Botanical Sensitivity Analyses for

Erf 2841 and Portion 51 of Farm 137

at Tergniet

in the Mossel Bay Municipality.

This report was prepared during March 2019 by:

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INTRODUCTION

The landowner of two adjoining properties, erf 2841 and farm 137/51, immediately east of Tergniet (Mossel bay district) intends to develop these properties. In order to assure that development of the properties will be environmentally sensitive the landowner requested a botanical sensitivity analysis of the affected area before any development layout plans are prepared.

The location of the properties is indicated on Map 1.

Map 1: The location of the two properties are marked Phase 2 & 3. The area marked Phase 1 is currently being developed.

The terms of reference for this study is to consider the principals outlined in the *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape (2nd edition) 2016* in the areas recommended for development.

Jan Vlok of RES surveyed the affected area in March 2019 and the results of my field study are provided here.

METHODOLOGY AND UNCERTAINTY REGARDING STUDY RESULTS

The national status of the affected vegetation type was determined by means of consulting Mucina *et al (*2006) and the regional conservation value of the affected vegetation was determined by means of consulting the updated fine-scale conservation plan for the region by Pence (2017). I am thus confident that the methodology followed complies with:

1. Appendix 6 of the 2014 National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (and as amended), detailing the requirements for specialist's reports; and,
2. The principals outlined in the *Guideline for Biodiversity Specialists* (WC: DEA&DP, 2005) and those of the *Western Cape Biodiversity Spatial Plan Handbook* (Pool-Stanvliet et al, 2017).

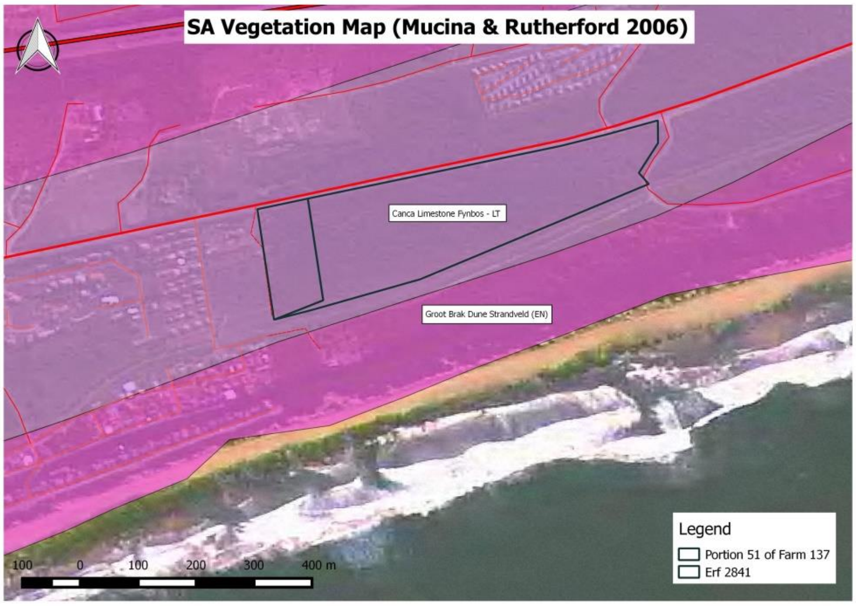
The proposed development area was surveyed on foot to determine the ecological condition of the area and to establish if any rare or endangered plant species (*sensu* Raimondo *et al*, 2009 and updates thereof in www.sanbi.redlist) are, or may be present in the proposed development area.

My field survey was conducted in autumn and the site has not been burned for a very long period, so fire ephemerals (annuals and geophytes) were absent at the survey period. Many of the smaller shrubs were dead and decayed as the fynbos is senescent. The species list provided is limited to those species that could still be identified with certainty, but is clearly far from a complete list of the species that will occur after a fire. Although not found during the survey, I considered threatened species that are likely to be present after a fire in the affected vegetation type.

I am thus confident that my findings and recommendations comply with the guidelines provided in the *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape (*2nd edition, 2016*)*, the *Guideline for Biodiversity Specialists* (DEA&DP, 2005) and those of the *Western Cape Biodiversity Spatial Plan Handbook* (Pool-Stanvliet et al, 2017).

STUDY RESULTS

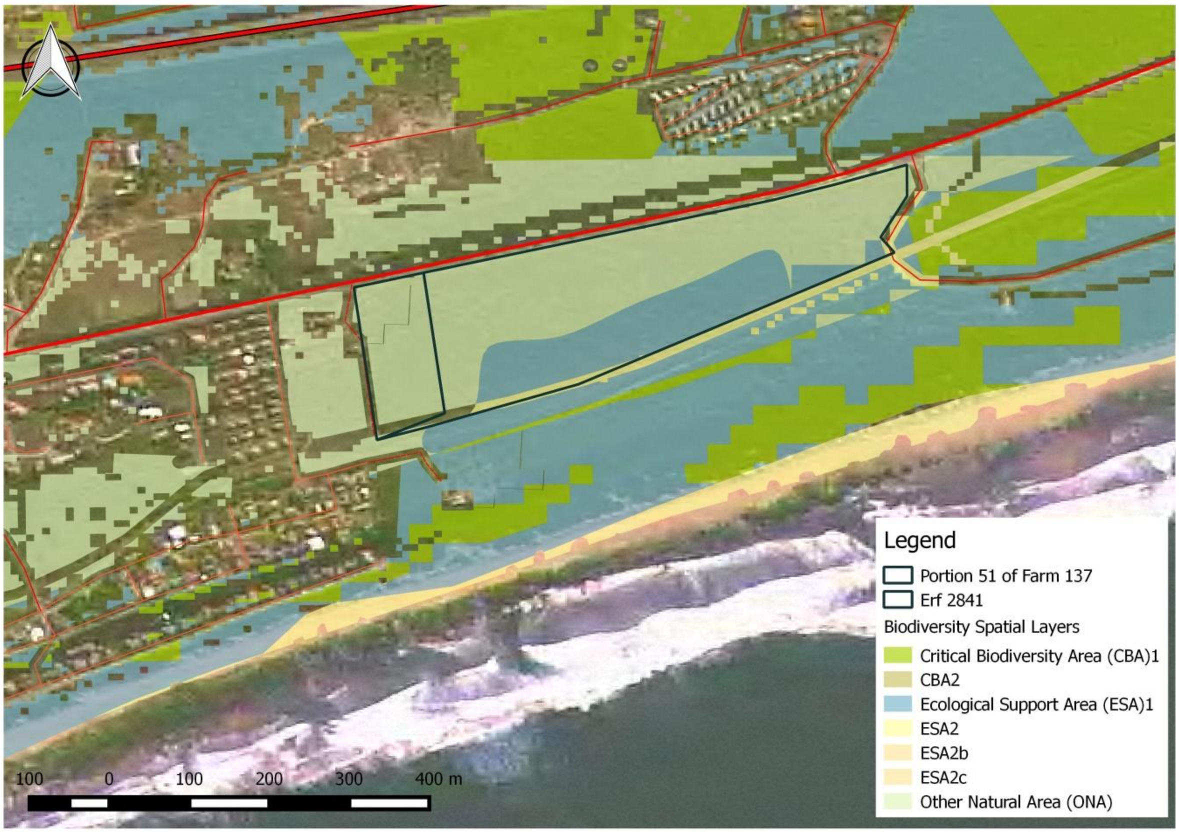
The national vegetation map indicates that the vegetation on the property is Canca Limestone Fynbos (status = Least Concern), while the fine-scale vegetation map for the region indicates that the vegetation consists of Hartenbos Strandveld (status = Endangered) on the southern tip of the property. Probably due to the coarse scale of mapping (see Maps 2 & 3).



Map 2. National vegetation types intersected by the property.

Map 3: Regional vegetation types intersected by the property.

Following the regional conservation plan, the proposed development area conists mostly of Other Natural Area (ONA) and some Ecological Support Areas (ESA1) in the southern part of the site (see Map 4).



Map 4: Regional conservation plan for the affected area. The proposed development area is outlined in black.

