
Tshedza 3 Investments (Pty) Ltd: Solar PV Project Phase 2 (40 MW): Gauteng Province

Terrestrial Fauna Species Assessment

August 2022



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Specialist Qualification & Declaration

Barbara Kasl (CV summary attached as Appendix A):

- Holds a PhD in Animal, Plant and Environmental Sciences from the University of the Witwatersrand;
- Is a registered SACNASP Professional Ecological and Environmental Scientist (Pr.Sci.Nat. Registration No.: 400257/09), with expertise in faunal ecology; and
- Has been actively involved in the environmental consultancy field for over 14 years.

I, Barbara Kasl, confirm that:

- I act as independent consultant and specialist in the field of ecology and environmental sciences;
- I have no vested interest in the project other than remuneration for work completed in terms of the Scope of Work;
- I have presented the information in this report in line with the requirements of the Animal Species and Terrestrial Biodiversity Protocols as required under the National Environmental Management Act (107/1998) (NEMA) as far as these are relevant to the specific subject and Scope of Work;
- I have taken NEMA Principals into account as far as these are relevant to the Scope of Work; and
- Information presented is, to the best of my knowledge, accurate and correct within the restraints of stipulated limitations.



30-08-2022

Acronyms

ADU	Animal Demographic Unit
AI(S)	Alien Invasive (Species)
BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Areas
ESA	Ecological Support Area
IUCN	International Union for Conservation of Nature
NEMA	National Environment Management Act, 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NPAES	National Protected Area Expansion Strategy
PA	Protected Area
PES	Present Ecological State
QDGS	Quarter Degree Grid Square
RIVCON	River Condition
RL	Red-listed
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern (SANBI's 2020 Species Guideline)
SEI	Site Ecological Importance
SWSA	Strategic Water Source Area
TOP(S)	Threatened or Protected (Species)
UNESCO	United Nations Educational, Scientific and Cultural Organization
VMUS	Virtual Museum

Executive Summary

General Introduction

The proposed project is being developed to generate electricity for the ERGO Mining plant's power requirements. The Phase 1 (19.9MW) assessment has been successfully completed through a Basic Assessment application process (Ref: GP158MREA) and included solar panel development on the Farm Witpoortje 117 IR with associated power lines and 100MWh containerised battery storage. The solar project will be expanded to incorporate Phase 2 (40MW- as assessed through this report) resulting in a 59.9MW total production site. This will require expansion of the approved panel development area of Phase 1 (referred to as Phase 2 area) and an additional expansion area to meet the output requirements (Preferred and Alternative areas considered for expansion areas). An access road was formalised after completion of the fauna assessment, but it is along existing mine and gravel roads, and only the final section along tracks affects some disturbed grasslands.

The site lies just south of the N17 and just east of the Heidelberg Road (R23), and lies within the Ekurhuleni Municipality, Gauteng Province.

The site and surrounds rank as high sensitivity (EIA Screening Report) for terrestrial biodiversity, but given the history of the site (old tailings facilities, historical mine areas, historical and current cultivation areas), it is expected that the on-site biodiversity value to terrestrial fauna is low. A full biodiversity impact assessment, in line with the new environmental theme's protocols where relevant to terrestrial fauna, has been completed with focus on the ecological corridors and natural habitat units.

The site and surrounds rank as medium and low sensitivity (EIA Screening Report) for animal species, with one butterfly (*Aloeides dentatis dentatis*) and two mammals (*Ourebia ourebi ourebi* and *Hydrictis maculicollis*) listed as potential species of conservation concern (SCC). Due to the current status of the site in terms of historical land use and impacts, it is expected that these animals are unlikely to permanently occur in the project area, or at least be restricted to the less disturbed habitats where these are ecologically connected, and the bulk of the site will have low value for significant animal species; a detailed compliance statement will be completed for animal species, with a more detailed discussion of the three listed SCCs.

Site Characterisation

Phase 2 areas were surveyed on the 25 March 2022 and the weather was warm and sunny, ideal for fauna surveys. The bulk of the areas are historically disturbed mine dumps / stockpile areas (either actively rehabilitated or left to naturally revegetate) or utilised as pastures and actively bailed. The proposed areas are adjacent to some

wetland habitats (listed as moist grasslands / wetlands in this report) and streams, but the site assessment indicated much of these areas to be highly disturbed and of minor value to sensitive fauna populations as habitat or ecological corridors. A section of moist grassland along the northern boundary of the Preferred expansion area (along the non-perennial tributary) was identified as the most significant habitat with highest potential to serve as habitat to significant fauna species, although has limited value as an ecological corridor.

