

# Ecological Habitat Survey

## Zandfontein, Tshwane Metropolitan Municipality



Alien invasive plant species *Tecoma stans*, at the site.  
Photo: R.F. Terblanche.

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ANTHENE ECOLOGICAL CC

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## I) SPECIALIST EXPERTISE

### SYNOPTIC CV: REINIER. F. TERBLANCHE

Reinier is an ecologist and in particular a habitat specialist with an exceptional combination of botanical and zoological expertise which he keeps fostering, updating and improving. He is busy with a PhD for which he registered at the Department of Conservation Ecology at the University of Stellenbosch in July 2013. The PhD research focuses on the landscape ecology of selected terrestrial and wetland butterflies in South Africa. Reinier's experience includes being a lecturer in ecology and zoology at the North West University, Potchefstroom Campus (1998-2008). Reinier collaborates with a number of institutes, organizations and universities on animal, plant and habitat research.

Qualifications:

Qualification	Main subject matter	University
<b>M.Sc Cum Laude, 1998:</b> Botany: Ecology	Quantitative study of invertebrate assemblages and plant assemblages of rangelands in grasslands.	North-West University, Potchefstroom
<b>B.Sc Honns Cum Laude, 1992</b> Botany: Taxonomy	Distinctions in all subjects: Plant Anatomy, Taxonomy, Modern Systematics, System Modelling, Plant Ecology, Taxonomy Project, Statistics Attendance Course.	North-West University, Potchefstroom
<b>B.Sc</b> Botany, Zoology	Main subjects: Botany, Zoology.	North-West University, Potchefstroom
<b>Higher Education Diploma, 1990</b>	Numerous subjects aimed at holistic training of teachers.	North-West University, Potchefstroom

In research Reinier specializes in conservation biology, threatened butterfly species, vegetation dynamics and ant assemblages at terrestrial and wetland butterfly habitats as well as enhancing quantitative studies on butterflies of Africa. He has published extensively in the fields of taxonomy, biogeography and ecology in popular journals, peer-reviewed scientific journals and as co-author and co-editor of books (see 10 examples beneath).

Reinier practices as an ecological consultant and has been registered as a Professional Natural Scientist by SACNASP since 2005: Reg. No. 400244/05. His experience in consultation includes: Flora and fauna habitat surveys, Threatened species assessments, Riparian vegetation index surveys, Compilation of Ecological Management Plans, Biodiversity Action Plans and Status quo of biodiversity for Environmental Management Frameworks, Wetland Assessments, Management of Rare Wetland Species.

*Recent activities/ awards:* Best Poster Award at Oppenheimer De Beers Group Research Conference 2015, Johannesburg. One of the co-authors of Guidelines for Standardised Global Butterfly Monitoring, 2015, Group on Earth Observations Biodiversity Observation Network, Leipzig, Germany (UNEP-WCMC), GEO BON Technical Series 1. Awarded the prestigious Torben Larsen Memorial Tankard in October 2017; one is awarded annually to the person responsible for the most outstanding written account on Afrotropical Lepidoptera. Lectured as Conservationist-in-Residence in the Wildlife Conservation Programme of the African Leadership University, Kigali, Rwanda, 9-23 February 2019. Reinier won a photographic competition which resulted his photograph of the Critically Endangered *Erikssonia edgei* (Waterberg Copper) being on the front cover of the Synthesis Report of the National Biodiversity Assessment (2018) prepared by SANBI.

## EXPERIENCE

Lecturer: Zoology 1998-2008	Main subject matter and level	Organization
Lectured subjects	- 3 <sup>rd</sup> year level Ecology, Plantparasitology - 2 <sup>nd</sup> year level Ethology - <i>Master's degree</i> Evolutionary Ethology, Systematics in Practice, Morphology and Taxonomy of Insect Pests, Wetlands.	North-West University, Potchefstroom and University of South Africa
Co-promoter	PhD: Edge, D.A. 2005. Ecological factors that influence the survival of the Brenton Blue butterfly	North-West University, Potchefstroom
Study leader/ assistant study leader	Six MSc students, One BSc Honn student: Various quantitative biodiversity studies (terrestrial and aquatic).	North-West University, Potchefstroom
Teacher 1994-1998	Biology and Science, Secondary School	Afrikaans Hoër Seunskool, Pretoria
Owned Anthene Ecological CC 2008 – present	- Flora and Fauna habitat surveys - Highly specialized ecological surveys - Riparian vegetation index surveys - Ecological Management Plans - Biodiversity Action Plans - Biodiversity section of Environmental Management Frameworks - Wetland assessments	Private Closed Corporation that has been subcontracted by many companies
Herbarium assistant 1988-1991	- Part-time assistant at the A.P. Goossens herbarium, Botany Department, North-West University, 1988, 1989, 1990 and 1991 (as a student).	North-West University, Potchefstroom

## 10 EXAMPLES OF PUBLICATIONS OF WHICH R.F. TERBLANCHE IS AUTHOR/ CO-AUTHOR

(Three books, two chapters in books and five articles are listed here as examples)

- HENNING, G.A., **TERBLANCHE, R.F.** & BALL, J.B. (eds) **2009**. *South African Red Data Book: butterflies. SANBI Biodiversity Series 13*. South African National Biodiversity Institute, Pretoria. 158p. ISBN 978-1-919976-51-8
- MECENERO, S., BALL, J.B., EDGE, D.A., HAMER, M.L., HENNING, G.A., KRÜGER, M, PRINGLE, E.L., **TERBLANCHE, R.F.** & WILLIAMS, M.C. (eds). 2013. *Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and atlas*. Safronics (Pty) Ltd., Johannesburg & Animal Demography Unit, Cape Town.
- VAN SWAAY, C., REGAN, E., LING, M., BOZHINOVSKA, E., FERNANDEZ, M., MARINI-FILHO, O.J., HUERTAS, B., PHON, C.-K., KÖRÖSI, A., MEERMAN, J., PE'ER, G., UEHARA-PRADO, M., SÁFIÁN, S., SAM, L., SHUEY, J., TARON, D., **TERBLANCHE, R.F.** & UNDERHILL, L. 2015. Guidelines for Standardised Global Butterfly Monitoring. Group on Earth Observations Biodiversity Observation Network, Leipzig, Germany. GEO BON Technical Series 1.
- TERBLANCHE, R.F.** & HENNING, G.A. **2009**. *A framework for conservation management of South African butterflies in practice*. In: Henning, G.A., Terblanche, R.F. & Ball, J.B. (eds). *South African Red Data Book: Butterflies. SANBI Biodiversity Series 13*. South African National Biodiversity Institute, Pretoria. p. 68 – 71.
- EDGE, D.A., **TERBLANCHE, R.F.**, HENNING, G.A., MECENERO, S. & NAVARRO, R.A. 2013. Butterfly conservation in southern Africa: Analysis of the Red List and threats. In: Mecenero, S., Ball, J.B., Edge, D.A., Hamer, M.L., Henning, G.A., Krüger, M., Pringle, E.L., Terblanche, R.F. & Williams, M.C. (eds). *Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas*. pp. 13-33. Safronics (Pty) Ltd., Johannesburg & Animal Demography Unit, Cape Town.
- TERBLANCHE, R.F.**, SMITH, G.F. & THEUNISSEN, J.D. **1993**. Did Scott typify names in *Haworthia* (Asphodelaceae: Alooideae)? *Taxon* **42**(1): 91–95. (International Journal of Plant Taxonomy).
- TERBLANCHE, R.F.**, MORGENTHAL, T.L. & CILLIERS, S.S. **2003**. The vegetation of three localities of the threatened butterfly species *Chrysoritis aureus* (Lepidoptera: Lycaenidae). *Koedoe* **46**(1): 73-90.
- EDGE, D.A., CILLIERS, S.S. & **TERBLANCHE, R.F.** **2008**. Vegetation associated with the occurrence of the Brenton blue butterfly. *South African Journal of Science* **104**: 505 - 510.
- GARDINER, A.J. & **TERBLANCHE, R.F.** **2010**. Taxonomy, biology, biogeography, evolution and conservation of the genus *Erikssonia* Trimen (Lepidoptera: Lycaenidae) *African Entomology* **18**(1): 171-191.
- TERBLANCHE, R.F.** 2016. *Acraea trimeni* Aurivillius, [1899], *Acraea stenobea* Wallengren, 1860 and *Acraea neobule* Doubleday, [1847] on host-plant *Adenia repanda* (Burch.) Engl. at Tswalu Kalahari Reserve, South Africa. *Metamorphosis* **27**: 92-102.

\* A detailed CV with more complete publication list is available.