My field study supports the regional vegetation map, rather than the national vegetation map, as the vegetation originally consisted of bush-clumps of thicket in a matrix of fynbos. Due to a lack of fire, over a period of at least 40 years, most of the fynbos became moribund and was displaced with early pioneers of thicket vegetation (mostly *Colpoon compressum*, *Diospyros dichrophylla*, *Grewia occidentalis*, *Pittosporum viridiflorum*, *Searsia crenata*, *S. glauca*, *Pterocelastrus tricuspidatus* and *Tarchonanthus littoralis*). The original occurrence of thicket bush-clumps is still marked by the occurrence of large Milkwood trees (*Sideroxylon inerme*), but many seedlings of these trees have also established in the original fynbos vegetation. Very dense stands of the alien Australian Myrtle (*Leptospermum laevigatum*) established in the eastern part of the proposed development area, with few indigenous species surviving in their understory. Second and third generation establishment of the Myrtle is present, indicating that little fynbos propagules will remain in the soil where the Myrtle form dense stands. Some Prickly pear (*Opuntia ficus-indica*) and Rooikrans (*Acacia cyclops*) is also present, but they do not form dense stands and could be eradicated fairly easily. The following species were recorded in the fynbos vegetation on the property:

Shrubs and Herbs: *Anthospermum galiodes, Carissa bispinosa, Chironia baccifera, Chrysocoma tenuifolia, Cliffortia falcata, C. stricta, Erica discolor, E. muscosa, Eriocephalus africanus, Euchaetis albertiniana, Helichrysum cymosum, H. cymosum, H. panduriforma, H. teretifolium, Hermannia althaeifolia, Leonitis oxymifolia, Leucodendrum salignum, Metalasia muricata, Osteospermum moniliferum, Passerina rigida, Pelargonium betulinum, P. capitatum, Polygala myrtillifolia, Phylica stipularis, Struthiola ciliate, Tetragonia fruticosa* and *Thesidium fragile*.

Succulents: *Aloe maculata, Carpobrotus edulis, C. muirii, Euphorbia clandestina, E. rhombifolia, Orbea variegata* and *Sarcostemma viminale*.

Graminoids: *Cynodon dactylon, Ehrharta villosa, Imperata cylindrica, Stenothaprum secundatum* and *Thamnochortus insignis*.

Geophytes: *Brunsvigia orientalis, Haemanthus sanguineus* and *Knowltonia vesicatoria*.

Of the above, the only threatened species is *Euchaetis albertiniana* (status = Endangered), of which a healthy population is present (100-200 plants). A typical example of the remaining fynbos in which *Euchaetis albertiniana* is present is shown in Photo 1. Other threatened species that may appear after a fire are *Disa hallackii* and *Leucospermum praecox*.

The lowest part of the dune slack area at the southern end of the proposed development area, where the grass *Imperata cylindrica* is dominant, is a seasonal wetland and should be regarded as a sensitive area. This area is shown in Photo 2.

Photo 1: Example of the mostly moribund fynbos vegetation on the property is in the foreground.

Photo 2: Dune slack area in which a seasonal wetland is present.

CONCLUSIONS AND RECOMMENDATIONS

Two sensitive areas are present on the proposed development area, the dune slack area in which the seasonal wetland is present (the wetland is located within the ESA1 area indicated on Map 4) and the area in which healthy *Euchaetis albertiniana* (status = Endangered) populations are present. These sensitive areas are indicated on Map 5.

Map 5: The sensitive areas within the proposed development area are indicated in yellow and blue.

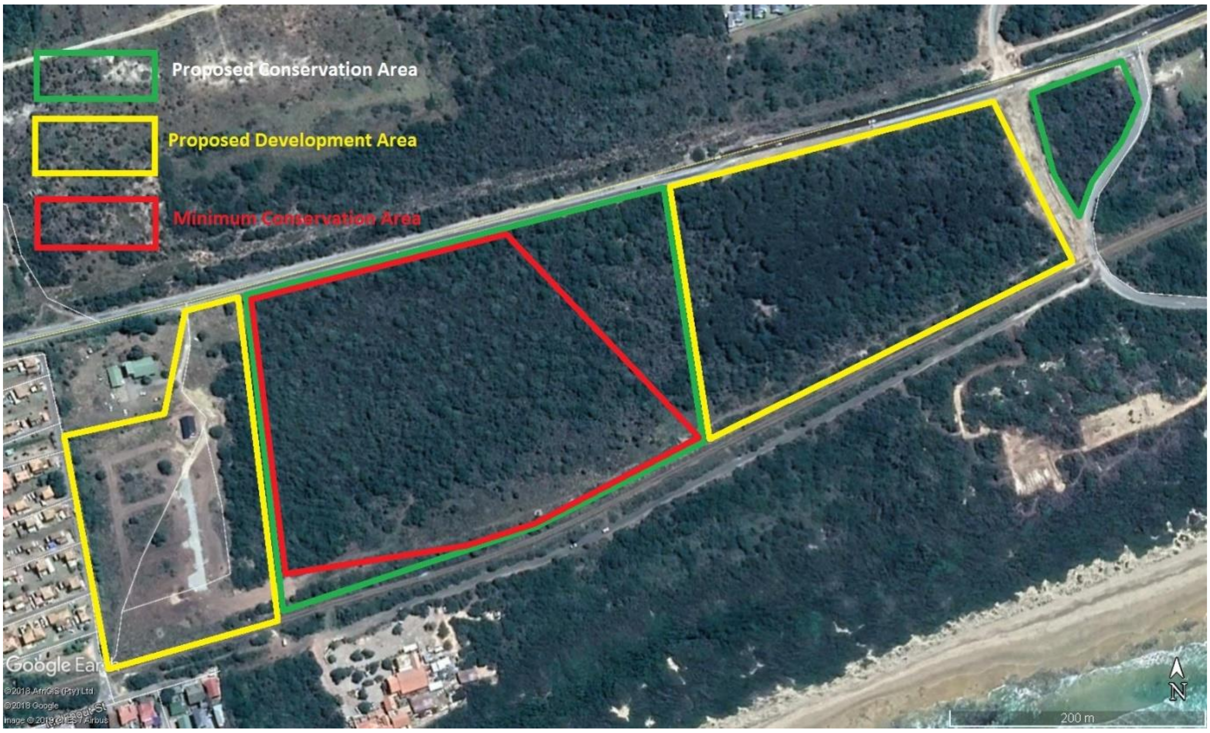
The sensitive dune slope area (see Photo 1) will have to be burned periodically to retain the biodiversity of the local fynbos vegetation. A strip of vegetation from the Great Brak-Tergniet road in the north to the railway in the south will have to be retained as an open area to facilitate periodic safe burns. This strip will have to be at about 200-300 m wide to act as a sound ecological unit and to achieve the required fire intensity to clear moribund vegetation. The ideal extent of the open area, which includes the wetland area, is indicated on Map 6 and this area is about 10 ha in extent. For economic reasons it may not be possible to retain the entire area as and open area. As the eastern end of this area is moderately transformed, it may be possible to shift this boundary on average about 80 m westwards, in which case the open area will be about 5.5 ha, which should be adequate as a functional ecological unit (see Map 7).

Map 6: The two proposed conservation areas are outlined in green.

My recommendations are as follows:

1. Retain a minimum of 5.5 ha as open space in the area marked in red on Map 7. This area must include the wetland area indicated on Map 5.
2. Establish a fire break of about 20 m wide along the western- and eastern boundaries of the conservation area.
3. Before any development takes place, burn the entire conservation area during late summer or early autumn (end January- end March).
4. Eradicate all the alien vegetation that will establish after the burn.
5. Retain all the larger Milkwood trees (stem diameter > 20 cm at breast height) within the proposed development area.

Once an acceptable development layout plan has been agreed upon, the open area should be clearly demarcated and rezoned to Open Space III and a management plan must be prepared for the maintenance of its intrinsic biodiversity and functioning as an ecological corridor.



Map 7: The minimum conservation area to be rezoned as Open Space III is indicated in red.

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TERRESTRIAL FAUNA SENSITIVITY REPORT

PROPOSED DEVELOPMENT ON PORTION 51 OF FARM 137 & ERF 2841 TERGNIET, MOSSEL BAY

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CONTENTS

1. INTRODUCTION, CREDENTIALS AND DECLARATION

1.1 INTRODUCTION

Ken Coetzee, of *Conservation Management Services*, was contracted by client representative and EAP working with the EIA application, Andrew West of Andrew West Environmental Consultancy, to do a fauna sensitivity analysis of Portion 51 of the Farm 137, and Erf 2841 Tergniet, Mossel Bay.(see Figure 1 for the locality of the study site).

The brief included the following:

i. Inventory of vertebrate fauna.
ii. Fauna and fauna habitat sensitivity analysis in terms of Red Data classified species predicted to occur on the study site and evaluate the outcomes of the EIA scoping tool in terms of fauna..
iii. Evaluate condition and value of habitat and correlate with other specialist studies.
iv. Determine the critical landscape connectivity corridors present on the study site if any.

