire. A good veld condition is therefore close to a good rangeland condition, which is not necessarily ideal for the conservation of smaller fauna and flora, especially at ridges where soils are naturally poor in nutrients. For the purposes of this study the application of these methods are doubtful to apply for three main reasons.

Firstly, natural grassland on rocky ridges may contain a low frequency or abundance of grass species that are of high ecological status in terms of grazing by megaherbivores, even though a patch may be ideal for rare flora and smaller fauna. For example a *Melinis nerviglumis* – *Aristida transvaalensis* community, which is inhabited by a number of grass species of lower ecological status, was found to include the ideal habitats of the rare and red-listed Heidelberg Copper butterfly, *Chrysoritis aureus* (Terblanche, Morgenthal & Cilliers, 2003). Threatened insect species often require habitats that are to some extent disturbed, for example the Brenton Blue Butterfly, *Orachrysops niobe* (Edge, Cilliers & Terblanche, 2008). Secondly, the diversity of indigenous forb species, and not necessarily grass species, is often of paramount importance for smaller fauna and flora. Thirdly, especially within and on the fringes of urban areas, pioneer forbs, shrubs and trees may be more important to indicate degradation of ecosystems than low ecological status grass species. Patches opened up by excavations do not necessarily follow the same succession pattern as patches that are opened up by overgrazing or fire.

Though not suitable for assessing ecological conditions in open grassland/savanna or rocky ridges the Riparian Vegetation Index method (Kemper, 2001) provided useful information that could be incorporated as guidance for ecosystems that are not wetlands as well. Vegetation adjacent to the rocky ridges has also been studied though the main focus remains the rocky ridges.

3.4. Limitations

It should be emphasized that the survey can by no means represent a full account of all the species and their abundances on the site. Full analyses, such as complete randomised sampling or detailed stratified random sampling, followed by detailed ordination analyses are not practical within the time constraint and objectives of the study. Survey methods and analyses were adapted to fulfil the objectives of the study within its practical limitations. The site was visited during April 2012 which comprises an optimal time of the year to document ecological conditions.

4. RESULTS AND DISCUSSION

Table 1 gives an outline of the main vegetation assemblages (communities) at the site with emphasis on the ridge vegetation. Only one community associated with the ridges at the site, has been identified.

Table 2 lists the species with a high fidelity to the vegetation assemblages locally at the site. Fidelity classes from preferential, selective to exclusive (Kent & Coker, 1992) are used here to indicate habitat specificity locally at the site. Some of the species with a high fidelity are widespread in Gauteng but can be locally indicative of unique ecosystems. In the case of this study some plant species with a high fidelity at certain rocky habitats also stands out as being particularly habitat specific in the regional and international context.

Table 3 gives a summary of the ecological conditions of the main vegetation assemblage at the rocky ridge.

Figure 1 illustrates of the main vegetation assemblage identified for the interpretation of ecological conditions at the ridge at the site.

A discussion of the results in tables 1, 2 and 3 as well as Figure 1 then follows.

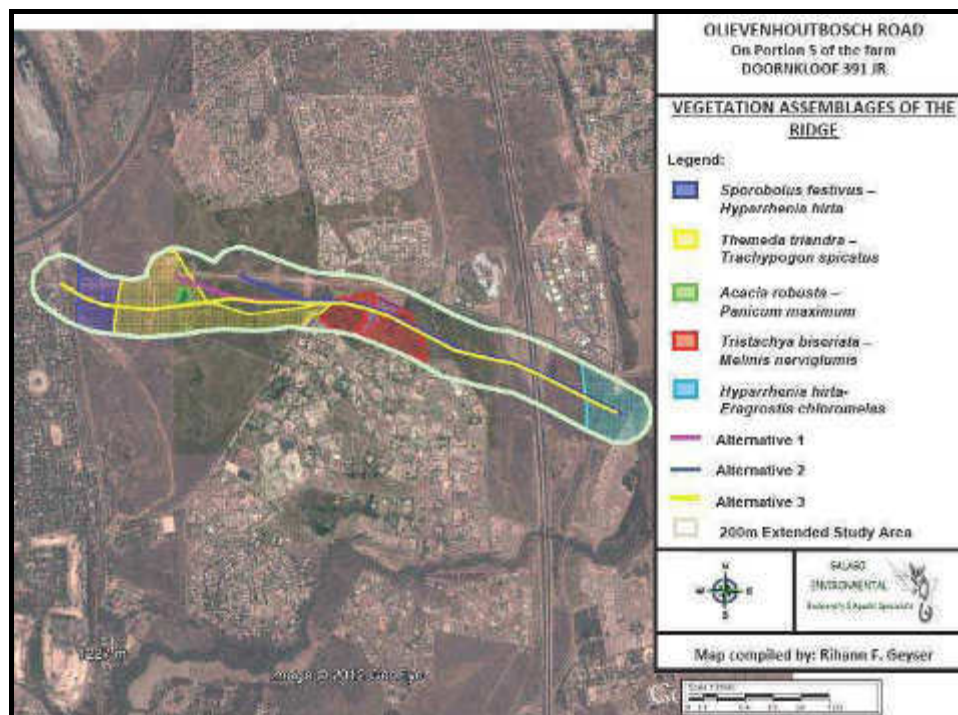


Figure 2: Vegetation assemblages (communities) at the ridge in terms of ecological conditions

Table 1: List of ridge vegetation assemblages at the site and a summary of the most dominant plant species recorded from each assemblage with 30m transect surveys (note: basal frequency). Most dominant species are listed as well as the relative frequency of other species combined.

| Plant assemblage | Location in study area | General vegetation structure | Number of 30m transects used | Species | Relative frequency: percentage |
|--|---|--|------------------------------|---|--------------------------------|
| <i>Hyparrhenia hirta</i> – <i>Eragrostis chloromelas</i> assemblage | Eastern section between M57 and Rietvlei NR | Grassland with very few trees | 4 | <i>Hyparrhenia hirta</i> <i>Eragrostis chloromelas</i> <i>Themeda triandra</i> Other species | 47 20 14 19 |
| <i>Tristachya biseriata</i> – <i>Melinis nerviglumis</i> assemblage | Central section between Cornwall Hill and Nellmapius road | Trees and shrubs with sparse grass cover | 3 | <i>Tristachya biseriata</i> <i>Melinis nerviglumis</i> <i>Themeda triandra</i> Other species | 30 27 14 29 |
| <i>Themeda triandra</i> – <i>Trachypogon spicatus</i> assemblage | Quartzite hill with reservoir on top | Grassland with sparse tree cover | 4 | <i>Themeda triandra</i> <i>Hyparrhenia hirta</i> <i>Trachypogon spicatus</i> Other species | 29 25 14 32 |
| <i>Acacia robusta</i> – <i>Panicum maximum</i> assemblage | Northern slope of quartzite hill | Dense woodland patch | 2 | <i>Panicum maximum</i> <i>Setaria sphacelata</i> <i>Themeda triandra</i> Other species | 56 16 15 13 |
| <i>Sporobolus festivus</i> – <i>Hyparrhenia hirta</i> assemblage | Lower dolomitic slopes north and west of quartzite hill | Mosaic of tall and short grassland (shorter grass at shallow dolomitic rock patches) | 4 | <i>Hyparrhenia hirta</i> <i>Themeda triandra</i> <i>Sporobolus festivus</i> Other species | 41 26 15 18 |

Table 2: Summary of characteristic species of the main vegetation assemblages of the site. Characteristic species are here indicated to be those plant species that are rare or absent elsewhere at the site i.e. with a high degree of fidelity to certain vegetation communities at the site.

| Description of plant assemblage* | Characteristic species with high degree of fidelity, including species that appear to be <u>locally</u> exclusive, selective or preferential in the study area | | |
|---|--|---------------------------------------|---|
| | Species/ groups | Growth form | Fidelity |
| <i>Hyparrhenia hirta</i> – <i>Eragrostis chloromelas</i> assemblage | Most species have low fidelity, few species locally unique to this vegetation unit | | |
| <i>Tristachya biseriata</i> – <i>Melinis nerviglumis</i> assemblage | <i>Melinis nerviglumis</i> <i>Monocymbium ceresiiforme</i> <i>Tristachya biseriata</i> | Grass Grass Grass | Preferential Selective Preferential |
| <i>Themeda triandra</i> – <i>Trachypogon spicatus</i> assemblage | <i>Trachypogon spicatus</i> <i>Helichrysum setosum</i> | Grass Herb | Selective Selective |
| <i>Acacia robusta</i> – <i>Panicum maximum</i> assemblage | <i>Panicum maximum</i> <i>Acacia robusta</i> <i>Combretum molle</i> <i>Scolopia zeyheri</i> <i>Pavetta gardenifolia</i> | Grass Tree Tree Tree Tree | Selective Selective Selective Exclusive Exclusive |
| <i>Sporobolus festivus</i> – <i>Hyparrhenia hirta</i> assemblage | <i>Sporobolus festivus</i> <i>Melolobium subspicatum</i> <i>Lotononis laxa</i> | Grass Herb Herb | Exclusive Exclusive Preferential |

Table 3: Summary of the ecological conditions of the main vegetation assemblages at the site. Categories: Very low, Low, Moderate, High, Very high, Confirmed.

| Community | <i>Hyparrhenia hirta</i> – <i>Eragrostis chloromelas</i> assemblage | <i>Tristachya biseriata</i> - <i>Melinis nerviglumis</i> assemblage | <i>Themeda triandra</i> - <i>Trachypogon spicatus</i> assemblage | <i>Acacia robusta</i> - <i>Panicum maximum</i> assemblage | <i>Sporobolus festivus</i> – <i>Hyparrhenia hirta</i> assemblage |
|---|--|---|--|---|---|
| Probability of unique habitat of threatened plant species | Low | Low | Low | Low | Confirmed (nearby < 200m) <i>Melolobium subspicatum</i> (Vulnerable) |
| Unique habitat for plant species which are not threatened but of conservation concern | Confirmed (nearby strip) <i>Boophone disticha</i> , <i>Hypoxis hemerocallidea</i> (Declining) | Low | Confirmed (nearby strip) <i>Boophone disticha</i> , <i>Hypoxis hemerocallidea</i> (Declining) | Low | Low |
| Diversity of indigenous plant species | Moderate | Moderate | High | High | High |
| Unique habitat for threatened fauna | Low | Low | Low | Low | High <i>Ichnestoma stobbiai</i> |
| Frequency of total indigenous plant species | Moderate (disturbed patches) | Moderate (disturbed patches) | Moderate (disturbed patches) | High | Moderate (disturbed patches) |
| Grazing importance | Low | Low | Moderate | Low | Low |
| Connectivity, intactness | Low (isolated) | Low (isolated) | Moderate (increasingly isolated) | Moderate | Moderate |
| *Ecologically negative edge effects from surrounding areas | High | High | High | High | High |
| *Ecologically negative edge effects to surrounding areas | Moderate | Low | Very low | Very low | Low |

- Ecologically negative edge effects are those edge effects that compromise the overall ecological function and integrity of an area.

Outline of plant assemblages at the ridge on the study site

Vegetation at the rocky ridges that cross the proposed development could be divided in five assemblages/ communities/ vegetation units. An outline of the vegetation assemblages that have been identified, follows:

***Hyparrhenia hirta* – *Eragrostis chloromelas* community (assemblage):**

Disturbed grassland between the M57 and residential developments adjacent the Rietvlei Nature Reserve. Grass species such as *Hyparrhenia hirta*, *Eragrostis chloromelas* are dominant. Most plant species in this vegetation unit is common and widespread in the region but also locally.

Structurally the *Hyparrhenia hirta* – *Eragrostis chloromelas* assemblage consist of tall grass with very few trees. Open patches dominated by weeds are also common.

Apart from the widespread and declining *Boophone disticha* and *Hypoxis hemerocallidea* no plant species of particular conservation concern appears to occur close or at the crossing of the ridge with the proposed development.

***Tristachya biseriata* – *Melinis nerviglumis* community (assemblage):**

The *Tristachya biseriata* – *Melinis nerviglumis* assemblage is present south of the Nellmapius road and some distance north of the Cornwall hill. Grass species such as *Tristachya biseriata*, *Melinis nerviglumis* and *Monocymbium cerasiiforme* are conspicuous in this assemblage. Some areas have been cleared or being disturbed where the shrub *Lippia javanica* and the grass *Melinis repens* can be abundant.

Structurally the *Tristachya biseriata* – *Melinis nerviglumis* assemblage consists of a variety of grass species with a mixture of shrubs and herbaceous plant species. However, where disturbances have been severe the vegetation is transformed to tall exotic weeds, shrubs and a high frequency of annual grass species.

Plant species of particular conservation concern do not appear to be present at the *Tristachya biseriata* – *Melinis nerviglumis* assemblage at this part of the ridge nearby the strip proposed for the development.

***Themeda triandra* – *Trachypogon spicatus* community (assemblage):**

Slopes of the quartzite ridge where a reservoir is present are favoured by the *Themeda triandra* – *Trachypogon spicatus* assemblage. Conspicuous grass species are *Themeda triandra*, *Trachypogon spicatus* and *Hyparrhenia hirta*.

Structurally the *Themeda triandra* – *Trachypogon spicatus* assemblage consists of a well-developed grass layer with scattered trees and shrubs.

Plant species of particular conservation concern at the *Themeda triandra* – *Trachypogon spicatus* assemblage nearby the strip proposed for the development are the declining *Boophone disticha* and *Hypoxis hemerocallidea*.

***Acacia robusta* – *Panicum maximum* community (assemblage):**

The *Acacia robusta* – *Panicum maximum* assemblage comprises a patch of trees at the northern slope of the quartzite koppie. Crown cover of a dense patch of trees is dominated by *Acacia robusta* (ankle thorn) and *Combretum molle* (velvet bushwillow). Basal cover is dominated by the grass species *Panicum maximum* that favours the shade of trees.

Structurally the *Acacia robusta* – *Panicum maximum* assemblage consists of a well-developed tree stratum and a well-developed grass layer.

Plant species of particular conservation concern at the *Acacia robusta* – *Panicum maximum* assemblage nearby the strip proposed for the development are the widespread but declining *Boophone disticha* and *Hypoxis hemerocallidea*.

***Sporobolus festivus* – *Hyparrhenia hirta* community (assemblage):**

The *Sporobolus festivus* – *Hyparrhenie hirta* assemblage occur at the lower and more gentle slopes of the rocky ridge where dolomite surface at small patches across this vegetation unit. Patches with tall grass, most abundant *Hyparrhenia hirta*, are interrupted by open patches where shorter grass species such as *Sporobolus festivus* are found around dolomitic rock on the surface.

A plant species of particular conservation concern at the *Sporobolus festivus* – *Hyparrhenia hirta* assemblage is the Threatened *Melolobium subspicatum* (Vulnerable) which became very scarce in the local area. Very few specimens seem to be left within 200m of the present proposed development.

General remarks

High frequencies of alien invasive plant species at excavations or disturbed places at the ridges in the area reflect urban edge effects.

The grazing importance of the area appears to be moderate to high. Palatable grass species such as *Themeda triandra* has overall a high frequency. See Bosch & Kellner (1991), Tainton (1999) for more information on degradation models and veld assessment. The site is too small and isolated to be of particular relevance to mega-herbivores. Smaller animals may benefit from the conservation of the indigenous vegetation at the rocky ridges.

A burning programme could be applied on the remaining natural veld, but would not be without practical difficulties in such a fragmented area with fair concentration of residences and other developed areas.

Rocky outcrops at the site should be regarded as stepping stone corridors with rocky ridges elsewhere in the local area. Rocky ridges is important for a number of ecological processes, including its function as a controller of water inputs into wetlands, fire-protection for some species and different microclimates for certain fauna and flora (Samways, 1994; Lowrey and Wright, 1987; Pfab 2001).

