

## ECOLOGICAL FAUNA AND FLORA HABITAT SURVEY

### **Aalwyndal, Western Cape Province, South Africa**



*Pelargonium peltatum*, a fairly widespread plant species in parts of the Western and Eastern Cape, at the site. A good prospect for the indigenous garden as part of urban nature conservation corridors.

Photo: Reinier F. Terblanche.

**JANUARY 2020**

**COMPILED BY:**

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(M.Sc Ecology, *Cum Laude*; Pr.Sci.Nat, Reg. No. 400244/05)

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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. Also completed a Statistics Attendance Course. Research project was about taxonomy of the plant genus <i>Haworthia</i> .	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. Appointed as Research Fellow at College of Agriculture and Environmental Sciences, Department of Environmental Sciences, University of South Africa, from 1 January 2020.

## EXPERIENCE

Lecturer: Zoology 1998-2008	Main subject matter and level	Organization
<b>Lectured subjects</b>	- <u>3<sup>rd</sup> year level</u> Ecology, Plantparasitology - <u>2<sup>nd</sup> year level</u> Ethology - <u>Master's degree</u> Evolutionary Ethology, Systematics in Practice, Morphology and Taxonomy of Insect Pests, Wetlands.	North-West University, Potchefstroom and University of South Africa
<b>Co-promoter</b>	PhD: Edge, D.A. 2005. Ecological factors that influence the survival of the Brenton Blue butterfly	North-West University, Potchefstroom
<b>Study leader/ assistant study leader</b>	Six MSc students, One BSc Honn student: Various quantitative biodiversity studies (terrestrial and aquatic).	North-West University, Potchefstroom
<b>Teacher 1994-1998</b>	Biology and Science, Secondary School	Afrikaans Hoër Seunskool, Pretoria
<b>Owned Anthene Ecological CC 2008 – present</b>	- 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
<b>Herbarium assistant 1988-1991</b>	- 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*. Saffronics (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., KÓRÖSI, 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. Saffronics (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 *Chrysothis 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 stenobeia* 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: 9 January 2020

# 1 INTRODUCTION

An ecological habitat survey was required for the proposed development at Aalwyndal, Mossel Bay in the Western Cape Province of South Africa (elsewhere referred to as the site). Survey focused on the possibility that threatened fauna or flora known to occur in Western Cape Province are likely to occur within the proposed development. Species of known high conservation priority that do not qualify for threatened status also received attention in the survey.

## 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;
- Recording of possible host plants or foodplants of fauna such as butterflies.
- Evaluate the conservation importance and significance of the site with special emphasis on the current status of threatened species;
- Literature investigation of possible species that may occur on site;
- Identification of potential ecological impacts on fauna and flora that could occur as a result of the development; and
- Make recommendations to reduce or minimise impacts, should the development be approved.

## 1.2 SCOPE OF STUDY

- Surveys to investigate key elements of habitats on the site, relevant to the conservation of fauna and flora.
- Recording of any sightings and/or evidence of existing fauna and flora.
- The selective and careful collecting of voucher specimens of invertebrates where deemed necessary.
- An evaluation of the conservation importance and significance of the site with special emphasis on the current status of threatened species.
- Recording of possible host plants or foodplants of fauna such as butterflies.
- Literature investigation of possible species that might occur on site.
- Integration of the literature investigation and field observations to identify potential ecological impacts that could occur as a result of the development.
- Integration of literature investigation and field observations to make recommendations to reduce or minimise impacts, should the development be approved.

## 2 STUDY AREA

The study area is at Aalwyndal in the Western Cape Province, South Africa (elsewhere referred to as the site). Site is situated at the Fynbos Biome which is represented by Groot Brak Dune Strandveld (FS 9) vegetation type (Mucina & Rutherford, 2006). A brief overview of the vegetation type follows.

### Groot Brak Dune Strandveld FS 9

**Distribution:** Groot Brak Dune Strandveld is present in the Western Cape Province of South Africa. It is found at coastal stretches between the mouth of the Gouritz River as far east as Victoria Bay near Wilderness, with by far the largest area covering the flats north of Mossel Bay (along the lower reaches of the Groot Brak, Klein Brak and Hartenbos Rivers) and extending up to 17 km from the coast. Altitude 0 – 180 m (Mucina & Rutherford, 2006).

**Vegetation & Landscape Features:** Flats, undulating landscapes (stabilized dunes) and steep coastal slopes, covered by dense and tall (up to 3 m), spiny, sclerophyllous scrub with gaps supporting shrublands with ericoids or succulent-leaved shrubs. The graminoid layer is sparse and short (Mucina & Rutherford, 2006).

**Geology & Soils:** Mostly underlain by the clastic sedimentary rocks of the Kirkwood Formation (Mesozoic Uitenhage Group). In the east, quartzite, schist, and phyllite of the Kaaimans Group (Namibian Erathem) and Cape Granite (edges of high coastal cliffs) are also present. In parts along the coast, these rocks are covered by the unconsolidated dune sand of the Strandveld Formation (Bredasdorp Group). Most important land types Db and Dc (Mucina & Rutherford, 2006).

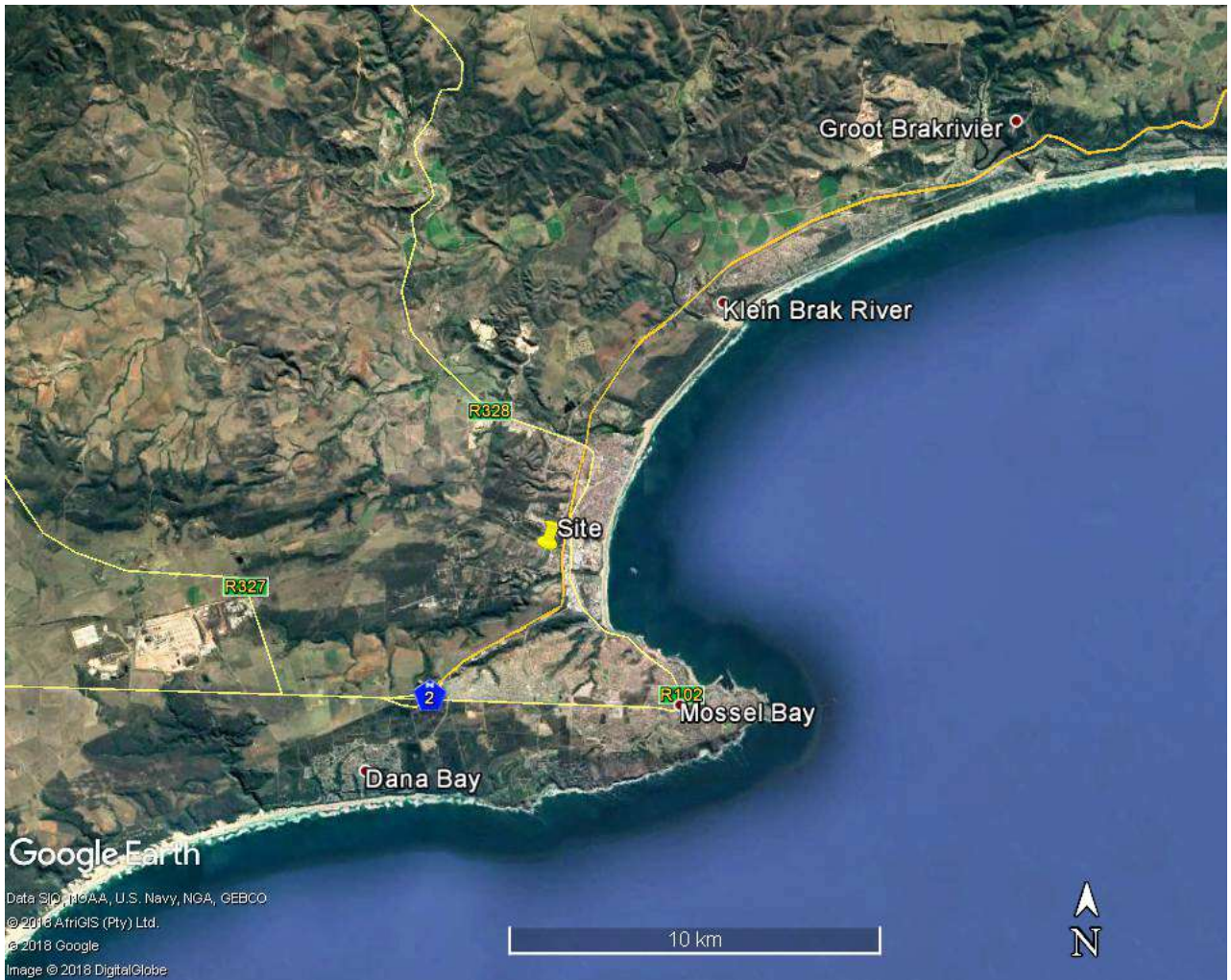
**Climate:** MAP varies between approximately 350 mm in the west to 750 mm in the east, with approximately 40% of the rain falling in the summer (October-March) and 60 % falling in the winter (April – September) (Mucina & Rutherford, 2006).

**Important Taxa:** Small Trees: *Chionanthus foveolatus*, *Clausena anisata*. Tall Shrubs: *Azima tetraacantha*, *Cussonia thyrsiflora*, *Diospyros dichrophylla*, *Euclea racemosa* subsp. *racemosa*, *Grewia occidentalis*, *Gymnosporia buxifolia*, *Maytenus procumbens*, *Metalasia muricata*, *Morella cordifolia*, *Myrsine africana*, *Mystroxylon aethiopicum*, *Olea exasperata*, *Pterocelastrus tricuspidatus*, *Putterlickia pyracantha*, *Searsia crenata*, *Searsia glauca*, *Searsia longispina*, *Searsia lucida*, *Schotia afra* var. *afra*, *Sideroxylon inerme*, *Tarchonanthus littoralis*. Low Shrubs: *Asparagus suaveolens*, *Ballota africana*, *Carissa bispinosa* subsp. *bispinosa*, *Chironia baccifera*, *Clutia daphnoides*, *Eriocephalus africanus* var. *africanus*, *Helichrysum teretifolium*, *Lauridia tetragona*, *Phylica axillaris*, *Polygala myrtifolia*. Succulent Shrubs: *Aloe arborescens*, *Cotyledon orbiculata* var. *dactyloopsis*, *Crassula perforata*,

*Crassula pubescens* subsp. *pubescens*, *Euphorbia burmannii*, *Euphorbia mauritanica*, *Tetragonia fruticosa*, *Zygophyllum morgsana*. Woody Climbers: *Asparagus aethiopicus*, *Cissampelos capensis*, *Rhoicissus digitata*. Woody Succulent Climber: *Sarcostemma viminale*. Semiparasitic Shrubs: *Osyris compressa*, *Thesidium fragile*. Soft Shrub: *Hypoestes aristata*. Herb: *Commelina africana*. Geophytic Herbs: *Brunsvigia orientalis*, *Chasmanthe aethiopicus*, *Hesperantha falcata*. Succulent Herbs: *Carpobrotus edulis*, *Crassula expansa* subsp. *expansa*, *Senecio radicans*. Herbaceous Climbers: *Astephanus triflorus*, *Cynanchum obtusifolium*, *Kedrostis nana*. Herbaceous Succulent Climber: *Pelargonium peltatum*. Graminoids: *Cynodon dactylon*, *Ehrharta erecta*, *Ficinia indica*, *Panicum deustum*, *Stipa dregeana*.