The access road, along existing roads and tracks, was formalised after the final preferred site was selected, and has been included as a desktop evaluation in this report. The photographs of the proposed road were taken on the 26 August 2022.

Animal Species

The following is relevant in terms of vertebrate fauna species:

- In terms of the mammals:
 - SCCs (Oribi and Spotted-necked Otter) are unlikely to occur within the project area for any length of time but may be present in the less disturbed surrounding habitats and may traverse the project area from time to time; considered possible species in the development areas. They are mobile species likely to move away from noise and human activity and unlikely to experience direct impact.
 - Three TOP species are maintained as likely to occur on site:
 - The Serval and Southern Reedbuck are linked to wetland habitats and associated reedbeds neighbouring the main development sites.
 - The disturbed nature of the terrestrial habitats reduces the likelihood of significant populations of the Southern African Hedgehog, but active monitoring for the species is required during the construction phase.
- In terms of herpetofauna:
 - No significant TOP herpetofauna populations are expected on the property.
 - The Giant Bullfrog, was the only TOP herpetofauna confirmed in the area along the Rietspruit Tributary, south of the alternative site. The species is threatened by loss and degradation of its wetland and neighbouring terrestrial habitat and effort must be made to conserve the species by way of maintaining the natural habitats and ecological corridors remaining in the area. In terms of the Phase 2 areas, the main potential area would be the wetland in the north and north-west of the project area which must be managed in accordance to the recommendations of the wetland specialist. Active monitoring must be undertaken for the species during construction phase.
- In terms of invertebrates
 - The Protected Baboon Spiders cannot be excluded from site, but it is expected that they would occupy the less disturbed habitats around site.
 - Despite several butterflies being confirmed on site, no *Aloeides dentatis dentatis* or similar species were noted on site. Populations of the butterfly are not expected to occur on the development sites.

Terrestrial Biodiversity

The historical activities that have taken place within the area means that there is very little likelihood of grassland representing TOP ecosystems (to be confirmed by the flora specialists) occurring in proposed Phase 2 development areas. The only other significant desktop features relevant to terrestrial fauna included the streams, CBAs and ESAs, largely associated with the streams and adjacent ecological buffer areas.

The northern non-perennial tributary and associated wetland area which overlaps the northern boundary of the Preferred expansion site is the most significant habitat unit associated with the proposed development areas and retains value as a CBA/ESA in terms of terrestrial fauna. This stream originates in the area and value as an ecological corridor is limited.

Site Ecological Importance, Site Sensitivity

No Site Ecological Importance (SEI) assessment was completed as no adequate habitat was noted for the relevant trigger SCCs (none of the areas will be critical to the survival or conservation of SCC populations) and no other SCC populations were identified as likely to occur within the proposed development areas.

In general, the overall site sensitivity is in partial agreement with the Gauteng conservation plan, in terms of terrestrial fauna (Plan 7). Where CBAs overlap natural habitat units, wetlands and areas most likely utilised by the more sensitive terrestrial fauna, these have been designated as highly sensitive areas. Where CBAs / ESAs have intersected disturbed habitat areas, then these have been designated as moderately sensitive areas where ecological function is still provided to terrestrial fauna (habitat provision, ecological corridor or water provision). The bulk of the sites are designated as low sensitivity due to the modified and / or disturbed nature of the areas.

Impacts Summary

In terms of the fauna biodiversity and animal species findings above, the following impacts could be significant during construction phase and have been assessed further:

- Destruction of fauna habitat, specifically potential TOPS habitat (designated highly sensitive areas).
- Hindering or interfering with TOP fauna species that may traverse through the project area.
- Contaminated or silt-loaded runoff to on-site and nearby aquatic ecosystems within the project area.

Impacts have been identified to be, at most, of moderate significance and can all be mitigated to low impact with vigilant activity and good house-keeping practices on site.