5. CONCLUSION

- Transformation of vegetation owing to present excavations, scraping or other disturbances are clear at the site. Exotic weeds and annual pioneer grass species invade such disturbed patches.
- Overall Alternative 2 appears to be ecologically the least sensitive strip.
- Alternative 3 is not preferred. This proposed alternative 3 passes the quartzite ridge and the lower dolomitic slopes near areas where a Threatened plant species, *Melolobium subspicatum* are present. Furthermore alternative 3 crosses sensitive ecosystems notably the *Acacia robusta* – *Panicum maximum* as well as the *Sporobolus festivus* – *Hyparrhenia hirta* assemblages. The slopes of the quartzite koppie as well as the intersection between the dolomite and chert approaches a habitat which may be suitable for the rare and threatened fruit chafer beetle, *Ichneustoma stobbiai*.
- *Ichneustoma stobbiai* is an endangered fruit chafer (Scarabaeidae: Cetoniinae) that occurs in small habitat fragments of South Africa (Kryger & Scholtz, 2008). The adults of this species are short-lived and the females are flightless. Thus, the vagility of these beetles is extremely low (Kryger & Scholtz, 2008). The species *I. stobbiai* (Holm, 1992) is thought to occur in a very restricted area in and around Gauteng Province and all habitat patches should be protected (Kryger & Scholtz, 2008; Deschodt, Scholtz & Kryger, 2009). Unlike most cetoniine larvae, the larvae of this species usually occur in dolomitic to cherty, well-drained soils (Deschodt, Scholtz & Kryger, 2009).

- A Class 3 rocky ridge is present at all the intersections of rocky ridges with the proposed strip allocated for the development.
- Fire and frost probably play an important role in maintaining the grassland at the ridge and therefore a burning programme is desirable.
- In an increasingly urbanised area, the possible conservation importance value of rocky ridges is underlined at the site both in terms of remarkable diversity and as refuge for threatened species.
- Though a class 3 rocky ridge is present it is believed that near pristine patches of rocky ridge may still be conserved at the site.
- Proper ecological planning and actions are urgent and include:
 - The eradication of invasive exotic plant species at the site.
 - Development of conservation infrastructure that would avoid the continuous trampling, excavations and informal dumping which are present in the area.
 - The zoning of habitats where threatened species occur as a no-go area for *any* developments.

It appears that Alternative 3 will have an undesirable impact on an ecosystem of high conservation priority and that Alternative 2 in terms of biodiversity and ecosystem functioning is the preferable option.

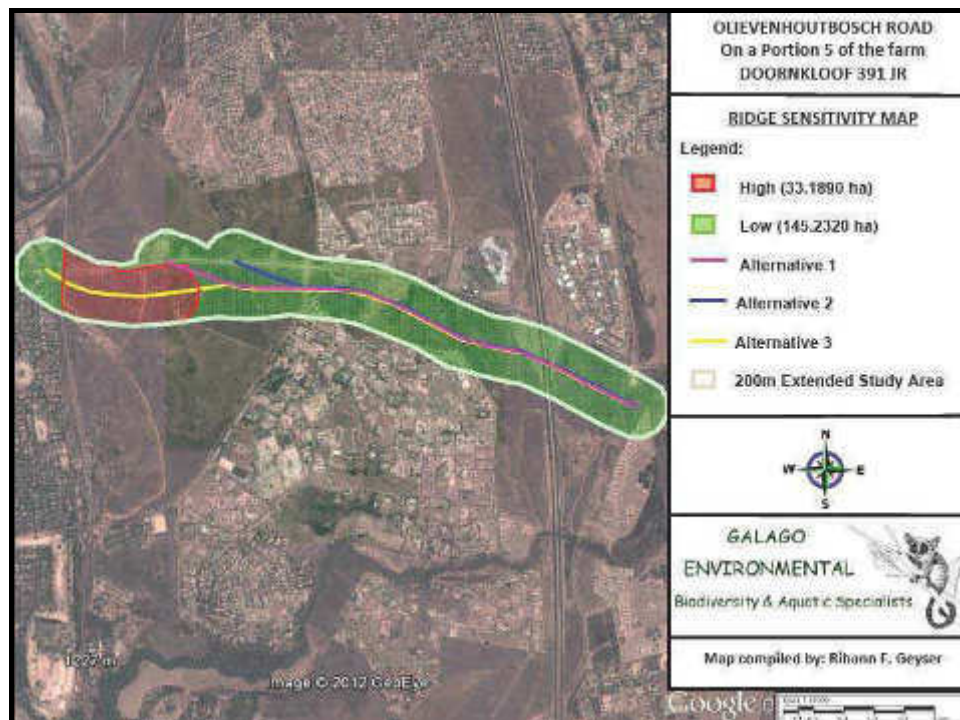


Figure 3: Sensitivity map of the ridges on site

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Annexure G2

Heritage Report



**PHASE 1 HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED NEW
OLIEVENHOUTBOSCH ROAD (MAIN ROAD TO K54) IRENE, GAUTENG PROVINCE**

| | |
|---|---|
|  |  |
| <p>Archaeos Archaeologists and Heritage Consultants (BK 98 09854/23) Dr A.C. van Vollenhoven Zurethe Collins</p> <p>PO Box 55 GROENKLOOF 0027 Mobile: 083 291 6104 E-mail: antonv@archaeos.co.za</p> | <p>Leonie Marais-Botes Heritage Practitioner</p> <p>868 Endeman Street Wonderboom South Pretoria 0084 Mobile: 082 576 6253 E-mail: leoniembotes@gmail.com</p> |
| <p><i>BA, BA (Hons), DTO, NDM, MA (Archaeology) [UP], MA (Culture History) [US], DPhil (Archaeology) [UP], Man Dip [TUT], DPhil (History)[US], L Akad [SA]</i></p> | <p><i>BA (Cultural History and Archaeology) (UP), BA (Hons) Cultural History (UP), Post Grad Dip Museology (UP), Cert Conservation of Traditional Buildings (Univ of Canberra) Post Grad Dip: Heritage (Wits)</i></p> |
| <p><i>Accredited member: SA Society for Cultural History (CH001) Accredited member: ASAPA</i></p> | <p><i>Accredited member: SA Society for Cultural History (CH002)</i></p> |

For:

Bokamoso Environmental
PO Box 11375
MAROELANA
0161

June 2014

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Leonie Marais-Botes Heritage Practitioner/Archaetnos Archaeologists and
Heritage Consultants.

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Marais-Botes Heritage Practitioner/ Archaetnos Archaeologists and Heritage
Consultants.

It may only be used for the purposes it was commissioned for by the client.

DISCLAIMER:

Although all possible care is taken to identify/find all sites of cultural importance during the initial survey of the study area, the nature of archaeological and historical sites are as such that it is always possible that hidden or sub-surface sites could be overlooked during the study. Leonie Marais-Botes Heritage Practitioner/ Archaetnos Archaeologists and Heritage Consultants will not be held liable will not be held liable for such oversights or for the costs incurred as a result thereof.

ACKNOWLEDGEMENTS

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Contents page

| <u>Contents</u> | <u>Page</u> |
|---|--------------------|
| ABOUT THIS REPORT | 5 |
| EXECUTIVE SUMMARY | 6 |
| 1.1 INTRODUCTION | 7 |
| 1.2 LOCATION AND STUDY AREA | 7 |
| 1.3 METHOD | 9 |
| 1.4 BACKGROUND HISTORY GREATER STUDY AREA | 9 |
| 1.5 PHOTOGRAPHIC RECORD OF THE SITE EARMARKED FOR DEV | 10 |
| | |
| 2. FINDINGS | 14 |
| 2.1Pre-Colonial Heritage Sites | 14 |
| 2.2Historical Period Heritage sites | 14 |
| 2.3Original Landscape | 15 |
| 2.4Intangible Heritage | 15 |
| | |
| 3. CATEGORIES OF HERITAGE VALUE | 16 |
| 3.1 HERITAGE VALUE WEIGHED AGAINST CULTURAL SIGNIFICANCE CATEGORIES | 16 |
| 3.2 SPECIFIC CATEGORIES INVESTIGATED AS PER SECTION 3 (1) AND (2) OF THE NATIONAL HERITAGE LEGISLATION (ACT 25 OF 1999) | 17 |
| 4. OPPORTUNITIES, RETRICTIONS, IMPACTS | 19 |
| 5. THE WAY FORWARD | 19 |

ABOUT THIS REPORT

The heritage report must reflect that consideration has been given to the history and heritage significance of the study area and that the proposed work is sensitive towards the heritage resources and does not alter or destroy the heritage significance of the study area.

The heritage report must refer to the heritage resources currently in the study area.

The opinion of an independent heritage consultant is required to evaluate if the proposed work generally follows a good approach that will ensure the conservation of the heritage resources.

The National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998) are the guideline documents for a report of this nature.

Leonie Marais-Botes Heritage Practitioner/Archaeologist and Heritage Consultants was appointed by Bokamoso Environmental to carry out a Phase 1 Heritage Impact Assessment (HIA) for the proposed new Olievenhoutbosch Road (Main Road to K54) Irene, Gauteng Province. The site investigation was conducted on 17 February 2014.

EXECUTIVE SUMMARY

This project may impact on any types and ranges of heritage resources that are outlined in Section 3 of the National Heritage Resources Act (Act 25 of 1999). Consequently a Heritage Impact Assessment was commissioned by Bokamoso Environmental and conducted by Leonie Marais-Botes/Archaetnos Archaeologists and Heritage Consultants.

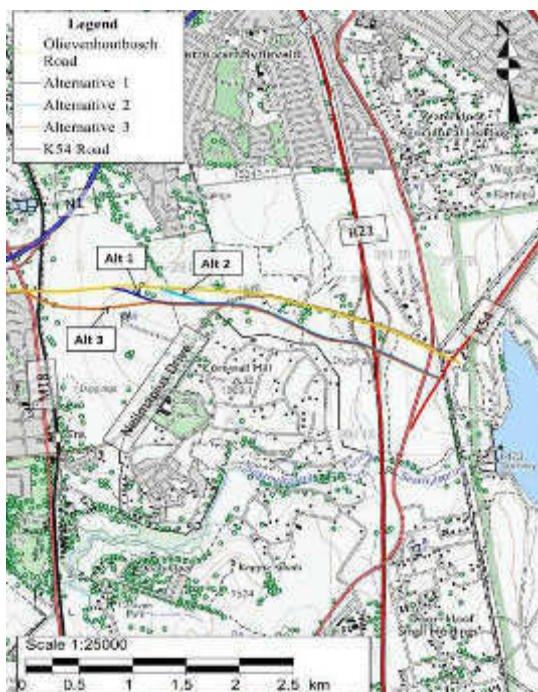
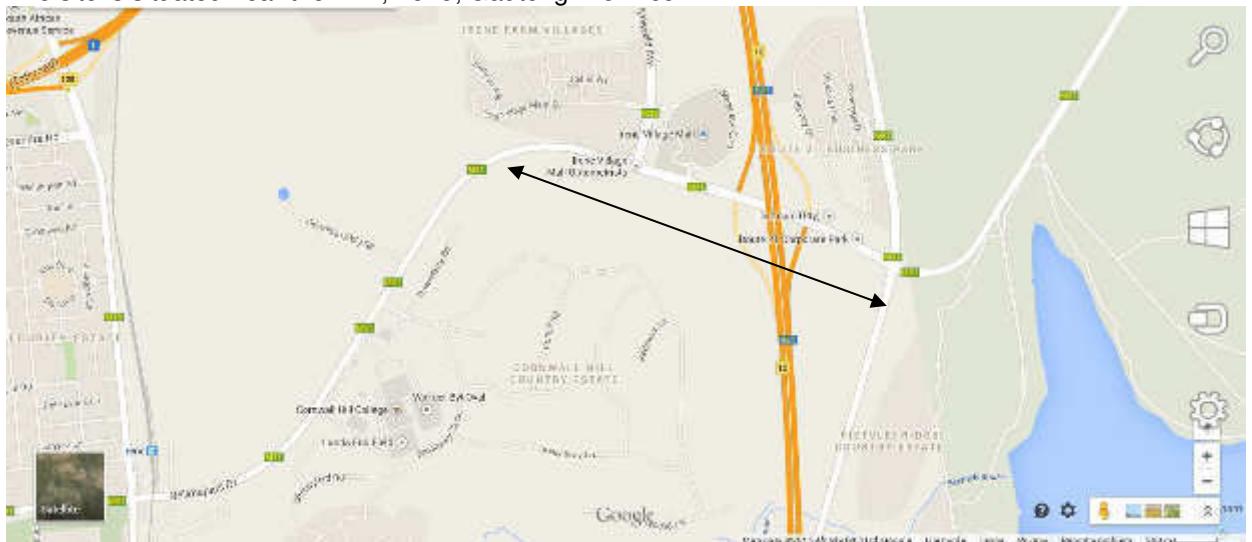
It is important to note that all graves and cemeteries are of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (Act 25 of 1999) whenever graves are 60 years and older. Other legislation with regard to graves includes those when graves are exhumed and relocated, namely the Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended).

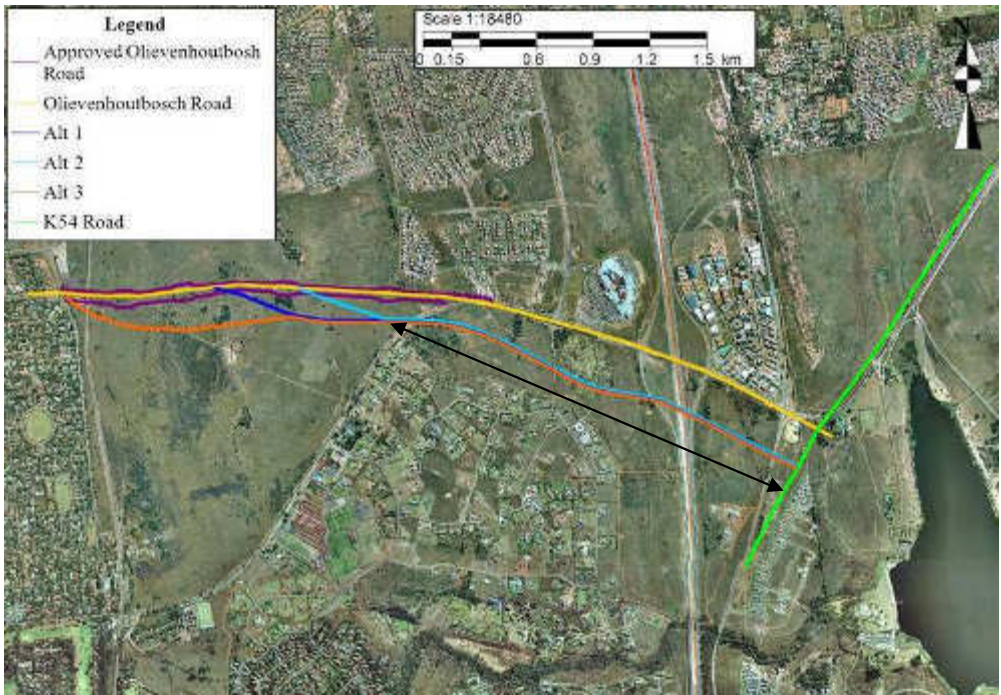
1.1 INTRODUCTION

The proposed development entails the construction of a new road.

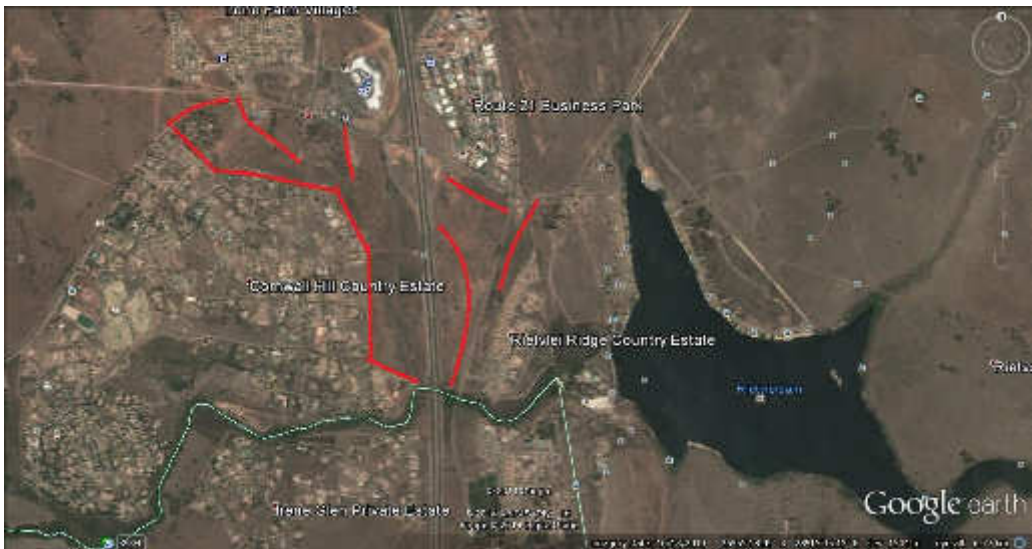
1.2 LOCATION AND STUDY AREA

The site is situated near the R21, Irene, Gauteng Province





← → Indicates study area



The red lines indicate the different access points utilised to survey the site

1.3 METHOD

The objective of this Phase 1 Heritage Impact Assessment (HIA) was to gain an overall understanding of the heritage sensitivities of the area and indicate how they may be impacted on through development activities. The survey took place on 17 February 2014.