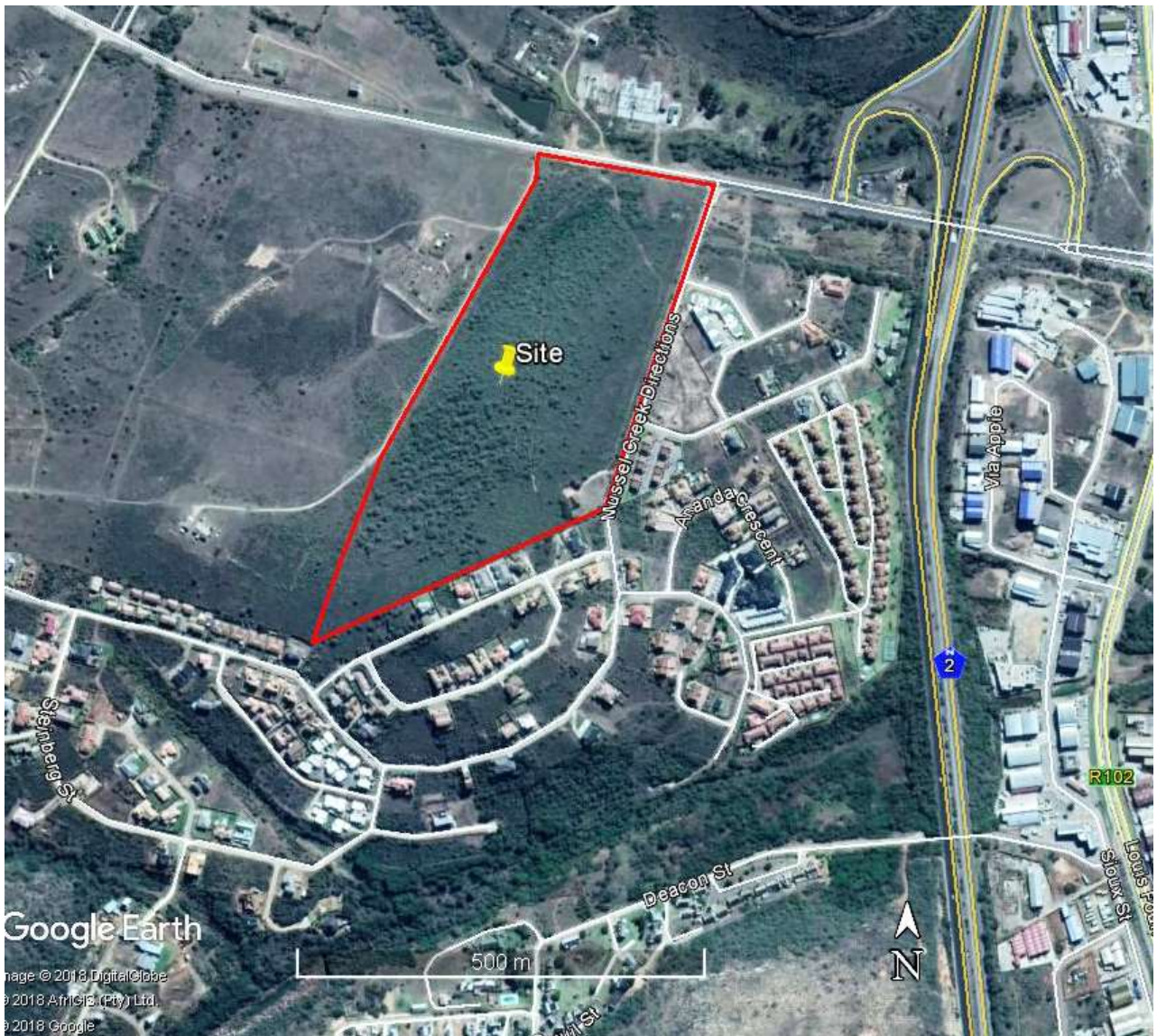
**Note:** Not all of the above listed plant species for the vegetation type occur at the site in the study area.





**Figure 1** Map of larger area with indication of the location of the site (yellow marker).

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, 2018).



**Figure 2** Map of larger area with indication of the location of the site.

*Red outline*                      Boundaries 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, 2018).

### **3 METHODS**

A desktop study comprised not only an initial phase, but also it was used throughout the study to accommodate and integrate all the data that become available during the field observations.

Surveys that consisted of a visit by R.F. Terblanche on 24 October 2018 and 28 December 2019 were conducted to note key elements of habitats on the site, relevant to the conservation of fauna and flora. The main purpose of the site visits was ultimately to serve as a habitat survey that concentrated on the possible presence or not of threatened species and other species of high conservation priority.

The following sections highlight the materials and methods applicable to different aspects or signs that were observed.

#### **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 Boon (2010), Court (2010), Germishuizen (2003), Germishuizen, Meyer & Steenkamp (2006), Goldblatt (1986), Goldblatt & Manning (1998), Jacobsen (1983), Manning (2003), Manning (2009), McMurtry, Grobler, Grobler & Burns (2008), Pooley (1998), Retief & Herman (1997), Smit (2008), Van Ginkel, Glen, Gordon-Gray, Cilliers, Muasya & Van Deventer (2011), Van Jaarsveld (2006), Van Oudtshoorn (1999), Van Wyk (2000), Van Wyk & Smith (2001), Van Wyk & Smith (2003), Van Wyk & Malan (1998) and Van Wyk & Van Wyk (1997). 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 though some bats, rodents and shrews can only be reliably identified in the hand, and even then some species needs 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 (Deutshländer & 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 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 *Ichnestoma* 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 2018 and December 2019 which includes optimal conditions to find signs of animals such as invertebrates, signs of habitat sensitive plant species and vertebrate animal species high conservation priority. Weather conditions during the surveys were favourable for recording fauna and flora. 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

### 4.1 HABITAT AND VEGETATION CHARACTERISTICS

Table 4.1 Outline of main landscape and habitat characteristics of the site.

HABITAT FEATURE	DESCRIPTION
Topography	Site is on gentle slopes to moderate slopes and generally elevated from the surrounding area. A small low-lying area is present at the northwestern corner of the site.
Rockiness	Some rocks surface at the site. Pebbles or stones are found at some places.
Presence of wetlands	No wetlands appear to be present at site. A small depression which is not a wetland and technically ascribes to a very small artificial waterbody where water could gather sporadically is found at a low-lying area at the northwestern corner of the site.
Vegetation	<p>For most of the site thorny sclerophyllous shrub is present as well as conspicuous infestation by the alien invasive <i>Acacia cyclops</i> (Redeye). A patch where <i>Elytropappus rhinocerotis</i> (Renosterbos) is more conspicuous occurs at the southwestern part of the site. Some areas have hitherto been cleared where pioneer species such as <i>Atriplex semibaccata</i> is noticeable.</p> <p>Indigenous shrub species that form a dense shrub-stratum at some parts of the site include <i>Carissa bispinosa</i>, <i>Searsia glauca</i>, <i>Gymnosporia buxifolia</i>, <i>Schotia afra</i> and <i>Grewia occidentalis</i>. Three <i>Aloe</i> species have been found at the site – <i>Aloe arborescens</i>, <i>Aloe ferox</i> and <i>Aloe maculata</i>. Other succulents such as <i>Euphorbia heptagona</i>, <i>Carpobrotus edulis</i>, <i>Glottiphyllum depressum</i>, <i>Drosanthemum speciosum</i>, <i>Trichodiadema intosum</i> and <i>Gasteria carinata</i> are also found. Indigenous grass species include <i>Cynodon dactylon</i>, <i>Ehrharta villosa</i>, <i>Pentameris pallida</i>, <i>Sporbolus fimbriatus</i> and <i>Themeda triandra</i>. Exotic grass species include <i>Pennisetum clandestinum</i>, <i>Briza maxima</i> and <i>Phalaris minor</i>. Other exotic plant species include <i>Lantana camara</i> and <i>Opuntia ficus-indica</i>.</p> <p>Alien invasive weeds are conspicuous at the small low-lying area at the northwestern corner of the site, while the aggressive alien invasive tree <i>Acacia cyclops</i> is visible at some of the the edges of this depression. Steep slopes with poor vegetation cover are found at the southern edges of the depression whereas the slopes at a fence north of the depression next to the tar road are covered by grasses such as the alien invasive <i>Pennisetum clandestinum</i> (Kikuyu) with some herbs and shrubs. The indigenous grass species <i>Cynodon dactylon</i> is also present at the depression. Extensive cover of pioneer plant species and alien invasive weeds such as <i>Atriplex semibaccata</i> (Australian Saltbush) and <i>Chenopodium</i> species at this possibly sporadically inundated area is noticeable. Other alien invasive weeds at the small low-lying area include <i>Sonchus oleraceus</i> and <i>Plantago lanceolata</i>. Typical wetland vegetation such as sedges, marsh-grasses and hydrophytic herbs, appears to be absent. Overall the small depression appears conspicuously degraded.</p>
Signs of disturbances	Tracks, fences and alien invasive plant species are found at the site. Roads and urban areas are present at some of the boundaries of the site. A powerline and some hitherto cleared areas are also found. Small scale informal dumping occurs from adjacent residential areas.
Connectivity	Some corridor with indigenous vegetation should remain at the site. If the development is approved cultivation of indigenous plant species will be an asset for urban conservation corridors.