<u>Figure 1</u>: Locality of the Tergniet study site on the south Cape coast.

1.2 CREDENTIALS OF THE AUTHOR

The author of this report, Mr Ken Coetzee, is registered with the South African Council for Natural Scientific Professions (Reg No 400099/08) as a “Professional Natural Scientist”, in the field of Ecological Science.

Mr Coetzee is a Master of Technology graduate of the School of Forestry and Nature Conservation of the Nelson Mandela Metropolitan University (Saasveld Campus) in the field of Ecological Science. His Master of Science thesis was a landscape fragmentation study of an endangered small mammal, the riverine rabbit (*Bunolagus monticularis)*. Mr. Coetzee is thus well qualified to carry out a fauna study which has the interests of sensitive fauna species and habitat as its core objective.

Mr Coetzee has over 40 years of relevant experience in the field of nature conservation and management, the most recent 26 years of which were self-employed as a biodiversity specialist consultant, involved in a wide variety of nature conservation, landscape planning, habitat evaluation, commercial game ranch and impact assessment projects as fauna specialist.

1.3 DECLARATION OF INDEPENDENCE AND COMPETANCY

I hereby declare that I, Ken Coetzee trading as Conservation Management Services, comply with all the conditions of PWC: DEA&DP for a person appointed in terms of the NEMA EIA Regulations to compile a specialist report, *viz*:

- I am independent;
- I have the required expertise, including knowledge of the NEMA, the EIA Regulations and any guidelines that have relevance to the proposed activity and specialist input or study;
- I have performed 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;
- I fully comply with NEMA, the EIA Regulations and all other applicable legislation;
- I have disclosed to the applicant, EAP and the Department all material information in the possession of the person that reasonably has or may have the potential of influencing –

  (i) any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or

  (ii) the objectivity of any report, plan or document to be prepared by the person in terms of these Regulations for submission to the competent authority;

- I ensure EIA and EMP best practice and clear communication on the methodologies used, and the assumptions, uncertainties and gaps in knowledge; and

- I adhere to the National Environmental Management principles contained in Section 2 of NEMA and the general objectives of Integrated Environmental management contained in Section 23 of NEMA.

2. DESCRIPTION OF THE STUDY SITE

2.1 TOPOGRAPHY

The topography of the study site can be described as gently sloping to the south (sea shore) and also to the north (towards the N2 highway). The two sloping planes (south and north facing) are relatively flat up to the two dune ridges. (see Figure 2A for the site layout).

Figure 2A: The layout of the Tergniet study site.

2.2 HABITAT DESCRIPTION AND EVALUATION

This section thus does not attempt to provide a specialist botanical report, although there will be considerable overlap with the botanical report completed for the study site. Reference can thus be made to the botanical report (Vlok, 2019) for plant species information and details of plant communities.

For the purpose of this report, it is necessary to examine vegetation as wildlife habitat at a different scale than that of biome, veld type or vegetation type. This is done further in this section on faunal habitats. (Refer to Figure 2).

It must be appreciated, however, that these units do not describe botanical communities, but rather broad topographical wildlife habitats, of which the vegetation is an important component.

It must also be appreciated that there are usually no clearly defined edges between these habitat types (vegetation units) and that overlap may be considerable. Similarly, there will be internal variation within each unit.

The habitats identified are thus a broad habitat description based on topography, soil type as well vegetation type and structure, from the point of view of the wild animals, and it disregards minor community variation within each unit.
The habitat types identified also represent practical and relatively homogenous units for habitat management purposes. The approximate extent of each of the habitat types is shown in Figure 3.

2.2.1 VEGETATION

A study of the vegetation was carried out by Vlok (2019) and is sketchily summarized here for ease of reference. He described the vegetation type as Hartenbos Strandveld.

Due to the lack of fire for approximately 40 years, the fynbos of the area became moribund and was displaced with pioneer thicket vegetation of which *Colpoon compressum, Grewia occidentalis, Searsia crenata, Pittosporum viridiflorum, Pterocelastrus tricuspidatus* and *Tarchonanthus littoralis* are typical.

The vegetation thus changed from a dense medium height dwarf shrubland type to a dense woody shrub and tree dominant thicket type.

Of particular importance is the dense infestation of the invasive alien Australian myrtle *(Leptospermum laevigatum)* which has invaded much of the eastern side of the proposed development area resulting in little or no remaining indigenous plant cover in the invaded area. The result is thus an exclusive alien tree infestation with very low or none of the local biodiversity remaining (see Figure 3B).

Vlok (2019) recorded the following alien and indigenous plant species on site as follows:

Trees: *Acacia cyclops, Acacia saligna, Pterocelastrus tricuspidatus, Colpoon compressum, Gymnosporia buxifolia, Searsia crenata, Searsia glauca, Mystrozylon* *aethiopicum, Syderoxylon inerme, Pittosporum viridiflorum* and *Tarchonanthus littoralis*.

Shrubs and herbs:*, Diospyros dichrophylla, Carissa bispinosa***,** *Anthospermum galioides***,** *Chrysocoma tenuifolia, Cliffortia falcata, Cliffortia stricta, Erica discolor, Erica muscosa, Eriocephalus africanus, Euchaetis albertiniana, Helichrysum cymosum, Helichrysum panduriforma, Helichrysum teretifolium, Hermannia althaeifolia, Leonotis oxymifolia, Leucodendron salignum, Metalasia muricata, Osteospermum moniliferum, Passerina rigida, Pelargonium betulinum, Pelargonium capitatum, Polygala myrtillifolia, Phylica stipularis, Struthiola ciliata, Tetragonia fruticosa* and *Thesidium fragile.,*

Creepers: *Asparagus aethiopicus*, *Cissampelos capensis, Cynanchum ellipticum, C. obtusifolium, Rhoicissus tridentata* and *Solanum africanum*.

Graminoids: *Sporobolus africanus***,** *Cynodon dactylon, Imperata cylindrica, Stenotaphrum secundatum, Ehrharta villosa, Thamnochortis insignis.*

Geophytes:*, Brusvigia orientalis***,** *Haemanthus sanguineus***,** *Knowltonia versicatoria* and *Anemone vesicatoria.*

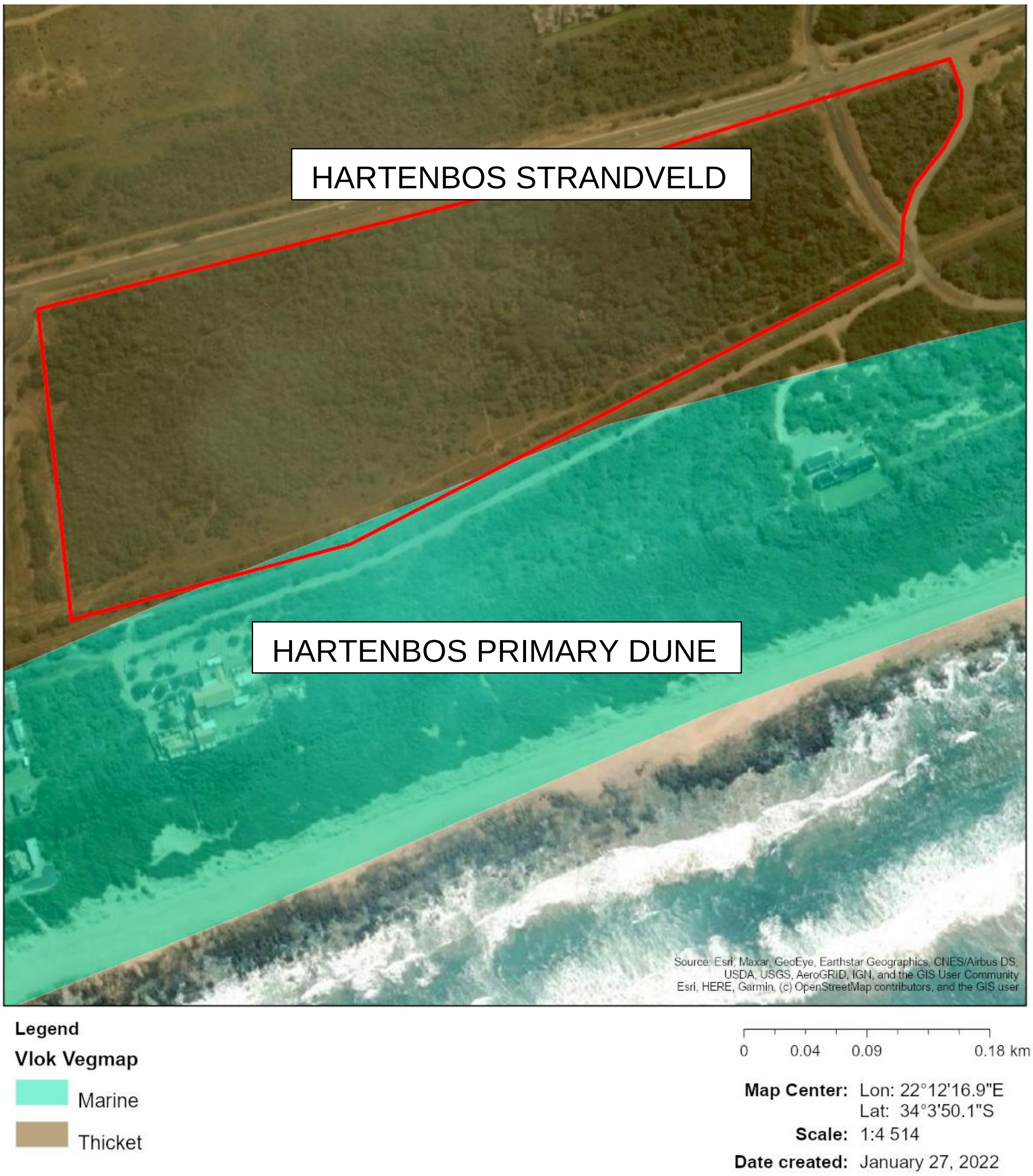
Succulents: *Aloe maculata, Carpabrotus edulis*, *C. muirii*, *Euphorbia clandestina, Euphorbia rhombifolia, Orbea variegata, a*nd *Sarcostemma viminale.*