## II) SPECIALIST DECLARATION

I, Reinier F. Terblanche, as the appointed independent specialist, in terms of the 2014 EIA Regulations (as amended), hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 (as amended) and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Name of Specialist: Reinier F. Terblanche



Signature of the specialist

Date: 15 October 2021

## **1 INTRODUCTION**

An ecological habitat survey of flora and fauna is required for proposed developments at Sandfontein, City of Tshwane Metropolitan Municipality, Gauteng Province, South Africa (elsewhere referred to as the site).

### **1.1 OBJECTIVES OF THE HABITAT STUDY**

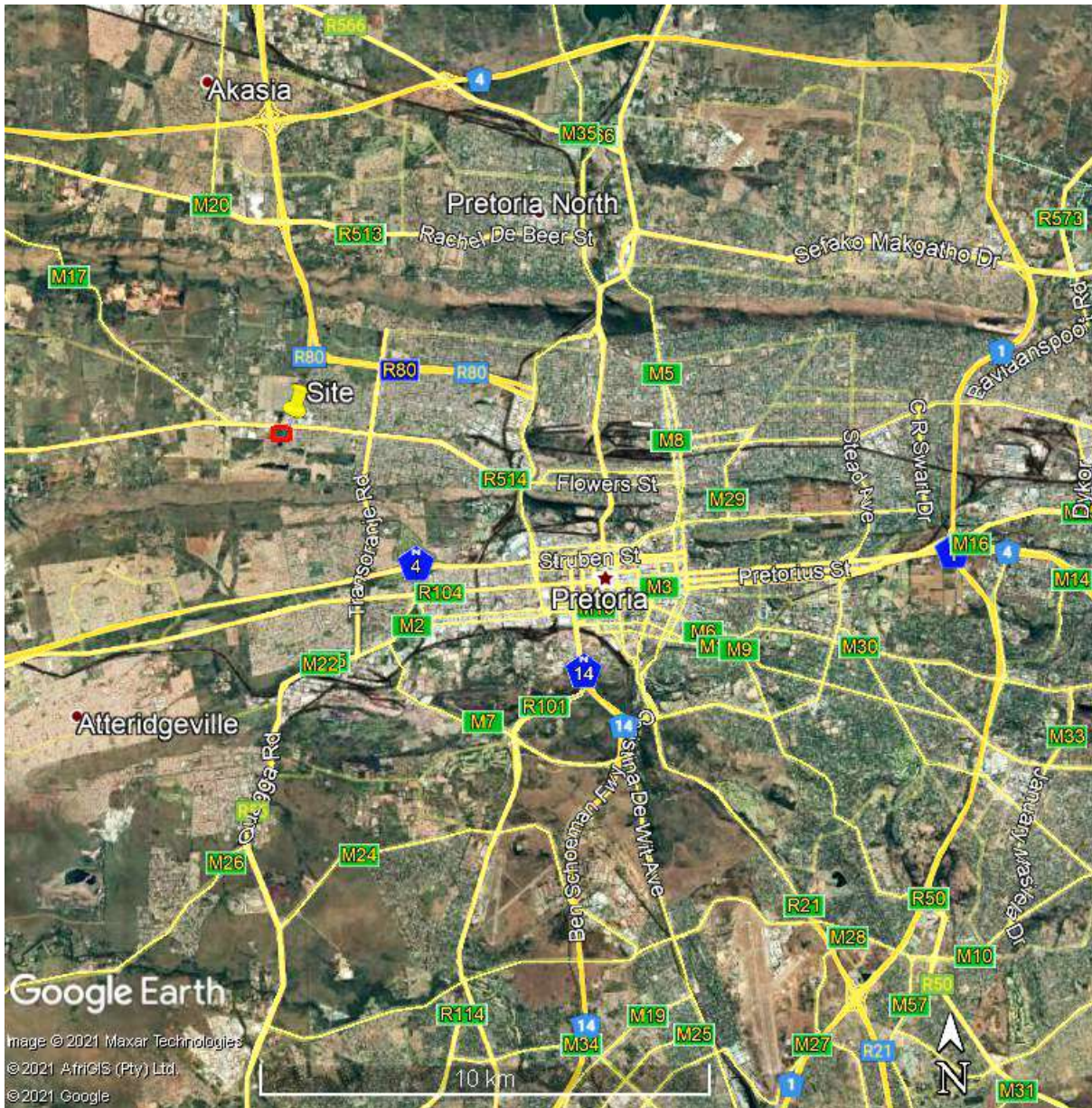
The objectives of the habitat study are to provide:

- A detailed fauna and flora habitat survey;
- A detailed habitat survey of possible threatened or localised plant species, vertebrates and invertebrates;
- Literature surveys that are integrated with the findings of the habitat survey;
- An evaluation of the sensitivity of habitats that in particular relate to current status of threatened species and conspicuous key biodiversity aspects;
- Identification of potential ecological impacts on fauna and flora that could occur as a result of the development; and

### **1.2 SCOPE OF STUDY**

- A survey consisting of two visits to investigate key elements of habitats on the site, relevant to the conservation of fauna and flora;
- Recording of any sightings and signs of existing fauna and flora;
- Recording of possible significant biological interactions of importance to conserve habitats of species;
- The selective and careful collecting of voucher specimens of invertebrates where deemed necessary;
- Literature studies and integration of existing knowledge with the findings of the surveys in the field.

## 2 STUDY AREA



**Figure 1** Map with indication of the location of the site.

Map information were analysed and depicted on Google images with the aid of Google Earth Pro (US Dept. of State Geographer, MapLink/ Tele Atlas, Google, 2021).

The study area is at Zandfontein, City of Tshwane Metropolitan Municipality, Gauteng Province, South Africa.

The site is situated at the Savanna Biome (Mucina & Rutherford 2006). Savanna Biome at the site is represented by the Moot Plains Bushveld vegetation type (Mucina & Rutherford 2006) of which an outline follows.

### **SVcb 8 Moot Plains Bushveld**

In South Africa Moot Plains Bushveld is found in North West and Gauteng Provinces. Main belt of this vegetation type occurs immediately south of the Magaliesberg from the Selons River Valley in the West through Maanhaarrand, filling the valley bottom of the Magalies River, proceeding east of the Hartebeestpoort Dam between the Magaliesberg and Daspoort mountain ranges to Pretoria. It also occurs as a narrow belt immediately north of the Magaliesberg from Rustenburg in the west to just east of the Crocodile River in the east; also south of the Swartruggens-Zeerust line. Altitude at this vegetation type is typically about 1050-1450 m.

Vegetation and landscape features comprise open to closed, low, often thorny savanna dominated by various species of *Acacia* in the bottomlands and plains as well as woodlands of varying height and density on the lower hillsides. Herbaceous layer is dominated by grasses (Mucina & Rutherford, 2009).

Geology and soils at the Moot Plains Vegetation type are clastic sediments and minor carbonates and volcanics of the Pretoria Group (including the Silverton Formation) and some Malmani dolomites in the west, all of the Transvaal Supergroup (Vaalian). There is also some contribution from mafic Bushveld intrusives. Soils often stony with colluvial clay-loam but varied, including red-yellow apedal freely drained, dystrophic and eutrophic catenas, vertic and melanic clays, and some less typical Glenrosa and Mispah forms. Land types Ae, Ba, Ea, Bc, Ac and less typically Fb (Mucina & Rutherford, 2006).

Climate: Summer rainfall with very dry winters. Mean annual precipitation (MAP) from about 550 mm in the west to about 700 mm in the east. Frost frequent in winter. Mean monthly maximum and minimum temperatures for Pretoria-Pur 33.6°C and -3.6°C for January and June respectively (Mucina & Rutherford, 2006).

Important taxa: Small trees: *Acacia nilotica*, *Acacia tortilis* subsp. *heteracantha*, *Searsia lancea*. Tall shrubs: *Buddleja saligna*, *Euclea undulata*, *Olea europaea* subsp. *africana*, *Grewia occidentalis*, *Gymnosporia polyacantha*, *Mystroxydon aethiopicum* subsp. *burkeanum*. Low shrubs: *Aptosimum elongatum*, *Felicia fascicularis*, *Lantana rugosa*, *Teucrium trifidum*. Succulent shrub: *Kalanchoe paniculata*. Woody Climber: *Jasminum breviflorum*. Herbaceous



climber: *Lotononis bainesii*. Graminoids: *Heteropogon contortus*, *Setaria sphacelata*, *Themeda triandra*, *Aristida congesta*, *Chloris virgata*, *Cynodon dactylon*, *Sporobolus nitens*, *Tragus racemosus*. Herbs: *Achyroopsis avicularis*, *Corchorus asplenifolius*, *Evolvulus alsinoides*, *Helichrysum nudifolium*, *Helichrysum undulatum*, *Hermannia depressa*, *Osteospermum muricatum*, *Phyllanthus maderaspatensis* (Mucina & Rutherford, 2006).

Note: Not all the plant species listed for the above vegetation type are present at the site.