In order to establish heritage significance the following method was followed:

- Investigation of primary resources (archival information)
- Investigation of secondary resources (literature and maps)
- Physical evidence (site investigation)
- Determining Heritage Significance

1.4 BACKGROUND HISTORY OF THE GREATER STUDY AREA

The original farm Doornkloof was some 8000 morgen (6852 hectares) in extent, situated on the outskirts of the village of Irene near Pretoria (Tshwane). The first title deeds were registered in the name of Gen. D.J.E. Erasmus in 1884¹. In 1889 A.H. Nellmapius bought six farms along the Six Mile Spruit², including a portion which later belonged to Gen. J.C. Smuts (1908) (Smuts bought 2000 morgen of the farm for £6000)³. Nellmapius employed 400 men and spent £ 200 000 to develop Irene, named after his daughter Irene Violet. Irene became a model farm. The first shop with shop owner Louis Joel Hack was built in 1898 on the farm⁴. The farm was bought in 1896⁵ by the Van der Byl family, who established the township on it. During the Anglo-Boer War (1899-1902) it was the site of a concentration camp⁶. A health committee was established in January 1947, and extension no. 1 was proclaimed on 4 June 1964, later followed by other extensions. The area was incorporated into the municipality of Lyttelton on 1 July 1964, which itself was absorbed in the Verwoerdburg (Centurion) complex shortly after⁷.

¹ D.J. Potgieter (editor-in-chief), Standard Encyclopaedia of Southern Africa Vol. 4, pp. 68-69

² D.J. Potgieter (editor-in-chief), Standard Encyclopaedia of Southern Africa Vol. 6, p. 138

³ D.J. Potgieter (editor-in-chief), Standard Encyclopaedia of Southern Africa Vol. 4, pp. 68-69

⁴ C.S. Kotzé, Doornkloof-wêreld, p. 129

⁵ N. Helme, Irene, p. 35

⁶ D.J. Potgieter (editor-in-chief), Standard Encyclopaedia of Southern Africa Vol. 6, p. 138

⁷ D.J. Potgieter (editor-in-chief), Standard Encyclopaedia of Southern Africa Vol. 6, p. 138

1.5 PHOTOGRAPHIC RECORD OF AREA EARMARKED FOR DEVELOPMENT

Photographs: eastern section of site (east of the R21)

Photograph taken towards west



Photograph taken towards east



Photograph taken towards south



Photographs: western section of site (west of the R21)

Photograph taken towards the east



Illegal dumping towards northern section of site west of the R21



View to the north site west of R21 (taken from central section)



View western section site west of R21



View to the south site west of the R21



2. FINDINGS

2.1 PRE-COLONIAL HERITAGE SITES

Possibilities: Greater study area taken into account.

Stone Age

The Stone Age is the period in human history when stone material was mainly used to produce tools⁸. In South Africa the Stone Age can be divided in three periods⁹;

- Early Stone Age 2 000 000 – 150 000 years ago
- Middle Stone Age 150 000 – 30 000 years ago
- Late Stone Age 40 000 years ago - +/- 1850 AD

Iron Age

The Iron Age is the period in human history when metal was mainly used to produce artefacts¹⁰. In South Africa the Iron Age can be divided in three periods;

- Early Iron Age 250-900 AD
- Middle Iron Age 900-1300 AD
- Late Iron Age 1300-1840 AD¹¹
-

There are no pre-colonial heritage sites evident in the study area. This can be attributed to previous infra-structure development activities in the greater study area.

2.2 HISTORICAL PERIOD HERITAGE SITES

Possibilities: Greater study area taken into account.

- Pioneer sites (Voortrekker sites cc 1836-1850's)
- Anglo-Boer War (1899-1902) sites.
- Structures older than 60 years.
- Graves.

There are no historical period sites in the area earmarked for development.

⁸ P. J. Coertze & R.D. Coertze, Verklarende vakwoordeboek vir Antropologie en Argeologie.

⁹ S.A. Korsman & A. Meyer, Die Steentydperk en rotskuns in J.S. Bergh (red) Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies.

¹⁰ P.J. Coertze & R.D. Coertze, Verklarende vakwoordeboek vir Antropologie en Argeologie.

¹¹ M.M. van der Ryst & A Meyer. Die Ystertydperk in J.S. Bergh (red) Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies and T.N Huffman, A Handbook to the Iron Age: The Archaeology of Pre-Colonial Farming Societies in Southern Africa.

2.3 ORIGINAL LANDSCAPE

Infrastructure (previous road construction, substation construction and power line construction) and other development have altered the original landscape in most of the greater study area.

2.4 INTANGIBLE HERITAGE

The intangible heritage of the greater study area can be found in the stories of past and present inhabitants.

3 CATEGORIES OF HERITAGE VALUE (ACT 25 OF 1999)

The National Heritage Resources Act (Act 25 of 1999) identifies the following categories of value under section 3(1) and (2) of the Act under the heading "National Estate":

- "3 (1) For the purpose of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.
- (2) Without limiting the generality of subsection (1), the national estate may include-
- (a) places, buildings, structures and equipment of cultural significance;
 - (b) places which oral traditions are attached or which are associated with living heritage;
 - (c) historical settlements and townscapes;
 - (d) landscapes and natural features of cultural significance;
 - (e) geological sites of scientific or cultural importance;
 - (f) archaeological and palaeontological sites;
 - (g) graves and burial grounds, including-
 - (i) ancestral graves;
 - (ii) royal graves and graves of traditional leaders;
 - (iii) graves of victims of conflict;
 - (iv) graves of individuals designated by the Minister by notice in the Gazette
 - (v) historical graves and cemeteries; and
 - (vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
 - (h) sites of significance relating to the history in South Africa;
 - (i) movable objects, including-
 - (i) objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - (ii) objects to which oral traditions are attached or which are associated with living heritage;
 - (iii) ethnographic art and objects;
 - (iv) military objects
 - (v) objects of decorative or fine art;
 - (vi) objects of scientific or technological interests; and
 - (vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

- (3) Without limiting the generality of the subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of-
- (a) Its importance in the community, or pattern of South Africa's history;
 - (b) Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
 - (c) Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
 - (d) Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural objects;
 - (e) Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
 - (f) Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
 - (g) Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
 - (h) Its strong or special association with the life and work of a person, group or organisation of importance in the history of South Africa; and
 - (i) Sites of significance relating to the history of slavery in South Africa."

3.1 HERITAGE VALUE OF WEIGHED AGAINST CULTURAL SIGNIFICANCE CATEGORIES

3.1.1 Spiritual value

During the site visit/field work no indication of any spiritual activity was observed on/near the proposed site. Thus no sites of spiritual value will be impacted on by the proposed project.

3.1.2 Scientific value

No sites of scientific value was observed on or near the site earmarked for development.

3.1.3 Historical value

No historical value associated with the proposed site could be found in primary and secondary sources.¹²

3.1.4 Aesthetic value

No heritage item with exceptional aesthetic (architectural) value was identified in the study area.

¹² Standard Encyclopaedia of Southern Africa and the Transvaalse Argiefbewaarplek (TAB) database at the National Archives, Pretoria;
J.S. Bergh (red), Geskiedenisatlas van Suid-Afrika: Die Vier Noordelike Provinsies.

3.1.5 Social value

Social value is attributed to sites that are used by the community for recreation and formal and informal meetings regarding matters that are important to the community. These sites include parks, community halls, sport fields etc. Visually none of the above is evident in the study area.

3.2 SPECIFIC CATEGORIES INVESTIGATED AS PER SECTION 3 (1) AND (2) OF THE NATIONAL HERITAGE LEGISLATION (ACT 25 OF 1999)

3.2.1 Does the site/s provide the context for a wider number of places, buildings, structures and equipment of cultural significance?

The study area does not provide context for a wider number of places, buildings, structures and equipment of cultural significance. The reason is the low density of heritage structures/sites in the study area, near or on the proposed site.

3.2.2 Does the site/s contain places to which oral traditions are attached or which are associated with living heritage?

Places to which oral traditions are attached or associated with living heritage are usually found in conjunction with traditional settlements and villages which still practise age old traditions. None of these are evident near or on the proposed site.

3.2.3 Does the site/s contain historical settlements?

No historical settlements are located on or near the proposed site.

3.2.4 Does the site/s contain landscapes and natural features of cultural significance?

Due to previous infra-structure development activities the original character of the landscape have been altered significantly in the study area.

3.2.5 Does the site/s contain geological sites of cultural importance?

Geological sites of cultural importance include meteorite sites (Tswaing Crater and Vredefort Dome), fossil sites (Karoo and Krugersdorp area), important mountain ranges or ridges (Magaliesburg, Drakensberg etc.). The proposed site is not located in an area known for sites of this importance.

3.2.6 Does the site/s contain a wide range of archaeological sites?

The proposed site does not contain any surface archaeological deposits, the reason being the large scale alteration of the original landscape.

The possibility of sub-surface findings always exists and should be taken into consideration in the Environmental Management Plan.

If sub-surface archaeological material is discovered work must stop and a heritage practitioner preferably an archaeologist contacted to assess the find and make recommendations.

3.2.7 Does the site/s contain any marked graves and burial grounds?

The site does not contain marked graves. The possibility of graves not visible to the human eye always exists and this should be taken into consideration in the Environmental Management Plan.

It is important to note that all graves and cemeteries are of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (Act 25 of 1999) whenever graves are 60 years and older. Other legislation with regard to graves includes those when graves are exhumed and relocated, namely the Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended).

If sub-surface graves are discovered work should stop and a professional preferably an archaeologist contacted to assess the age of the grave/graves and to advice on the way forward.

3.2.8 Does the site/s contain aspects that relate to the history of slavery?

This is not an area associated with the history of slavery like the Western Cape Province.

3.2.9 Can the place be considered as a place that is important to the community or in the pattern of South African history?

In primary and secondary sources the proposed site is not described as important to the community or in the pattern of South African history.¹³

3.2.10 Does the site/s embody the quality of a place possessing uncommon or rare endangered aspects of South Africa's natural and cultural heritage?

The proposed site does not possess uncommon, rare or endangered aspects of South Africa's natural and cultural heritage. These sites are usually regarded as Grade 1 or World Heritage Sites.

3.2.11 Does the site/s demonstrate the principal characteristics of South Africa's natural or cultural places?

The proposed site does not demonstrate the principal characteristics of South Africa's natural or cultural places. These characteristics are usually associated with aesthetic significance.

¹³ Standard Encyclopaedia of Southern Africa and the Transvaalse Argiefbewaarplek (TAB) database at the National Archives, Pretoria.

J.S. Bergh (red), Geskiedenisatlas van Suid-Afrika. Die Vier Noordelike Provinsies.

3.2.12 Does the site/s exhibit particular aesthetic characteristics valued by the community or cultural groups?

This part of the greater study area does not exhibit particular aesthetic characteristics valued by the community or cultural groups. The reason being the low density of heritage buildings and structures located in the greater study area.

3.2.13 Does the site/s contain elements, which are important in demonstrating a high degree of creative technical achievement?

The site does not contain elements which are important in demonstrating a high degree of creative technical achievement. Reason being none of the above evident on site.

3.2.14 Does the site/s have strong and special associations with particular communities and cultural groups for social, cultural and spiritual reasons?

The proposed site does not have a strong or special association with particular communities and cultural groups for social, cultural and spiritual reasons, the reason being that the particular site is located on mainly developed land and it is evident that the site is not utilised for social, cultural or spiritual reasons.

3.2.15 Does the site/s have a strong and special association with the life or work of a person, group or organisation?

The greater study area has a special association with the van der Byl-family and General J.C. Smuts (see Historical Background).

4. OPPORTUNITIES, RESTRICTIONS, IMPACTS

- Because of the good summer rains grass is long and vegetation dense. Some areas of the development area is very difficult to access due to previous landfill activities.
- There are no visible restrictions or negative impacts in terms of heritage associated with the site other than the structures older than 60 years. In terms of heritage this project can proceed.
- 3.2.6 and 3.2.7 must be taken into account in the Environmental Management Plan.

5. THE WAY FORWARD

- **Submit this report as a Section 38 application to the South African Heritage Resources Authority (SAHRA) for comment/approval.**

Annexure H

Correspondence from SARHA



Letter

In terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999)

Attention: JR 209 Investments (Pty) Ltd

Portion 1, Portion 188 and the Remainder of Portion 330; Portion 335 and Portion 5 of the Farm Doornkloof 391 JR; the Road reserve of Nellmapius Drive/M31 and the Road servitude of the R21

Thank you for your notification regarding this development.

In terms of the National Heritage Resources Act, no 25 of 1999, heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are protected. They may not be disturbed without a permit from the relevant heritage resources authority. This means that prior to development it is incumbent on the developer to ensure that a **Heritage Impact Assessment** is done. This must include the archaeological component (Phase 1) and any other applicable heritage components. Appropriate (Phase 2) mitigation, which involves recording, sampling and dating sites that are to be destroyed, must be done as required.

The quickest process to follow for the archaeological component is to contract an accredited specialist (see the web site of the Association of Southern African Professional Archaeologists www.asapa.org.za) to provide a Phase 1 Archaeological Impact Assessment Report. This must be done before any large development takes place.

The Phase 1 Impact Assessment Report will identify the archaeological sites and assess their significance. It should also make recommendations (as indicated in section 38) about the process to be followed. For example, there may need to be a mitigation phase (Phase 2) where the specialist will collect or excavate material and date the site. At the end of the process the heritage authority may give permission for destruction of the sites.

Where bedrock is to be affected, or where there are coastal sediments, or marine or river terraces and in potentially fossiliferous superficial deposits, a Palaeontological Desk Top study must be undertaken to assess whether or not the development will impact upon palaeontological resources - or at least a letter of exemption from a Palaeontologist is needed to indicate that this is unnecessary. If the area is deemed sensitive, a full Phase 1 Palaeontological Impact Assessment will be required and if necessary a Phase 2 rescue operation might be necessary.

If the property is very small or disturbed and there is no significant site the heritage specialist may choose to send a letter to the heritage authority to indicate that there is no necessity for any further assessment.



Olievenhoutbosch Road from Main Road to K54

Our Ref: 9/2/258/0044

Enquiries: Andrew Salomon
Tel: 021 462 4502
Email: asalomon@sahra.org.za
CaseID: 3915

Date: Wednesday October 30, 2013

Page No: 2



Any other heritage resources that may be impacted such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or viewsapes must also be assessed.

Should you have any further queries, please contact the designated official using the case number quoted above in the case header.

Yours faithfully

A handwritten signature in black ink, appearing to read 'A. Salomon', with a horizontal line extending from the end.

Andrew Salomon
Heritage Officer: Archaeology
South African Heritage Resources Agency

A handwritten signature in black ink, appearing to read 'C. Scheermeyer', with a horizontal line extending from the end.