According to Vlok (2019) the only threatened plant located was *Euchaetis albertiniana* which is classed as endangered. He found 100 to 200 plants in some of the remaining Fynbos on the site. He also considered the dune slack area in the south portion of the proposed development site to be sensitive as it contains a seasonal wetland with the grass *Imperata cylindrica.*

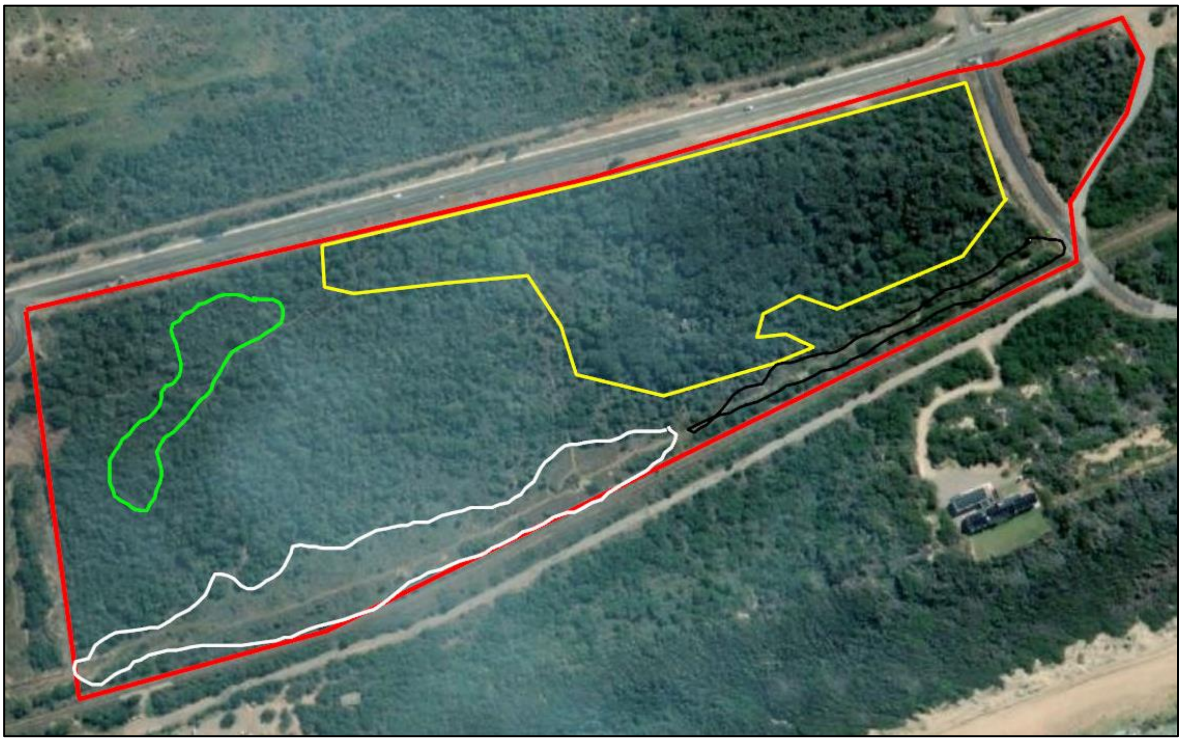
Further observation on 1/2/2022 revealed that *Stenotaphrum secunadatum, Ehrharta villosa* and *Ehrharta calycina* now completely dominate the dune slack wetland habitat.

2.2.2 SUMMARY OF ANIMAL HABITAT POTENTIAL

The following Table (1) illustrates the range of habitats that are available for wildlife on the study site (see Figures 3A & 3B). These habitat descriptions are based on the physical characteristics, soil type, fire history, availability of water, the vegetation types and also the degree of disturbance or transformation at the site. Presence or absence of faunal biodiversity will be largely based on the availability of suitable habitat within these categories.



<u>Figure 3A</u>: Vegetation types on the study area (Vlok, 2019).



<u>Figure 3B</u>: Broad animal habitat units within the Hartenbos Strandveld.

Yellow: Area severely invaded by Australian myrtle
White: Valley floor grassland
Green: Patches of relatively intact Fynbos
Balance of the area: Indigenous coastal thicket

<u>Table 1</u>: Summarized description of habitat for wildlife.

HABITAT DESCRIPTION	IMPORTANT PHYSICAL AND HABITAT FEATURES	IMPORTANT PLANT COVER SPECIES
1. Indigenous Thicket	Consists of a very dense mix of indigenous thicket shrubs and small trees by on a dune sand substrate. Although mostly natural it does have some infestation of rooikrans *(Acacia cyclops)* and prickly pear *(Opuntia ficus-indica)* See Plates 1 & 2.	*Acacia cyclops, Searsia glauca, Tarchonanthus littoralis, Sideroxylon inerme, Mystroxylon aethiopicum, Grewia occidentalis, Polygala myrtillifolia, Carissa bispinosa, Cussonia thyrsiflora, Pterocelastrus tricuspidatus and Pittosporum viridiflorum*
2. Fynbos matrix patches	Consists of relatively open habitat on dune sand with mostly a medium height fynbos plant cover with some Acacia cyclops invasion**..** Physical features consist of densely vegetated gently sloping dune sand. See Plate 3.	*Anthospermum galiodes, Erica discolor, Euchaetis albertiniana, Hermannia altheifolia, Leucodendron salignum, Metalasia muricata, Ostespermum moniliferum, Passerina rigida, Poligala myrtillifolia and Phylica stipularis. Helichrysum teretifolium, Passerina vulgaris, Tetragonia fruticosa and Pelargoinium capitatum.*
3. Dune slack grassland	Broad flat valley in between two dune ridges that lie parallel to the sea shore with a dense cover of grasses and dwarf shrubs. Has been disturbed in the past to install a pipeline and with a sand track lying along the length of the site. This habitat lies on deep, loose sand. See Plates 4 & 5.	*Cynodon dactylon, Ehrharta villosa, Ehrharta calycina, Stenotaphrum secundatum and Eragrostis curvula*
4. Alien tree invaded thicket habitat	Consists of a very dense infestation of the alien Australian myrtle *Leptospermum laevigatum.* In most parts the habitat is completely dominated by the myrtle with little or no indigenous plant cover. This tree cover is up to 7m tall and too dense to walk into while in some parts of the invasion it is open under the tree canopy. See Plates 6 & 7.	*Leptospermum laevigatum,* with occasional *Searsia, Diospyros, Metalasia and Ostespermum.*

<u>Plate 1</u>: The dense indigenous thicket on the northern hillslope*.*

<u>Plate 2</u>: The dense nature of the Thicket habitat.

<u>Plate 3</u>: A small patch of fynbos within the area dominated by thicket.