**Photo 1** Mixed alien and indigenous vegetation at the site. Taller shrubs in the picture are alien invasive *Acacia cyclops* (Redeye) which is originally from Australia.  
Photo: R.F. Terblanche.



**Photo 2** Track along powerline at the site.  
Photo: R.F. Terblanche



**Photo 3** South-western part of the site.  
Photo: R.F. Terblanche.



**Photo 4** Part of site in foreground and substation adjacent to the northern part of the site opposite the road in the background.  
Photo: R.F. Terblanche





**Photo 5** View of part of site along the road.  
Photo: R.F. Terblanche.



**Photo 6** Some informal dumping from adjacent residential areas that takes place at the site.  
Photo: R.F. Terblanche



**Photo 7** Indigenous *Ericephalus africanus* is a conspicuous shrub at the site.  
Photo: R.F. Terblanche.



**Photo 8** Foliage of highly invasive alien *Acacia cyclops* at the site.  
Photo: R.F. Terblanche



**Photo 9** *Aloe arborescens* at the site.  
Photo: R.F. Terblanche.



**Photo 10** Small succulent *Trichodiadema intosum* is present at open areas adjacent to few rocks that surface at the site.  
Photo: R.F. Terblanche



**Photo 11** *Pelargonium peltatum*, a fairly widespread plant species in parts of the Western and Eastern Cape, at the site. A good prospect for the indigenous garden.

Photo: R.F. Terblanche.



**Photo 12** Striking indigenous plant species, *Drosanthemum speciosum*, at the site.

Photo: R.F. Terblanche



**Photo 13** *Euphorbia heptagona*, a widespread plant species in the larger area including the Little Karoo.  
Photo: R.F. Terblanche.



**Photo 14** Characteristic flowerheads of the widespread *Aloe maculata* at the site.  
Photo: R.F. Terblanche



**Photo 15** *Boophone disticha*, a widespread plant species which is not threatened but listed as Declining at the site.  
Photo: R.F. Terblanche.



**Photo 16** *Hypoxis hemerocallidea* a widespread plant species which is not threatened but listed as Declining at the site.  
Photo: R.F. Terblanche



**Photo 17** The variable leaf shapes of *Gasteria carinata*, a plant species fairly widely distributed in the southern Cape, are also observed at the site.  
Photo: R.F. Terblanche.



**Photo 18** One of the few records of *Junonia orithya madagascariensis* (Eyed Pansy) in the Western Cape found at the site. The range of this widespread butterfly is expanding in South Africa (also in urban areas) owing to the use of exotic host-plant species by its larvae.  
Photo: R.F. Terblanche

#### **4.2 ASSESSMENT OF PLANT SPECIES OF PARTICULAR CONSERVATION PRIORITY**

#### 4.2.1 Plant species of particular conservation concern according to the red list of plants

A large number of plant species of particular conservation concern is present in the Western Cape Province. Tables below focus on the district.

**Table 4.2** Threatened plant species of a part of the Western Cape Province which are listed in the **Critically Endangered** category. The list here follows the red list of South African plant species (Raimondo *et al.* 2009) and its updates. No = Plant species is unlikely to be a resident at the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Agathosma pallens</i>	Critically Endangered	No
<i>Diosma aristata</i>	Critically Endangered	No
<i>Euphorbia bayeri</i>	Critically Endangered	No
<i>Gladiolus roseovenosus</i>	Critically Endangered	No
<i>Haworthia kingiana</i>	Critically Endangered	No
<i>Haworthia magnifica</i> var. <i>acuminata</i>	Critically Endangered	No
<i>Haworthia parksiana</i>	Critically Endangered	No
<i>Haworthia pygmaea</i> var. <i>argenteo-maculosa</i>	Critically Endangered	No
<i>Haworthia pygmaea</i> var. <i>pygmaea</i>	Critically Endangered	No
<i>Lebeckia fasciculata</i>	Critically Endangered	No
<i>Lobostemon belliformis</i>	Critically Endangered	No

**Table 4.3** Threatened plant species of a part of the Western Cape Province which are listed in the **Endangered** category. The list here follows the red list of South African plant species (Raimondo *et al.* 2009) and its updates. No = Plant species is unlikely to be a resident at the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Anisodonteia pseudocapensis</i>	Endangered	No
<i>Argyrolobium harmsianum</i>	Endangered	No
<i>Aspalathus acutiflora</i>	Endangered	No
<i>Aspalathus odontoloba</i>	Endangered	No
<i>Athanasia cochlearifolia</i>	Endangered	No
<i>Brunsvigia litoralis</i>	Endangered	No
<i>Disa hallackii</i>	Endangered	No
<i>Disa lugens</i> var. <i>lugens</i>	Endangered	No
<i>Drosanthemum lavisii</i>	Endangered	No
<i>Duvalia immaculata</i>	Endangered	No



<i>Erica platycalyx</i>	Endangered	No
<i>Erica unicolor</i> subsp. <i>mutica</i>	Endangered	No
<i>Erica vlokii</i>	Endangered	No
<i>Eriospermum vermiforme</i>	Endangered	No
<i>Euchaetis albertiniana</i>	Endangered	No
<i>Haworthia bayeri</i>	Endangered	No
<i>Haworthia cloracantha</i> var. <i>denticulifera</i>	Endangered	No
<i>Haworthia cloracantha</i> var. <i>subglauca</i>	Endangered	No
<i>Hesperantha muirii</i>	Endangered	No
<i>Hypodiscus procurrens</i>	Endangered	No
<i>Lachenalia nervosa</i>	Endangered	No
<i>Lampranthus diutinus</i>	Endangered	No
<i>Lampranthus foliosus</i>	Endangered	No
<i>Lampranthus pauciflorus</i>	Endangered	No
<i>Leucospermum muirii</i>	Endangered	No
<i>Lidbeckia pinnata</i>	Endangered	No
<i>Lotononis filiformis</i>	Endangered	No
<i>Ocotea bullata</i>	Endangered	No
<i>Ruschia leptocalyx</i>	Endangered	No
<i>Stoebe rugulosa</i>	Endangered	No

**Table 4.4** Threatened plant species of a part of the Western Cape Province which are listed in the **Vulnerable** category. The list here follows the red list of South African plant species (Raimondo *et al.* 2009) and its updates. No = Plant species is unlikely to be a resident at 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>Agathosma microcarpa</i>	Vulnerable	No
<i>Agathosma muirii</i>	Vulnerable	No
<i>Agathosma riversdalensis</i>	Vulnerable	No
<i>Amauropelta knysnaensis</i>	Vulnerable	No
<i>Aspalathus obtusifolia</i>	Vulnerable	No

<i>Aspalathus quadrata</i>	Vulnerable	No
<i>Aspalathus steudeliana</i>	Vulnerable	No
<i>Cliffortia longifolia</i>	Vulnerable	No
<i>Diosma tenella</i>	Vulnerable	No
<i>Erica dispar</i>	Vulnerable	No
<i>Erica glandulosa</i> subsp. <i>fourcadei</i>	Vulnerable	No
<i>Erica stylaris</i>	Vulnerable	No
<i>Erica viscosissima</i>	Vulnerable	No
<i>Freesia fergusoniae</i>	Vulnerable	No
<i>Freesia leichtlinii</i>	Vulnerable	No
<i>Geissorhiza outeniquensis</i>	Vulnerable	No
<i>Helichrysum incarnatum</i>	Vulnerable	No
<i>Hermannia muirii</i>	Vulnerable	No
<i>Leucadendron galpinii</i>	Vulnerable	No
<i>Leucospermum praecox</i>	Vulnerable	No
<i>Muraltia cliffortiifolia</i>	Vulnerable	No
<i>Oedera steyniae</i>	Vulnerable	No
<i>Relhania garnotii</i>	Vulnerable	No
<i>Ruellia pilosa</i>	Vulnerable	No
<i>Selago villicaulis</i>	Vulnerable	No
<i>Thamnochortus muirii</i>	Vulnerable	No
<i>Watsonia fergusoniae</i>	Vulnerable	No

**Table 4.5 Near Threatened** plant species of a part of the Western Cape Province. The list here follows the red list of South African plant species (Raimondo *et al.* 2009) and its updates. No = Plant species is unlikely to be a resident at 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>Acmadenia densifolia</i>	Near Threatened	No
<i>Aristea simplex</i>	Near Threatened	No
<i>Aulax umbellata</i>	Near Threatened	No
<i>Babiana nana</i> subsp. <i>maculata</i>	Near Threatened	No
<i>Centella calcarea</i>	Near Threatened	No
<i>Cephalophyllum diversiphyllum</i>	Near Threatened	No
<i>Cliffortia schlechteri</i>	Near Threatened	No
<i>Dioscorea mundii</i>	Near Threatened	No
<i>Gladiolus teretifolius</i>	Near Threatened	No
<i>Helichrysum cochleariforme</i>	Near Threatened	No

<i>Holothrix pilosa</i>	Near Threatened	No
<i>Metalasia erectifolia</i>	Near Threatened	No
<i>Pentaschistis calcicola</i> var. <i>calcicola</i>	Near Threatened	No
<i>Sebaea rara</i>	Near Threatened	No
<i>Tetrasia brachyphylla</i>	Near Threatened	No
<i>Tritonia squalida</i>	Near Threatened	No
<i>Watsonia aletroides</i>	Near Threatened	No

**Table 4.6** Plant species of a part of the Western Cape Province which are not threatened and not near threatened but which are of particular conservation concern and listed in the **Critically Rare** category (Raimondo *et al.* 2009). The list here follows the red list of South African plant species (Raimondo *et al.* 2009) and its updates. No = Plant species is unlikely to be a resident at the site; Yes = Plant species is a resident at the site.

Species	Conservation status	Resident at the site
<i>Gasteria polita</i>	Critically Rare	No

**Table 4.7** Plant species of a part of the Western Cape Province which are not threatened and not near threatened but of which are of particular conservation concern and listed in the **Rare** category (Raimondo *et al.* 2009). The list here follows the red list of South African plant species (Raimondo *et al.* 2009) and its updates. No = Plant species is unlikely to be a resident at the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Cyrtanthus debilis</i>	Rare	No
<i>Pachites bodkinii</i>	Rare	No

**Table 4.8** Plant species of a part of the Western Cape Province which are not threatened and not near threatened but which are of particular conservation concern and listed in the **Declining** category (Raimondo *et al.* 2009). The list here follows the red list of South African plant species (Raimondo *et al.* 2009) and its updates. No = Plant species is unlikely to be a resident at the site; Yes = Plant species is a resident at the site.