Colette Scheermeyer
SAHRA Head Archaeologist
South African Heritage Resources Agency

ADMIN:

Direct URL to case: <http://www.sahra.org.za/node/136557>
(GDARD, Ref: Gaut: 002/11-12/E0135)

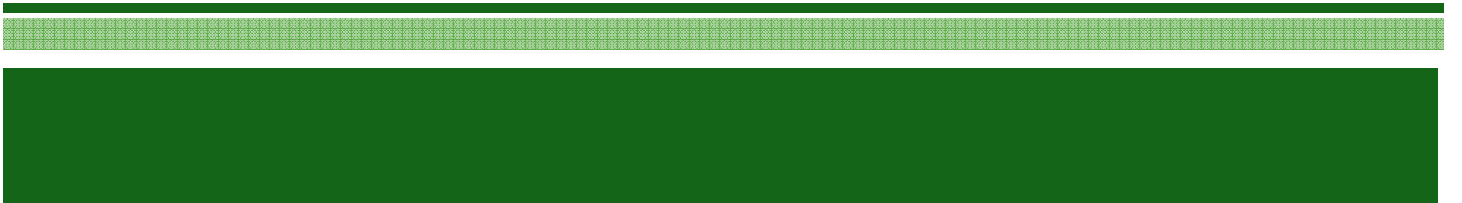


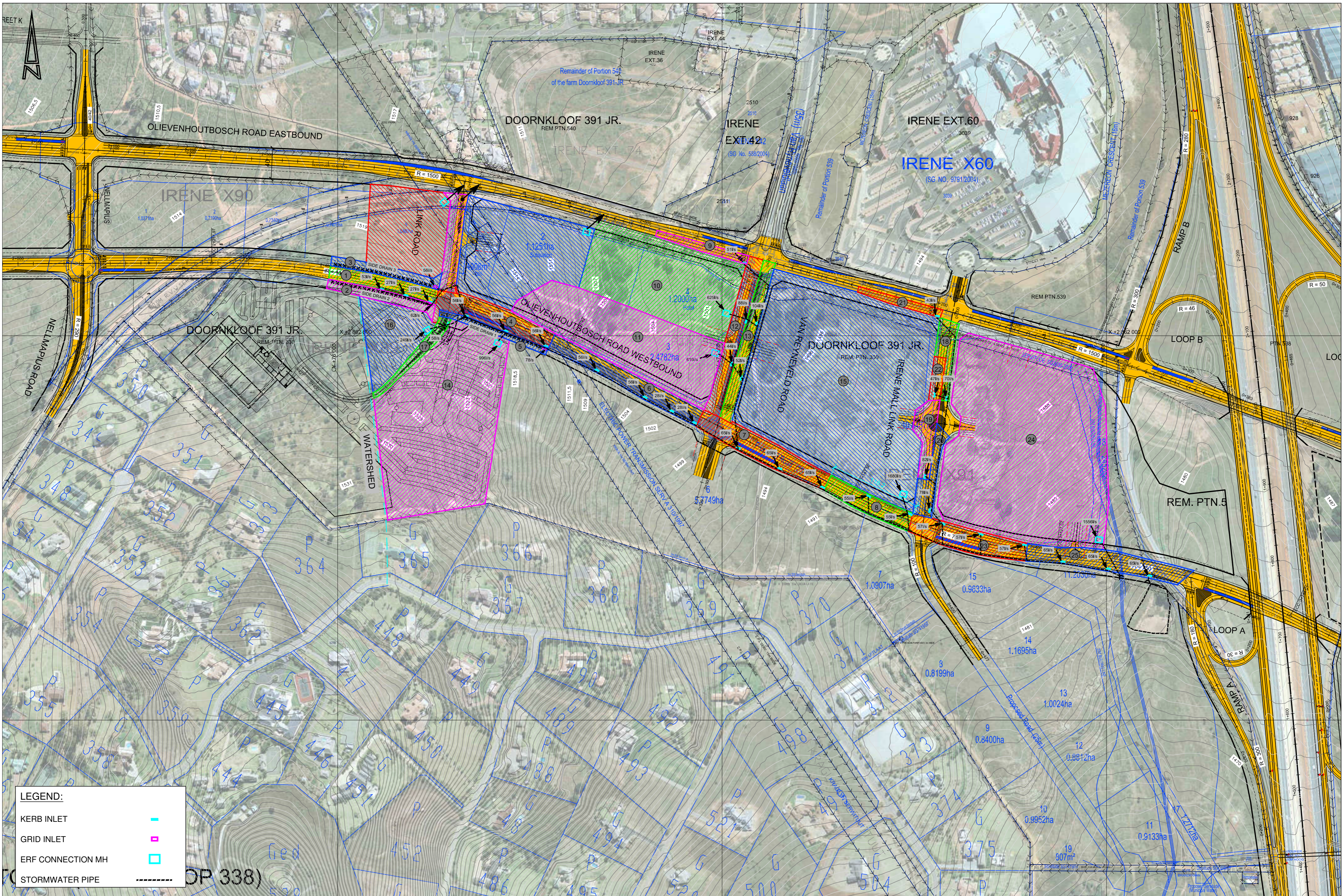
The South African Heritage Resources Agency

Street Address: 111 Harrington Street, Cape Town 8000 * Postal Address: PO Box 4637, Cape Town 8000
* Tel: +27 21 462 4502 * Fax: +27 21 462 4509 * Web: <http://www.sahra.org.za>

Annexure I

Stormwater Management Plan





LEGEND:

| | |
|-------------------|--|
| KERB INLET | |
| GRID INLET | |
| ERF CONNECTION MH | |
| STORMWATER PIPE | |

its
 29 De Havilland Crescent
 Pro Park, Building 1
 Pretorius Technopark
 Pretoria
 0000
 Tel: (012) 349 1664
 Fax: (012) 349 1665
 mail@its.co.za
 www.its.co.za

CLIENT:
 PD Box 75100
 Lynnwood Ridge
 0090

Development
 Irene Land

| APPROVED | | |
|----------|------|--|
| SIGNED | DATE | |
| | | |

| NO. | DATE | FOR APPROVAL | REVISION |
|-----|---------|--------------|----------|
| 0 | SEPT 11 | FOR APPROVAL | |

| NAME | STATUS | DATE |
|----------------------|--------|------|
| DESIGNED: J. ERASMUS | | |
| DRAWN: J. BECKER | | |
| CHECKED: J. COETZEE | | |

PROJECT: OLIVENHOUTBOSCH ROAD - PRELIMINARY DESIGN (NELLMAPIUS - K54)

DRAWING TITLE: STORMWATER - MASTER PLAN

SCALE: 1:1500@A0

REV: 0

DATE: 2012/05/30

DRAWING NUMBER: 2827/SWMP/01

PROJECT: OLIVENHOUTBOSCH ROAD - PRELIMINARY DESIGN (NELLMAPIUS - K54)

DRAWING TITLE: STORMWATER - MASTER PLAN

SCALE: 1:1500@A0

REV: 0

DATE: 2012/05/30

DRAWING NUMBER: 2827/SWMP/01

Annexure J

Service Scheme Report



501
1020



Chasidibushes RD
IRENE EXTENSION 91

SERVICE SCHEME REPORT
ROADS AND STORMWATER

MARCH 2011



Prepared for:
M&T Development
P O Box 39727
Faerie Glen
0043

Prepared by:
Velo VKE
P O Box 72927
Lynnwood Ridge
0040



Table of Contents

| | | |
|-----|---|----|
| 1 | INTRODUCTION..... | 1 |
| 1.1 | Location..... | 1 |
| 1.2 | Development..... | 1 |
| 1.3 | Developer..... | 1 |
| 1.4 | Engineers..... | 2 |
| 2 | TRAFFIC IMPACT STUDY..... | 3 |
| 3 | ROADS AND STREETS..... | 4 |
| 3.1 | Existing roads and township access..... | 4 |
| 3.2 | Proposed road upgrades..... | 4 |
| 3.3 | Planned future road network..... | 4 |
| 3.4 | Township streets..... | 4 |
| 3.5 | Access to erven..... | 5 |
| 3.6 | Pavement design..... | 5 |
| 4 | STORMWATER DRAINAGE..... | 6 |
| 4.1 | Drainage systems..... | 6 |
| 4.2 | Floodlines..... | 6 |
| 4.3 | Stormwater management..... | 7 |
| 5 | COST ESTIMATE AND APPORTIONMENT..... | 9 |
| 5.1 | Roads and reserves..... | 9 |
| 5.2 | Stormwater and servitudes..... | 9 |
| 5.3 | Cost estimate..... | 10 |
| 6 | CONTRIBUTIONS BY THE DEVELOPER..... | 14 |
| 6.1 | Contributions towards boundary services..... | 14 |
| 6.2 | Bulk services contributions..... | 14 |
| 7 | DEVELOPMENT PHASES AND CONSTRUCTION PERIOD..... | 15 |

Annexure List

| | |
|------------|--|
| Annexure A | Proposed Township Layout |
| Annexure B | Traffic Impact Study |
| Annexure C | Key Plan (Roads & Stormwater) |
| Annexure D | Letter of Appointment of Consulting Engineer |

1 INTRODUCTION

M&T Development is proposing the development of Irene Extension 91 situated on part of Portion 330 of the farm Doornkloof 391-JR.

1.1 LOCATION

The site is located within the City of Tshwane Metropolitan Municipality, to the north and east of the Cornwall Hill residential estate, west of the Nellmapius Interchange on the R21 freeway between Pretoria and the O R Tambo International Airport. The section to be developed as Irene Extension 91 is bordered in the south and west by the Cornwall Hill Estate, in the north by the existing Nellmapius Drive, and in the east by the R21 freeway and the Nellmapius interchange.

1.2 DEVELOPMENT

The proposed development will be a mixed-use development as shown on Plan No. IRNX91-1, attached as Annexure A. The land use budget is also defined on the plan.

1.3 DEVELOPER

The details of the developer are follows:

- Company: JR 209 Investments (Pty) Ltd
- Trading as: M&T Development
- Registration no.: 2000/020447/07
- Physical address: 1st Floor, Eco Court, 340 Witch-Hazel Street, Highveld Ext. 70, Centurion, 0157
- Postal address: P O Box 39727, Faerie Glen, 0043
- Telephone no.: (012) 676-8500
- Fax no.: (012) 676-8585
- Authorized person: James Barry Munnik Hertzog (ID No. 660830 5017 083)

1.4 ENGINEERS

Vela VKE Consulting Engineers (Pty) Ltd was appointed by M&T Development for the provision of the Roads and Stormwater services for the proposed development (see Annexure D). The details of the company and the individual responsible for this project are as follows:

- Company: Vela VKE Consulting Engineers (Pty) Ltd
- Physical address: 230 Albertus Street, La Montagne, 0184
- Postal address: P O Box 72927, Lynnwood Ridge, 0040
- Telephone no.: (012) 481-3800
- Fax no.: (012) 803-7943
- Responsible person: A W Malan (Technical Director - Pr. Eng 20070105)
- Cell phone number: 082 940 3834
- E-mail address: malana@velavke.co.za

LV & Partners (Pieter Lindeque; 012 664 6490) was similarly appointed for the Water and Sewer services and Geopower (Robert Zietsman; 012 361 5000) for the Electrical and Telephone services.

2 TRAFFIC IMPACT STUDY

The Traffic Impact Study for Irene x91 was compiled by ITS Engineers, submitted to City of Tshwane and comprises two documents:

- Traffic Impact Study : Irene x91 dated March 2011 (attached in Annexure B)
- Traffic Impact Study : N1, R21 Development Area Master Plan dated March 2011 (extracts attached in Annexure B)

The Trip Generation Tables indicate 2984 trips generated during the AM peak hour and 4108 trips generated during the PM peak hour.

The Traffic Impact Study states that several strategic road network upgrades are required to accommodate the developments in the area. A cost apportionment model, showing a total cost of R 92 million attributed to Irene x91, was also proposed which must form the basis for an implementation strategy for the various developments in the area. This implementation strategy must be agreed on and will form part of the final services agreement to be entered into with the local authority.

3 ROADS AND STREETS

Refer to the township layout (Annexure A), the Traffic Impact Study (Annexure B) and the Key Plan (Annexure C).

3.1 EXISTING ROADS AND TOWNSHIP ACCESS

The existing Nelmaplus Drive runs to the north of the proposed township. The Irene x91 township will gain access to the existing road network through the extension of Van Ryneveld Avenue from the existing intersection on Nelmaplus Drive.

3.2 PROPOSED ROAD UPGRADES

The road upgrades to be implemented as part of the Irene x91 township will be based on the implementation strategy as discussed in the Traffic Impact Study and as agreed to by all the relevant parties.

3.3 PLANNED FUTURE ROAD NETWORK

The Traffic Impact Study proposes that Olievenhoutbosch Drive be developed as a one-way couplet. The eastbound leg of this one-way couplet adjacent to the Irene x91 township will follow the alignment of the existing Nelmaplus Drive. The westbound leg of the one-way couplet passes through the Irene x91 township inside a 40m road reserve. The required road reserve widths for the two legs of the one-way couplet must be confirmed by the City of Tshwane.

The Irene x91 township layout makes provision for the road reserve of the future Olievenhoutbosch/R21 split diamond interchange.

3.4 TOWNSHIP STREETS

A public class 4 road will be constructed inside a 25m road reserve from an intersection on the westbound Olievenhoutbosch Drive to at cul-de-sac at the entrance to erf 13. A public class 5 road will be constructed inside a 16m road reserve from the class 4 road up to a traffic circle cul-de-sac giving access to erven 6, 7, 8 and 11.

All township streets will be constructed in accordance with the applicable standards of the City of Tshwane Metropolitan Municipality and according to the Guidelines for Human Settlement Planning and Design issued by the CSIR. Road widths will comply with municipal standards.

All township streets will be designed with a 3% chamber and provided with 150mm concrete channels and Figure 7 semi-mountable kerbs. Ramps will be provided at the accesses to individual erven. The minimum radii at intersections will be 10m.

3.5 ACCESS TO ERVEN

Access to the public transport facility on erf 1 will be integrated with the design of the public road to the west of erf 1.

Access to the municipal erf 2 will be via a right of way servitude on erf 1.

Access to erf 3 will be in the form of right-in-right-out access from both legs of the Olievenhoutbosch one-way couplet, as well as full access from the extension of Van Ryneveld Avenue.

Access to erf 4 will be from the Van Ryneveld Avenue extension, midway between the two legs of the one-way couplet, as well as both legs of the Olievenhoutbosch one-way couplet, with a possible future road linking the two legs of the one-way couplet through erf 4.

Access to erf 5 will be at the intersection between Van Ryneveld Avenue and the westbound leg of the one-way couplet, which also provides access via a right of way to the adjacent Irene x89 township.

Access to erven 6, 7, 8 and 11 will be at the traffic circle cul-de-sac on the 16m wide class 5 public road.

Access to erven 9, 10, 12 and 13 will be direct from the class 4 public road.

3.6 PAVEMENT DESIGN

All township roads and streets will be flexible pavements and designed and constructed in accordance with the applicable standards of the City of Tshwane Metropolitan Municipality and according to the Guidelines for Human Settlement Planning and Design issued by the CSIR.

4 STORMWATER DRAINAGE

The proposed township is affected by three main catchments:

- The largest catchment conveys discharge from the north through existing culverts underneath Nellinapius Drive and the R21 freeway.
- The second catchment discharges concentrated flow from the existing Cornwall Hill Estate and the proposed Irene x89 township, which are situated west of the proposed township.
- The third catchment is the proposed township itself.

4.1 DRAINAGE SYSTEMS

Stormwater drainage systems will comprise concrete pipe culverts up to 1350mm diameter. Refer to Plan No. PE149-x91-R1-DKp01 attached as Annexure C. These drainage systems will be installed in accordance with the applicable standards of the City of Tshwane Metropolitan Municipality.

The pipes will be concrete with spigot and socket joints due to the dolomitic nature of the area. The pipes will be sized to accommodate at least 1 in 5 year storms. The combination of pipes and street flow will convey 1 in 25 year floods to the lowest points, where the 1 in 25 year floods will be intercepted and conveyed to the discharge points.

The floodline canalisation systems comprise concrete lined canals in combination with earth berms, concrete box culverts and concrete pipe culverts. These systems are sized to accommodate 1 in 100 year floods.

Stormwater servitudes will be required as indicated to accommodate the stormwater run-off from the higher lying stands.

4.2 FLOODLINES

The proposed township is affected by the 1 in 100 year floodline as shown on the township layout. North of the public class 4 road providing access to erf 13, the floodline will be managed within canalisation systems along the eastern township boundary. North of the westbound Olievenhoutbosch, the system is located inside a 10m stormwater servitude along the eastern boundary of erf 4. South of the westbound Olievenhoutbosch, the system is located on public open space erf 15. South of the public class 4 road the natural floodline will be maintained on public open space erf 14.

The proposed township is also affected by the 1 in 100 year floodline resulting from the Sesmyspruit backwater, to a level of 1453,5m. The flow of the river, and therefore this floodline, is affected by the existing Cornwall Hill Estate township boundary wall. This floodline is located on public open space erf 14.

4.3 STORMWATER MANAGEMENT

The stormwater run-off from the largest catchment situated to the north of the township will be accommodated in canalisation systems comprising concrete canals, earth berms, concrete box culverts and concrete pipe culverts sized to accommodate 1 in 100 year floods.

The floodline on erf 4 will be managed through a trapezoidal concrete canal inside a 10m servitude along the eastern boundary of erf 4, from where it will discharge through 2 x 2400 x 1500mm box culverts underneath the westbound leg of Olievenhoutbosch, into the existing dam.