Conclusion & recommendations

In terms of the two alternative sites, the preferred site has more natural habitat units than the alternative site and is closer to areas designated as highly sensitive areas (should be avoided pending wetland specialist findings), making it marginally more important in terms of terrestrial fauna than the alternative site. However, developing the preferred site with panels will keep development clustered (closer to the main Phase 2 panel area and existing active mine areas) and maintain the impact footprint and associated anthropogenic activity (traffic, maintenance work) to a consolidated area; it will also result in maintaining the open spaces within and around the alternative site which is within the less disturbed Rietspruit Tributary catchment area. Therefore, in terms of terrestrial fauna, either alternative site is considered appropriate for development.

The access road is proposed over existing mine roads and tracks; the latter will result in minimal removal of vegetation; no significant loss of fauna habitat is expected, limited to marginal impact to the edges, dominated by disturbed and modified habitats (as per photographic evidence).

In terms of terrestrial fauna biodiversity, no additional faunal assessments or studies are deemed necessary. There is no reason for not authorising the activity as long as the following recommendations are adhered to:

- Recommendations of the flora and wetland specialist must be implemented on site.
- Any areas designated as highly sensitive by the flora and wetland specialists should be considered as highly sensitive in terms of fauna (unique and unmodified fauna habitat provision) and should be considered no-go areas.
- Staff and contractors must be made aware of the potential activity of SCCs (Spotted-necked Otter, Oribi and *Aloeides dentatis dentatis*) and the confirmed TOPS (Giant Bullfrog) and likely TOPS (Southern Reedbuck and Serval) in the surrounds and highly likely TOPS (South African Hedgehog) in the development areas and report sightings of these species to the Environmental Control Officer.
- The mitigation measures in this report and that of the flora report and wetland report must be included within the environmental management programme and implemented on site.

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1. Introduction & Site Characterisation

The proposed project is being developed to generate electricity for the ERGO Mining plant’s power requirements. The Phase 1 (19.9MW) assessment has been successfully completed through a Basic Assessment application process (Ref: GP158MREA) and included solar panel development on the Farm Witpoortje 117 IR with associated power lines and 100MWh containerised battery storage. The solar project will be expanded to incorporate Phase 2 (40MW- as assessed through this report) resulting in a 59.9MW total production site. This will require expansion of the approved panel development area of Phase 1 (referred to as Phase 2 area) and an additional expansion area to meet the output requirements (Preferred and Alternative areas considered for expansion areas).

An access road was formalised after completion of the fauna assessment, but it is along existing mine and gravel roads, and only the final section along tracks affects some disturbed grasslands.

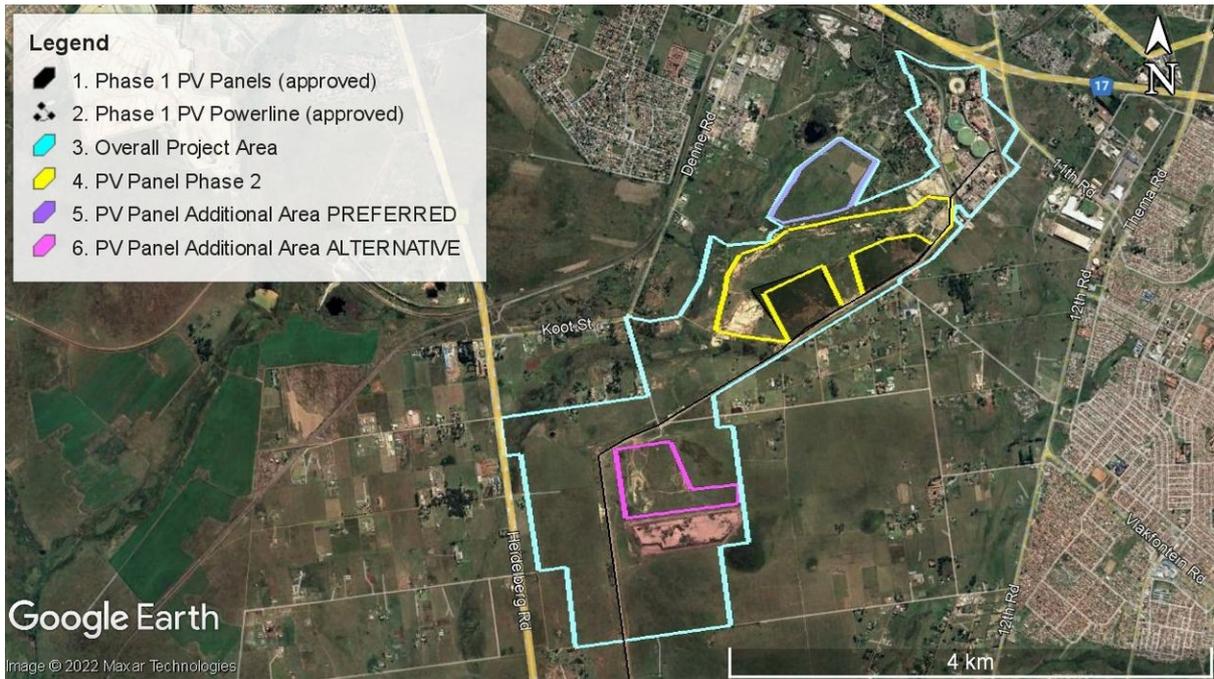
The site lies just south of the N17 and just east of the Heidelberg Road (R23), and lies within the Ekurhuleni Municipality, Gauteng Province. Table 1 provides a summary of the desktop assessment of the ecologically significant features relevant to the site.