Species	Status: Global status or national status indicated	Resident at the site
<i>Babiana patula</i>	Declining	No
<i>Boophone disticha</i>	<b>Declining</b>	<b>Yes</b>
<i>Cyathea capensis</i>	Declining	No

<i>Eulophia speciosa</i>	Declining	No
<i>Gunnera perpensa</i>	Declining	No
<i>Hypoxis hemerocallidea</i>	<b>Declining</b>	<b>Yes</b>
<i>Ilex mitis</i>	Declining	No
<i>Prionium serratum</i>	Declining	No
<i>Rapanea melanophloeos</i>	Declining	No

#### 4.2.2 Plant species of particular conservation concern: Protected tree species

**Table 4.9** Tree species of a part of the Western Cape Province which are listed as **Protected Species** under the National Forests Act No. 84 of 1998, Section 15(1,3) (Government Notice No. 1602, December 2016). 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>Curtisia dentata</i> Assegai	Protected	No
<i>Leucadendron argenteum</i> Silver Tree	Protected	No
<i>Ocotea bullata</i> Stinkwood	Protected	No
<i>Pittosporum viridiflorum</i> Cheesewood	Protected	No
<i>Podocarpus elongatus</i> Breede River Yellowwood	Protected	No
<i>Podocarpus falcatus</i> Outeniqua Yellowwood	Protected	No
<i>Podocarpus latifolius</i> Real Yellowwood	Protected	No
<i>Sideroxylon inerme</i> subsp. <i>inerme</i> White-milkwood	Protected	No
<i>Widdringtonia cederbergensis</i> Clanwilliam Cedar	Protected	No

## 4.3 ASSESSMENT OF VERTEBRATE SPECIES OF PARTICULAR HIGH CONSERVATION PRIORITY

### 4.3.1 Mammals of particular high conservation priority

**Table 4.10 Threatened, Critically Endangered** mammal species of the Western Cape Province (marine species excluded). Main source: Child, Roxburgh, Do Linh San, Raimondo & Davies-Mostert (2016) with updates by several authors per species. With mammal species which normally needs a large range their residential status does not implicate that they are exclusively dependent on the site or use the site as important shelter or for reproduction. No = Not recorded at site/ Unlikely to be resident at the site. Yes: Recorded at the site/ Likely to be resident at the site.

Species	Threatened Status (Regional)	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Bunolagus monticularis</i> Riverine Rabbit	Critically Endangered	No	No

**Table 4.11 Threatened, Endangered** mammal species of the Western Cape Province (marine species excluded). Main source: Child, Roxburgh, Do Linh San, Raimondo & Davies-Mostert (2016) with updates by several authors per species. With mammal species which normally needs a large range their residential status does not implicate that they are exclusively dependent on the site or use the site as important shelter or for reproduction. No = Not recorded at site/ Unlikely to be resident at the site. Yes: Recorded at the site/ Likely to be resident at the site.

Species	Threatened Status (Regional)	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Cryptochloris zyl</i> Van Zyl's Golden Mole	Endangered	No	No
<i>Myosorex longicaudatus</i> Long-tailed Forest Shrew	Endangered	No	No
<i>Redunca fulvorufula fulvorufula</i> Southern Mountain Reedbuck	Endangered	No	No

**Table 4.12 Threatened, Vulnerable** mammal species of the Western Cape Province (marine species excluded). Main source: Child, Roxburgh, Do Linh San, Raimondo & Davies-Mostert (2016) with updates by several authors per species. With mammal species which normally needs a large range their residential status does not implicate that they are exclusively dependent on the site or use the site as important shelter or for reproduction. No = Not recorded at site/ Unlikely to be resident at the site. Yes: Recorded at the site/ Likely to be resident at the site.

Species	Threatened Status (Regional)	Recorded at site during survey	Likely to be found based on habitat assessment
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<b><i>Acinonyx jubatus</i></b> Cheetah	Vulnerable	No	No
<b><i>Chlorotalpa duthieae</i></b> Duthie's Golden Mole	Vulnerable	No	No
<b><i>Damaliscus pygargus pygargus</i></b> Bontebok	Vulnerable	No	No
<b><i>Dasymys capensis</i></b> Cape Marsh Rat	Vulnerable	No	No
<b><i>Equus zebra hartmannae</i></b> Hartmann's Mountain Zebra	Vulnerable	No	No
<b><i>Eremitalpa granti granti</i></b> Grant's Golden Mole	Vulnerable	No	No
<b><i>Felis nigripes</i></b> Black-footed Cat	Vulnerable	No	No
<b><i>Mystromys albicaudatus</i></b> White-tailed Rat	Vulnerable	No	No
<b><i>Panthera pardus</i></b> Leopard	Vulnerable	No	No

**Table 4.13 Near Threatened** mammal species of the Western Cape Province (marine species excluded). Main source: Child, Roxburgh, Do Linh San, Raimondo & Davies-Mostert (2016) with updates by several authors per species. With mammal species which normally needs a large range their residential status does not implicate that they are exclusively dependent on the site or use the site as important shelter or for reproduction. No = Not recorded at site/ Unlikely to be resident at the site. Yes: Recorded at the site/ Likely to be resident at the site.

<b>Species</b>	<b>Threatened Status (Regional)</b>	<b>Recorded at site during survey</b>	<b>Likely to be found based on habitat assessment</b>
<b><i>Amblysomus corriae</i></b> Fynbos Golden Mole	Near Threatened	No	No
<b><i>Aonyx capensis</i></b> Cape Clawless Otter	Near Threatened	No	No

<b><i>Graphiurus ocellaris</i></b> Spectacled Dormouse	Near Threatened	No	No
<b><i>Leptailurus serval</i></b> Serval	Near Threatened	No	No
<b><i>Parahyaena brunnea</i></b> Brown Hyaena	Near Threatened	No	No
<b><i>Pelea capreolus</i></b> Grey Rhebok	Near Threatened	No	No
<b><i>Poecilogale albinucha</i></b> African Striped Weasel	Near Threatened	No	No

#### 4.3.2 Birds of particular high conservation priority

**Table 4.14 Threatened** bird species of the Western Cape Province (marine birds excluded). Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden, Davies & Weiersbye (2013). No = Not recorded at site/ Unlikely to use site as breeding area or particular habitat on which the species depends. Yes = Recorded at site/ Likely to use site as breeding area or particular habitat on which the species depends.

Species	Common name	Threatened Status	Recorded at site during survey	Likely to use site as breeding area or habitat
<i>Afrotis afra</i>	<b>Southern Black Korhaan</b>	Vulnerable	No	No
<i>Aquila verreauxii</i>	<b>Black Eagle/ Verreaux's Eagle</b>	Vulnerable	No	No
<i>Bradypterus sylvaticus</i>	<b>Knysna Warbler</b>	Vulnerable	No	No
<i>Ciconia nigra</i>	<b>Black Stork</b>	Vulnerable	No	No
<i>Circus maurus</i>	<b>Black Harrier</b>	Endangered	No	No
<i>Circus ranivorus</i>	<b>African Marsh- Harrier</b>	Endangered	No	No
<i>Cursorius rufus</i>	<b>Burchell's Courser</b>	Vulnerable	No	No
<i>Falco biarmicus</i>	<b>Lanner Falcon</b>	Vulnerable	No	No
<i>Falco naumanni</i>	<b>Lesser Kestrel</b>	Vulnerable	No	No
<i>Gyps coprotheres</i>	<b>Cape Vulture</b>	Endangered	No	No
<i>Hydroprogne caspia</i>	<b>Caspian Tern</b>	Vulnerable	No	No
<i>Neotis denhami</i>	<b>Denham's Bustard</b>	Vulnerable	No	No
<i>Neotis ludwigii</i>	<b>Ludwig's Bustard</b>	Endangered	No	No
<i>Pelecanus onocrotalus</i>	<b>Great White Pelican</b>	Vulnerable	No	No
<i>Polemaetus bellicosus</i>	<b>Martial Eagle</b>	Endangered	No	No

<i>Sarothrura affinis</i>	<b>Striped Flufftail</b>	Vulnerable	No	No
<i>Sagittarius serpentarius</i>	<b>Secretary Bird</b>	Vulnerable	No	No
<i>Turnix hottentotus</i>	<b>Hottentot Buttonquail</b>	Endangered	No	No

\* Though some of the above bird species which roam over large areas may occasionally be found at the site, the site does not appear to be a habitat of particular importance to these birds, and these birds also do not use the site as breeding area.

**Table 4.15 Near Threatened** bird species of the Western Cape Province (marine birds excluded). Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden, Davies & Weiersbye (2007). No = Not recorded at site/ Unlikely to be particularly dependent on the site as breeding area or habitat. Yes = Recorded at site/ Likely to be particularly dependant on the site as breeding area or habitat.

<b>Species</b>	<b>Common name</b>	<b>Threatened Status</b>	<b>Recorded at site during survey</b>	<b>Likely to use site breeding area or habitat</b>
<i>Alcedo semitorquata</i>	<b>Half-collared Kingfisher</b>	Near Threatened	No	No
<i>Anthus crenatus</i>	<b>African Rock Pipit</b>	Near Threatened	No	No
<i>Ardeotis kori</i>	<b>Kori Bustard</b>	Near Threatened	No	No
<i>Chaetops frenatus</i>	<b>Cape Rockjumper</b>	Near Threatened	No	No
<i>Calidris ferruginea</i>	<b>Curlew Sandpiper</b>	Near Threatened	No	No
<i>Campephera notata</i>	<b>Knysna Woodpecker</b>	Near Threatened	No	No
<i>Certhilauda brevirostris</i>	<b>Agulhas Long-billed Lark</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>Crithagra leucoptera</i>	<b>Protea Canary</b>	Near Threatened	No	No
<i>Eupodotis vigorsii</i>	<b>Karoo Korhaan</b>	Near Threatened	No	No
<i>Falco peregrinus</i>	<b>Peregrine Falcon</b>	Near Threatened	No	No
<i>Grus paradisea</i>	<b>Blue Crane</b>	Near Threatened	No	No
<i>Oxyura maccoa</i>	<b>Maccoa Duck</b>	Near Threatened	No	No
<i>Microcarbo coronatus</i>	<b>Crowned Cormorant</b>	Near Threatened	No	No
<i>Numenius arquata</i>	<b>Eurasian Curlew</b>	Near Threatened	No	No
<i>Phoenicopus minor</i>	<b>Lesser Flamingo</b>	Near Threatened	No	No
<i>Phoenicopus ruber</i>	<b>Greater Flamingo</b>	Near Threatened	No	No

\* Though some of the above bird species which roam over large areas may occasionally be found at the site, the site does not appear to be a habitat of particular importance to these birds, and these birds also do not use the site as breeding area.