<u>Plate 4</u>: The dune slack grassland viewed towards the east.

<u>Plate 5</u>: Part of the dune slack grassland with dense coastal buffalo grass *Stenotaphrum secundatum.*

<u>Plate 6</u>: The edge of the Australian myrtle *Leptospermum laevigatum* Infestation with impenetrable and exclusive myrtle litter.

<u>Plate 7</u>: The almost bare soil surfaces under the older Australian myrtle trees.

2.2.3 A GENERAL DESCRIPTION OF THE STUDY SITE

The study site lies within an east-west dune valley that lies parallel to the coastline. It lies on the gentle northern slope (south facing) of the valley as well as all along the floor of the valley.

The study site is partly transformed with an access vehicle track that lies along a pipeline in the dune slack valley as well as numerous human-made pathways through both the indigenous thicket area and the area of Australian myrtle infestation. A tarred road cuts through the far eastern tip of the site, cutting off a small area of indigenous thicket.

The southern slope of the valley is partly developed and is separated from the study site by a gravel road and railway line.

The single biggest feature of the study site, apart from the wonderful indigenous thicket is the alien Australian myrtle infestation. It is dense and expanding into the natural thicket area and together with the *Acacia cyclops* and the prickly pear infestations, is a very real threat to the integrity of the thicket habitat. The prickly pear infestation is clearly expanding with numerous small rooted cladodes surrounding each of the many mature plants within the thicket. Any attempt to conserve the thicket will have to address the alien plant invasions of all three alien plant species if it is to succeed.

The natural fauna in these thicket and grassland/wetland areas may be intact, but the expanding residential developments to the west, north, south and east of the study site will eventually compromise effective landscape connectivity. The study site thus does not represent any kind of "last link" between the foredune area along the coast and the inland thicket, fynbos and wetland habitats. All of the last remnants of natural habitat in the surrounding area are currently being degraded by dense infestations of the alien plants already described, all of which will result in a range of altered habitat conditions, grading from partial to severe to completely transformed.

In terms of the local fauna, the developments in the surrounding area, as well as the proposed development, will surely reduce natural habitat to the point of the eventual local extinctions of many species. This is inevitable and no attempt to rectify the situation at this late stage will make it right. The damage has already been irretrievably done.

3. FAUNAL OCCURRENCE

3.1 THE BASIC HABITAT MODEL

The fauna of the study area is typical of the South Cape Coastal Thicket/Fynbos Mosaic. It is relatively intact, except that most of the original larger mammal species were eradicated by the end of the nineteenth century. Smaller wildlife, however, is also under threat in the Southern Cape area as a result of habitat destruction for expanding residential development and the effects of over-frequent fires fueled by invasive alien plants.

A habitat model forms the basis for habitat inventory and entails using a set of habitat components or attributes to predict some or other characteristic of a wildlife population (Cooperrider et al, 1986). For this study, the method used to determine the presence or absence of faunal species closely follows the habitat model of Cooperrider et al (1986) and can be simply illustrated as follows:

BASIC HABITAT MODEL

Habitat components or attributes of the site	Predictive equation →	Presence of absence of faunal species

The single most important predictor of occurrence is probably geographic location. Most wildlife species are quite restricted in geographic distribution, therefore, geographic location, together with knowledge of species distribution, is adequate to predict species potentially present in the area. However, wildlife species are rarely present continuously within their geographic ranges, and complete delineations of all sites used by a species are usually not available. (Cooperrider et al, 1986).

A more accurate prediction of presence and more detailed predictions about population attributes obviously requires much more detailed information on habitat components present (Cooperrider et al, 1986), but this degree of detail is outside of the scope of this study.

3.2 FAUNA INVENTORY

The most recently published distribution data for mammal, reptile, amphibian and avian species were used for this study. The presence of animals in the study area was determined on a probability basis assessed in terms of the habitats found on the study site (Table 2) and the known (published) geographic distribution of each likely species. Local knowledge and site observations were also used to refine the predictions. This method has been widely used for inventory and impact assessment purposes as an alternative to the physical location of fauna which is restrictive and impractical in terms of time and cost.

It must be appreciated that these checklists are preliminary. The following description of the fauna is per faunal group:

3.2.1 AMPHIBIAN INVENTORY

The study site provides no examples of typical amphibian wetland habitat nor are there any indications that such habitat may temporarily become available during the wet season. Vlok (2019) described the valley floor habitat as a dune slack wetland but it is doubtful that the normal wetland serving processes still apply due to the presence of the railway line, pipeline, roads and other water flow barriers that line the upper slopes of the valley. The deep, loose sand of the valley floor are also unlikely to hold surface water.

Of the 15 amphibian species listed, and that are known to occur in the general area, only one species, the plain rain frog *Breviceps fuscus* is considered likely to occur on the study site because it does not require open water in which to breed, as is the case with all the other listed species. (See Appendix 1).

Distributions were determined with reference to Passmore & Carruthers (1995), Carruthers (2001), Wager (1965) and Minter et al (2004).

3.2.2 REPTILE INVENTORY

The presence or absence of reptiles is much more difficult to predict than that of the amphibians which have a more predictable habitat. Of the 33 reptile species predicted to occur in the area, 5 are excluded due to unsuitable habitat. Of the 28 reptiles considered to be likely to or possibly occurring on the study site, 3 are *Chelonians* (tortoises), 1 is a chameleon, 18 are snakes, 3 are geckos and 8 are lizards. (See Appendix 2).

8 of the 33 reptile species are endemic to the subregion, most with very small distribution ranges. Although it is highly unlikely that all 33 reptile species actually do occur on the study site, the list merely reflects probability of occurrence based on known distribution and predicted habitat suitability.

Distributions were determined with reference to Fitzimons (1962), Branch (1988) and Bates et al, (2014).

3.2.3 MAMMAL INVENTORY

The limited range of habitats (see Table 2) provide for an equally limited variety of mammal types (see Table 3). Of the 28 species predicted to occur in the general study area, the habitat is unsuitable for 3, 16 are considered likely to occur and 9 are considered possibilities. The breakdown of number of species per mammal group is as follows:

Insectivores (shrews, moles)	- 4
Chiroptera (bats)	- 3
Lagomorphs (rabbits and hares)	- 1
Rodents (rats and mice)	-13
Carnivores (genets and mongooses)	- 2
Ungulates (antelopes)	- 1

Distribution was determined with reference to Skinner & Chimimba (2005) Stuart & Stuart (1996), Mills & Hess (1997), Roberts (1951) and Friedman & Daly (2004).

3.2.4 BIRD (AVIFAUNA) INVENTORY

Birds are comparatively more mobile than other animals and their predicted and observed presence on the study site does not necessarily indicate permanent residence or occupation of the available habitats. The habitats available to birds on the study site may thus constitute only part of the ecological requirements for certain species. Habitat variability on the study area for birds, however, is minimal, which is reflected in the relatively low diversity of species predicted to occur.

Of the 43 bird species predicted to occur, either permanently or partly on the study area, 19 were by sightings made during the fieldwork (See Appendix 4 for the full checklist).

Distributions were determined with reference to Sinclair et al (1997), Maclean (1985), Harrison et al (1997) and Taylor et al (2015).

3.2.5 INVERTEBRATE INVENTORY

There is no concise inventory for the invertebrates of the general Groot Brak/Tergniet area nor was it within the scope of this study to produce such an inventory. Both the screening tool and SANBI (2021) identifies two insect species of high sensitivity that may occur at the study site as follows:

A. *Aneuryphymus montanus* – yellow winged agile grasshopper. This grasshopper occurs in fynbos in rocky foothills, particularly on the cooler south-facing slopes. Threatened by farmland expansion and alien plant invasions. It is known to occur in the Southern Cape but details are not available.

4. RED DATA CLASSIFICATION, OCCURRENCE AND HABITAT SENSITIVITY

Animals have been classified in terms of the ever-increasing threats of overexploitation, illegal trade or habitat transformation. They are rated in terms of their vulnerability to extinction in Red Data lists, one for each animal group. See Appendix 5 for Red Data classifications (ie: degree of vulnerability).

The screening tool identified a number of sensitive species that may occur in the study area or that may be impacted by the proposed development. These species will be discussed separately under each faunal group.

4.1 AMPHIBIAN AND REPTILE SENSITIVITY

With respect to amphibians, Minter et al (2004) state that "habitat loss or modification as a result of agriculture and other forms of human activity (like residential developments) remains the most important single threat to the survival of amphibian populations, because of the scale of these changes and their relative permanence. At greatest risk are species that have limited distributions." It is thus clear that the remaining natural habitats on the study area should also be considered in terms of amphibian conservation and impacted as little as possible, in the interests of herptile persistence in the area.