A separate avifauna assessment is being undertaken, and the birds have been omitted from this report, which focusses on mammals and herpetofauna and also provides a high-level assessment of threatened or protected (TOP) invertebrates. Where terrestrial fauna is referred to in this report the avifauna should be considered omitted.

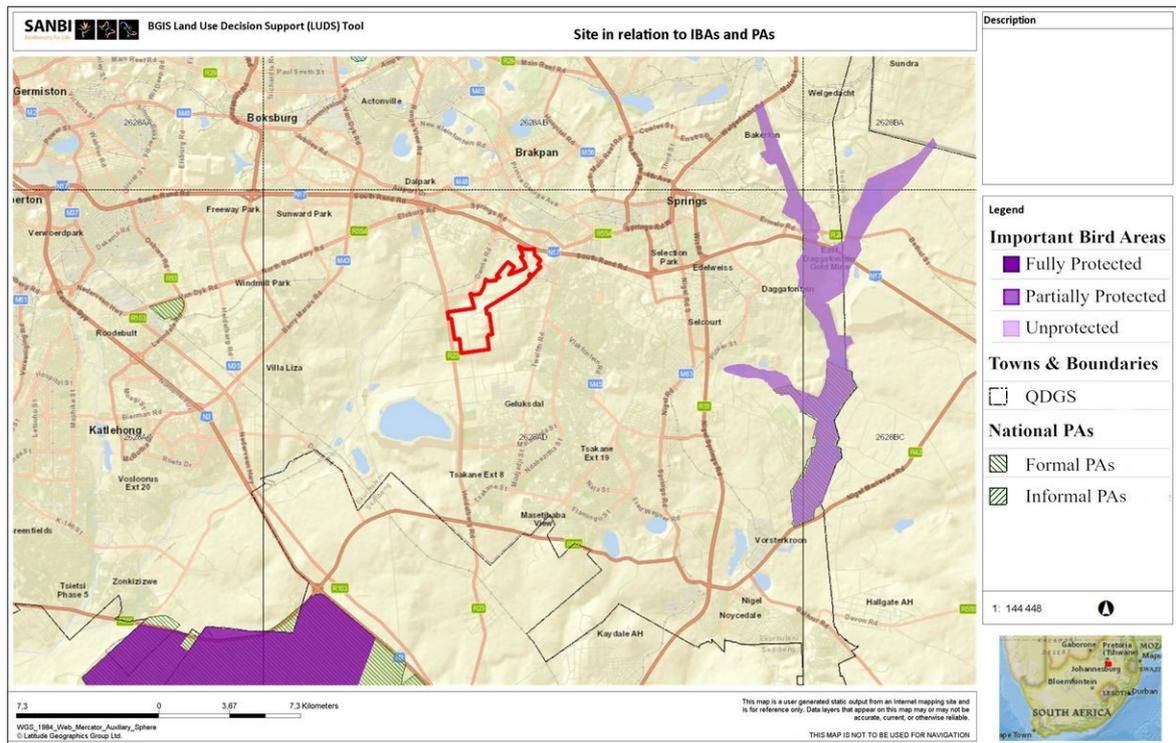
Table 1: Desktop ecologically significant features (distances are “as the crow flies” approximations)