### 4.3.3 Reptiles of particular high conservation priority

The following tables list possible presence or absence of Threatened reptile or Near Threatened reptile species in the study area. The Atlas and Red List of Reptiles of South Africa, Lesotho and South Africa (Bates, Branch, Bauer, Burger, Marais, Alexander & de Villiers, 2014) has been used as the main source to compile the list for assessment.

**Table 4.16 Threatened** reptile species of the Western Cape 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.

Species	Threatened Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Bitis armata</i> Southern Adder	Vulnerable	No	No	No
<i>Bradypodion pumilum</i> Cape Dwarf Chameleon	Vulnerable	No	No	No
<i>Hemicordylus nebulosus</i> Dwarf Cliff Lizard	Vulnerable	No	No	No
<i>Homopus signatus</i> Speckled Dwarf Tortoise	Vulnerable	No	No	No
<i>Psammobates geometricus</i> Geometric Tortoise	Critically Endangered	No	No	No
<i>Psammophis leightoni</i> Cape Sand Snake	Vulnerable	No	No	No
<i>Tetradactylus fitzsimonsi</i> Fitzsimons's Long-tailed Seps	Vulnerable	No	No	No

**Table 4.17 Near Threatened** reptile species of Western Cape Province. Main Source: Bates, Branch, Bauer, Burger, Marais, Alexander & de Villiers (2014). Though *Homoroselaps dorsalis* has not yet been recorded from the North West Province, its presence in some areas of the Province is anticipated. No = Reptile species is not a resident on the site; Yes = Reptile species is found to be resident on the site.

Species	Threatened Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Afroedura hawequensis</i> Hawequa Flat Gecko	Near Threatened	No	No	No
<i>Cordylus macropholus</i> Large-scaled Girdled Lizard	Near Threatened	No	No	No
<i>Cordylus niger</i> Black Girdled Lizard	Near Threatened	No	No	No

<b><i>Cordylus oelofseni</i></b> Oelofsen's Girdled Lizard	Near Threatened	No	No	No
<b><i>Goggia braacki</i></b> Braack's Pygmy Gecko	Near Threatened	No	No	No
<b><i>Homopus boulengeri</i></b> Karoo Dwarf Tortoise	Near Threatened	No	No	No
<b><i>Scelotes gronovii</i></b> Gronovi's Dwarf Burrowing Skink	Near Threatened	No	No	No
<b><i>Scelotes kasneri</i></b> Kasner's Dwarf Burrowing Skink	Near Threatened	No	No	No
<b><i>Scelotes montispectus</i></b> Bloubergstrand Dwarf Burrowing Skink	Near Threatened	No	No	No

#### 4.3.4 Amphibian species of particular high conservation priority

**Table 4.18 Threatened, Critically Endangered** amphibian species of the Western Cape Province. No = Amphibian species is not a resident on the site; Yes = Amphibian species is found to be resident on the site. Sources: Carruthers & du Preez, 2011; Du Preez & Carruthers, 2009; Minter, Burger, Harrison, Braack, Bishop & Kloepfer, 2004.

Species	Threatened Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<b><i>Arthroleptella rugosa</i></b> Rough Moss Frog	Critically Endangered	No	No	No
<b><i>Heleophryne rosei</i></b> Table Mountain Ghost Frog	Critically Endangered	No	No	No
<b><i>Microbatrachella capensis</i></b> Micro Frog	Critically Endangered	No	No	No

**Table 4.19 Threatened, Endangered** amphibian species of the Western Cape Province. No = Amphibian species is not a resident on the site; Yes = Amphibian species is found to be resident on the site. Sources: Carruthers & du Preez, 2011; Du Preez & Carruthers, 2009; Minter, Burger, Harrison, Braack, Bishop & Kloepfer, 2004.

Species	Threatened Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Afrixalus knysnae</i> Knysna Leaf-folding Frog	Endangered	No	No	No
<i>Amietophrynus pantherinus</i> Western Leopard Toad	Endangered	No	No	No
<i>Heleophryne hewitti</i> Hewitt's Ghost Frog	Endangered	No	No	No
<i>Xenopus gilli</i> Cape Platanna	Endangered	No	No	No

**Table 4.20 Threatened, Vulnerable** amphibian species of the Western Cape Province. No = Amphibian species is not a resident on the site; Yes = Amphibian species is found to be resident on the site. Sources: Carruthers & du Preez, 2011; Du Preez & Carruthers, 2009; Minter, Burger, Harrison, Braack, Bishop & Kloepfer, 2004.

Species	Threatened Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Capensibufo rosei</i> Rose's Mountain Toadlet	Vulnerable	No	No	No

**Table 4.21 Near Threatened** amphibian species of the Western Cape Province. No = Amphibian species is not a resident on the site; Yes = Amphibian species is found to be resident on the site.

Species	Threatened Status	Resident at site	Recorded at site during survey	Likely to be found based on habitat assessment
<i>Arthroleptella drewesii</i> Drewes's Moss Frog	Near Threatened	No	No	No
<i>Arthroleptella landdrosia</i> Landdroskop Moss Frog	Near Threatened	No	No	No
<i>Arthroleptella lightfooti</i> Cape Peninsula Moss Frog	Near Threatened	No	No	No
<i>Breviceps gibbosus</i> Cape Rain Frog	Near Threatened	No	No	No
<i>Cacosternum capense</i> Cape Caco	Near Threatened	No	No	No
<i>Poyntonina paludicola</i> Montane Marsh Frog	Near Threatened	No	No	No

#### 4.4 ASSESSMENT OF INVERTEBRATE SPECIES OF PARTICULAR HIGH CONSERVATION PRIORITY

A large taxonomic impediment and an overall deficiency of data compromise or prohibit a sensible assessment of many invertebrate groups and species. With increase of knowledge about more insect groups in future the assessments are likely to cover more invertebrates. Tables are given below for some of the more well-known groups and taxa of known conservation concern.

##### 4.4.1 Butterflies (Lepidoptera: Papilionoidea) of particular conservation priority

**Table 4.22 Threatened, Critically Endangered** butterfly species of the Western Cape Province. Sources: Henning, Terblanche & Ball (2009); Mecenero *et al.* (2013); Turner (2017); Veldtman *et al.* (2017). Invertebrates such as threatened butterfly species are often very habitat specific and residential status imply a unique ecosystem that is at stake.

Species	Threatened Status	Recorded at site during survey	Residential status at the site: Yes confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<i>Chrysoritis dicksoni</i> Strandveld Copper	Critically Endangered	No	Highly unlikely
<i>Chrysoritis rileyi</i> Riley's Opal	Critically Endangered	No	Highly unlikely
<i>Chrysoritis thysbe mithras</i> Brenton Opal	Given as Data Deificent but currently Critically Endangered	No	Highly unlikely
<i>Chrysoritis thysbe schloszae</i> Moreesburg Opal	Critically Endangered	No	Highly unlikely
<i>Kedestes barberae bunta</i> Cape Flats Ranger	Critically Endangered	No	Highly unlikely
<i>Orachrysops niobe</i> Brenton Blue	Critically Endangered	No	Highly unlikely
<i>Stygionympha dicksoni</i> Dickson's Hillside Brown	Critically Endangered	No	Highly unlikely
<i>Stygionympha brachycerus brachycerus</i> Seaside Skolly	Critically Endangered	No	Highly unlikely
<i>Trimenia malagrida malagrida</i> Scarce Mountain Copper	Critically Endangered (Possibly Extinct)	No	Highly unlikely
<i>Trimenia malagrida paarlensis</i> Scarce Mountain Copper	Critically Endangered	No	Highly unlikely
<i>Trimenia wallengrenii wallengrenii</i> Wallengren's Silver-spotted Copper	Critically Endangered	No	Highly unlikely

**Table 4.23 Threatened, Endangered** butterfly species of the Western Cape Province. Sources: Henning, Terblanche & Ball (2009); Mecenero *et al.* (2013); Turner (2017); Veldtman *et al.* (2017). Invertebrates such as threatened butterfly species are often very habitat specific and residential status imply a unique ecosystem that is at stake.

Species	Threatened Status	Recorded at site during survey	Residential status at the site: Yes confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<i>Kedestes lenis lenis</i> False Bay Unique Ranger	Endangered	No	Highly unlikely
<i>Aloeides carolynnae carolynnae</i> Carolynn's Copper	Endangered	No	Highly unlikely
<i>Aloeides lutescens</i> Worcester Copper	Endangered	No	Highly unlikely
<i>Aloeides thyra orientis</i> Brenton Copper	Endangered	No	Highly unlikely
<i>Aloeides trimeni southeyae</i> Southey's Copper	Endangered	No	Highly unlikely
<i>Aloeides kaplani</i> Kaplan's Skolly	Endangered	No	Highly unlikely

**Table 4.24 Threatened, Vulnerable** butterfly species of the Western Cape Province. Sources: Henning, Terblanche & Ball (2009); Mecenero *et al.* (2013); Turner (2017); Veldtman *et al.* (2017). Invertebrates such as threatened butterfly species are often very habitat specific and residential status imply a unique ecosystem that is at stake.

Species	Threatened Status	Recorded at site during survey	Residential status at the site: Yes confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<i>Aloeides egerides</i> Red Hill Copper	Vulnerable	No	Highly unlikely
<i>Chrysochrysis brooksi tearei</i> Brook's Opal	Vulnerable	No	Unlikely
<i>Thestor claassensi</i> Claassen's Skolly	Vulnerable	No	Unlikely
<i>Thestor dicksoni malagas</i> Atlantic Skolly	Vulnerable	No	Unlikely
<i>Trimenia wallengrenii gonnemioi</i> Piquetberg Silver-spotted Copper	Vulnerable	No	Highly unlikely

**Table 4.25 Near Threatened** butterfly species of the Western Cape Province. Sources: Henning, Terblanche & Ball (2009); Mecenero *et al.* (2013); Turner (2017); Veldtman *et al.* (2017). Invertebrates such as threatened butterfly species are often very habitat specific and residential status imply a unique ecosystem that is at stake.