### **3 MATERIAL AND METHODS**

Site visit by R.F. Terblanche was conducted during October 2021.

#### **3.1 Habitat characteristics and vegetation**

The habitat was investigated by noting habitat structure (rockiness, slope, plant structure/ physiognomy) as well as floristic composition. Voucher specimens of plant species were only taken where the taxonomy was in doubt and where the plant specimens were of significant relevance for invertebrate conservation. In this case no plant specimens were needed to be collected as voucher specimens or to be send to a herbarium for identification. A wealth of guides and detailed works of plant identifications, ecology and conservation is fortunately available and very useful. Field guides, biogeographic works, species lists, diagnostic outlines, conservation statuses and detail on specific plant groups were sourced from Crouch, Klopper, Burrows & Burrows (2011), Germishuizen (2003), Johnson & Bytebier (2015), Manning (2003), Manning (2009), Van Oudtshoorn (2012), Van Wyk (2000), Van Wyk & Malan (1998), Goldblatt (1986), Goldblatt & Manning (1998), McMurtry, Grobler, Grobler & Burns (2008), Smit (2008), Van Ginkel *et al.* (2011), Van Jaarsveld (2006), Van Wyk & Smith (2014) and Van Wyk & Van Wyk (2013). Lists of species, species names and the conservation status of species were mainly sourced from Raimondo, von Staden, Victor, Helme, Turner, Kamundi & Manyama (2009) and updated versions of red lists and species from the Threatened Species Programme of SANBI and the Red List of South African Plants ([sanbi.org.za](http://sanbi.org.za)).

#### **3.2 Mammals**

Mammals were noted as sight records by day. For the identification of species and observation of diagnostic characteristics Smithers (1986), Skinner & Chimimba (2005), Cillié, Oberprieler and Joubert (2004) and Apps (2000) are consulted. Sites have been walked, covering as many habitats as possible. Signs of the presence of mammal species, such as calls of animals, animal tracks (spoor), burrows, runways, nests and faeces were recorded. Walker (1996), Stuart & Stuart (2000) and Liebenberg (1990) were consulted for additional information and for the identification of spoor and signs. Trapping was not done since it proved not necessary in the case of this study. Habitat characteristics were also surveyed to note potential occurrences of mammals. Many mammals can be identified from field sightings but, with a few

exceptions, bats, rodents and shrews can only be reliably identified in the hand, and then some species need examination of skulls, or even chromosomes (Apps, 2000).

### **3.3 Birds**

Birds were noted as sight records, mainly with the aid of binoculars (10x30). Nearby bird calls of which the observer was sure of the identity were also recorded. For practical skills of noting diagnostic characteristics, the identification of species and observation techniques Ryan (2001) is followed. For information on identification, biogeography and ecology Barnes (2000), Hockey, Dean & Ryan, P.G. (2005), Cillié, Oberprieler & Joubert (2004), Tarboton & Erasmus (1998) and Chittenden (2007) were consulted. Ringing of birds fell beyond the scope of this survey and was not deemed necessary. Sites have been walked, covering as many habitats as possible. Signs of the presence of bird species such as spoor and nests have additionally been recorded. Habitat characteristics were surveyed to note potential occurrences of birds.

### **3.4 Reptiles**

Reptiles were noted as sight records in the field. Binoculars (10x30) can also be used for identifying reptiles of which some are wary. For practical skills of noting diagnostic characteristics, the identification of species and observation techniques, Branch (1998), Marais (2004), Alexander & Marais (2007) and Cillié, Oberprieler and Joubert (2004) were followed. Sites were walked, covering as many habitats as possible. Smaller reptiles are sometimes collected for identification, but this practice was not necessary in the case of this study. Habitat characteristics are surveyed to note potential occurrences of reptiles.

### **3.5 Amphibians**

Frogs and toads are noted as sight records in the field or by their calls. For practical skills of noting diagnostic characteristics, the identification of species and observation techniques Carruthers (2001), Du Preez (1996), Conradie, Du Preez, Smith & Weldon (2006) and the recent complete guide by Du Preez & Carruthers (2009) are consulted. CD's with frog calls by Carruthers (2001) and Du Preez & Carruthers (2009) are used to identify species by their calls when applicable. Sites are walked, covering as many habitats as possible. Smaller frogs are often collected by pitfall traps put out for epigeal invertebrates (on the soil), but this practice falls beyond the scope of this survey. Habitat characteristics are also surveyed to note potential occurrences of amphibians.

### **3.6 Butterflies**

Butterflies were noted as sight records or voucher specimens. Voucher specimens are mostly taken of those species of which the taxa warrant collecting due to taxonomic difficulties or in the cases where species can look similar in the veldt. Many butterflies use only one species or a limited number of plant species as host plants for their larvae. Myrmecophilous (ant-loving) butterflies such as the *Aloeides*, *Chrysoritis*, *Erikssonia*, *Lepidochrysops* and *Orachrysops* species (Lepidoptera: Lycaenidae), which live in association with a specific ant species, require a unique ecosystem for their survival (Deutschländer & Bredenkamp, 1999; Terblanche, Morghental & Cilliers, 2003; Edge, Cilliers & Terblanche, 2008; Gardiner & Terblanche, 2010). Known food plants of butterflies were therefore also recorded. After the visits to the site and the identification of the butterflies found there, a list was also compiled of butterflies that will most probably be found in the area in all the other seasons because of suitable habitat. The emphasis is on a habitat survey.

### **3.7 Fruit chafer beetles**

Different habitat types in the areas were explored for any sensitive or special fruit chafer species. Selection of methods to find fruit chafers depends on the different types of habitat present and the species that may be present. Fruit bait traps would probably not be successful for capturing *Ichneustoma* species in a grassland patch (Holm & Marais 1992). Possible chafer beetles of high conservation priority were noted as sight records accompanied by the collecting of voucher specimens with grass nets or containers where deemed necessary.

### **3.8 Rock scorpions**

Relatively homogenous habitat / vegetation areas were identified and explored to identify any sensitive or special species. Selected stones that were lifted to search for Arachnids were put back very carefully resulting in the least disturbance possible. All the above actions were accompanied by the least disturbance possible.

### **3.9 Limitations**

For each site visited, it should be emphasized that surveys can by no means result in an exhaustive list of the plants and animals present on the site, because of the time constraint. Surveys were conducted during October 2021 which includes an optimal time of the year to find signs of animals such as invertebrates, signs of habitat sensitive plant species and vertebrate animal species high conservation priority. The focus of the survey remains a habitat survey that concentrates on the possibility that species of particular conservation priority occur on the site or not. It is unlikely that any more visits would reveal information that would change the outcome of this assessment both in terms of ecosystems of special conservation concern or suitable habitats of species of particular conservation concern. Visits that were conducted therefore appear to be sufficient to address the objectives of this study.

## 4 RESULTS

**Table 4.1** Outline of main landscape and habitat characteristics of the affected area and immediate surroundings at site.

HABITAT FEATURE	DESCRIPTION
Topography	The area proposed for the development is on very gentle slopes (flat plain).
Rockiness	No rocky ridges are present.
Presence of wetlands	No wetlands are present at the site.
Vegetation	<p>Vegetation as the site is extensively disturbed, modified and at some places transformed. A mixture of alien invasive and indigenous plant species exists at the site. Indigenous tree species at the site include <i>Vachellia karroo</i>. A number of alien invasive tree species such as <i>Melia azedarach</i>, <i>Eucalyptus camaldulensis</i>, <i>Solanum mauritianum</i> and <i>Tecoma stans</i> are present at the site. The alien invasive reed species <i>Arundo donax</i> occur in clumps at the site. A clump of <i>Typha capensis</i> has established at a ditch that has been dug next to the tar road at the northern limits of the site.</p> <p>Indigenous grass species at the site include <i>Heteropogon contortus</i>, <i>Hyparrhenia hirta</i>, and <i>Cynodon dactylon</i>. The herbaceous shrub <i>Gomphocarpus fruticosus</i> also occurs at the site. Indigenous forb species appear to be scarce at the site. Many alien invasive weed species are found at the site and these include <i>Argemone ochroleuca</i>, <i>Datura ferox</i>, <i>Datura stramonium</i>, <i>Gomphrena celosioides</i>, <i>Schkuhria pinnata</i>, <i>Tagetes minuta</i>, <i>Conyza bonariensis</i>, <i>Malva parviflora</i>, <i>Verbena aristigera</i>, <i>Bidens bipinnata</i>, <i>Bidens pilosa</i> and <i>Flaveria bidentis</i>.</p>
Signs of disturbances	Informal dumping is extensive at the site. Excavations and clearing of areas of the site took place in the past. The site is surrounded by formal and informal developments. Tracks and dirt roads cross the site. Alien invasive plant species are widespread and conspicuous at the site.
Connectivity	There is little scope for the site to be part of a corridor of particular conservation importance.