The floodline south of the existing dam will be canalised through a combination of a concrete canal and earth berm, containing the stormwater run-off within the confines of the public open space erf 15. The concrete canal will daylight upstream of the public class 4 road, resulting in stormwater run-off on natural ground level, spread over a wide area by an energy dissipater for erosion protection consisting of an outlet structure, gabion boxes and mattresses. The run-off will be contained within erf 15 through an earth berm along the eastern boundary of erf 9 and discharged underneath the road through a set of 25 x 1350mm diameter pipe culverts into the existing floodline south of the road. The natural floodline south of the road will be maintained on public open space erf 14.

The stormwater run-off from erven 1, 2 and 3 will be accommodated in a system inside a 3m stormwater servitude along the northern boundary of erven 2 and 3, and linked into the system inside the Van Ryneveld Avenue road reserve, which in turn links into the system inside the westbound Olievenhoutbosch road reserve.

The stormwater run-off draining towards the westbound Olievenhoutbosch from sections of the proposed Irene x89 township and Irene x91 erf 5, will be accommodated in the system installed inside the road reserve. This system inside the westbound Olievenhoutbosch road reserve discharges into the existing dam on public open space erf 15.

The stormwater run-off from the western section of erf 4 is accommodated in the system installed inside the future road reserve and linked into the system inside the westbound Olievenhoutbosch road reserve.

The stormwater run-off from the eastern section of erf 4 is linked into the canal inside the 30m servitude along the eastern boundary of erf 4.

The stormwater run-off draining onto erf 5 from a section of the proposed Irene x89 township will be accommodated in a system inside a 3m stormwater servitude and linked into the system inside the public access road reserve.

The stormwater run-off from Cornwall Hill Estate discharged at the southern tip of erf 5 (between Cornwall Hill erf 371 and 372), will be intercepted by the pipe system installed inside the 3m stormwater servitude at this location, linking into the system inside the public road reserve. This run-off from Cornwall Hill Estate results in an increase in the size of the Irene x91 internal drainage system from 750mm diameter pipe culverts to 1200mm diameter pipe culverts. The size of the final sections of this system is increased from 900mm diameter to 1350mm diameter as a result of the additional run-off from Cornwall Hill Estate.

The stormwater run-off from erven 6, 8, 9, 10 and 11 is linked into the system inside the public access road reserve. This system discharges into the floodline, with appropriate erosion protection at the outlet.

The stormwater run-off from erf 7 links into the canalisation system on public open space erf 15.

The stormwater run-off from Cornwall Hill Estate discharging onto Irene x91 erf 12 either side of Cornwall Hill erf 377, will be intercepted by 1350mm diameter pipe culverts inside 3m stormwater servitudes. This system then runs parallel to an existing servitude and discharges into the floodline on public open space erf 14, with appropriate erosion protection at the outlet.

The servitudes required to accommodate the proposed drainage system are shown on the Township Layout (Annexure A) and the Key Plan (Annexure C).

5 COST ESTIMATE AND APPORTIONMENT

The construction cost of the roads and stormwater services as well as the acquisition of the related road reserves and servitudes are distributed between the Developer and the City of Tshwane, as discussed below.

5.1 ROADS AND RESERVES

The cost of upgrading the Nelmapius Interchange to a split diamond Interchange, with the accompanying road reserve acquisition, should be allocated to the City of Tshwane but is not discussed in further detail in this report.

The cost apportionment and implementation strategy of the road network in the area is to be finalised with the local authority and other interested parties. Some of the cost associated with the road network upgrades have been included in the cost estimate described in this report.

The Olievenhoutbosch Drive one-way couplet is a Class 3 road and is therefore allocated to the City of Tshwane. A two lane single carriageway inside the westbound Olievenhoutbosch road reserve, between the Link Road and the class 4 public access road, will provide sufficient access to Irene x91 should the Olievenhoutbosch one-way couplet not be implemented prior to development of the township. This report therefore only includes the cost associated with the construction of such a single carriageway in terms of the westbound Olievenhoutbosch.

The extension of Van Ryneveld Avenue, the Link Road and the public access road towards erf 13 are Class 4 roads and therefore the Developer is responsible for the first 7,4m surfaced width and the first 20m road reserve width, with the remainder of the cost and road reserve being allocated to the City of Tshwane.

The public access road giving access to erven 6, 7, 8 and 11 is a Class 5 road and therefore the Developer is responsible for all the costs associated with this road.

5.2 STORMWATER AND SERVITUDES

The stormwater run-off from the catchment area north of the Irene x91 township created an unnatural floodline on Irene x91 between Nelmapius Drive and the existing dam to the south. The section of the canal up to the existing dam is required to accommodate this external stormwater run-off and therefore the cost and associated servitude for this canalisation are allocated to the City of Tshwane.

The floodline between the existing dam and the class 4 public access road to erf 13 will be managed by a canalisation system. This canalisation system mainly manages external stormwater, with the township stormwater run-off added to this system having a negligible effect on the size of the system. Therefore, the cost and associated public open space required for this system are allocated to the City of Tshwane.

The floodline south of the class 4 public access road will be maintained inside public open space erf 14.

The cost and servitudes related to managing the stormwater run-off from the Cornwall Hill Estate through Irene x91 are allocated to the City of Tshwane. This includes the increase in the township drainage system culvert sizes due to the additional run-off from Cornwall Hill.

5.3 COST ESTIMATE

The construction costs are estimated based on unit rates obtained from the recent construction costs of similar projects.

Table 5.1 shows a summary of the cost estimate, Table 5.2 the distribution of the acquisition of road reserves. The cost estimates for the roadworks and stormwater drainage are shown in Table 5.3 and Table 5.4 respectively.

Table 5.1: Summary of cost estimate

| Description | Developer | City of Tshwane | Total |
|---------------------------|------------------------|------------------------|------------------------|
| Roadworks | R 6,280,500.00 | R 9,216,100.00 | R 15,496,600.00 |
| Stormwater drainage | R 6,009,300.00 | R 7,993,850.00 | R 13,997,150.00 |
| Total Construction | R 12,283,800.00 | R 17,209,950.00 | R 29,493,750.00 |
| P&G's (20%) | R 2,456,760.00 | R 3,441,990.00 | R 5,898,750.00 |
| Professional Fees | R 614,190.00 | R 860,497.50 | R 1,474,687.50 |
| Sub Total | R 15,354,750.00 | R 21,512,437.50 | R 36,867,187.50 |
| VAT (14%) | R 2,149,665.00 | R 3,011,741.25 | R 5,161,406.25 |
| Total | R 17,504,415.00 | R 24,524,178.75 | R 42,028,593.75 |

Table 5.2: Distribution of acquisition of road reserves

| Road/Street | Class | Length (m) | Road Reserve Area (m ²) | | |
|------------------------|-------|---------------|-------------------------------------|---------------|---------------|
| | | | Developer | Municipality | Total |
| Olievenhoutbosch West | 3 | 740 | 0 | 43,650 | 43,650 |
| Van Ryneveld Extension | 4 | 200 | 4,000 | 2,515 | 6,515 |
| Link Road | 4 | 80 | 1,600 | 1,355 | 2,955 |
| Public Access Road (1) | 4 | 690 | 13,800 | 4,025 | 17,825 |
| Public Access Road (2) | 5 | 110 | 3,332 | 0 | 3,332 |
| | | | 22,732 | 51,545 | 74,277 |

Table 5.3: Cost estimate - Roadworks

| Road/Street | Class | Length (m) | Surfaced Area (m ²) | | | Unit Rate (R/m ²) | Construction Cost (excl. VAT) | | |
|------------------------|-------|------------|---------------------------------|---------------|---------------|-------------------------------|-------------------------------|-----------------------|------------------------|
| | | | Developer | Municipality | Total | | Developer | Municipality | Total |
| Olievenhoutbosch West | 3 | 740 | 0 | 6,068 | 6,068 | R 950,00 | R - | R 5,764,600,00 | R 5,764,600,00 |
| Van Ryneveld Extension | 4 | 200 | 1,480 | 3,260 | 4,740 | R 750,00 | R 1,110,000,00 | R 2,645,000,00 | R 3,555,000,00 |
| Link Road | 4 | 80 | 592 | 818 | 1,410 | R 750,00 | R 424,000,00 | R 613,500,00 | R 1,037,500,00 |
| Public Access Road (1) | 4 | 690 | 5,106 | 524 | 5,630 | R 750,00 | R 3,829,500,00 | R 393,000,00 | R 4,222,500,00 |
| Public Access Road (2) | 5 | 110 | 1,380 | 0 | 1,380 | R 650,00 | R 897,000,00 | R - | R 897,000,00 |
| | | | 8,558 | 10,670 | 19,228 | | R 6,280,500,00 | R 9,216,100,00 | R 15,496,600,00 |

Table 5.4: Cost estimate - Stormwater

| Item | Unit Rate (R/m) | Quantities (m) | | | Construction Cost (excl. VAT) | | |
|------------------|--------------------|----------------|--------------|-------|-------------------------------|-----------------------|------------------------|
| | | Developer | Municipality | Total | Developer | Municipality | Total |
| 450mm Ø P.C. | R 1,110,00 | 590 | 0 | 590 | R 654,900,00 | R - | R 654,900,00 |
| 525mm Ø P.C. | R 1,530,00 | 250 | 0 | 250 | R 382,500,00 | R - | R 382,500,00 |
| 600mm Ø P.C. | R 1,670,00 | 1,020 | 0 | 1,020 | R 1,703,400,00 | R - | R 1,703,400,00 |
| 750mm Ø P.C. | R 2,120,00 | 1,005 | -425 | 580 | R 2,130,600,00 | R -901,000,00 | R 1,229,600,00 |
| 900mm Ø P.C. | R 2,940,00 | 385 | -95 | 290 | R 1,131,900,00 | R -279,300,00 | R 852,600,00 |
| 1200mm Ø P.C. | R 4,590,00 | 0 | 425 | 425 | R - | R 1,950,750,00 | R 1,950,750,00 |
| 1350mm Ø P.C. | R 6,040,00 | 0 | 660 | 660 | R - | R 3,986,400,00 | R 3,986,400,00 |
| 2400 x 1500 B.C. | R 19,400,00 | 0 | 35 | 35 | R - | R 679,000,00 | R 679,000,00 |
| Canalisation (1) | R 3,000,00 | 0 | 286 | 286 | R - | R 858,000,00 | R 858,000,00 |
| Canalisation (2) | R 5,000,00 | 0 | 340 | 340 | R - | R 1,700,000,00 | R 1,700,000,00 |
| Total | | | | | R 6,006,300,00 | R 7,993,850,00 | R 13,997,150,00 |

6 CONTRIBUTIONS BY THE DEVELOPER

6.1 CONTRIBUTIONS TOWARDS BOUNDARY SERVICES

These contributions will be determined in terms of the City of Tshwane Metropolitan Municipality's current policy.

6.2 BULK SERVICES CONTRIBUTIONS

The bulk service contributions are based on the rights of each erf and the current policy applicable at the City of Tshwane Metropolitan Municipality.

The developer proposes that these contributions be utilized to construct services which are the responsibility of the municipality.

7 DEVELOPMENT PHASES AND CONSTRUCTION PERIOD

The development of the township will be done in phases and will be subject to market forces/economic conditions. The estimated construction period for the phases constructed consecutively is 12 months.

Annexure K

Public Participation



Annexure K(i)

Site Notice



NOTICE OF ENVIRONMENTAL SCOPING PROCESS

Notice is given of an application for Environmental Authorisation that was submitted to the Gauteng Department of Agriculture and Rural Development, in terms of Regulation No. R543 published in the Government Notice No. 33306 of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing **Environmental Scoping Procedures (Listing Notice: 1, 2 and 3 – Governing Notice R5.44, R.545 & R.546)** for the following activity:

Project Name: Olievenhoutbosch Road from Main Road to K54.

Reference Number: Gaut 002/11-12/E0135

Property Description: Portion 1, Portion 188 and the Remainder of Portion 330; Portion 335 and Portion 5 of the Farm Doornkloof 391-JR; the Road reserve of Nellmapius Drive/M31 and the Road servitude of the R21.

Proposed Zoning Information: The current zoning is "Agriculture"

Extent of Development: The proposed road is approximately 4, 67785 km in extent.

Listing Notices Applied For:

| | |
|--|-------------|
| GNR 544 (Listing Notice 1), 18 June 2010 | Activity 11 |
| GNR 544 (Listing Notice 1), 18 June 2010 | Activity 18 |
| GNR 545 (Listing Notice 2), 18 June 2010 | Activity 18 |
| GNR 546 (Listing Notice 3), 18 June 2010 | Activity 4 |
| GNR 544 (Listing Notice 3), 18 June 2010 | Activity 13 |
| GNR 544 (Listing Notice 3), 18 June 2010 | Activity 19 |

Proponent Name: JR 209 Investments (Pty) Ltd trading as M&T Development.

Location: The proposed road will connect Main Road with the K54. The proposed Olievenhoutbosch Road is located south of the N1 Highway, west of the K54, east of Main Road and to the north of Cornwall Hill.

Date of Notice: 13 October 2011

Queries regarding this matter should be referred to:

Bokamoso Landscape Architects and Environmental Consultants

George Gericke / Genevieve Tredoux

P.O. Box 11375

Maroelana 0161

www.bokamoso.net

Tel: (012) 346 3810

Fax: (086) 570 5659

E-mail: lizelleg@mweb.co.za

In order to ensure that you are identified as an Interested and/or Affected Party (I&AP) please submit your name, contact information and interest in the matter, in writing, to the contact person given above **within 40 days of publication of this advertisement.**

Annexure K(ii)

Notice/flyers distributed to I&AP's



Olievenhoutbosch Rd Final Scoping Report for Review

All interested and affected parties are invited to review the development information.

Please submit your comments on the Final

Scoping Report within 21 days to the

Gauteng Department of Agriculture and

Rural Development (GDARD) – Attention:

Justine Chan (email:

Justine.Chan@gauteng.gov.za or fax: 011 355

1000). Please cc your comments to

Bokamoso (email: lizelleg@mweb.co.za or

fax: 086 570 5659)

Venue: Lyttleton Library

Tel: 012 644 0382

Date: 17 July – 6 August 2013

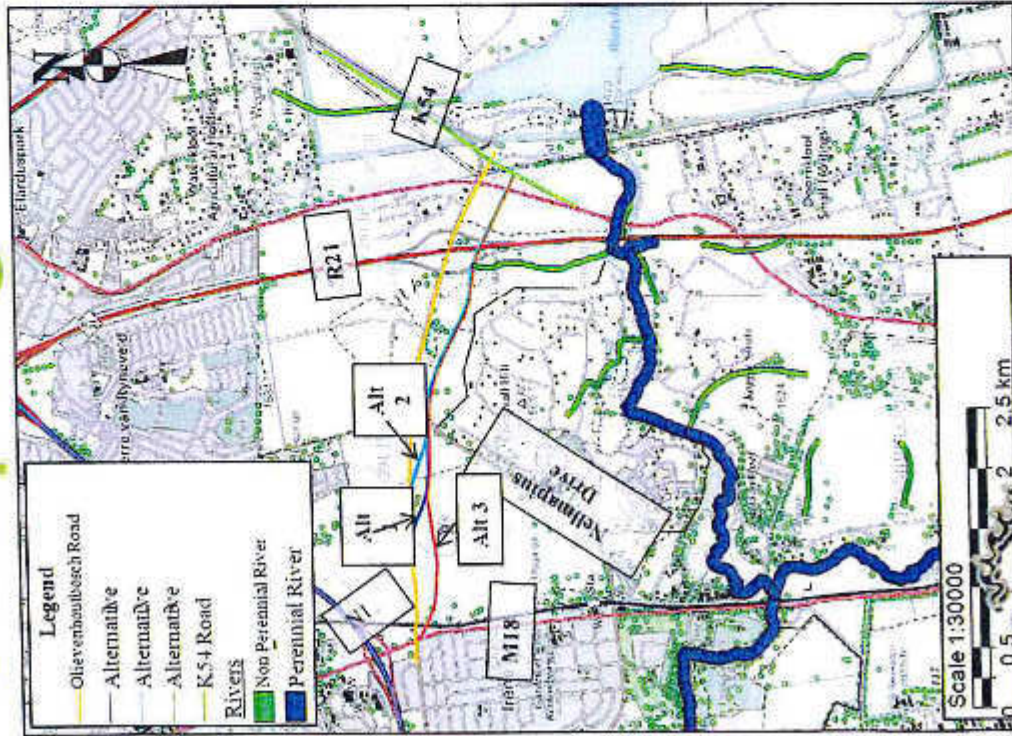
Website: www.bokamoso.biz

Please do not hesitate to contact us if there are any questions in connection with the above mentioned development.