The screening tool did not pick up any amphibian or reptile species of conservation concern.

4.2 MAMMAL SENSITIVITY

Table 3 lists the Red Data listed mammal species but not identified by the screening tool. (See Table 3 and Appendix 3).

Red Data listed mammals: *Myosorex longicaudatus*

The long-tailed forest shrew is classified as *endangered*. It is essentially a forest animal but it also occurs in Forest/Fynbos ecotones and fynbos, but always in moist bog-like habitat. It is not likely to occur on the study site due to habitat unsuitability because there are definitely no wetland-like or moist habitats on the study site. It is all dry dune sand. The long-tailed forest shrew is classed as endangered due to the sustained and increasing loss and fragmentation of forest and thicket habitat in its distribution area. Fortunately, this does not apply to the study area.

Red Data listed mammals: *Philantomba monticola*

The blue duiker is classified as *vulnerable.* They occur in forests, thickets and very dense coastal bush along the East coast of South Africa. The rooikrans and Australian myrtle invaded thicket/Fynbos on the study site does not provide suitable habitat as it does not contain suitable forage or cover habitat.

The indigenous thicket similarly does not have the open understory that is favoured by blue duiker. Blue duiker is thus not likely to occur on the study site.

Other Red Data listed mammal species: *Mystromus albicaudatus*

The white-tailed mouse is classified as *vulnerable*. It is essentially a grassland animal but it also occurs in the parts of the Fynbos biome, preferring the more-grassy habitats (De Graaff, 1981). The study site does not provide suitable habitat. The loose sandy soil of the dunes is not the typical substrate habitat of this mouse although the forage appears to be suitable. According to Skinner and Chimimba (2005), the study site lies within a marginal area for this species. According to De Graaff (1981) there are no distribution records for this species in the general study area. The white-tailed mouse is thus not likely to occur on the study site.

TABLE 3: Red Data classification and occurrence potential of some of the Mammals listed for the area but for which the available habitat is not suitable (see appendix 3).

COMMON NAME	**SCIENTIFIC NAME**	**RED DATA CATEGORY (SANBI, 2016)**	**PREDICTED OCCURRENCE ON THE STUDY SITE**	**HABITAT REQUIREMENTS** (Skinner & Chimimba, 2005)
Duthies golden mole	*Chlorotalpa duthieae*	Endangered	Will not occur on the study site due to habitat unsuitability, there is no forest habitat on the study site.	Occur in alluvial sands and sandy loam soils within the coastal forests of the fynbos biome.
Long-tailed forest shrew	*Myosorex longicaudatus*	Endangered	Will not occur on the study site due to habitat unsuitability. There are definitely no wetland-like or moist habitats on the study site.	Essentially a forest animal but also occurs in ecotones and fynbos, but always in moist bog-like habitat.
Blue duiker	*Philantomba monticola*	Vulnerable	Will not occur on the study site. The rooikrans invaded Thicket/Fynbos on the study site does not provide suitable foraging or cover habitat.	Occur in forests, thickets and very dense coastal bush. The rooikrans invaded thicket/Fynbos on the study site does not provide suitable habitat.
White tailed mouse	*Mystromys albicaudatus*	Vulnerable	The study site does not provide suitable habitat. The loose sandy soil of the dunes is not the typical substrate of this	Essentially a grassland animal but also occur in the Fynbos biome, preferring grassy habitats (De Graaff, 1981).

			mouse but forage appears to be suitable.	

4.3 AVIFAUNA (BIRD) SENSITIVITY

The Red Data Classification and probability of occurrence for the birds predicted by the screening tool to occur on the study site is listed in Table 4. Red Data classification is according to Taylor (2015). See Table 4 and appendix 4.

Species identified by the screening tool: *Circus ranivorus*.

The marsh harrier is classified as *endangered.* It is not considered to be likely or even a possible to occur on the study site because it is dependent on permanent wetland habitat. There are no such permanent wetlands on the study site. It is thus not likely to occur on the study site, even temporarily.

Species identified by the screening tool: *Neotis denhami*

Denhams bustard is classified as *vulnerable.* This bustard will not occur on the study site due to the complete lack of suitable habitat. The rooikrans and myrtle invaded Thicket/Fynbos is certainly not suitable habitat in terms of food potential or cover, bustards prefer open pasture, cropland, grassy or dwarf shrub habitats.

The valley floor grassland may provide near suitable habitat but it is much too small to permanently support a bustard population. Denhams bustard is a large bird and its feeding requirements imply an extensive foraging area for a group of birds. At most it may provide stepping-stone or occasional feeding habitat for this species. Denhams bustard may occur in the general area on farmlands and pastures but it is not very likely that they will use the study site as a critical part of their habitat in the area because the built-up nature of the area is generally unsuitable habitat.

Species identified by the screening tool: *Bradypterus sylvaticus*.

The Knysna warbler is classified as *vulnerable*. They occur along edges of Afro--temperate forest and in thick tangled vegetation along drainages in the Forest and Fynbos Biomes. It is thus unlikely that they occur on the study site due to the lack of suitable habitat, there are no forest edges or drainage habitats on the study site. The rooikrans/Australian myrtle invaded Fynbos/Thicket on the study site does not provide the preferred habitat for this species.

Species identified by the screening tool: *Campethera notata*

The Knysna woodpecker is classified as *near threatened*. They occur in dense arboreal (tree rich) habitats, coastal bush and other forest types. It is thus possible (but unlikely) that they may occur on the study site. Unlikely because of the more scrub-like nature of the woody component of the vegetation.

The Knysna woodpecker is known to nest in stands of alien trees in which they can excavate their nests into the trunks of the trees. The stands of Australian myrtle may thus provide suitable nesting habitat but it represents poor foraging habitat due to the mono-cultural nature of the habitat which is unlikely to provide for the range of invertebrate food items normally associated with pristine indigenous woodland habitat.

TABLE 4: Red Data classification and occurrence potential for the BIRDS that were predicted by the screening tool to occur on the study site.

COMMON NAME	SCIENTIFIC NAME	RED DATA CATEGORY (Taylor et al, 2015)	PREDICTED OCCURRENCE ON THE STUDY SITE	HABITAT REQUIREMENTS (Taylor et al, 2015)
African marsh harrier	*Circus ranivorus*	Endangered	Will not occur due to habitat unsuitability	Dependant on permanent wetlands, inland and coastal. May hunt over Fynbos but breeds and feeds in wetlands.
Denhams bustard	*Neotis denhami*	Vulnerable	Will not occur on the study site due to the lack of suitable habitat. The rooikrans invaded Thicket/Fynbos is certainly not suitable habitat.	Occurs in groups on pastures, croplands and coastal grasslands.
Knysna warbler	*Bradypterus sylvaticus*	Vulnerable	Will not occur on the study site due to the lack of suitable habitat.	Occurs along edges of Afro-temperate forest and in thick tangled vegetation along drainages in forest and Fynbos
Knysna woodpecker	*Campethera notata*	Near threatened	Will not occur due to the lack of any kind of dense tree habitat	Occurs in dense arboreal (tree rich) habitats, coastal bush and forest. types.

4.4 INVERTEBRATE SENSITIVITY

Species identified by the screening tool: *Aneuryphymus montanus*

The yellow winged agile grasshopper is classified as *vulnerable*. As it is reported to occur in fynbos in rocky foothills, this species is not likely to occur on the study site.

There is no such rocky foothill fynbos on the study site or anywhere near to it. This grasshopper is known to be threatened by the invasions of alien plants and if it did occur in the general study area then residential expansion and repeated generations of alien plant invasions will already have eliminated the populations some time ago. This species is thus not likely to occur on the study site.

5. LANDSCAPE CONNECTIVITY

The study site lies close to the seashore but the coastal belt of natural habitat has already been compromised by residential development to the southwest of the study site. The potential corridor along the coast has thus been compromised.

Immediately to the north of the study site is a tarred road, as well as fairly near northwards lies the very busy N2 dual carriageway. These roads represent severe barriers to animal dispersal and movement. North of the N2 lies the town of Groot Brakrivier.

The immediate west of the study site Is already developed (Tergniet) as well as part of the area between the study site and the N2.

The only area of remaining natural habitat thus lies to the east but this too is cut off some distance away by the Suiderkruis development.