**Photo 1** View of site from the southeastern part of the site.  
Photo: R.F. Terblanche.



**Photo 2** View of a northern part of the site.  
Photo: R.F. Terblanche



**Photo 3** View at northeastern boundary of the site (brick wall).  
Photo: R.F. Terblanche.



**Photo 4** View of southern part of the site.  
Photo: R.F. Terblanche





**Photo 5** Excavations at the northern part of the site.  
Photo: R.F. Terblanche.



**Photo 6** Foliage of the alien invasive tree species *Melia azedarach*, at the site.  
Photo: R.F. Terblanche



**Photo 7** The alien invasive small tree, *Tecoma stans*, at the site.  
Photo: R.F. Terblanche.



**Photo 8** Flowers of the widespread indigenous herbaceous shrub *Gomphocarpus fruticosus*, at the site.  
Photo: R.F. Terblanche



**Photo 9** The alien invasive weed *Argemone ochroleuca*, at the site.  
Photo: R.F. Terblanche.



**Photo 10** Flowers of the alien invasive weed *Verbena aristigera*, at the site.  
Photo: R.F. Terblanche

## ASSESSMENT OF PLANT SPECIES OF CONSERVATION CONCERN

**Table 4.2** Threatened plant species of the Gauteng Province that are listed in the **Critically Endangered** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Encephalartos middelburgensis</i>	Critically Endangered	No

**Table 4.3** Threatened plant species of the Gauteng Province that are listed in the **Endangered** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Aloe peglerae</i>	Endangered	No
<i>Brachystelma discoideum</i>	Endangered	No
<i>Delosperma purpureum</i>	Endangered	No
<i>Frithia humilis</i>	Endangered	No
<i>Habenaria mossii</i>	Endangered	No
<i>Holothrix micrantha</i>	Endangered	No

**Table 4.4** Threatened plant species of the Gauteng Province that are listed in the **Vulnerable** category. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at a site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Bowiea volubilis</i> subsp. <i>volubilis</i>	Vulnerable	No
<i>Brachycorythis conica</i> subsp. <i>transvaalensis</i>	Vulnerable	No
<i>Ceropegia decidua</i> subsp. <i>pretoriensis</i>	Vulnerable	No
<i>Cheilanthes deltoidea</i> subsp. <i>silicicola</i>	Vulnerable	No
<i>Cineraria longipes</i>	Vulnerable	No
<i>Cucumis humifructus</i>	Vulnerable	No
<i>Delosperma gautengense</i>	Vulnerable	No
<i>Dioscorea sylvatica</i>	Vulnerable	No
<i>Encephalartos lanatus</i>	Vulnerable	No
<i>Eulophia coddii</i>	Vulnerable	No
<i>Khadia beswickii</i>	Vulnerable	No
<i>Melolobium subspicatum</i>	Vulnerable	No
<i>Prunus africana</i>	Vulnerable	No

**Table 4.5 Near Threatened** plant species of the Gauteng Province. The list here follows the most recent updated red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

<b>Species</b>	<b>Status:</b> Global status or national status indicated	<b>Resident at the site</b>
<i>Alepidea attenuata</i>	Near Threatened	No
<i>Adromischus umbraticola</i> subsp. <i>umbraticola</i>	Near Threatened	No
<i>Argyrolobium campicola</i>	Near Threatened	No
<i>Argyrolobium megarrhizum</i>	Near Threatened	No
<i>Ceropegia turricula</i>	Near Threatened	No
<i>Cineraria austrotransvaalensis</i>	Near Threatened	No
<i>Cleome conrathii</i>	Near Threatened	No
<i>Delosperma leendertziae</i>	Near Threatened	No
<i>Drimia sanguinea</i>	Near Threatened	No
<i>Gladiolus robertsoniae</i>	Near Threatened	No
<i>Habenaria barbertoni</i>	Near Threatened	No
<i>Habenaria bicolor</i>	Near Threatened	No
<i>Habenaria kraenzliniana</i>	Near Threatened	No
<i>Holothrix randii</i>	Near Threatened	No
<i>Kniphofia typhoides</i>	Near Threatened	No
<i>Lithops leslei</i> subsp. <i>leslei</i>	Near Threatened	No
<i>Nerine gracilis</i>	Near Threatened	No
<i>Searsia gracillima</i> var. <i>gracillima</i>	Near Threatened	No
<i>Stenostelma umbelluliferum</i>	Near Threatened	No

**Table 4.6** Least Concern (= not threatened) plant species of the Gauteng Province that are however of particular conservation concern and listed in the **Rare** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

<b>Species</b>	<b>Status:</b> Global status or national status indicated	<b>Resident at the site</b>
<i>Blepharis uniflora</i>	Rare	No
<i>Frithia pulchra</i>	Rare	No
<i>Gladiolus pole-evansii</i>	Rare	No
<i>Gnaphalium nelsonii</i>	Rare	No

**Table 4.7** Not threatened plant species of the Gauteng Province which are however of particular conservation concern and listed in the **Declining** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

<b>Species</b>	<b>Status:</b> Global status or national status indicated	<b>Resident at the site</b>
<i>Boophone disticha</i>	Declining	No
<i>Callilepis leptophylla</i>	Declining	No
<i>Crinum bulbispermum</i>	Declining	No
<i>Crinum macowanii</i>	Declining	No
<i>Drimia altissima</i>	Declining	No
<i>Eucomis autumnalis</i>	Declining	No
<i>Gunnera perpensa</i>	Declining	No
<i>Hypoxis hemerocallidea</i>	Declining	No
<i>Ilex mitis</i>	Declining	No

**Table 4.8** Plant species of the Gauteng Province of which the conservation status is uncertain owing to a lack of information and which are listed in the **Data Deficient** category. The list here follows the most recent red list of South African plant species (Raimondo *et al.* 2009). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

<b>Species</b>	<b>Status:</b> Global status or national status indicated	<b>Resident at the site</b>
<i>Lepidium mossii</i>	Data Deficient	No

**Table 4.9** Some of the tree species of the Gauteng Province which are not threatened but listed as **Protected Species** under the National Forests Act No. 84 of 1998, Section 51(1). No = Plant species is not a resident on the site; Yes = Plant species is a resident at the site.

Species	Conservation status	Resident at the site
<i>Boscia albitrunca</i>	Protected	No
<i>Combretum imberbe</i>	Protected	No
<i>Sclerocarya birrea</i>	Protected	No
<i>Vachellia erioloba</i>	Protected	No

## ASSESSMENT OF VERTEBRATE SPECIES OF CONSERVATION CONCERN

### 4.3.1 Mammals of particular high conservation priority

**Table 4.10 Threatened** mammal species of the Gauteng Province. Literature sources: Friedman & Daly, (2004), Skinner & Chimimba (2005), Wilson & Reeder (2005). Furthermore golden mole species that are rare and being reported from the adjacent Free State and Limpopo Provinces have also been included.

Species	Red Listed Status	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Chrysoxalax villosus</i> Rough-haired golden mole	Vulnerable	No	No
<i>Cloeotis percivali</i> Short-eared Trident Bat	Vulnerable/ Near-threatened	No	No
<i>Diceros bicornis</i> Black rhinoceros	Critically Endangered	No	No
<i>Lycaon pictus</i> African wild dog	Endangered	No	No
<i>Loxodonta africana</i> African elephant	Vulnerable	No	No
<i>Mystromys albicaudatus</i> White-tailed mouse	Endangered	No	No
<i>Neamblysomus julianae</i> Juliana's Golden Mole	Critically Endangered	No	No

<b><i>Panthera leo</i></b> Lion	Vulnerable	No	No
<b><i>Rhinolophus blasii</i></b> Blasi's Horseshoe Bat	Vulnerable	No	No
<b><i>Smutsia temminckii</i></b> Ground Pangolin	Vulnerable	No	No

**Table 4.11** Near threatened mammal species known to occur in the Gauteng Province, Free State Province and North-West Province. Literature sources: Skinner & Chimimba (2005).