Ecological feature / area	Description of feature relevant to the site
International Conservation	The Blesbokspruit RAMSAR Wetlands (incorporated, in part, in the Marievale Bird Sanctuary Provincial Nature Reserve) are approximately 12km east of site. No World Heritage sites occur within 50km of site.
Protected Areas (PAs) (Plan 2)	The formally protected Suikerbosrand Provincial Nature Reserve lies <10km south of site. Other nearby provincial nature reserves and bird sanctuaries are all more than 10km from site. No National Protected Area Expansion Strategies (NPAES) occur within 10km of site.

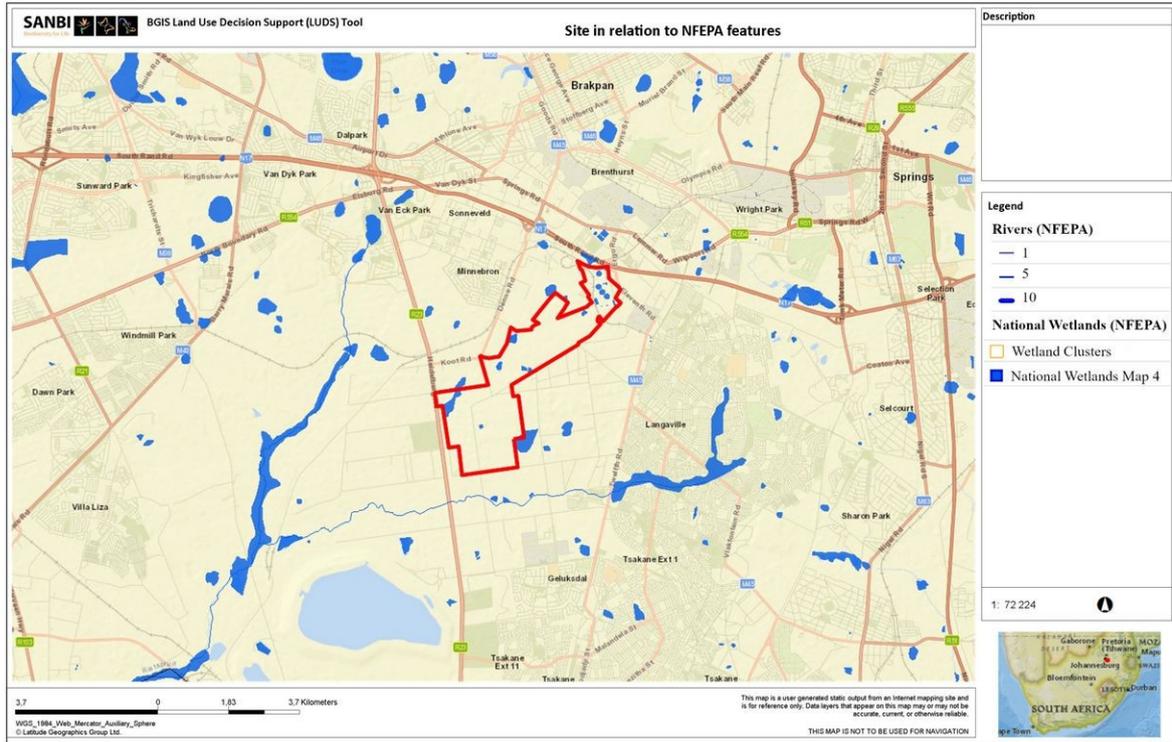
Ecological feature / area	Description of feature relevant to the site
National Freshwater Priority Area (NFPEA) Features (Plan 3)	<p>The site is not within a NFPEA Catchment.</p> <p>A non-perennial tributary flows along and within the north and north-west boundary of the project area and flows south into the Rietspruit Tributary (approximately 1.5km south of the Alternative expansion area), which is a NFPEA river with an unacceptable ecological state (river condition has not been assessed). The Rietspruit Tributary eventually confluences with the Rietspruit (unacceptable ecological state and river condition), 5.3km further west.</p> <p>The wetlands associated with this non-perennial tributary and with the mine area and other nearby wetlands are Rank 5 and 6 NFPEA wetlands, which provide little in terms of habitat for TOP species (cranes, TOP water birds and frogs).</p> <p>The aquatic habitats are impaired and unlikely to have significant conservation value for sensitive riverine and wetland terrestrial fauna populations.</p>
Strategic Water Source Areas (SWSAs)	<p>The Eastern Karst Belt SWSA occurs just over 2km north-east of the project area.</p>
Biome and Ecosystem	<p>The area falls within the Grassland Biome. The following is relevant:</p> <ul style="list-style-type: none"> • The bulk of the development areas overlap designated Klipriver Highveld Grassland, listed as a Critically Endangered ecosystem (NEM:BA, GN1002, 2011). • The northern section of the Phase 2 area extends into designated Tsakane Clay Grassland, listed as an Endangered ecosystem (NEM:BA, GN1002, 2011). <p>Given the history of the site, and the historical impacts and ongoing activities in and around the area, it is not expected that the area will support representative units of these ecosystems (to be confirmed by the flora specialist), however any good grassland habitats would support grassland fauna species.</p>
Gauteng Ridges	<p>No Class 1 or 2 ridges occur on or near site. Small Class 4 (lowest ridge classification) ridges occur within 4-11km of site, many related to mine dumps and not natural features.</p>
Conservation Plan(Plan 4)	<p>Much of the Phase 2 area and Alternative expansion area are currently / were historically occupied by mining-related infrastructure. Phase 2 area overlaps with undesignated areas in terms of the Gauteng Conservation Plan; whereas the alternative area overlaps a designated Ecological Support Area (ESAs). The preferred site overlaps Critical Biodiversity Areas (CBAs) and ESAs associated with the non-perennial tributary which forms an ecological corridor in the immediate area.</p>
QDGS	<p>The site lies within QDGS 2628AD.All desktop data obtained from the citizen science sites have been sourced for this QDGS.</p>