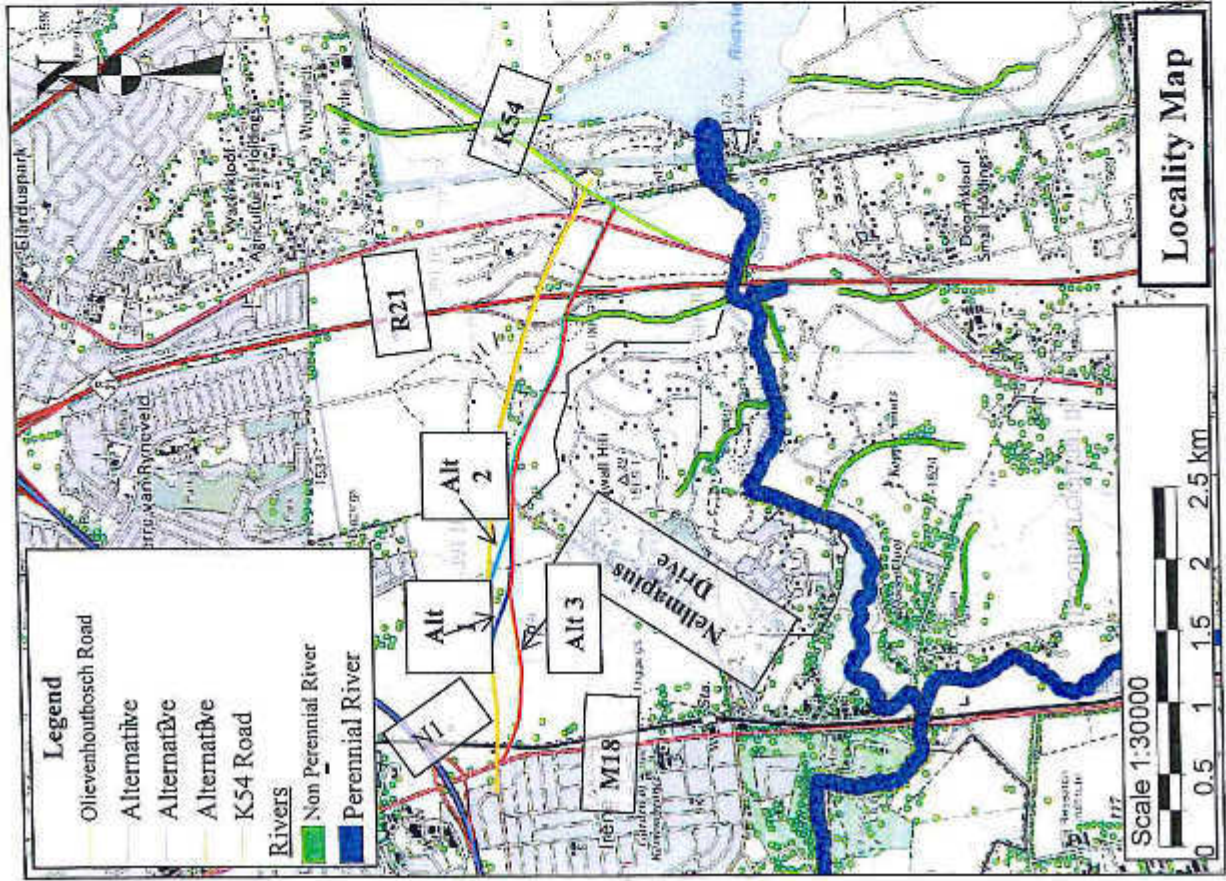
Contact person: **Juanita De Beer**

Tel: 012 346 3810 Fax: 086 570 5659

E-mail: lizelleg@mweb.co.za



OLIEVENHOUTBOSCH ROAD FROM MAIN ROAD TO K54.



NOTICE OF ENVIRONMENTAL SCOPING PROCESS

Notice is given of an application for Environmental Authorisation that was submitted to the Gauteng Department of Agriculture and Rural Development, in terms of Regulation No. R543 published in the Government Notice No. 33306 of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing **Environmental Scoping Procedures (Listing Notice: 1, 2 and 3 – Governing Notice R5.44, R.545 & R.546)** for the following activity:

Project Name: Olievenhoutbosch Road from Main Road to K54.

Reference Number: Gaut 002/11-12/E0135

Property Description: Portion 1, Portion 188 and the Remainder of Portion 330; Portion 335 and Portion 5 of the Farm Doornkloof 391-JR; the Road reserve of Nellmapius Drive/M31 and the Road servitude of the R21.

Proposed Zoning Information: The current zoning is "Agriculture"

Extend of Development: The proposed road is approximately 4, 67785 km in extent.

Proponent Name: JR 209 Investments (Pty) Ltd trading as M&T Development.

Location: The proposed road will connect Main Road with the K54. The proposed Olievenhoutbosch Road is located south of the N1 Highway, west of the K54, east of Main Road and to the north of Carnwall Hill.

Date of Notice: 18 October 2011

Queries regarding this matter should be referred to:

Bokamoso Landscape Architects and Environmental Consultants

George Gericke/Genevieve Tredoux Tel: (012) 346 3810

P.O. Box 11375 Fax: (086) 570 5659

Maroelana 0161

E-mail: lizelleg@mweb.co.za

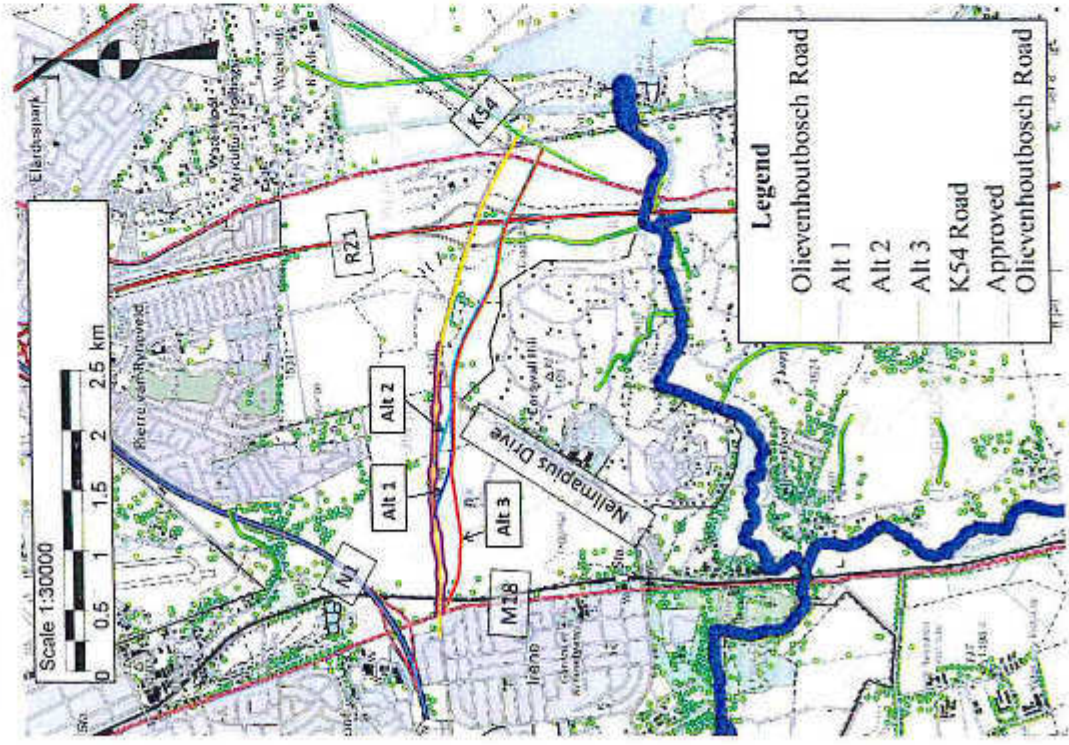
www.bokamoso.net



In order to ensure that you are identified as an interested and/or Affected Party (I&AP) please submit your name, contact information and interest in the matter, in writing, to the contact person given above **within 40 days of publication of this advertisement.**

Draft Scoping Report for Review

Olievenhoutbosch Road



All interested and affected parties are invited to review the development information and to register any issues and concerns to be included and addressed in the Final Scoping Report.

Venue: Lyttleton Library

Tel: 012 644 0382

Date: Available until 4 June 2012

Website: No access at the moment.

Please do not hesitate to contact us if there are any questions in connection with the above-mentioned development.

Contact Person: Juanita De Beer

Tel (012) 346 3810 Fax (086) 570 5659

E-mail: lizelle@mweb.co.za

Website: www.bokamoso.net

List of REGISTERED LETTERS
Lys van GEREgistreERDE BRIEWE
 (With an insurance option/met 'n versekeringsopsie)



Full tracking and tracing/Volledige volg en spoor

Name and address of sender Bobamase, PO Box 11375,
 Naam en adres van afsender Marcelona 0161

Enquiries/Navan
 Toll-free number
 Tolvry nommer
0800 111 502

| No | Name and address of addressee Naam en adres van geadresseerde | Insured amount Versekerde bedrag | Insurance fee Versekeringsgeld | Postage Posgeld | Service fee Diensgeld | Affix Track and Trace customer copy Plak Volg-en-Spoor-klëntafskrif |
|----|--|-------------------------------------|-----------------------------------|--------------------|--------------------------|--|
| 1 | Irene Estate PO Box 589, Irene, 0062 | | | | | REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 697 ZA |
| 2 | Irene Land Corporation PO Box 444, Irene, 0062 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 710 ZA |
| 3 | N. Molebatsi, PO Box 151 Irene 0062 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 723 ZA |
| 4 | M.A Swanepoel, PO Box 295, Senekal 9660 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 737 ZA |
| 5 | Kilochron Investments, PO Box 75266 Lynnwood Ridge 0060 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 745 ZA |
| 6 | J. B. Koen, PO Box 11505, Erasmuskloof 0068 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 799 ZA |
| 7 | Moo Zoo CC, PO Box 6, Irene 0062 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 808 ZA |
| 8 | G.S. le Roux, PO Box 100, Crown Mines 2025 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 771 ZA |
| 9 | Mr E.H.H Meyer, PO Box 4659 Rivonia 2128 | | | | | CUSTOMER COPY 301028R REGISTERED LETTER <small>(with a domestic insurance option) ShareCall 0800 111 502 www.sapo.co.za</small> RD 585 454 785 ZA |
| 10 | | | | | | |
| | | Total Totaal | R | R | R | R |

Number of letters posted 9
 Getal briewe gepos

Signature of client
 Handtekening van klient

Signature of accepting officer
 Handtekening van aanneembeampte

The value of the contents of these letters is as indicated and compensation is not payable for a letter received unconditionally. Compensation is limited to R100,00. No compensation is payable without documentary proof. Optional insurance of up to R2 000,00 is available and applies to domestic registered letters only.


Die waarde van die inhoud van hierdie briewe is soos aangedui en vergoeding sal nie betaal word vir 'n brief wat sonder voorbehoud ontyang word nie. Vergoeding is beperk tot R100,00. Geen vergoeding is sonder dokumentêre bewys betaalbaar nie. Opsionele versekering van tot R2 000,00 is beskikbaar en is slegs op binnelandse geregistreerde briewe van toepassing.



Olievenhoutbosch Road from Main Road to K54.

Construction of a section of Olievenhoutbosch Road (from Main Road to K54) and associated infrastructure.

Acknowledgement of Receipt of Public Notice concerning the proposed development on Portion 1, Portion 188, Remainder of Portion 330; Portion 335 and Portion 5 of the farm Doornkloof 391-JR; the Road reserve of Nellmapius Drive/M31 and the Road servitude of the R21.

| | Name | Address | Contact Details | Signature |
|----|---|------------------------------|---|---|
| 1 | No answer - bell in PO box | 2 Wellington Rd | Email: Fax: Tel: | |
| 2 | No bell - PO box | 3 Wellington Rd | Email: Fax: Tel: | |
| 3 | Eben Maré | 7 Lotus Straat | Email: elen.erasmus@gmail.com Fax: Tel: 012 667 2294 | |
| 4 | No one - PO box | 5 Lotus Str | Email: Fax: Tel: | |
| 5 | Akutstroof. | 71 Lobelius Str | Email: ceo@phasa.co.za Fax: 026672049 Tel: 012 667 2048 | anew. |
| 6 | No answer - Post box | 11 Lobelius Alexander Str | Email: Fax: Tel: | |
| 7 | No intercom | 68 Main Rd | Email: Fax: Tel: | |
| 8 | AP VAN NIEKERK ESTATE MANAGER, FARM VI | IRENE | Email: estatemanager@ Fax: Tel: 079-525-9281 |  |
| 9 | | | Email: Fax: Tel: | |
| 10 | | | Email: Fax: Tel: | |
| 11 | | | Email: Fax: Tel: | |
| 12 | | | Email: Fax: Tel: | |
| 13 | | | Email: Fax: Tel: | |

irenefarmvillages.co.za

Olievenhoutbosch Road from Main Road to K54.

Construction of a section of Olievenhoutbosch Road (from Main Road to K54) and associated infrastructure.

Acknowledgement of Receipt of Public Notice concerning the proposed development on Portion 1, Portion 188, Remainder of Portion 330; Portion 335 and Portion 5 of the farm Doornkloof 391-JR; the Road reserve of Nellmapius Drive/M31 and the Road servitude of the R21.

| | Name | Address | Contact Details | Signature |
|----|-------------------------|------------------------------------|---|------------|
| 1 | L. BOTHA SP. BOTHA | 4 WELLINGTON ROAD; IRENE | Email: lizanne@bestclothing.co.za Fax: 0866395928 Tel: 0824437639 | |
| 2 | No Intercom | 1 Wellington Road | Email: Fax: - Tel: - | In Mailbox |
| 3 | SG. MAHABA | 3 WELLINGTON ROAD; IRENE | Email: Fax: Tel: 0836694449 | |
| 4 | No answer | 6 Wellington Road | Email: Fax: - Tel: - | In Mailbox |
| 5 | ANN CAMPBELL | 9 LOTUS ST IRENE | Email: Fax: Tel: | |
| 6 | J JOSEPHSON | 70 COBEA LN IRENE | Email: Fax: Tel: 082 298 9919 | |
| 7 | Roux Props V. Mditsheng | 5 Alexandra Road. | Email: vuyile@rouxprops.co.za Fax: Tel: 0126672772 | |
| 8 | Lizette Visser | 7 Alexandra Road | Email: lisserviz@w.welo.co.za Fax: 012-6672819 Tel: 012-6672638 | |
| 9 | HANNES HOLTZHAUSEN | | Email: parkmahaba@R21.co.za Fax: 012 345 5461 Tel: 012 345 4331 | |
| 10 | MANDISA ZWANE | 957 Nellmapius Drive EUGENROUTE 21 | Email: Fax: 0866215268 Tel: 012 345 5461 | |
| 11 | | | Email: Fax: Tel: | |
| 12 | | | Email: Fax: Tel: | |
| 13 | | | Email: Fax: Tel: | |
| | | | Email: | |

LEBOMBO GARDEN BUILDING
35 LEBOMBO ROAD
ASHLEA GARDENS
0081

P.O. BOX 11375
MAROELANA
0161

Tel: (012) 346 3810
Fax: 036 570 5659
E-mail: lizelig@mweb.co.za
Website: www.Bokamoso.net



Home Owners Associations & Estate Managers

NAME:

AP VAN NIEKERK (TRENK FARM VILLAGES)
OLIFENHOUT BOSCH ROAD HOA

We are currently undertaking a Public Participation Process for the proposed development project namely ~~Site Foundation Internal Access Road~~ in terms of regulation no. R543 published in the Government Notice no. 23306 of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing Scoping procedures (Notice 1, 2, and 3 - Governing Notices R544, 545 & R546)

We (Bokamoso) are usually not allowed inside residential estates due to security reasons. According to the regulation guidelines we are required to inform all landowners within a 100 m radius of the proposed development site. We kindly request that you forward the public notice regarding this project to all relevant landowners/tenants.

If you agree to distribute these notices please sign below.