<b>Species</b>	<b>Red Listed Status</b>	<b>Recorded at site during survey</b>	<b>Likely to be found based on habitat assessment</b>
<b><i>Ceratotherium simum</i></b> White Rhinoceros	Near-threatened	No	No

#### 4.3.2 Birds of particular high conservation priority

**Table 4.12 Threatened** bird species of the Gauteng Province. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

<b>Species</b>	<b>Common name</b>	<b>Red Listed Status</b>	<b>Recorded at site during survey</b>	<b>Likely to be found breeding on site based on being dependant on site</b>
<i>Aegypius tracheliotos</i>	<b>Lappet-faced Vulture</b>	Vulnerable	No	No
<i>Anthropoides paradiseus</i>	<b>Blue Crane</b>	Vulnerable	No	No
<i>Aquila rapax</i>	<b>Tawny Eagle</b>	Vulnerable	No	No
<i>Ardeotis kori</i>	<b>Kori Bustard</b>	Vulnerable	No	No
<i>Botaurus stellaris</i>	<b>Eurasian Bittern</b>	Critically Endangered	No	No
<i>Buphagus africanus</i>	<b>Yellow-billed Oxpecker</b>	Vulnerable	No	No
<i>Circus ranivorus</i>	<b>African Marsh-Harrier</b>	Vulnerable	No	No



<i>Crex crex</i>	<b>Corn Crane</b>	Vulnerable	No	No
<i>Eupodotis senegalensis</i>	<b>White-bellied Korhaan</b>	Vulnerable	No	No
<i>Gorsachius leuconotus</i>	<b>White-backed Night-heron</b>	Vulnerable	No	No
<i>Gyps africanus</i>	<b>White-backed Vulture</b>	Vulnerable	No	No
<i>Gyps coprotheres</i>	<b>Cape Vulture</b>	Vulnerable	No	No
<i>Neophron percnopterus</i>	<b>Egyptian Vulture</b>	Regionally almost extinct	No	No
<i>Neotis denhami</i>	<b>Denham's Bustard</b>	Vulnerable	No	No
<i>Pelecanus rufescens</i>	<b>Pink-backed Pelican</b>	Vulnerable	No	No
<i>Polemaetus bellicosus</i>	<b>Martial Eagle</b>	Vulnerable	No	No
<i>Rhynchops flavirostris</i>	<b>African Skimmer</b>	Endangered	No	No
<i>Sarothrura ayresii</i>	<b>White-winged Flufftail</b>	Critically Endangered	No	No
<i>Therathopius ecaudatus</i>	<b>Bateleur</b>	Vulnerable (in South Africa)	No	No
<i>Tyto capensis</i>	<b>African Grass-Owl</b>	Vulnerable	No	No

**Table 4.13 Near threatened** bird species of the Gauteng Province. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

<b>Species</b>	<b>Common name</b>	<b>Red Listed Status</b>	<b>Recorded at site during survey</b>	<b>Likely to be found breeding on site based or being dependant on site</b>
<i>Alcedo semitorquata</i>	<b>Half-collared Kingfisher</b>	Near threatened	No	No
<i>Anastomus lamelligerus</i>	<b>African Openbill</b>	Near threatened	No	No
<i>Aquila ayresii</i>	<b>Ayres's Hawk-Eagle</b>	Near threatened	No	No
<i>Buphagus erythrorhynchus</i>	<b>Red-Billed Oxpecker</b>	Near threatened	No	No
<i>Charadrius pallidus</i>	<b>Chestnut-banded Plover</b>	Near threatened	No	No
<i>Ciconia nigra</i>	<b>Black Stork</b>	Near threatened	No	No
<i>Circus macrourus</i>	<b>Pallid Harrier</b>	Near threatened	No	No
<i>Falco biarmicus</i>	<b>Lanner Falcon</b>	Near threatened	No	No
<i>Falco peregrinus</i>	<b>Peregrine Falcon</b>	Near threatened	No	No
<i>Glareola nordmanni</i>	<b>Black-winged Pratincole</b>	Near threatened	No	No

<i>Leptoptilos crumeniferus</i>	<b>Marabou Stork</b>	Near threatened	No	No
<i>Mirafra cheniana</i>	<b>Melodious lark</b>	Near threatened	No	No
<i>Mycteria ibis</i>	<b>Yellow-billed Stork</b>	Near threatened	No	No
<i>Pelecanus onocrotalus</i>	<b>Great White Pelican</b>	Near threatened	No	No
<i>Phoenicopterus minor</i>	<b>Lesser Flamingo</b>	Near threatened	No	No
<i>Phoenicopterus ruber</i>	<b>Greater Flamingo</b>	Near threatened	No	No
<i>Pterocles gutturalis</i>	<b>Yellow-throated Sandgrouse</b>	Near threatened	No	No
<i>Rostratula benghalensis</i>	<b>Greater Painted-snipe</b>	Near threatened	No	No
<i>Sagittarius serpentarius</i>	<b>Secretarybird</b>	Near threatened	No	No
<i>Sterna caspia</i>	<b>Caspian Tern</b>	Near threatened	No	No

### 4.3.3 Reptiles of particular high conservation priority

The following table lists possible presence or absence of reptile species of particular conservation concern at the site. This list to assess the possible presence or not of reptile species of conservation concern was compiled by using mainly the source Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers (2014), that is the Atlas and Red List of South Africa, Lesotho and Swaziland.

**Table 4.1 Near Threatened** reptile species in Gauteng Province. Main source: Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers (2014). No = Reptile species is not a resident on the site; Yes = Reptile species is found to be resident on the site.

<b>Species</b>	<b>Red Listed Status</b>	<b>Resident at site</b>	<b>Recorded at site during survey</b>	<b>Likely to be found based on habitat assessment</b>
<i>Chamaesaura aenea</i> <b>Coppery Grass Lizard</b>	Near Threatened	No	No	No
<i>Homoroselaps dorsalis</i> <b>Striped Harlequin Snake</b>	Near threatened	No	No	No

## 4.4 ASSESSMENT OF INVERTEBRATE SPECIES OF CONSERVATION CONCERN

### 4.4.1 Butterflies of particular conservation priority

**Table 4.15 Threatened (Endangered) butterfly species** of the Gauteng Province. Sources: Mecenero *et al.* (2013), Henning, Terblanche & Ball (2009).

<b>Species</b>	<b>Red List Status</b> (Global status)	<b>Recorded at site during survey</b>	<b>Residential status at the site:</b> Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<b><i>Aloeides dentatis dentatis</i></b> Roodepoort Copper	Endangered	No	Highly unlikely
<b><i>Chrysothrix aureus</i></b> Golden Opal/ Heidelberg Opal	Endangered	No	Highly unlikely
<b><i>Lepidochrysothrix praeterita</i></b> Highveld Blue	Endangered	No	Highly unlikely
<b><i>Orachrysothrix mijburghi</i></b> Mijburgh's Blue	Endangered	No	Highly unlikely

**Table 4.16 Rare butterfly species** of the Gauteng Province. Source: Mecenero *et al.* (2013).

<b>Species</b>	<b>Red List Status</b>	<b>Recorded at site during survey</b>	<b>Residential status at the site:</b> Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<b><i>Colotis celimene amina</i></b> Lilac Tip	Rare (Low density)	No	Highly unlikely
<b><i>Lepidochrysothrix procera</i></b> Grassland Blue	Rare (Habitat specialist)	No	Highly unlikely
<b><i>Metisella meninx</i></b> Marsh Sylph	Rare (Habitat specialist)	No	Highly unlikely
<b><i>Platylesches dolomitica</i></b> (Hilltop hopper)	Rare (Low density)	No	Highly unlikely

#### 4.4.2 Beetles of particular conservation priority

**Table 4.17** Fruit chafer species (Coleoptera: Scarabaeidae: Cetoninae) in the Gauteng Province and Gauteng Province which are of known high conservation priority.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Ichneustoma stobbiai</i>	Uncertain (Probably endangered)	No	No	No
<i>Trichocephala brincki</i>	Uncertain	No	No	No

#### 4.4.3 Mygalomorph spiders of particular conservation priority

**Table 4.18** Baboon spiders species (Araneae: Teraphosidae) species that are of known high conservation priority in the Gauteng Province and Gauteng Province.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Brachionopus pretoriae</i>	Uncertain	No	No	No

#### 4.4.4 Scorpions of particular conservation priority

**Table 4.19** Rock scorpion species (Scorpiones: Ischnuridae) species that are of known high conservation priority in the Gauteng Province and Gauteng Province.

Species	Red Listed Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Hadogenes gracilis</i>	Uncertain	No	No	No
<i>Hadogenes gunningi</i>	Uncertain	No	No	No

## **5 DISCUSSION**

### **5.1 HABITAT AND VEGETATION CHARACTERISTICS**

An outline of the habitat and vegetation characteristics is given in Table 4.1.

### **5.2 PLANT SPECIES**

Extinct, threatened, near threatened and other plant species of high conservation priority in Gauteng Province are listed in Tables 4.2 – 4.9. The presence or not of all the species listed in the tables were investigated during the survey. Presence of Threatened and Near Threatened species of plants at the site is unlikely. Protected tree species appear to be absent at the site. No other plant species of particular conservation concern have been found at the site.

### **5.3 VERTEBRATES**

#### **5.3.1 Mammals**

Table 4.10 and Table 4.11 list the possible presence or absence of threatened mammal species and near threatened mammal species at the site. Literature sources that were used are Friedman & Daly (2004), Skinner & Chimimba (2005) and Wilson & Reeder (2005). Because the site falls outside reserves, threatened species such as the black rhinoceros (*Diceros bicornis*) and the African wild dog (*Lycaon pictus*) are obviously not present. No smaller mammals of particular high conservation significance are likely to be found on the site as well.