Species	Threatened Status	Recorded at site during survey	Residential status at the site: Yes confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely
<i>Aloeides carolynnae aurata</i> De Hoop Copper	Near Threatened	No	Highly unlikely
<i>Lepidochrysops littoralis</i> Coastal Blue	Near Threatened	No	Unlikely

\* In addition to the above butterfly species listed as of particular conservation concern the assessment also applied for Critically Rare and Rare species as well as Data Deficient species such as *Thestor barbatus*, the latter which is likely to be upgraded to a threatened category soon. These species could easily become threatened with immediate effect once an impact is imposed (Terblanche, unpublished; Mecenero *et al.* 2013; Cape Nature, 2017; Veldtman *et al.*, 2017).

#### 4.4.2 Beetles (Coleoptera) of particular conservation priority

**Table 4.26** Beetle species of the Western Cape Province which are of known high conservation priority. Sources: Bellamy & Endrody-Younga (1996); Turner (2017); Veldtman *et al.* (2017).

Species	Threatened Status	Recorded at site during survey	Likely to be resident based on habitat assessment
<i>Colophon barnardi</i>	EN	No	No
<i>Colophon berrisfordi</i>	CR	No	No
<i>Colophon cameroni</i>	VU	No	No
<i>Colophon cassoni</i>	CR	No	No
<i>Colophon eastmani</i>	EN	No	No
<i>Colophon endrodyi</i>	Not listed	No	No
<i>Colophon haughtoni</i>	EN	No	No
<i>Colophon izardi</i>	NT	No	No
<i>Colophon kawaii</i>	Not listed	No	No
<i>Colophon montisatris</i>	CR	No	No
<i>Colophon neli</i>	VU	No	No
<i>Colophon oweni</i>	Not listed	No	No
<i>Colophon primosi</i>	CR	No	No
<i>Colophon stokoei</i>	VU	No	No
<i>Colophon thunbergi</i>	EN	No	No
<i>Colophon westwoodi</i>	VU	No	No

<i>Colophon whitei</i>	EN	No	No
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#### 4.4.3 Dragonflies and damselflies (Odonata) of particular conservation concern

**Table 4.27 Threatened Odonata** (Dragonflies and damselflies) of the Western Cape Province. Sources: Samways & Simaika (2016); Turner (2017); Veldtman *et al.* (2017).

Species	Threatened Status	Recorded at site during survey	Likely to be resident at site based on habitat assessment
<i>Orthetrum rubens</i> Elusive Skimmer	EN	No	No
<i>Proischnura polychromatica</i> Mauve Bluet	EN	No	No
<i>Spesbona angusta</i> Spesbona Streamjack	EN	No	No
<i>Syncordulia gracilis</i> Yellow Presba	VU	No	No
<i>Syncordulia legator</i> Gilded Presba	VU	No	No
<i>Syncordulia serendipator</i> Rustic Presba	VU	No	No
<i>Syncordulia venator</i> Mahogany Presba	VU	No	No

CR: Critically Endangered; EN: Endangered; VU: Vulnerable

## 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 of the Western Cape Province are listed in Tables 4.2 – 4.8. Protected tree species are listed in Table 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 plant species at the site is unlikely.

Two plant species, which are not threatened but listed as Declining occur at the site: *Boophone disticha* and *Hypoxis hemerocallidea* (Star Flower).

### 5.3 VERTEBRATES

#### 5.3.1 Mammals

Tables 4.10 – 4.13 list the possible presence or absence of threatened mammal species, near threatened mammal species and mammal species of which the status is uncertain, respectively, at the site. Because the site falls outside reserves, large threatened species are absent. No smaller mammals of particular high conservation significance are likely to be found on the site as well.

#### 5.3.2 Birds

Table 4.14 and Table 4.15 list the possible presence or absence of threatened bird species and near threatened bird species at the site. With bird species which often have a large distributional range, their presence does not imply that they are particularly dependent on a site as breeding location. Therefore the emphasis in the right hand columns of Table 4.12 and Table 4.13 are on the particular likely dependence or not of bird species on the site. No distinct habitat or population of any threatened bird species or any bird species of particular conservation importance have been found.



### **5.3.3 Reptiles**

Tables 4.16 – 4.17 list the possible presence or absence of threatened and near threatened reptile species on the site. There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

### **5.3.4 Amphibians**

Tables 4.18 – 4.21 list the possible presence or absence of threatened and near threatened amphibian species at the site. There appears to be no threat to any amphibian species of particular conservation importance if the site is developed.

## **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 (Deuschländer and Bredenkamp 1999; Terblanche, Morgenthal & Cilliers 2003; Edge, Cilliers & Terblanche, 2008). Threatened butterfly species in South Africa can then be regarded as bio-indicators of rare ecosystems.

Tables 4.22 – 4.25 list the likely presence or absence of threatened and near threatened butterfly species at the site. There appears to be no threat to any butterfly species of particular conservation importance if the site is developed.

### **5.4.2 Beetles**

Tables 4.26 lists the likely presence or absence of threatened and near threatened beetle species at the site. There appears to be no threat to any beetle species of particular conservation importance if the site is developed.

### **5.4.3 Dragonflies and damselflies**





Tables 4.27 lists the likely presence or absence of threatened and near threatened dragonfly or damselfly species at the site. There appears to be no threat to any dragonfly or damselfly species of particular conservation importance if the site is developed.

### **5.4.4 Invertebrates in general**

The site provides a microhabitat diversity for a number of indigenous invertebrate species to co-exist. No distinct indications of a habitat or of invertebrate species of particular known conservation concern were found at the site.



**Figure 3** Indications of ecological sensitivity at the site.

- |   |                                  |                         |
|---|----------------------------------|-------------------------|
|  | Red outline and shading          | Boundaries of the site  |
|  | Green outline and shading        | Medium-high sensitivity |
|  | Orange-brown outline and shading | Medium sensitivity      |
|  | Light yellow outline and shading | Low sensitivity         |

Grid references and altitudes were taken at site with a GPS Garmin E-trex 20 © instrument. 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, 2018).







**Figure 4** Indications of ecological sensitivity and some ecological indicators at the site.

Red markers: *Gasteria carinata* (Not listed as threatened but regarded as ecological indicator)






Purple markers: A core distribution of the Declining *Boophone disticha* at the site

White markers: Rocks surface above ground

	Red outline and shading	Boundaries of the site
	Green outline and shading	Medium-high sensitivity
	Orange-brown outline and shading	Medium sensitivity
	Light yellow outline and shading	Low sensitivity



**Figure 5** Indications of ecological sensitivity and proposed conservation corridor at the site.

- |   |                                  |   |
|---|----------------------------------|---|
|  | Red outline and shading          | Boundaries of the site                  |
|  | Green outline and shading        | Medium-high sensitivity                 |
|  | Orange-brown outline and shading | Medium sensitivity                      |
|  | Light yellow outline and shading | Low sensitivity                         |
|  | Purple outline and shading       | Proposed route of conservation corridor |

## 6 RISKS, IMPACT AND MITIGATION

The primary cause of loss of biological diversity is habitat degradation and loss (IUCN, 2004; Primack, 2006). 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 (Deuschländer and Bredenkamp 1999; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Though human impacts in few cases have improved the habitat for mammalian species such as greater cane rats, that prosper in sugar cane and maize fields (Apps 2000), for many mammalian habitat specialist species, human impacts has lead to habitat loss. Some mammal species, especially many of the larger species, could adapt to a wide range of habitat types, but then need a large range. Some animals and plants are rare and occupy only one or a few specialised habitats (Primack 2006). Habitat conservation, either as large available land or as specialised habitats is therefore key to the conservation of many threatened plant species and animal species or any other species of high conservation priority (i.e. rare, near threatened species). In addition corridors and linkages may play a significant role in conservation of fauna.

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). Corridors for mammalian species are especially important for migratory species (Mwalyosi, 1991, Pullin 2002). 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. Corridors have a number of advantages related to dispersal and gene flow by avoiding isolation of ecological patches. However, corridors could also have potential drawbacks, for example creating gene flow where none has occurred naturally in the past and also as reservoirs for pathogens or introduced species (Pullin, 2002). Perhault and Lomolino (2000) studied corridors and mammal community structure in an old-growth forest landscape in the United States of America and their data suggest that each corridor should be valued individually. A lot of research remains to be conducted to have a better idea of the value of corridors, but in general corridors would be of considerable value. It appears that a network of wetland corridors and rocky ridges is highly likely to be of considerable benefit in environmental management and planning. 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.

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

#### *Application to this study*

Vegetation at most of the site consists of sclerophyllous shrub mixed with a conspicuous infestation of the alien invasive *Acacia cyclops* (Redeye). A patch where *Elytropappus rhinocerotis* (Renosterbos) is more conspicuous occurs at the southwestern part of the site. Some areas of the site have hitherto been cleared where pioneer species such as *Atriplex semibaccata* is noticeable. Vegetation composition at the site include a number of succulents such as three *Aloe* species and one *Gasteria* species. Tracks, fences and alien invasive plant species are found at the site. Roads and urban areas are present at some of the boundaries of the site. A powerline and some hitherto cleared areas are also found. Small scale informal dumping occurs from adjacent residential areas.

Some rocks surface but overall no conspicuous ridges or natural outcrops are visible above the soil surface (there is a small area where some rocks were piled in the past).

Wetland types appear to be absent at the site (kindly see wetland assessment report). A small depression, which is technically similar to a very small artificial waterbody (not a wetland depression/ pan) of approximately 0.03 ha, possibly excavated in the past and also cut off by tar road elevation, ha is present at the northwestern corner of the site. This small low-lying area appears to be hitherto excavated, though shallow. The northern edge of the small area where water may gather during substantial rainfall events is a slightly elevated tar road which in effect cuts of waterflow under normal conditions. In the case when excessive water runs down from a shallow valley west of the site and from the surface of tar road and road verge north of the site, water could potentially gather at the shallow depression. Under what would likely be extraordinary circumstances this depression would overflow over the tar road in a northern direction to feed into the non-perennial river north of the site. Technically the depression could be described as a very small artificial waterbody which could be inundated sporadically. Historically this area where the depression occurs was part of a drainage line that ran through the extreme northwestern part of the site. This drainage line which starts at the head of the small shallow valley west of the site, has been conspicuously modified in the past by a groundwater (dam), buildings, fences, cleared areas and a tar road, the latter seemingly without culverts in the immediate area.