The study site thus does not represent any kind of critical connectivity for fauna in the area except for the connection between it and the undeveloped area at the coastline. The connectivity in the general area has already been compromised by rapidly expanding residential and other development.

The ever-increasing problem of *Acacia cyclops, Leptospermum laevigatum* and *Opuntia ficus-indica* invasion also has a negative effect on most parts of remaining natural vegetation in the general area because it completely transforms the original natural habitat. On the study site *L. laevigatum* has invaded approximately half of the site which will eventually result in the loss of half of the original Fynbos/Thicket vegetation. The other half is already partly invaded and if not controlled will also be lost to alien plant invasion.

In terms of the local fauna persistence, the development along the coastal area should never have taken place and no attempt to rectify the situation at this late stage will make it right. The damage has already been irretrievably done. There is thus little scope for corridor preservation or development for the long term.

6. RECOMMENDED CONSERVATION POTENTIAL

As already discussed very little of the study site is still in a completely pristine condition. Despite this, in terms of both plant and animal biodiversity, it is recommended that at least part of the near natural habitats be retained as conservation areas or green open space, for the sake of local biodiversity.

In this regard I fully concur with the recommendations made by Vlok (2019) in terms of the areas that could be retained for local biodiversity. These areas are indicated in Figure 4. Parts of these areas (the thicket and grassland), are not classified as CBA or as endangered vegetation types, the recommendation is simply based on conserving areas that will at least provide some habitat for the local plant and animal diversity, which according to the checklists (Appendices 1 to 4) is actually quite considerable.

It follows that to adequately conserve these areas for animal biodiversity, something must be done about the invasive alien plants, without their control the area will in any case become too degraded to provide suitable habitat for plant and animal diversity. The control of alien vegetation could possibly be a condition of approval to develop?

Figure 4: The Tergniet study site showing the recommended development potential in red and the proposed conservation areas in yellow.

7. CONCLUSION

Inventories for terrestrial fauna of the general study site were drawn up from the literature. Each species identified was then evaluated in terms of the occurrence of its required habitat on the study site and then listed as likely to occur, a possibility to occur or unlikely to occur on the study site.

The Red Data listed species of each group were then also evaluated in terms of their occurrence on the study site in terms of habitat suitability.

Animal species that were identified by means of the screening tool were also evaluated in terms of habitat suitability on the study site.

None of the red Data listed, or the screening tool identified species were considered to occur on or even to use the study site on a semi-permanent basis. The study site habitats do not represent any kind of critical or specialized resource for any of the sensitive animal species.

The habitats available on the study site are all anthropogenically impacted, to a variable degree, but the current situation is set to deteriorate swiftly due to the devastating impact of invasive alien plants, which in the last few years has spread over much of the site and which will mature to the further detriment of all indigenous plant and animal species.

The currently disturbed habitats cannot be described as useful or necessary linkage habitat, and with the continued spread and maturity of the alien trees, will become even less likely to provide linkages for animal movement.

It can thus be summarized with a high degree of confidence that the study site is of little long-term importance to the fauna predicted to occur on it and that this fauna is already in an advanced state of decline due to habitat transformation and insufficient dispersal opportunities. A recommendation is made to conserve a part of the proposed development site for the conservation of the plant and animal diversity that still occurs in the area.

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APPENDIX 1: AMPHIBIA CHECKLIST

SPECIES	COMMON NAME	OCCURRENCE	HABITAT REQUIREMENTS
Bufo pardalis	Eastern leopard toad	Habitat unsuitable	Grassy or open habitats in fynbos, with open water.
Bufo rangeri	Raucus toad	Habitat unsuitable	Vleis, pans, rivers, open pasture areas in fynbos habitats.
Semnodactylus wealii	Rattling frog	Habitat unsuitable	Vleis, ponds, dams in grassland & fynbos.
Hyperolius marmoratus	Marbles reed frog	Habitat unsuitable	Vleis, pans, dams in forest & fynbos habitats.
Hyperolius horstockii	Arum lily frog	Habitat unsuitable	Vegetated shores, reeds, bushes, arums in fynbos habitats.
Afrixalus knysnae	Knysna leaf-folding frog	Habitat unsuitable	Mountain fynbos and Afromontane- forest with open water.
Breviceps fuscus	Plain rain frog	Likely	Live underground in burrows in forest and fynbos.
Xenopus laevis	Common platana	Habitat unsuitable	Permanent water a requirement.
Cacosternum boettgeri	Common caco	Habitat unsuitable	Permanent and/or temporary ponds and puddles.
Cacosternum nanum	Bronze caco	Habitat unsuitable	Marshes, vleis, small streams.
Afrana angolensis	Common river frog	Habitat unsuitable	Permanent water with aquatic vegetation.
Afrana fuscigula	Cape river frog	Habitat unsuitable	Permanent water, still water.
Strongylopus fasciatus	Striped stream frog	Habitat unsuitable	Streams, ponds, dams, seepages with grassy margins.
Strongylopus grayii	Clicking stream frog	Habitat unsuitable	Shallow water with well vegetated borders.
Tomopterna delalandii	Cape sand frog	Habitat unsuitable	Edges of pans, dams, vleis, sandy areas with open water.

Amphibians – Probability of each species occurring on the study site (main reference - Minter et al, 2004)

Confirmed: Species presence actually confirmed by means of sighting, spoor or droppings on the study site.
Likely : Species presence recorded in similar habitats in neighbouring areas and within known distribution.
Possible : Species presence possible on site due to overlap of habitat requirements and nearby known distribution.

APPENDIX 2: REPTILE CHECKLIST

SPECIES	COMMON NAME	OCCURRENCE	HABITAT REQUIREMENTS
Rhinotyphlops lalandei	Delalande's beaked blind snake.	Likely	Varied; fossorial. (Endemic).
Boaedon capensis	Brown house snake.	Likely	Varied.
Lamphrophis aurora	Aurora house snake.	Likely	Fynbos habitat.
Lycodonomorphus inornatus	Olive house snake.	Likely	Moist coastal areas. (Endemic).
Duberria lutrix lutrix	Common slug eater.	Likely	Coastal forest and fynbos – moist areas.
Pseudaspis cana	Mole snake.	Likely	Varied, coastal, sandy fynbos, thicket.
Amplorhinus multimaculatus	Many-spotted snake.	Habitat unsuitable	Mountain streams and vleis.
Psammophylax rhombeatus	Rhombic skaapsteker.	Likely	Forest fynbos – moist areas.
Psammophis cruifer	Montaine grass snake.	Habitat unsuitable	Mountain fynbos/grassveld.
Homoroselaps lacteus	Spotted harlequin snake.	Possible	Varied. (Endemic).
Philothamnus hoplogaster	Eastern green snake.	Possible	Varied.
Dasypeltiis scabra	Common or rhombic egg eater.	Likely	Varied.
Crotaphopeltis hotamboeia	Red-lipped snake.	Possible	Open moist areas.
Dispholidus typus	Boomslang.	Likely	Forest, fynbos.
Causus rhombeatus	Common or rhombic night adder.	Possible	Forest, fynbos – moist areas.
Bitis arietans	Puff adder.	Likely	Varied, sandy coastal, fynbos.
Pachydactylus geitjie	Ocellated, thick-toed gecko.	Possible	Fynbos. (Endemic).
Pachydactylus maculatus	Spotted thick-toed gecko	Possible	Fynbos, coastal bush.

Reptiles. (Continued overleaf).

SPECIES	COMMON NAME	OCCURRENCE	HABITAT REQUIREMENTS
Afrogecko porphyreus	Marbled leaf-toed gecko	Likely	Coastal, fynbos & forest. (Endemic).
Acontias meleagris meleagris	Cape legless skink	Habitat unsuitable	Leaf litter in forest & forest edge. (Endemic).
Trachylepis capensis	Cape skink	Likely	Forest, forest edge & fynbos.
Trachylepis homalocephala	Red-sided skink	Likely	Forest, forest edge & seepages. (Endemic).
Nucras lalandii	Delalande's sandveld lizard	Likely	Open fynbos. (Endemic).
Pedioplanis lineoocellata pulchella	Spotted sand lizard	Likely	Varied.
Tetradactylus seps seps	Short-legged seps	Possible	Fynbos, varied.
Chamaesaura anguina	Cape grass lizard	Likely	Grassy/fynbos slopes.
Agama atra	Southern rock agama	Habitat unsuitable	Fynbos rocky areas.
Gerrhosaurus flavigularis	Yellow-throated plated lizard	Possible	Open coastal forest.
Geochelone pardalis	Leopard tortoise	Likely	Varied, fynbos and thicket.
Homopus areolatus	Parrot-beaked tortoise	Likely	Varied, coastal – must have cover.
Chersina angulata	Angulate tortoise	Confirmed	Forest, coastal fynbos, sandy areas.
Pelomedusa subrufa	Cape terrapin	Habitat unsuitable	Permanent water, burrows in drought.
Bradypodion damaranum	Knysna dwarf chameleon	Likely	Coastal forest, bush, gardens.