#### **5.3.2 Birds**

Table 4.12 and Table 4.13 list the possible presence or absence of threatened bird species and near threatened bird species at the site. Literature sources that were mainly consulted are Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007). The site does not appear to form part of any habitat of particular importance for any threatened bird species or any bird species of particular conservation importance.

### 5.3.3 Reptiles

Table 14 lists the possible presence or absence of near threatened reptile species on the site. The Atlas and Red List of Reptiles of South Africa, Lesotho and Swaziland were used to compile the list for the assessment (Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers, 2014). There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

### 5.3.4 Amphibians

No frog species that occur in the Gauteng are red listed as threatened species or near threatened species at present. There appears to be no threat to any amphibian species of particular high conservation importance if the site is developed. Presence of *Pyxicephalus adspersus* (Giant Bullfrog), a species hitherto listed as near threatened is unlikely.

## 5.4 INVERTEBRATES

### 5.4.1 Butterflies

Studies about the vegetation and habitat of threatened butterfly species in South Africa showed that ecosystems with a unique combination of features are selected by these often localised threatened butterfly species (Deutschländer and Bredenkamp 1999; Edge 2002, 2005; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Threatened butterfly species in South Africa can then be regarded as bio-indicators of rare ecosystems.

Because invertebrates are often less well known the expected presence or not of threatened butterfly species in the Endangered category (Table 4.15) and other high conservation priority species such as Rare butterfly species (Table 4.16) follows.

#### 5.4.1.1 Assessment of threatened butterfly species (Endangered) in the Gauteng Province

##### *Aloeides dentatis dentatis* (Roodepoort Copper)

The proposed global red list status for *Aloeides dentatis dentatis* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.* 2013). *Aloeides dentatis dentatis*

colonies are found where one of its host plants *Hermannia depressa* or *Lotononis eriantha* is present. Larval ant association is with *Lepisiota capensis* (S.F. Henning 1983; S.F. Henning & G.A. Henning 1989). The habitat requirements of *Aloeides dentatis dentatis* are complex and not fully understood yet. See Deutschländer and Bredenkamp (1999) for the description of the vegetation and habitat characteristics of one locality of *Aloeides dentatis* subsp. *dentatis* at Ruimsig, Roodepoort, Gauteng Province. There is not an ideal habitat of *Aloeides dentatis* subsp. *dentatis* on the site and it is unlikely that the butterfly is present at the site.

*Chrysochrysis aureus* (Highveld Golden Opal/ Heidelberg Copper)

The proposed global red list status for *Chrysochrysis aureus* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.* 2013). *Chrysochrysis aureus* (Golden Opal/ Heidelberg Copper) is a resident where the larval host plant, *Clusia pulchella* is present. However, the distribution of the butterfly is much more restricted than that of the larval host plant (S.F. Henning 1983; Terblanche, Morgenthal & Cilliers 2003). One of the reasons for the localised distribution of *Chrysochrysis aureus* is that a specific host ant *Crematogaster liengmei* must also be present at the habitat. Fire appears to be an essential factor for the maintenance of suitable habitat (Terblanche, Morgenthal & Cilliers 2003). Research revealed that *Chrysochrysis aureus* (Golden Opal/ Heidelberg Copper) has very specific habitat requirements, which include rocky ridges with a steep slope and a southern aspect (Terblanche, Morgenthal & Cilliers 2003). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon is highly unlikely.

*Lepidochrysis praeterita* (Highveld Blue)

The proposed global red list status for *Lepidochrysis praeterita* according to the most recent IUCN criteria and categories is Endangered (G.A. Henning, Terblanche & Ball, 2009; Mecenero *et al.* 2013). *Lepidochrysis praeterita* is a butterfly that occurs where the larval host plant *Ocimum obovatum* (= *Becium obovatum*) is present (Pringle, G.A. Henning & Ball, 1994), but the distribution of the butterfly is much more restricted than the distribution of the host plant. *Lepidochrysis praeterita* is found on selected rocky ridges and rocky hillsides in parts of Gauteng, the extreme northern Free State and the south-eastern Gauteng Province. No ideal habitat appears to be present for the butterfly on the site. It is unlikely that *Lepidochrysis praeterita* would be present on the site and at the footprint proposed for the development.

*Orachrysis mijburghi* (Mijburgh's Blue)

The proposed global red status for *Orachrysis mijburghi* according to the most recent IUCN criteria and categories is Endangered (Mecenero *et al.* 2013). *Orachrysis mijburghi* favours

grassland depressions where specific *Indigofera* plant species occur (Terblanche & Edge 2007). The Heilbron population of *Orachrysops mijburghi* in the Free State uses *Indigofera evansiana* as a larval host plant (Edge, 2005) while the Suikerbosrand population in Gauteng uses *Indigofera dimidiata* as a larval host plant (Terblanche & Edge 2007). There is no suitable habitat for *Orachrysops mijburghi* on the site and it is unlikely that *Orachrysops mijburghi* would be present on the site.

#### *Conclusion on threatened butterfly species*

There appears to be no threat to any red listed butterfly species if the site is developed.

#### *5.4.1.2 Butterfly species that are not threatened but also of high conservation priority*

##### *Colotis celimene amina (Lilac tip)*

*Colotis celimene amina* is listed as Rare (Low density) by Mecenero *et al.* (2013). In South Africa *Colotis celimene amina* is present from Pietermaritzburg in the south and northwards into parts of Kwa-Zulu Natal, Gauteng, Limpopo, Mpumalanga and the North West Provinces (Mecenero *et al.* 2013). Reasons for its rarity are poorly understood. It is highly unlikely that *Colotis celimene amina* would be present at the site.

##### *Lepidochrysops procera (Savanna Blue)*

*Lepidochrysops procera* is listed as Rare (Habitat specialist) by Mecenero *et al.* (2013). *Lepidochrysops procera* is endemic to South Africa and found in Gauteng, KwaZulu-Natal, Mpumalanga and North West (Mecenero *et al.* 2013). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

##### *Metisella meninx (Marsh Sylph)*

Henning and Henning (1989) in the first South African Red Data Book of butterflies' listed *Metisella meninx* as threatened under the former IUCN category Indeterminate. Even earlier in the 20th century Swanepoel (1953) raised concern about vanishing wetlands leading to habitat loss and loss of populations of *Metisella meninx*. According to the second South African Red Data Book of butterflies (Henning, Terblanche & Ball, 2009) the proposed global red list status of *Metisella meninx* has been Vulnerable. During a recent large scale atlasing project the Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas (Mecenero *et al.* 2013) it was found that more *Metisella meninx* populations are present than thought before. Based on this valid new information, the conservation status of



*Metisella meninx* is now regarded as Rare (Habitat specialist) (Mecenero *et al.* 2013). Though *Metisella meninx* is more widespread and less threatened than perceived before, it should be regarded as a localised rare habitat specialist of conservation priority, which is dependent on wetlands with suitable patches of grass at wetlands (Terblanche In prep.). Another important factor to keep in mind for the conservation of *Metisella meninx* is that based on very recent discoveries of new taxa in the group the present *Metisella meninx* is a species complex consisting of at least three taxa (Terblanche In prep., Terblanche & Henning In prep.). The ideal habitat of *Metisella meninx* is treeless marshy areas where *Leersia hexandra* (rice grass) is abundant (Terblanche In prep.). The larval host plant of *Metisella meninx* is wild rice grass, *Leersia hexandra* (G.A. Henning & Roos, 2001). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

#### *Platylesches dolomitica* (Hilltop Hopper)

*Platylesches dolomitica* is listed as Rare (Low density) by Mecenero *et al.* (2013). Historically the conservation status of *Platylesches dolomitica* was proposed to be Vulnerable (Henning, Terblanche & Ball 2009). However, this butterfly which is easily overlooked has a wider distribution than perceived before. *Platylesches dolomitica* has a patchy distribution and is found on rocky ledges where *Parinari capensis* occurs, between 1300 m and 1800m (Mecenero *et al.* 2013, Dobson Pers comm.). At the study area, it is highly unlikely that *Platylesches dolomitica* would be present.

### 5.4.2 Fruit chafer beetles

Table 4.17 lists the fruit chafer beetle species (Coleoptera: Scarabaeidae: Cetoniinae) that are of known high conservation priority in the Gauteng Province.