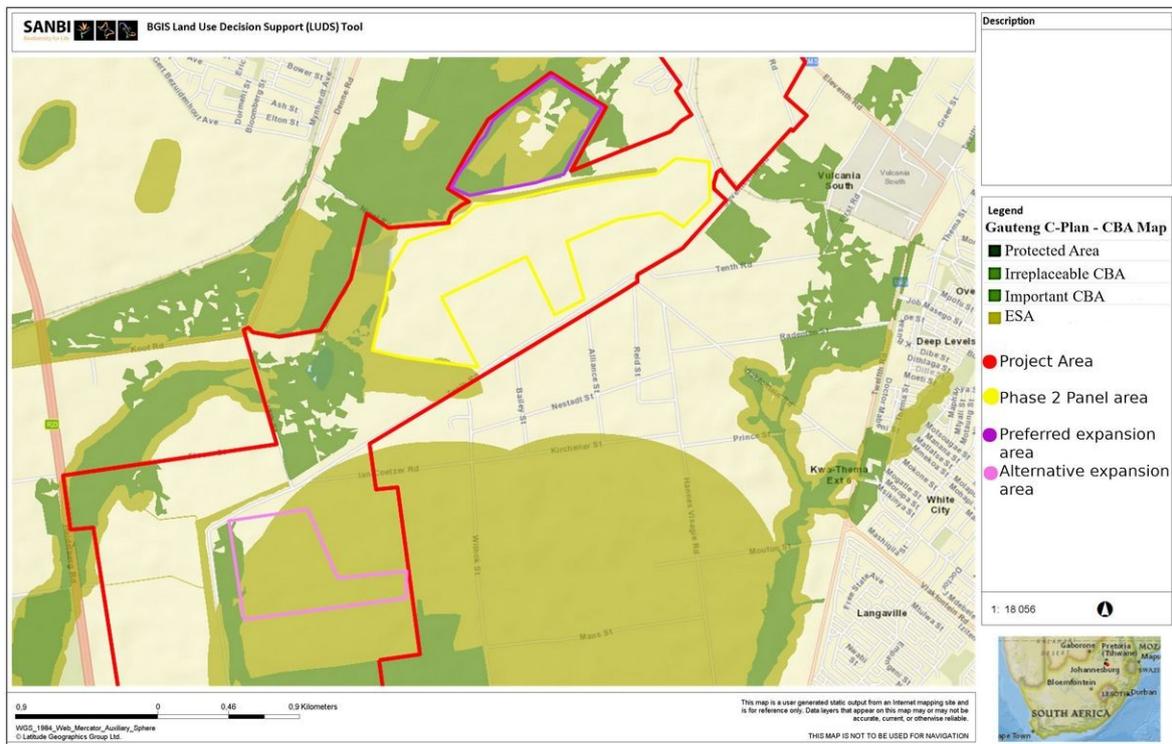
Plan 1: Phase 2 project area and Preferred and Alternative expansion areas, including approved Phase 1 activities overlaid onto Google Earth Image (April 2021)