No Threatened or Near Threatened plant or animal species are anticipated to the present at the site. Two widespread plant species which are not Threatened but which are listed as Declining are found at the site.

If the development is approved cultivation of indigenous plant species will be an asset for urban conservation corridors. Eradication of alien invasive *Acacia cyclops* at the site is a key issue.

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 footprint for 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.

### Operational Phase

- Potential impact 5: An increased infestation of exotic or alien invasive plant species owing to disturbances associated with the proposed development.

## 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.
Status	Negative
Mitigation Required	Establishment of exotic and invasive plant species should be avoided and where these have been found at the site continuous eradication should take place. It is in particular declared alien invasive species such as <i>Acacia cyclops</i> (Redeye) that should not be allowed to establish. If the development is approved a <u>conservation corridor</u> with indigenous vegetation at the site should be demarcated and conserved as such. It is important for urban nature conservation to plant indigenous plant species at the site.
Impact Significance (Pre-Mitigation)	High
Impact Significance (Post-Mitigation)	Moderate
RISK	Following the mitigation measures a moderate risk of impact is expected.

Aspect/Activity	Removal of sensitive species
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Sensitive species: Loss of Threatened or Near-Threatened Plants, Mammals, Reptiles, Amphibians and Invertebrates at the proposed footprint appears to be unlikely. No threatened wetland species are anticipated to occur at the site.
Status	Neutral.
Mitigation Required	Mitigation for <i>Boophone disticha</i> and <i>Hypoxis hemerocallidea</i> : If the development is approved a conservation corridor is strongly recommended which also contain a number of <i>Boophone disticha</i> as well as <i>Hypoxis hemerocallidea</i> . If the development is approved individuals of the Declining plant species <i>Boophone disticha</i> and <i>Hypoxis hemerocallidea</i> which are situated in the footprint (and outside the conservation corridor) should be relocated to a suitable site nearby before the construction phase. The translocation operation should be done with necessary care by a qualified specialist (example <i>Boophone disticha</i> contains highly toxic substances).



Impact Significance (Pre-Mitigation)	High
Impact Significance (Post-Mitigation)	Low
<b>RISK</b>	A low risk of impact is anticipated if the mitigations relevant to connectivity and biodiversity corridors are upheld.

Aspect/Activity	Fragmentation of corridors of particular conservation concern
<b>Type of Impact (i.e. Impact Status)</b>	Direct
<b>Potential Impact</b>	Clearing of vegetation at the proposed development.
<b>Status</b>	Negative
<b>Mitigation Required</b>	If the development is approved a conservation corridor with indigenous vegetation at the site should be demarcated and conserved as such. Eradication of alien invasive plant species and cultivation of indigenous plant species in remaining areas are important for urban nature conservation networks. A proper stormwater system that allows for free drainage of water at the northwestern corner of the site should be planned and implemented.
Impact Significance (Pre-Mitigation)	High
Impact Significance (Post-Mitigation)	Moderate
<b>RISK</b>	Following mitigation, a moderate 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
<b>Type of Impact (i.e. Impact Status)</b>	Direct
<b>Potential Impact</b>	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.
<b>Status</b>	Negative
<b>Mitigation Required</b>	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
<b>RISKS</b>	A low risk is expected following mitigation.

### 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. 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.
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	Establishment of exotic and invasive plant species should be avoided and where these have been found at the site continuous eradication should take place. It is in particular declared alien invasive species such as <i>Acacia cyclops</i> (Redeye) that should not be allowed to establish. If the development is approved a conservation corridor with indigenous vegetation at the site should be demarcated and conserved as such. It is important for urban nature conservation to plant indigenous plant species at the site.	High	Moderate	High

Loss of sensitive species	Loss of sensitive species	Negative	Site	Long-Term	Low (No Threatened species anticipated). Two Declining species	Unlikely	Not applicable	Not applicable	<p><u>Mitigation for <i>Boophone disticha</i> and <i>Hypoxis hemerocallidea</i>:</u>  If the development is approved a conservation corridor is strongly recommended which also contain a number of <i>Boophone disticha</i> as well as <i>Hypoxis hemerocallidea</i>.  If the development is approved individuals of the Declining plant species <i>Boophone disticha</i> and <i>Hypoxis hemerocallidea</i> which are situated in the footprint (and outside the conservation corridor) should be relocated to a suitable site nearby before the construction phase. The translocation operation should be done with necessary care by a qualified specialist (example <i>Boophone disticha</i> contains highly toxic substances).</p>	High	Low	High
Loss of corridors of particular conservation concern	Fragmentation of landscape and loss of connectivity	Negative	Site	Long-Term	Moderate	Likely	Moderate	Moderate	<p>If the development is approved a conservation corridor with indigenous vegetation at the site should be demarcated and conserved as such.  Eradication of alien invasive plant species and cultivation of indigenous plant species in remaining areas are important for urban nature conservation networks.  A proper stormwater system that allows for free drainage of water at the northwestern corner of the site should be planned and implemented.</p>	High	Moderate	High
Contamination of soil by spilling pollutants on soil which could infiltrate the soil	Soil contamination	Negative	Site	Long-Term	Moderate	Unlikely	Moderate	Moderate	<p>Rubble and waste removal.  Measures that avoid hydrocarbon (petroleum) spills to get into contact with the soil.</p>	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.	Moderate	Low	High

## 6.6 Summary of risks and impacts

Ecological sensitivity at most of the site is medium. Considerably degraded areas at the northeastern parts of the site are regarded as a low sensitivity area. There is an area at the higher points of the site where a number of succulents and Declining plant species are found which is indicated to be of medium-high sensitivity (Figures 3-5).

Vegetation at most of the site consists of sclerophyllous shrub mixed with a conspicuous infestation of the alien invasive *Acacia cyclops* (Redeye). A patch where *Elytropappus rhinocerotis* (Renosterbos) is more conspicuous occurs at the southwestern part of the site. Some areas of the site have hitherto been cleared where pioneer species such as *Atriplex semibaccata* is noticeable. Vegetation composition at the site include a number of succulents such as three *Aloe* species and one *Gasteria* species. Tracks, fences and alien invasive plant species are found at the site. Roads and urban areas are present at some of the boundaries of the site. A powerline and some hitherto cleared areas are also found. Small scale informal dumping occurs from adjacent residential areas.

Some rocks surface but overall no conspicuous ridges or natural outcrops are visible above the soil surface (there is a small area where some rocks were piled in the past).

Wetland types appear to be absent at the site (kindly see wetland assessment report). A small depression, which is technically similar to a very small artificial waterbody (not a wetland depression/ pan) of approximately 0.03 ha, possibly excavated in the past and also cut off by tar road elevation, ha is present at the northwestern corner of the site. This small low-lying area appears to be hitherto excavated, though shallow. The northern edge of the small area where water may gather during substantial rainfall events is a slightly elevated tar road which in effect cuts off waterflow under normal conditions. In the case when excessive water runs down from a shallow valley west of the site and from the surface of tar road and road verge north of the site, water could potentially gather at the shallow depression. Under what would likely be extraordinary circumstances this depression would overflow over the tar road in a northern direction to feed into the non-perennial river north of the site. Technically the depression could be described as a very small artificial waterbody which could be inundated sporadically. Historically this area where the depression occurs was part of a drainage line that ran through the extreme northwestern part of the site. This drainage line which starts at the head of the small shallow valley west of the site, has been conspicuously modified in the past by a groundwall (dam), buildings, fences, cleared areas and a tar road, the latter seemingly without culverts in the immediate area.

No Threatened or Near Threatened plant or animal species are anticipated to the present at the site. Two widespread plant species which are not Threatened but which are listed as Declining are found at the site.

If the development is approved cultivation of indigenous plant species will be an asset for urban conservation corridors. Eradication of alien invasive *Acacia cyclops* at the site is a key issue.

Impacts to the watercourses west and north of the site are anticipated to comprise a low\ moderate risk. If the development is approved the surface flow and erosion at the watercourses are unlikely to be significantly enhanced. There is no distinct indication that interflow of the watercourses at and near the site would be impacted significantly by the proposed developments. The geomorphological setting and flow regime likely to be similar post development, if the development is approved according to the mitigation measures stated. Loss of any wetland animal or plant species of particular conservation importance are not expected.

A key issue at the site that emerged from the risk and impact assessment is the implementation of efficient control of alien invasive plant species and rehabilitation as well as a proper stormwater management plan.

Another key issue at the site is the planning and implementation of a proper stormwater system which could also enhance and restore free drainage at the northwestern corner of the site.

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 most of the site consists of sclerophyllous shrub (often with thorns/spikes) mixed with a conspicuous infestation of the alien invasive *Acacia cyclops* (Redeye). A patch where *Elytropappus rhinocerotis* (Renosterbos) is more conspicuous occurs at the southwestern part of the site. Some areas of the site have hitherto been cleared where pioneer species such as *Atriplex semibaccata* is noticeable.
- Vegetation composition at the site include a number of succulent species such as three *Aloe* species, *Gasteria carinata*, *Trichodiadema intosum*, *Crassula* species, *Cotyledon orbiculata* and *Euphorbia haptagona*.
- Tracks, fences and alien invasive plant species are found at the site. Roads and urban areas are present at some of the boundaries of the site. A powerline and some hitherto cleared areas are also found. Small scale informal dumping occurs from adjacent residential areas.
- Wetland types appear to be absent at the site (kindly see wetland assessment report). A small depression, which is technically similar to a very small artificial waterbody (*not* a wetland depression/ pan) of approximately 0.03 ha, possibly excavated in the past and also cut off by tar road elevation, ha is present at the northwestern corner of the site. This small low-lying area appears to be hitherto excavated, though shallow. The northern edge of the small area where water may gather during substantial rainfall events is a slightly elevated tar road which in effect cuts of waterflow under normal conditions. In the case when excessive water runs down from a shallow valley west of the site and from the surface of tar road and road verge north of the site, water could potentially gather at the shallow depression. Under what would likely be extraordinary circumstances this depression would overflow over the tar road in a northern direction to feed into the non-perennial river north of the site. Technically the depression could be described as a very small artificial waterbody which could be inundated sporadically. Historically this area where the depression occurs was part of a drainage line that ran through the extreme northwestern part of the site. This drainage line which starts at the head of the small shallow valley west of the site, has been conspicuously modified in the past by a groundwall (dam), buildings, fences, cleared areas and a tar road, the latter seemingly without culverts in the immediate area.
- Impacts to the watercourses west and north of the site are anticipated to comprise a low\ moderate risk. If the development is approved the surface flow and erosion at the watercourses are unlikely to be significantly enhanced. There is no distinct indication that interflow of the watercourses at and near the site would be impacted significantly by the proposed developments. The geomorphological setting and flow regime likely to be similar post development, if the development is approved according to the mitigation measures stated. Loss of any wetland animal or plant species of particular conservation importance are not expected.