*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 Cetoniinae (Coleoptera: Scarabaeidae) genus *Ichnestoma* Gory & Percheron, 1833 currently comprises 13 described species and is endemic to South Africa. 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). *Ichnestoma* larvae feed under the soil surface and also pupate under the soil surface in

specific grassland areas (Perissinotto, Smith & Stobbiai, 1999). All the habitat requirements of *Ichnestoma stobbiai* in these grassland patches are not fully understood yet, but it is normally a rocky area (dolomite to chert: see Deschodt, Scholtz & Kryger, 2009), consisting of grassland with a variety of indigenous grass species. From personal experience few trees occur in such patches, with species diverse grassland that are well developed in terms of succession. Rocks, often well-embedded in the soil, are scattered throughout such areas. Occurrence of *Ichnestoma stobbiai* at the site is highly unlikely. There appears to be no threat listed rare and localized fruit-chafer beetles if the site is developed.

#### **5.4.3 Mygalomorph spiders**

Table 4.18 lists the baboon spider species (Araneae: Teraphosidae) that are of known high conservation priority in the Gauteng Province. The assessment of the conservation status of baboon spiders in South Africa is in process but as a pre-caution the species listed in Table 4.18 has been included. None of the above baboon spider species were found on the site, or are likely to be resident at the site. There appears to be no threat to the baboon spider species of high conservation significance if the study site is developed.

#### **5.4.4 Scorpions**

Table 4.19 lists the rock scorpion species (Scorpiones: Ischnuridae) that are of known high conservation priority in the Gauteng Province. There appears to be no threat to the rock scorpion species of high conservation priority if the study site is developed.

### **5.5 Ecological Sensitivity at the site**

Ecological sensitivity at the site is low (Figure 2). Threatened and Near Threatened animal and plant species appear to be absent. No other animal or plant species of particular conservation concern appear to be present at the site.



**Figure 2** Indications of ecological sensitivity at the site.

- Red outline                      Boundaries of the site
- Light yellow outline and shading      Low Sensitivity

## 6 RISKS, IMPACTS AND MITIGATION

### Background:

Habitats of threatened plants are in danger most often due to urban developments such as is the case for the Gauteng Province (Pfab & Victor, 2002). Habitat conservation is the key to the conservation of invertebrates such as threatened butterflies (Deutschländer and Bredenkamp 1999; Edge 2005; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Furthermore, corridors and linkages may play a significant role in insect conservation (Pryke & Samways, 2003, Samways, 2005).

Urbanisation is a major additional influence on the loss of natural areas (Rutherford & Westfall 1994). In the South Africa the pressure to develop areas are high since its infrastructure allows for improvement of human well-being. Urban nature conservation issues in South Africa are overshadowed by the goal to improve human well-being, which focuses on aspects such as poverty, equity, redistribution of wealth and wealth creation (Cilliers, Müller & Drewes 2004). Nevertheless, the conservation of habitats is the key to invertebrate conservation, especially for those threatened species that are very habitat specific. This is also true for any detailed planning of corridors and buffer zones for invertebrates. Though proper management plans for habitats are not in place, setting aside special ecosystems is in line with the recent Biodiversity Act (2004) of the Republic of South Africa.

Corridors are important to link ecosystems of high conservation priority. Such corridors or linkages are there to improve the chances of survival of otherwise isolated populations (Samways, 2005). How wide should corridors be? The answer to this question depends on the conservation goal and the focal species (Samways, 2005). For an African butterfly assemblage this is about 250m when the corridor is for movement as well as being a habitat source (Pryke and Samways 2003). Hill (1995) found a figure of 200m for dung beetles in tropical Australian forest. In the agricultural context, and at least for some common insects, even small corridors can play a valuable role (Samways, 2005). Much more research remains to be done to find refined answers to the width of grassland corridors in South Africa. The width of corridors will also depend on the type of development, for instance the effects of the shade of multiple story buildings will be quite different from that of small houses.

To summarise: In practice, as far as developments are concerned, the key would be to prioritise and plan according to sensitive species and special ecosystems.

In the case of this study:

Vegetation as the site is extensively disturbed, modified and at some places transformed. A mixture of alien invasive and indigenous plant species exists at the site.

Rocky ridges are absent at the site.

No wetlands have been noted at the site.

Threatened and Near Threatened animal and plant species appear to be absent. No other animal or plant species of particular conservation concern appear to be present at the site.

The scope for the site to be a corridor of particular conservation importance is small.

The following potential risks, impacts and mitigation measures apply to the proposed development:

### **6.1 Identification of potential impacts and risks**

The potential impacts identified are:

#### **Construction Phase**

- Potential impact 1: Loss of habitat owing to the removal of vegetation at the proposed development.
- Potential impact 2: Loss of sensitive species (Threatened, Near Threatened, Rare, Declining or Protected species) during the construction phase.
- Potential impact 3: Loss of connectivity and conservation corridor networks in the landscape.
- Potential impact 4: Contamination of soil during construction in particular by hydrocarbon spills.
- Potential impact 5: Killing of vertebrate fauna during the construction phase.

#### **Operational Phase**

- Potential impact 6: An increased infestation of exotic or alien invasive plant species owing to disturbance.

## 6.2 Potential impacts and risks during the construction phase

Classes of impacts for this study: Very High, High, Moderate, Low, Very Low

Aspect/Activity	Clearance of vegetation at part of the site for the development
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Clearing of vegetation at the proposed development. This will entail the destruction of habitat of low ecological sensitivity.
Status	Negative
Mitigation Required	If the development is approved cultivation of indigenous vegetation at the site is imperative.
Impact Significance (Pre-Mitigation)	Moderate
Impact Significance (Post-Mitigation)	Low
RISK	Following the mitigation measures a low risk of impact is expected.

Aspect/Activity	Removal of sensitive species
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Sensitive species: Presence of Threatened or Near Threatened Plants, Mammals, Reptiles, Amphibians and Invertebrates at the site appear to be unlikely. No other plant or animal species of particular conservation concern are anticipated to be resident at the site.
Status	Neutral.
Mitigation Required	No specific mitigation measures for sensitive species which are threatened apply at the site.
Impact Significance (Pre-Mitigation)	Low
Impact Significance (Post-Mitigation)	Low
RISK	A low risk of threat to any sensitive species at the site is anticipated.

Aspect/Activity	Fragmentation of corridors of particular conservation concern
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Savanna at the site is ecologically visibly degraded.
Status	Negative
Mitigation Required	If the development is approved cultivation of indigenous plant species at the site is imperative.
Impact Significance (Pre-Mitigation)	Moderate
Impact Significance (Post-Mitigation)	Low
RISK	Following mitigation, a low impact risk is expected.

Aspect/Activity	Contamination of soil by leaving rubble/ waste or spilling petroleum fuels or any pollutants on soil which could infiltrate the soil
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Rubble or waste could lead to infiltration of unwanted pollutants into the soil. Spilling of petroleum fuels and unwanted chemicals onto the soils that infiltrate these soils could lead to pollution of soils.
Status	Negative
Mitigation Required	Rubble or waste that could accompany the construction effort, if the development is approved, should be removed during and after construction. Measures should be taken to avoid any spills and infiltration of petroleum fuels or any chemical pollutants into the soil during construction phase.
Impact Significance (Pre-Mitigation)	Moderate
Impact Significance (Post-Mitigation)	Low
RISKS	A low risk is expected following mitigation.

Aspect/Activity	Possible disturbance, trapping, hunting and killing of vertebrates during construction phase
<b>Type of Impact (i.e. Impact Status)</b>	Direct
<b>Potential Impact</b>	During the construction phase animal species could be disturbed, trapped, hunted or killed.
<b>Status</b>	Negative
<b>Mitigation Required</b>	If the development is approved, contractors must ensure that no animal species are disturbed, trapped, hunted or killed during the construction phase.
Impact Significance (Pre-Mitigation)	Moderate
Impact Significance (Post-Mitigation)	Low
<b>RISKS</b>	Following mitigation a low risk is anticipated.

### 6.3 Potential impacts during the operational phase

Aspect/Activity	An increased infestation of exotic or alien invasive plant species owing to clearance or disturbance where the footprint took place.
<b>Type of Impact (i.e. Impact Status)</b>	Direct
<b>Potential Impact</b>	Infestation by alien invasive species could replace indigenous vegetation or potential areas where indigenous vegetation could recover. It is in particular declared alien invasive species such as <i>Melia azedarach</i> (Syringa) or alien invasive Australian <i>Acacia</i> species (Australian Wattles) that should not be allowed to establish. Once established combatting these alien invasive plant species may become very expensive in the long term.
<b>Status</b>	Negative
<b>Mitigation Required</b>	Continued monitoring and eradication of alien invasive plant species are imperative. It is in particular declared alien invasive species such as <i>Melia azedarach</i> (Syringa) and alien invasive Australian <i>Acacia</i> species (Australian wattles) that should not be allowed to establish.
Impact Significance (Pre-Mitigation)	Moderate
Impact Significance (Post-Mitigation)	Low
<b>RISKS</b>	Following mitigation, a low risk is anticipated.