Plan 2: Overall project area in relation to Important Bird Areas and Protected Areas (SANBI, BGIS Map Viewers)



Plan 3: Overall project area in relation to National Freshwater Priority Areas (SANBI, BGIS Map Viewers)



Plan 4: Phase 2 areas in relation to the Gauteng biodiversity conservation plan (SANBI, BGIS Map Viewers)

1.1 Scope of Work

The site and surrounds rank as high sensitivity (EIA Screening Toolkit) for terrestrial biodiversity from a desktop perspective, but given the history of the site (old tailings facilities, historical mine areas, historical and current cultivation areas), it is expected that the on-site biodiversity value to terrestrial fauna is low, other than the potential tributaries and associated ecological corridors on site. A full biodiversity impact assessment, in line with the new environmental theme's protocols where relevant to terrestrial fauna, has been completed with focus on the ecological corridors and natural habitat units.

The site and surrounds rank as medium and low sensitivity (EIA Toolkit) for animal species, with one butterfly (*Aloeides dentatis dentatis*) and two mammals (*Ourebia ourebi ourebi* and *Hydrictis maculicollis*) listed as potential species of conservation concern (SCC). Due to the current status of the site in terms of historical land use and impacts, it is expected that these animals are unlikely to permanently occur in the project area, or at least be restricted to the less disturbed habitats where these are ecologically connected, and the bulk of the site will have low value for significant animal species; a detailed compliance statement will be completed for animal species, but with a more detailed discussion of the three listed SCCs.

As per NEMA EIA Regulations (GNR982, 2017) and the requirements of the EIA Screening Tool Protocols for the Assessment and Reporting of Environmental Themes (GN320 & GN1150 of 2020), the following is relevant regarding the scope of work considering the site rankings and state:

- Assess and comment on the significance of the terrestrial fauna habitat components and current general conservation status of the property in terms of SANBI BGIS data (Table 1).
- Comment on the likelihood of threatened or protected (TOP) and potential SCC fauna occurring on site.
- Discuss important ecological drivers, processes and services as may be relevant.
- Address site sensitivity based on site survey findings in relation to regional ecological setting.
- Complete an impact statement for TOP fauna species and complete an impact assessment for biodiversity features of relevance to terrestrial fauna.
- Provide management recommendations to mitigate negative impacts of the activities on terrestrial fauna.
- Summary of Phase 1 findings are included where relevant, but the focus of this report is the proposed Phase 2 development (and the two expansion area alternatives).

1.2 Relevant Legislation

Several Acts govern the environment and development in relation to the environment within South Africa. In addition to NEMA, its regulations and protocols as mentioned above, the following are relevant:

- The National Environmental Management Biodiversity Act, 2004. (Act 10 of 2004).
- The National Environmental Management: Protected Areas Act (Act 57 of 2003).

NEM:BA and its regulations are of particular importance in terms of the fauna and flora ecosystems. The principal regulations considered within this report are:

- The National Environmental Management: Biodiversity Act (10/2004): Threatened or Protected Species Regulations. General Notice 152 of the 23/02/2007.
- The National Environmental Management: Biodiversity Act (10/2004): Publication of lists of species that are threatened or protected, activities that are prohibited and exemption from restriction. General Notice 151 of the 23/02/2007.
- The National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Lists. General Notice 1003 of 18 September 2020.
- National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations. General Notice Regulation 1020 of 18 September 2020.

The Nature Conservation Ordinance 12 of 1983 as amended by Gauteng General Law Amendment Act 4 of 2005 provides for the regulation of nature conservation within the Gauteng Province. The activity does not intend any specific scheduled activities regarding terrestrial fauna and this report does not delve into the legislation, but should any animal need to be handled on site then the relevant requirements must be complied with regarding the proposed development.