- An important issue at the site is the planning and implementation of a proper stormwater system which could also enhance and restore free drainage at the northwestern corner of the site.
- Site is part of the Groot Brak Dune Strandveld (FS 9) vegetation type which is listed as a threatened ecosystem (Endangered) according to the National List of Threatened Ecosystems (2011). Parts of the site have been cleared or degraded in the past and is also infested by alien invasive *Acacia cyclops* (Redeye). Site is partly adjacent and increasingly surrounded by urbanised areas. The scope to conserve the small site as a reserve for Groot Brak Dune Strandveld in the long term is small.
- Parts of the site, mainly owing to the threatened ecosystem listed above represent an Ecological Support Area. Ecological Support Areas ensure the long-term ecological functioning of the landscape as a whole. From an environmental management perspective these Ecological Support Areas must retain ecological processes, which often requires at least semi-natural ecological conditions (SANBI, 2017). This means if developments are approved the site should retain ecological functioning. In the case of this site a corridor is proposed if the development is approved (see below).
- No Threatened or Near Threatened plant or animal species are anticipated to be present at the site.
- Two widespread plant species which are not Threatened but which are listed as Declining are found at the site: *Boophane disticha* and *Hypoxis hemerocallidea*. Where individuals of these two species are not within a proposed corridor those individuals should be translocated by qualified specialist to the conservation corridor or a suitable site nearby.
- Of concern is the obvious high frequency of the alien invasive declared weed *Acacia cyclops* (Redeye) at most parts of the site. Eradication of alien invasive *Acacia cyclops* at the site is key also when possible dispersal to more sensitive ecosystems in the larger area is considered.
- If the development is approved cultivation of indigenous plant species will be an asset for urban conservation corridors.
- Ecosystems and species in particular species that change over relatively fine scales such as often in the Fynbos are likely to become increasingly impacted by climate change.
- Therefore, though threatened plant or animal species are unlikely to be present at the site, for considerations of the succulent plant diversity, ecological support areas and possible shifts in suitable habitat caused by climate change a continuous conservation corridor is imperative at the site if the development is approved. Such a continuous conservation corridor should only at appropriate restricted areas be interrupted by any roads. Such a conservation corridor if accompanied by the eradication of alien invasive *Acacia cyclops* could be beneficial to the quality of life if the development is approved, apart from conserving indigenous plants and associated smaller animals (such as sunbirds) in an increasingly urbanised area.

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

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## ANNEXURE 1: Plants

List of plant species recorded or likely to occur at the site.

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

Sources include: Bayer (1999); Bromilow (2010); Crouch, Klopper, Burrows & Burrows (2011); Court (2010); Duncan (2016); Goldblatt (1986); Goldblatt & Manning (1998); Manning (2007); Manning (2009); Moriarty (1997); Smith, Crouch. & Figueiredo (2017); Van Ginkel *et al.* (2011); Van Jaarsveld (2006); Van Oudtshoorn (2012); Van Wyk & Gericke (2000); Van Wyk & Smith (2014); Van Wyk, van Oudtshoorn & Gericke (2009); Van Wyk & van Wyk (2013); Vlok & Schutte-Vlok (2010).

PLANT GROUPS AND SPECIES	COMMON NAME	PLANT FAMILY
<b>GRASSES/ GRAMINOIDS</b>		
* <i>Briza maxima</i>	Large Quaking Grass	POACEAE
<i>Cynodon dactylon</i>	Couch Grass	POACEAE
<i>Ehrharta calycina</i>		POACEAE
<i>Ehrharta villosa</i>		POACEAE
* <i>Pennisetum clandestinum</i>	Kikuyu	POACEAE
* <i>Phalaris minor</i>	Small Canary Grass	POACEAE
<i>Pentameris pallida</i>		POACEAE
<i>Sporobolus fimbriatus</i>	Dropseed Grass	POACEAE
<i>Themeda triandra</i>	Red Grass	POACEAE
<i>Tribolium uniola</i>	Hare Grass	POACEAE
* <i>Vulpia myuros</i>	Rat's Tail Fescue	POACEAE
<b>HERBS, SEDGES AND GEOPHYTES</b>		
<i>Aloe maculata</i>		ASPHODELACEAE
<i>Anchusa capensis</i>		BORAGINACEAE
<i>Arctotis incisa</i>		ASTERACEAE
* <i>Atriplex semibaccata</i>	Australian Salt Bush	CHENOPODIACEAE

<i>Ballota africana</i>		LAMIACEAE
<i>Berkheya rigida</i>		ASTERACEAE
<i>Boophone disticha</i>	Poison Bulb	AMARYLLIDACEAE
<i>Bulbine abyssinica</i>		ASPHODELACEAE
<i>Carpobrotus edulis</i>		AIZOACEAE
* <i>Chenopodium album</i>	White Goosefoot	CHENOPODIACEAE
* <i>Chenopodium murale</i>	Nettle-leaved Goosefoot	CHENOPODIACEAE
<i>Chrysocoma ciliata</i>		ASTERACEAE
<i>Chironia baccifera</i>		GENTANIACEAE
<i>Cotyledon orbiculata</i>	Kouterie	CRASSULACEAE
<i>Crassula capitella</i>		CRASSULACEAE
<i>Crassula expansa</i>		CRASSULACEAE
<i>Crassula tetragona</i>		CRASSULACEAE
<i>Drosanthemum hispidum</i>		AIZOACEAE
<i>Euphorbia heptagona</i>	Bokmelkbos	EUPHORBIACEAE
<i>Glottiphyllum depressum</i>		AIZOACEAE
<i>Helichrysum teretifolium</i>		ASTERACEAE
<i>Hypoestes aristata</i>		ACANTHACEAE
<i>Hypoxis hemerocallidea</i>	African Star Flower	HYPOXIDACEAE
<i>Indigofera heterophylla</i>		FABACEAE
* <i>Lactuca serriola</i>	Wild Lettuce	ASTERACEAE
<i>Lepidium africanum</i>	Pepperweed	BRASSICACEAE
<i>Leysera tenella</i>		ASTERACEAE
<i>Lobostemon echioides</i>		BORAGINACEAE
<i>Ornithogalum canadense</i>	Wittamarak	HYACINTHACEAE
<i>Oxalis pes-caprae</i>		OXALIDACEAE
* <i>Picris echioides</i>	Bristly Oxtongue	ASTERACEAE
* <i>Plantago lanceolata</i>	Buckhorn Plantain	PLANTAGINACEAE
<i>Polygala microlopha</i>		POLYGALACEAE

<i>Polygala umbellata</i>		POLYGALACEAE
* <i>Rapistrum rugosum</i>	Wild Mustard	BRASSICACEAE
<i>Senecio burchellii</i>		ASTERACEAE
<i>Sisymbrium capense</i>	Cape Wild Mustard	BRASSICACEAE
<i>Solanum linnaeanum</i>		SOLANACEAE
<i>Solanum tomentosum</i>	Slangappel	SOLANACEAE
* <i>Sonchus oleraceus</i>	Sowthistle	ASTERACEAE
<i>Tribulus terrestris</i>	Devil's Thorn	ZYGOPHYLLACEAE
<i>Trichodiadema intosum</i>		AIZOACEAE
<i>Ursinia chrysanthemoides</i>		ASTERACEAE
<b>CLIMBERS</b>		
<i>Asparagus africanus</i>		ASPARAGACEAE
<i>Convolvulus capensis</i>	Cape Bindweed	CONVOLVULACEAE
<i>Pelargonium peltatum</i>		GERANIACEAE
<b>SHRUBS</b>		
<i>Asparagus suaveolens</i>		ASPARAGACEAE
<i>Cadaba aphylla</i>	Desert Broom	CAPPARACEAE
<i>Erica hispidula</i>		ERICACEAE
<i>Eriocephalus africanus</i>	Kapokbossie	ASTERACEAE
<i>Elytropappus rhinocerotis</i>		ASTERACEAE
<i>Felicia filifolia</i>	Draaibossie	ASTERACEAE
* <i>Lantana camara</i>	Lantana	VERBENACEAE
<i>Metalasia densa</i>		ASTERACEAE
<i>Muraltia spinosa</i>		POLYGALACEAE
<i>Oedera squarrosa</i>		ASTERACEAE
<i>Passerina corymbosa</i>		THYMELAEACEAE
<i>Polygala myrtifolia</i>		POLYGALACEAE

<i>Pteronia camphorata</i>		ASTERACEAE
<b>TREES</b>		
* <i>Acacia cyclops</i>	Redeye, Rooikrans	FABACEAE
<i>Aloe arborescens</i>	Krantz Aloe	ASPHODELACEAE
<i>Aloe ferox</i>	Bitter Aloe	ASPHODELACEAE
<i>Carissa bispinosa</i>	Lowveld Numnum	APOCYNACEAE
<i>Euclea undulata</i>	Guarri	EBENACEAE
<i>Grewia occidentalis</i>	Crossberry	SPARRMANNIACEAE
<i>Gymnosporia buxifolia</i>	Spikethorn	CELASTRACEAE
* <i>Opuntia ficus-indica</i>	Prickly Pear	CACTACEAE
<i>Osteospermum moniliferum</i> (= <i>Chrysanthemoides monilifera</i> )	Tickberry	ASTERACEAE
<i>Osyris compressa</i>		SANTALACEAE
<i>Putterlickia pyracantha</i>	False-spikethorn	CELASTRACEAE
<i>Schotia afra</i> var. <i>afra</i>	Karoo Boerbean	FABACEAE
<i>Searsia glauca</i>	Blue Kunibush	ANACARDIACEAE