Name:

AP VAN NIEKERK

Signature:

Kind Regards

George Gericke

Bokamoso Landscape Architects and Environmental Consultants

Tel: (012) 346 3810

Fax: (086) 570 5659

LEBOMBO GARDEN BUILDING
36 LEBOMBO ROAD
ASHLEA GARDENS
0081

P.O. BOX 11375
MARDELANA
0181

Tel: (012) 346 3810
Fax: 086 570 5659
E-mail: lizelleg@mweb.co.za
Website: www.Bokamoso.net



Background Information Document for **ENVIRONMENTAL SCOPING PROCESS**

Application for Environmental Authorization for
Olievenhoutbosch Road from Main Road to the K54

Reference Number: Gaut 002/11-12/E0135

October 2011

PROJECT BACKGROUND

Notice is given, in terms of the new 2010 EIA Regulations published in Government Notice No. R543 of the National Environmental Management Act (Act No. 107 of 1998), of intent to carry out a **Scoping Phase Environmental Impact Assessment (i.t.o. Listing Notice 1, 2 & 3 – G.N. R.544, R.545 & R.546)**

Bokamoso Environmental Consultants were appointed by **JR 209 Investments (Pty) Ltd (Trading as M&T Development)** to undertake to a **Scoping Phase (Environmental Impact Assessment Process)** for the proposed construction of a section of Olievenhoutbosch Road (from Main Road to K54) and associated infrastructure.

THE PROPOSED PROJECT

The proposed project will consist of the following:

The construction of a section of Olievenhoutbosch Road (from Main Road to K54) and any associated infrastructure.

THE PROPOSED SITE

The proposed site consists of the following properties: Portion 1, Portion 188 and the Remainder of Portion 330; Portion 335 and Portion 5 of the Farm Doornkloof 391-JR. The road reserve of Nellmapius Drive/M31 and road servitude of the R21 are also included.

LEGAL ASPECTS OF PROJECT

In terms of Regulation No. R543 published in the Government Notice No. 33306 of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) a specific list of activities was identified which could have a detrimental impact on the receiving environment. These listed activities require Environmental Authorization from the Competent Authority, i.e. the Gauteng Department of Agriculture and Rural Development (GDARD).

The application was submitted for the following activities in terms of the Government Listing Notice 1, 2 and 3 (R.544, R.545 & R.546), 18 June 2010:

| Indicate the number and date of the relevant Government Notice: | Activity No (s) (in terms of the relevant notice): e.g. Listing Notices 1, 2 or 3 | Describe each listed activity as per the wording in the relevant Listing Notice: |
|---|---|--|
| Listing No. 1, R. 544, 18 June 2010 | Activity 11 | <p>The construction of:</p> <ul style="list-style-type: none"> (i) Canals; (ii) Channels; (iii) Bridges; (iv) Dams; (v) Weirs; (vi) Bulk storm water outlet structures; (vii) Marinas; (viii) Jetties exceeding 50 square metres in size; (ix) Slipways exceeding 50 square metres in size; (x) Building exceeding 50 square metres or more <p>Where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.</p> |
| Listing No. 1, R. 544, 18 June 2010 | Activity 18 | <p>The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from :</p> <ul style="list-style-type: none"> (i) A watercourse; (ii) The sea; (iii) The seashore; (iv) The littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is greater – <p>But excluding where such infilling, depositing, dredging, excavation, removal or moving</p> <ul style="list-style-type: none"> (i) Is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or (ii) Occurs behind the development setback line. |

| | | | |
|--|--------------------|--|--|
| <p>Listing No. 2, R. 545, 18 June 2010</p> | <p>Activity 18</p> | <p>The route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before 03 July 2006 and which have not been authorized by a competent authority in terms of the Environmental Impact Assessment Regulations, 2006 or 2009, made under section 24(5) of the Act and published in Government Notice No. 385 of 2006, -</p> <ul style="list-style-type: none"> (i) It is a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); (ii) It is a road administered by a provincial authority; (iii) The road reserve is wider than 30 metres, or (iv) The road will cater for more than one lane of traffic in both directions. | |
| <p>Listing No. 3, R. 546, 18 June 2010</p> | <p>Activity 4</p> | <p>The construction of a road wider than 4 metres with a reserve less than 13.5 metres.</p> | <p>(b) In Gauteng:</p> <ul style="list-style-type: none"> i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus area; iii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; iv. Sites identified in terms of the Rasmus Convention; v. Sites identified as irreplaceable or important in the Gauteng Conservation plan; vi. Areas larger than 2 hectares zoned for use as public open space; vii. Areas zoned for a conservation purpose. viii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environmental Conservation Act, 1989 (Act No. 73 of 1989) and the Nature Conservation Ordinance (Ordinance 12 of 1983); <p>Any site identified as land with high agricultural potential located within the Agricultural Hubs or important Agricultural Sites identified in terms of the Gauteng Agricultural Potential Atlas, 2006.</p> |
| <p>Listing No. 3, R. 546, 18 June 2010</p> | <p>Activity 13</p> | <p>The clearance of an area of 1 hectare or more of vegetation where 75% or more</p> | <p>d) In Gauteng</p> <ul style="list-style-type: none"> i. A protected area identified in terms of NEMPAA, excluding conservancies; |

| | | | |
|-------------------------------------|-------------|--|---|
| | | of the vegetative cover constitutes indigenous | <ul style="list-style-type: none"> ii. National Protected Area Expansion Strategy Focus areas; iii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environment Conservation Act, 1989 (Act No. 73 of 1989), the Nature Conservation Ordinance (Ordinance 12 of 1983); (v) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; iv. Sites or areas identified in terms of an international convention; v. Sites identified as irreplaceable or important in the Gauteng Conservation Plan. |
| Listing No. 3, R. 546, 18 June 2010 | Activity 19 | The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. | <p>(b) In Gauteng</p> <ul style="list-style-type: none"> i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus areas; iii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; iv. Sites or areas identified in terms of an International Convention; v. Any site identified as land with high agricultural potential located within the Agricultural Hubs or important Agricultural Potential Atlas, 2006; vi. All sites identified as irreplaceable or important in terms of the applicable Gauteng Conservation Plan; vii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environment Conservation Act, 1989 (Act No. 73 of 1989), the Nature Conservation Ordinance (Ordinance 12 of 1983) and |

| | | | |
|--|--|--|-------------|
| | | | the NEMPAA. |
|--|--|--|-------------|

Accordingly, the proposed project requires authorisation from GDARD via the EIA Process outlined in Regulation 543 published in the Government Notice No. 33306 of 18 June 2010 of NEMA.

After GDARD have issued an Environmental Authorization, Interested and/or Affected Parties (I&AP's) will be notified of the decision and of the opportunity to appeal to the MEC of the Department of Agriculture and Rural Development.

THE PUBLIC PARTICIPATION PROCESS

A Public Participation Process is being conducted according to the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the new Environmental Impact Assessment Regulations, June 2010.

1. Site notices will be erected (at prominent points on and around the study area).
2. Flyers were distributed to the neighboring properties and estates/developments that may be affected by the proposed development. Not all these properties could be reached due to a lack of sufficient access to them and therefore these flyers, together with this Background Information Document will be sent via email to a preset list of possible Interested and/or Affected Parties (I&AP's) and surrounding landowners via e-mail & registered mail.
3. Registered mail will be send to all surrounding land owners within a 100m radius of the study area.
4. Notices regarding the project will further be e-mailed and faxed to the councilors in the area and possible stakeholders in the area.
5. An advertisement was placed in "**Die Beeld**" newspaper on **10 October 2011**.

CONCERNS RAISED BY THE PUBLIC

Possible concerns to be addressed:

- Visibility
- Noise
- Dust
- Speed
- Safety and Security
- Maintenance of road
- Increase in traffic
- Ecological Surroundings
- "Sense of Place"
- Rivers and Wetlands

PURPOSE OF THIS DOCUMENT

The purpose of this document is to provide information regarding the **construction of a section of Olievenhoutbosch Road (from Main Road to the K54) and associated infrastructure**, and to provide possible stakeholders with an opportunity to register as Interested and/or Affected Parties (I&AP's) and to add their comments and issues to our final reports that will be submitted to the Gauteng Department of Agriculture and Rural Development (GDARD).

In order to ensure that you are identified as an Interested and/or Affected Party (I&AP) please submit your name, contact information and concerns regarding the proposed development, **within 40 days of receipt of this document**.

Please do not hesitate to contact us if there are any questions in connection with the above-mentioned development.

Contact Person: George Gericke/Genevieve Tredoux

Tel (012) 346 3810

Fax (086) 570 5659

E-mail lizelleg@mweb.co.za

Website: www.bokamoso.net

REG NO: CK 2000/054190/23
VAT REG NO: 4440192781
ABUTI 1064 CC TRADING AS BOKAMOSO

MEMBER: Lizelle Gregory

Figure 1: Locality Map

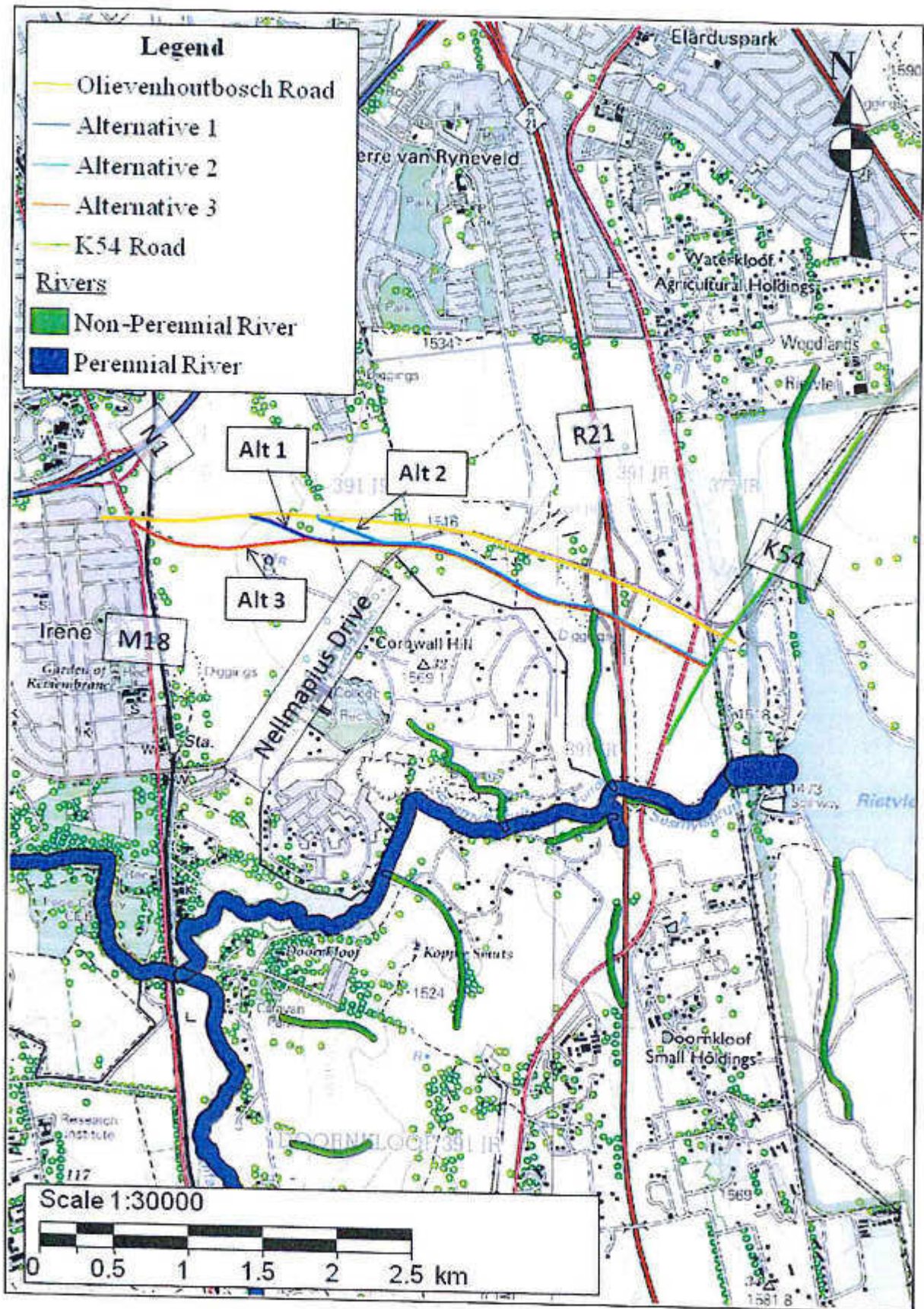


Figure 2: Aerial Map

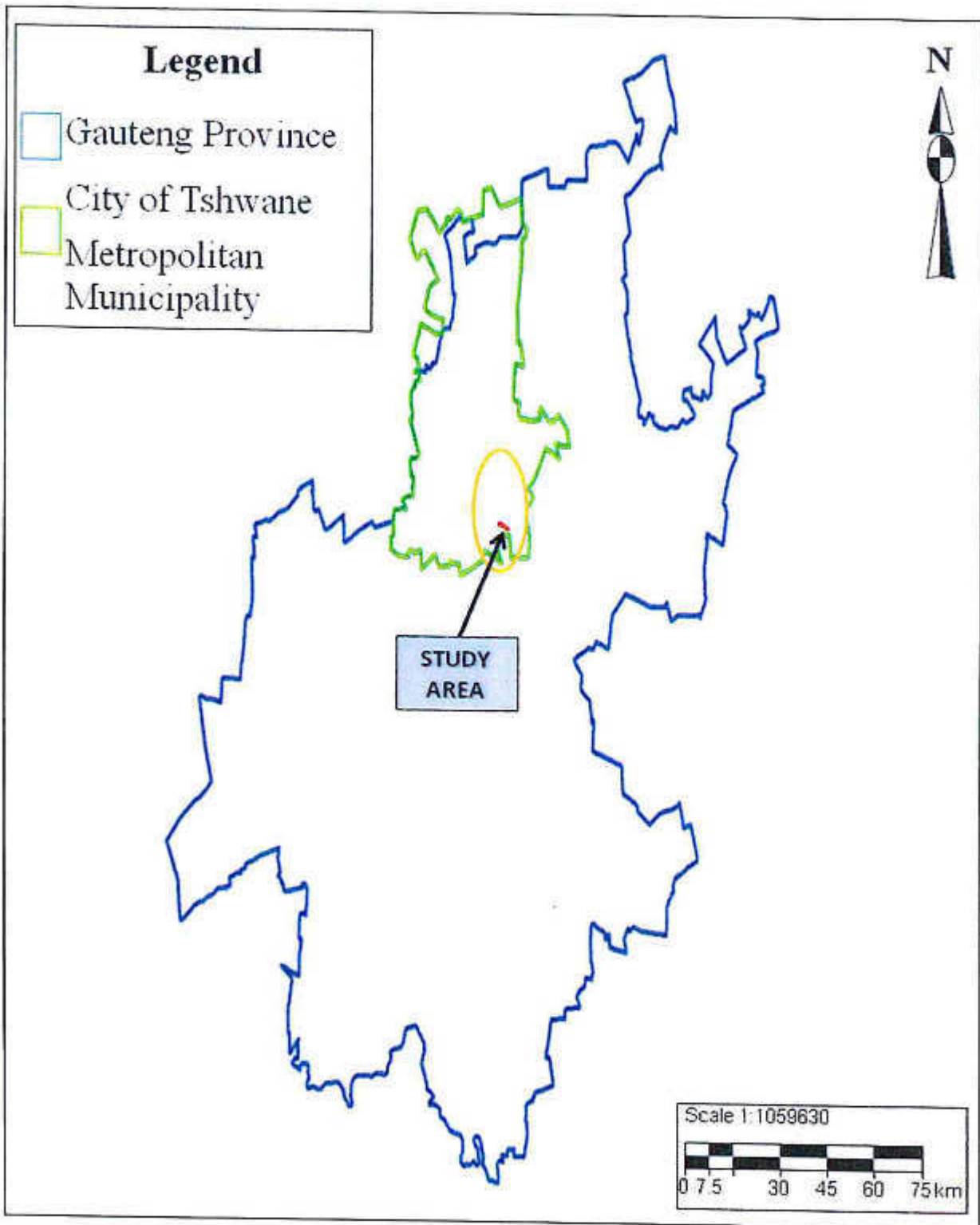
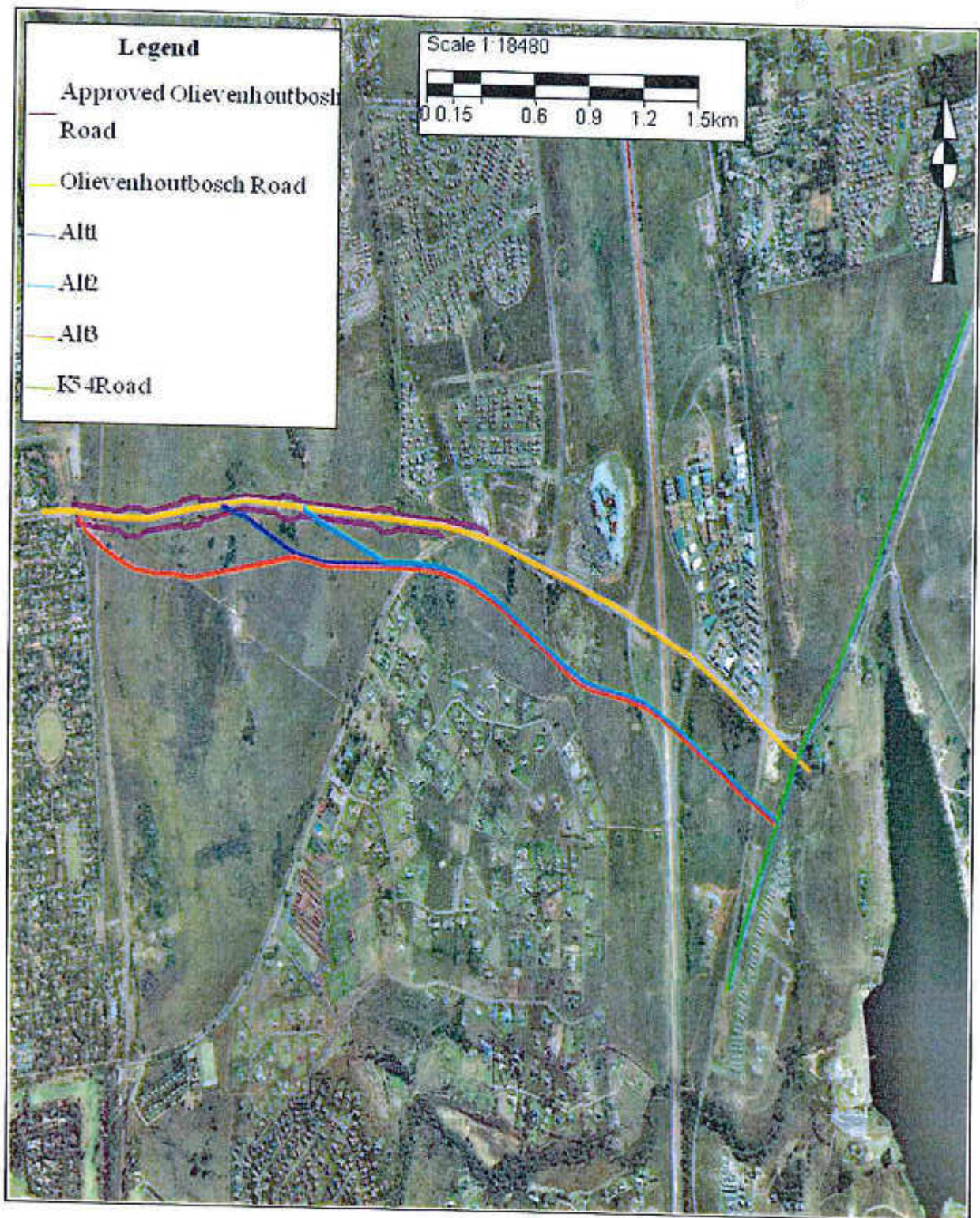