#### 6.4 Risk and impact assessment summary for the construction phase

Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)	
Clearing of vegetation	Habitat loss, loss of indigenous species	Negative	Part of site	Long-Term	Substantial	Very likely	Low	Low	The removal of vegetation takes place at an area of low ecological sensitivity. If the development is approved, cultivation of indigenous plant species at the site is essential.	Moderate	Low	High
Loss of sensitive species	Loss of sensitive species (Note no Threatened species or Near Threatened species)	Negative	Site	Long-Term	Very low (No species anticipated)	Unlikely	Not applicable	Not applicable	No specific mitigation measures apply to sensitive species which are Threatened or Near Threatened at the site. No other animal or plant species of particular conservation concern is anticipated to be present at the site.	Low	Low	High
Loss of corridors of particular conservation concern	Fragmentation of landscape and loss of connectivity	Negative	Site	Long-Term	Moderate	Unlikely	Moderate	Moderate	The scope for the degraded and isolated site to be a corridor of particular conservation importance is small. Cultivation of indigenous plant species at the site is essential and will enhance urban conservation corridors.	Moderate	Low	High



Contamination of soil by spilling pollutants on soil which could infiltrate the soil	Soil contamination	Negative	Site	Long-Term	Moderate	Unlikely	Moderate	Moderate	Rubble and waste removal. Measures that avoid hydrocarbon (petroleum) spills to get into contact with the soil.	Moderate	Low	High
Disturbance or killing of vertebrates	Disturbance or killing of species	Negative	Site	Long-Term	Moderate	Unlikely	Moderate	Moderate	If the development is approved, contractors must ensure that no animal species are disturbed, trapped, hunted or killed during the construction phase.	Moderate	Low	High

### 6.5 Risk/ Impact assessment summary for the operational phase

Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)	
Increased infestation of exotic or alien invasive plant species	Loss of habitat quality	Negative	Site	Long-Term	Substantial	Likely	Moderate	Moderate	Monitoring and eradication of alien invasive plant species. Cultivation of indigenous plant species at the site is imperative.	Moderate	Low	High

## 6.5 Summary of risks and impacts

Vegetation at the site is extensively disturbed, modified and at some places transformed. A mixture of alien invasive and indigenous plant species exists at the site. Rocky ridges are absent at the site. No wetlands have been noted at the site. Threatened and Near Threatened animal and plant species appear to be absent. No other animal or plant species of particular conservation concern appear to be present at the site. The scope for the site to be a corridor of particular conservation importance is small.

The site is regarded as of low ecological sensitivity.

Following the mitigations which will be upheld and planned footprint for development all the impact risks listed above are moderate or low.

## 7 CONCLUSION

- Vegetation at the site is extensively disturbed, modified and at some places transformed. A mixture of alien invasive and indigenous plant species exists at the site.
- Indigenous tree species at the site include *Vachellia karroo*. A number of alien invasive tree species such as *Melia azedarach*, *Eucalyptus camaldulensis*, *Solanum mauritianum* and *Tecoma stans* are present at the site. The alien invasive reed species *Arundo donax* occur in clumps at the site. A clump of *Typha capensis* has established at a ditch that has been dug next to the tar road at the northern limits of the site.
- Indigenous grass species at the site include *Heteropogon contortus*, *Hyparrhenia hirta*, and *Cynodon dactylon*. The herbaceous shrub *Gomphocarpus fruticosus* also occurs at the site. Indigenous forb species appear to be scarce at the site. Many alien invasive weed species are found at the site and these include *Argemone ochroleuca*, *Datura ferox*, *Datura stramonium*, *Gomphrena celosioides*, *Schkuhria pinnata*, *Tagetes minuta*, *Conyza bonariensis*, *Malva parviflora*, *Verbena aristigera*, *Bidens bipinnata*, *Bidens pilosa* and *Flaveria bidentis*.
- Rocky ridges are absent at the site.
- No wetlands appear to be present at the site.
- Savanna at the site is represented by the Moot Plains Bushveld (SVcb 8) vegetation type which is not listed as a Threatened Ecosystem, according to the National List of Threatened Ecosystems (2011).
- Threatened and Near Threatened animal and plant species appear to be absent. Other animal or plant species of particular conservation concern also appear to be absent at the site.
- The scope for the site to be a corridor of particular conservation importance is small.
- Ecological sensitivity at the site is low.
- Following the mitigations which will be upheld and planned footprint for development all the impact risks listed above are moderate or low.
- If the development is approved continued monitoring and eradication of alien invasive plant species are imperative. It is in particular declared alien invasive species such as *Melia azedarach* (Syringa) and alien invasive Australian *Acacia* species (Australian wattles) that should not be allowed to establish.
- If the development is approved an opportunity presents itself to cultivate indigenous plant species which would benefit urban nature conservation.

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## ANNEXURE 1: Plants

### List of plant species that have been recorded at the affected area and immediate surroundings

Plant species marked with an asterisk (\*) are exotic.



Sources: Crouch, Klopper, Burrows & Burrows (2011), Germishuizen (2003), Johnson & Bytebier (2015), Manning (2003), Manning (2009), Van Oudtshoorn (2012), Van Wyk (2000), Van Wyk & Malan (1998), Goldblatt (1986), Goldblatt & Manning (1998), McMurtry, Grobler, Grobler & Burns (2008), Smit (2008), Van Ginkel *et al.* (2011), Van Jaarsveld (2006), Van Wyk & Smith (2014) and Van Wyk & Van Wyk (2013).

TAXON	ENGLISH NAMES	FAMILY
<b>ANGIOSPERMS: MONOCOTYLEDONS</b>		
<i>Aristida adscensionis</i>	Annual Three-awn	POACEAE
<i>Aristida congesta</i>	Tassel Three-awn	POACEAE
* <i>Arundo donax</i>	Giant Reed	POACEAE
<i>Cynodon dactylon</i>	Couch Grass	POACEAE
<i>Heteropogon contortus</i>	Spear Grass	POACEAE
<i>Hyparrhenia hirta</i>	Common Thatching Grass	POACEAE
<i>Melinis repens</i>	Natal Red Top	POACEAE
<i>Pogonarthria squarrosa</i>	Herringbone Grass	POACEAE
<i>Setaria sphacelata</i>	Common Bristle Grass	POACEAE
<i>Themeda triandra</i>	Red Grass	POACEAE
<i>Trachypogon spicatus</i>	Giant Spear Grass	POACEAE
<i>Tragus berteronianus</i>	Carrot-Seed Grass	POACEAE
<i>Typha capensis</i>	Bulrush	TYPHACEAE
<b>ANGIOSPERMS: DICOTYLEDONS</b>		
* <i>Alternanthera pungens</i>	Duwweltjie	AMARANTHACEAE
* <i>Argemone ochroleuca</i>	White-flowered Mexican poppy	PAPAVERACEAE
* <i>Bidens bipinnata</i>	Spanish blackjack	ASTERACEAE
* <i>Chenopodium album</i>	White Goosefoot	CHENOPODIACEAE
<i>Convolvulus sagittatus</i>		CONVOLVULACEAE
* <i>Datura ferox</i>	Large Thorn-apple	SOLANACEAE
* <i>Eucalyptus camaldulensis</i>	Red Gum	MYRTACEAE
<i>Felicia muricata</i>		ASTERACEAE
<i>Gazania krebsiana</i>		ASTERACEAE

<b><i>Gomphocarpus fruticosus</i></b>	Milkweed	APOCYNACEAE
* <b><i>Gomphrena celosioides</i></b>	Bachelor's Button	AMARANTHACEAE
* <b><i>Hibiscus trionum</i></b>	Bladder hibiscus	MALVACEAE
* <b><i>Lantana camara</i></b>		VERBENACEAE
* <b><i>Lepidium bonariense</i></b>	Pepperweed	BRASSICACEAE
* <b><i>Malva parviflora</i></b>	Small Mallow	MALVACEAE
* <b><i>Melia azedarach</i></b>	Seringa	MELIACEAE
* <b><i>Plantago lanceolata</i></b>	Narrow-leaved plantain	PLANTAGINACEAE
* <b><i>Schkuhria pinnata</i></b>	Dwarf Marigold	ASTERACEAE
<b><i>Senecio inaequidens</i></b>	Canary Weed	ASTERACEAE
<b><i>Sida dregei</i></b>		MALVACEAE
<b><i>Solanum lichtensteinii</i></b>		SOLANACEAE
* <b><i>Sonchus oleraceus</i></b>	Sowthistle	ASTERACEAE
* <b><i>Tecoma stans</i></b>		BIGNONIACEAE
* <b><i>Tagetes minuta</i></b>	Khakiweed	ASTERACEAE
<b><i>Vachellia karroo</i></b>	Sweet Thorn	FABACEAE
* <b><i>Verbena aristigera</i></b>	Fine-leaved Verbena	VERBENACEAE
* <b><i>Verbena bonariensis</i></b>	Purple top	VERBENACEAE