Reptiles – Probability of each species occurring on the study site. (Main reference - Bates et al, 2014)

Confirmed: Species presence actually confirmed by means of sighting, spoor, droppings on the study site.
Likely : Species presence recorded in similar habitats in neighbouring areas and within known distribution.
Possible : Species presence possible on site due to overlap of habitat requirements and nearby known distribution.

<u>APPENDIX 3</u>: MAMMAL CHECKLIST

SPECIES	COMMON NAME	OCCURRENCE	HABITAT REQUIREMENTS
Myosorex longicaudatus	Long-tailed forest shrew	Habitat unsuitable	Forest ecotone – fern clumps, insectivorous.
Myosorex varius	Forest shrew	Habitat unsuitable	Moist, dense habitat, insectivorous.
Crocidura flavescens	Greater musk shrew	Habitat unsuitable	Moist, dense habitat, insectivorous.
Crocidura cyanea	Reddish-grey musk shrew	Possible	Moist – dry habitats.
Crocidura silacea	Lesser grey-brown musk shrew	Possible	Forest / grassland / woodland
Amblysomus corriae	Fynbos golden mole	Likely	Fynbos and forest
Chlorotalpa duthieae	Duthie's golden mole	Habitat unsuitable	Coastal forests.
Miopterus fraterculus	Lesser long-fingered bat	Likely	Various
Neoromicia capensis	Cape serotine bat	Possible	Forest areas, insectivorous.
Rhinolopus capensis	Cape horseshoe bat	Possible	Caves in varied habitats, insectivorous.
Lepus saxatilus	Scrub hare	Possible	Scrub areas, grass cover, vegetarian.
Bathyergus suillus	Cape dune mole-rat	Possible	Sandy soils, vegetarian.
Cryptomus hottentotus	Common mole-rat	Confirmed	Moist soils, vegetarian.
Myomyscus verreauxi	Verreaux's mouse	Likely	Fynbos scrub. forest edge
Gerbillurus paeba	Hairy-footed gerbil	Likely	Sandy substrates, disturbed sites
Georychus capensis	Cape mole-rat	Possible	Sandy soils, vegetarian.
Hystrix africaeutralis	Porcupine	Likely	Varied habitat, vegetarian.
Otomys irroratus	Vlei rat	Confirmed	Wetland & swampy areas, eats grass/sedges.
Mus musculus	House mouse	Likely	Varied habitat, eats grass seeds, insects & vegetable matter.
Rhabdomys pumilio	Striped mouse	Confirmed	Fynbos, shrubveld, wetland.
Mus minutoides	Pygmy mouse	Likely	Fynbos, wetland, disturbed areas.
Mastomys coucha	Multimammate mouse	Likely	Varied habitat, omnivorous.
Saccostomys campestris	Pouched mouse	Likely	Varied habitat.
Mystromys albicaudatus	White-tailed mouse	Possible	Macchia, grassland.
Genetta genetta	Small-spotted genet	Likely	Wooded & wetland areas
Ictonyx striatus	Striped polecat	Likely	Varied habitat, insectivorous & carnivorous.

(Continued overleaf)

SPECIES	COMMON NAME	OCCURRENCE	HABITAT REQUIREMENTS
Galerella pulverulenta	Small grey mongoose	Confirmed	Forest, scrub & grassland.
Raphiceros melanotis	Grysbok	Possible	Thick bush, hilly areas, fynbos.
Philantomba monticola	Blue duiker	Habitat unsuitable	Forest and dense shrub habitats.

Mammals – Probability of each species occurring on the study site (Friedman & Daly, 2004).

Confirmed: Species presence actually confirmed by means of sighting, spoor, droppings on the study area.
Likely : Species presence recorded in similar habitats in neighbouring areas and within known distribution.
Possible : Species presence possible on site due to overlap of habitat requirements and nearby known distribution.

APPENDIX 4: BIRD CHECKLIST

SPECIES	LIKELY	C'FIRMED
Bar-throated apalis	X	X
Black-shouldered kite	X	
African goshawk	X	X
Bar throated apalis	X	X
Bokmakierie	X	X
Cape batis	X	
Cape bulbul	X	X
Cape bunting	X	
Cape canary	X	
Cape francolin	X	
Cape robin	X	
Cape sparrow	X	
Cape wagtail	X	
Cape white-eye	X	X
Common quail	X	
Common waxbill	X	
Crowned plover	X	
Diederik cuckoo	X	X
European starling	X	
European swallow	X	X
Familiar chat	X	
Fiscal flycatcher	X	
Fiscal shrike	X	X
Fork tailed drongo	X	X
Grassbird	X	
Grassveld pipit	X	
Greater double-collared sunbird	X	
Greater striped swallow	X	
Guinea fowl	X	
Hadeda	X	X
Kelp gull	X	
Laughing dove	X	X
Lesser double-collared sunbird	X	
Malachite sunbird	X	
Olive thrush	X	X
Orange-breasted sunbird	X	
Red-eyed dove	X	X
Red-necked francolin	X	
Redwing starling	X	
Rock pigeon	X	
Sombre bulbul	X	X
Southern boubou	X	X
Speckled mousebird	X	X
Spotted prinia	X	X
Turtle dove	X	X

Birds – Probability of each species occurring on the study site (Harrison et al, 1997).
Confirmed: Species presence confirmed by means of sightings and birdsong.
Likely : Species presence recorded in similar habitats in neighbouring areas and within known distribution for each species.

APPENDIX 5

RED DATA BOOK CATEGORIES FOR MAMMALS

(SOURCE: Friedman Y and Daly, B (editors) 2004. Red Data Book of the Mammals of South Africa: A conservation Assessment: CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa).

EXTINCT (EX)
A taxon is extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time appropriate to the taxon's life cycle and life form.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it is considered to be facing an extremely high risk extinction in the wild.

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it is considered to be facing a very high risk extinction in the wild.

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it is considered to be facing a high risk extinction in the wild.

NEAR THREATENED (NT)
A taxon is Near Threatened when it does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)
A taxon is Least Concern when it has been evaluated and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment on its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

RED DATA BOOK CATEGORIES FOR AMPHIBIANS & REPTILES

(SOURCE: Minter, L R; Burger, M; Harrison, J A; Braak, H H; Bishop, P J & Kloepfer, D (Eds) 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series 9. Smithsonian Institution, Washington, DC.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M, ,Marais, J, Alexander,G.J & De Villiers. 2014.Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Suricata 1, SANBI, Pretoria).

EXTINCT (EX)
A taxon is extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time appropriate to the taxon's life cycle and life form.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it is considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it is considered to be facing a very high risk extinction in the wild.

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it is considered to be facing a high risk extinction in the wild.

NEAR THREATENED (NT)
A taxon is Near Threatened when it does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)
A taxon is Least Concern when it has been evaluated and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment on its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

RED DATA BOOK CATEGORIES FOR BIRDS

(SOURCE: Taylor, M.R Peacock, F. & Wanless, R.M. 2015. The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Birdlife South Africa, Johannesburg.

EXTINCT (EX)
A taxon is extinct when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

REGIONALLY EXTINCT (RE)
A taxon is regionally extinct when there is no reasonable doubt that the last individual potentially capable of reproduction within the region has died or disappeared from the region or, if a former visiting taxon, the last individual has died or disappeared from the region.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when available scientific evidence indicates that it is considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)
A taxon is Endangered when available scientific evidence indicates that it is considered to be facing a very high risk extinction in the wild.

VULNERABLE (VU)
A taxon is Vulnerable when the best available scientific evidence indicates that it is considered to be facing a high risk extinction in the wild.

NEAR THREATENED (NT)
A taxon which has been assessed but does not currently qualify for Critically Endangered, Endangered or Vulnerable, but is close to qualifying for or is likely to become Vulnerable in the near future. Also included here are taxa that are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.

LEAST CONCERN (LC)
A taxon which has been assessed but does not qualify for Critically Endangered, Endangered, Vulnerable and does not qualify for Near Threatened.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment on its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.