Figure 3: Regional and Local Government Map



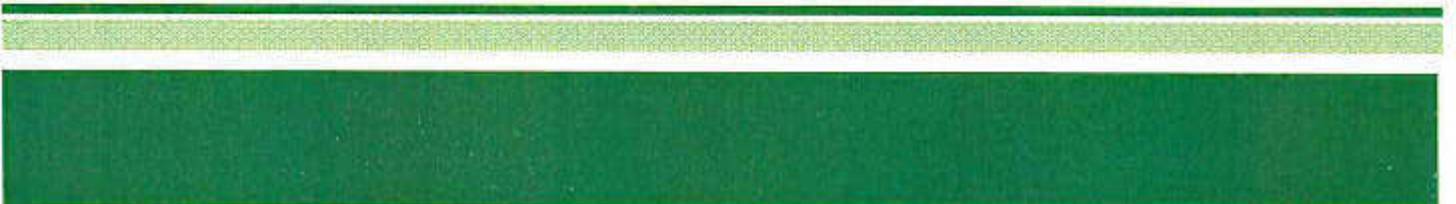
Annexure K(iii)

Proof of Advertisement



Annexure K(iv)

List of registered I&AP's



| Nr | Registered Parties | Contact details | Address |
|-----------------------------|-----------------------------|--|---|
| Stakeholders | | | |
| | Council Geo-Science | igrobler@geoscience.org.za | |
| | SAHRA Gauteng | asalomon@sahra.org.za nndobochani@sahra.org.za | |
| | PHRAG | maphata.ramphele@gauteng.gov.za | |
| | DWA | keetm@dwaf.gov.za siwelanel@dwa.gov.za tshifaror@dwa.gov.za mathebet@dwa.gov.za | |
| | Eskom | central@eskom.co.za pala@eskom.co.za | |
| | SANRAL | schmidk@nra.co.za | |
| | Gautrans | kumen.govender@gauteng.gov.za | |
| | Randwater | mmpshe@randwater.co.za nkoneigh@randwater.co.za | |
| | City Of Tshwane | RudzaniM@tshwane.gov.za | |
| | Spoornet | daniel.ramokone@transnet.net loveous.tampane@transnet.net | |
| Registered I&APs | | | |
| 1 | James AH Cambell | james.ah.cambell@gmail.com 083 457 3724 012 667 5187 | 9 lotus Street, Irene |
| 2 | Ross Howarth | rrhowarth@gmail.com | 68 Main Rd, Irene |
| 3 | Beverley Wulff | tph@tph.co.za 012 809 2229 012 809 2090 (f) | 98 Pony Street Tijger Vallei Office Park |
| 4 | Brian & Jenny Melvill-Smith | Brian.Melvill-Smith@barloworldmotor.com 011 552 9344 083 645 1504 | 37 Alexandra Road, Irene |

| | | | |
|----|--------------------------------|--|-----------------------------|
| | | 012 667 2379 | |
| | | | |
| 5 | Chris Grobler | chrisg@bibletruths.co.za 083 415 7549 | |
| | | | |
| 6 | Craig Comrie | ccomrie@mhq.co.za 011 381 2060 | |
| | | | |
| 7 | Dirk Heyns | manager@cornwallhill.co.za 012 667 2938 | |
| | | | |
| 8 | Gill Udal | gill.udal@telkomsa.net | 16B Iris Lane, Irene |
| | | | |
| 9 | Gerard O' Rourke | gorourke@chieftain.ie 083 313 9671 | 75 Jean Avenue, Doringkloof |
| | | | |
| 10 | Wisani Justice Maluleke | MalulekeJ@dwa.gov.za 012 392 1409 | |
| | | | |
| 11 | Cllr Christa Spoelstra | mwespoel@mweb.co.za 082 880 5300 | |
| | | | |
| 12 | Riaan Marais CoT | RiaanM@tshwane.gov.za | |
| | Rietveli Nature Reserve | | |

| | | | |
|----|--------------------------|--|---|
| 13 | Kobus Knoetze | kobus@dhkthinkspace.co.za 021 421 6803 | 1 Clifford Road, Irene |
| 14 | Hilton Bothma | hiltb@telkomsa.net 076 729 6931 | 31 Pioneer Rd, Irene |
| 15 | Dawie Gouws | dawie@gs2.co.za 083 635 6515 012 667 4630 | 1 Lesley Road, Irene |
| 16 | Malcolm Fawkes | FawkesMG@eskom.co.za 011 655 2552 082 652 7581 | |
| 17 | Michelle Marais | michelle.marais@angloamerican.com 012 679 2058 083 608 0998 | PO Box 129 Irene |
| 18 | David Larsen Salbu | dkoa@salbu.co.za | |
| 19 | Robert Hartman | robert@multicat.co.za 012 663 4660 083 414 4197 | Cornwall Hill Estate |
| 20 | Lisa Trublet de Nermont | trublet@global.co.za 082 885 1554 | Cornwall Hill Residents |
| 21 | Roger Trublet de Nermont | 082 885 1554 | Cornwall Hill Residents |
| 22 | Carlo Machinè | carlomach@absamail.co.za 082 521 1115 | 350 Downderry Way Cornwall Hill Estate |
| 23 | Tom Hannay | tomhannay.sa@gmail.com 083 447 9442 012 667 4520 | 15 Alexandra Road, Irene |
| 24 | Sonya Semmelink | semmelink@webmail.co.za | Cornwall Hill Estate |

| | | | |
|----|---|--|--|
| 25 | Mara Temple | Mara.Temple@gpaa.gov.za 012 319 1004 012 319 3812 (f) | |
| 26 | Nina Strydom | Nina.Strydom@up.ac.za 083 636 1399 072 449 1012 | 3C Iris Lane, Irene |
| 27 | Councillor Casper McDonald | CasperM@tshwane.gov.za 082 563 4570 086 503 5231 | |
| 28 | Manda Botha | manda@soundandimage.co.za 083 760 4385 | PO Box 227 Cornwall Hill, 0178 |
| 29 | Mr Roux Shabangu | roux@rouxprops.co.za 012 667 2772 | Erf 122, Irene |
| 30 | Marese Herbst | marese@rouxprops.co.za 012 667 2772 | Erf 122, Irene |
| 31 | Bea Fletcher The Town Planning Hub (TPH) | bea@tph.co.za tph@tph.co.za | Erf 122, Irene |
| 32 | Natalie Koneight Rand Water | nkoneigh@randwater.co.za 011 724 9366 | |
| 33 | James AH Cambell | james.ah.cambell@gmail.com 083 457 3724 012 667 5187 | 9 lotus Street, Irene |
| 34 | Lizette Visser Moo Zoo | visserliz@mweb.co.za 083 400 2804 012 667 2638 | 7 Alexandra Road, Irene |
| 35 | Raj Shunmugam | raj@glencarol.co.za | 428 Shillingford Road Cornwall Hill |
| 36 | Cllr Christa Spoelsta Ward Councillor | mwespoel@mweb.co.za 082 880 5300 | |

| Nr | Registered Parties | Contact details | Address |
|-----------------------------|-----------------------------|--|---|
| Stakeholders | | | |
| | Council Geo-Science | jgrobler@geoscience.org.za | |
| | SAHRA Gauteng | asalomon@sahra.org.za nndobochani@sahra.org.za | |
| | PHRAG | maphata.ramphele@gauteng.gov.za | |
| | DWA | keetm@dwaf.gov.za siwelanel@dwa.gov.za tshifaror@dwa.gov.za mathebet@dwa.gov.za | |
| | Eskom | central@eskom.co.za paia@eskom.co.za | |
| | SANRAL | schmidk@nra.co.za | |
| | Gautrans | kumen.govender@gauteng.gov.za | |
| | Randwater | mmpshe@randwater.co.za nkoneiqh@randwater.co.za | |
| | City Of Tshwane | RudzaniM@tshwane.gov.za | |
| | Spoornet | daniel.ramokone@transnet.net loveous.tampane@transnet.net | |
| Registered I&APs | | | |
| 1 | James AH Cambell | james.ah.cambell@gmail.com 083 457 3724 012 667 5187 | 9 lotus Street, Irene |
| 2 | Ross Howarth | rrhowarth@gmail.com | 68 Main Rd, Irene |
| 3 | Beverley Wulff | tph@tph.co.za 012 809 2229 012 809 2090 (f) | 98 Pony Street Tijger Vallei Office Park |
| 4 | Brian & Jenny Melvill-Smith | Brian.Melvill-Smith@barloworldmotor.com 011 552 9344 083 645 1504 | 37 Alexandra Road, Irene |

| | | | |
|----|--|--|-----------------------------|
| | | 012 667 2379 | |
| | | | |
| 5 | Chris Grobler | chrisg@bibletruths.co.za 083 415 7549 | |
| | | | |
| 6 | Craig Comrie | ccomrie@mhq.co.za 011 381 2060 | |
| | | | |
| 7 | Dirk Heyns | manager@cornwallhill.co.za 012 667 2938 | |
| | | | |
| 8 | Gill Udal | gill.udal@telkomsa.net | 16B Iris Lane, Irene |
| | | | |
| 9 | Gerard O' Rourke | gorourke@chieftain.ie 083 313 9671 | 75 Jean Avenue, Doringkloof |
| | | | |
| 10 | Wisani Justice Maluleke | MalulekeJ@dwa.gov.za 012 392 1409 | |
| | | | |
| 11 | Clr Christa Spoelstra | mwespoel@mweb.co.za 082 880 5300 | |
| | | | |
| 12 | Riaan Marais CoT Rietveli Nature Reserve | RiaanM@tshwane.gov.za | |

| | | | |
|----|--------------------------|--|---|
| 13 | Kobus Knoetze | kobus@dhkthinkspace.co.za 021 421 6803 | 1 Clifford Road, Irene |
| 14 | Hilton Bothma | hiltb@telkomsa.net 076 729 6931 | 31 Pioneer Rd, Irene |
| 15 | Dawie Gouws | dawie@qs2.co.za 083 635 6515 012 667 4630 | 1 Lesley Road, Irene |
| 16 | Malcolm Fawkes | FawkesMG@eskom.co.za 011 655 2552 082 652 7581 | |
| 17 | Michelle Marais | michelle.marais@angloamerican.com 012 679 2058 083 608 0998 | PO Box 129 Irene |
| 18 | David Larsen Salbu | dkoa@salbu.co.za | |
| 19 | Robert Hartman | robert@multicat.co.za 012 663 4660 083 414 4197 | Cornwall Hill Estate |
| 20 | Lisa Trublet de Nermont | trublet@global.co.za 082 885 1554 | Cornwall Hill Residents |
| 21 | Roger Trublet de Nermont | 082 885 1554 | Cornwall Hill Residents |
| 22 | Carlo Machiné | carlomach@absamail.co.za 082 521 1115 | 350 Downderry Way Cornwall Hill Estate |
| 23 | Tom Hannay | tomhannay.sa@gmail.com 083 447 9442 012 667 4520 | 15 Alexandra Road, Irene |
| 24 | Sonya Semmelink | semmelink@webmail.co.za | Cornwall Hill Estate |

| | | | |
|----|-----------------------------|--|--|
| 25 | Mara Temple | Mara.Temple@gpaa.gov.za | |
| | | 012 319 1004 | |
| | | 012 319 3812 (f) | |
| | | | |
| 26 | Nina Strydom | Nina.Strydom@up.ac.za | 3C Iris Lane, Irene |
| | Nina | 083 636 1399 | |
| | Phillip | 072 449 1012 | |
| | | | |
| 27 | Councillor Casper McDonald | CasperM@tshwane.gov.za | |
| | | 082 563 4570 | |
| | | 086 503 5231 | |
| | | | |
| 28 | Manda Botha | manda@soundandimage.co.za | PO Box 227 Cornwall Hill, 0178 |
| | | 083 760 4385 | |
| | | | |
| 29 | Mr Roux Shabangu | roux@rouxprops.co.za | Erf 122, Irene |
| | | 012 667 2772 | |
| | | | |
| 30 | Marese Herbst | marese@rouxprops.co.za | Erf 122, Irene |
| | | 012 667 2772 | |
| | | | |
| 31 | Bea Fletcher | bea@tph.co.za | Erf 122, Irene |
| | The Town Planning Hub (TPH) | tph@tph.co.za | |
| | | | |
| 32 | Natalie Koneight | nkoneigh@randwater.co.za | |
| | Rand Water | 011 724 9366 | |
| | | | |
| 33 | James AH Cambell | james.ah.cambell@gmail.com | 9 lotus Street, Irene |
| | | 083 457 3724 | |
| | | 012 667 5187 | |
| | | | |
| 34 | Lizette Visser | visserliz@mweb.co.za | 7 Alexandra Road, Irene |
| | Moo Zoo | 083 400 2804 | |
| | | 012 667 2638 | |
| | | | |
| 35 | Raj Shunmugam | raj@glencarol.co.za | 428 Shillingford Road Cornwall Hill |
| | | | |
| | | | |
| 36 | Cllr Christa Spoelsta | mwcspoel@mweb.co.za | |
| | Ward Councillor | 082 880 5300 | |
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