2. Methodology

2.1 Desktop Ecological Status

The desktop assessment utilised predominantly SANBI BGIS data as detailed above, accompanied by Google Earth satellite imagery.

2.2 TOP Species Desktop Lists

A TOP species assessment was undertaken, which incorporates the potential SCCs. The term TOP species (TOPS) was coined in terms of the threatened and protected species lists published under NEM:BA's General Notice 151 of 2007 (GN151, 2007). In this report TOPS also includes threatened (Vulnerable, Endangered, Critically Endangered) Red-listed and IUCN (IUCNredlist.org) species

(Near Threatened species are not detailed to retain focus on threatened taxa, but status is indicated where species is listed as threatened under another listing). Distribution and general information as presented in this report were sourced for:

- Mammals [sourced from Child, *et al.* (2016) as presented in the mammal Red-list on SANBI.org.za, and the Endangered Wildlife Trust Red-listed mammal fact sheets on ewt.org.za/reddata; supplemented by Stuart and Stuart (2013), Stuart and Stuart (2015), Murray (2011), Monadjem *et al.* (2010a) and Monadjem *et al.* (2010b)].
- Reptiles [Bates, *et al.* (2014). Although an Atlas Project and not strictly a Red-listed species book, provides recent taxonomic names and more recent listings to the prior outdated Red-Data Book of 1988. Reptile information was supplemented by Tolley and Burger (2012)]
- Frogs [sourced from Minter, *et al.* (2004) as presented in the frog Red-lists on FrogMap.adu.org.za and supplemented by du Preez and Carruthers (2009)].
- Invertebrates [also supplemented by Picker *et al.* (2012), Woodhall (2005) and SANBI Biodiversity Advisor Animal Checklists for ants, millipedes, Orthoptera and scarabs]:
 - Butterflies [Mecenero *et al.* (2013) as obtained from the South African Butterfly Conservation Association lists].
 - Dragonflies (Samways & Simaika, 2016).
 - Spiders (Dippenaar-Schoeman *et al.*, 2010).
 - Scorpions (Leeming, 2019).

Endemic species for mammals, birds, reptiles and frogs (supplemented by information on inaturalist.org) were also indicated where relevant. Variation between sources on endemic species (just South Africa or South Africa, Lesotho and Swaziland) is not seen as critical in terms of this report.

In order to determine recent fauna diversity data, various citizen science sites were consulted:

- Mammal, amphibian, reptile and available invertebrate species lists for the QDGS over the last 10 year period from the Virtual Museum of the Animal Demographic Unit (VMUS.ADU.org).
- Furthermore, iNaturalist (iNaturalist.org) was also consulted for presences of potential TOP species.

Exotic and / or Alien Invasive (AI) Species (AIS) recorded in the area as per the citizen science sites are also discussed where relevant.

2.3 Site Assessment

Much of the area was historically disturbed (mostly through mining and related activities, but also crop agriculture), as evidenced in historical Google Earth imagery. Most of the grasslands assessed during Phase 1 can be considered historically disturbed and recovering to varying degrees and only a few patches were regarded as undisturbed habitat units.

Additional meanders were completed for the proposed Phase 2 project area scheduled during late summer. Meanders focussed on the Preferred and Alternative expansion areas, as the Phase 2 panel area was visually noted to be an expansion of the Phase 1 area which consisted of very homogeneous grassland; regarded as a rehabilitated mine dump.

During meanders the areas were assessed for micro-habitats, signs (tracks, scat, etc.) of fauna and actual fauna species sightings.

2.4 Likelihood of TOP Species

For the desktop TOP species, a probability assessment to determine the likelihood of species occurring on site was completed. The probability assessment should be seen as a ranking system rather than an absolute and is designed to reduce subjectivity of results. Likelihood of occurrence was generally assessed as follows:

- Confirmed: either through past surveys, citizen science sites and local knowledge where provided.
- Likely: Distribution of the species occurs over the sites and the sites and immediate surrounds provide habitat, roosting and food requirements of the specific species. There is nothing to prevent the species from residing on site for a length of time (season or year).
- Possible: Distribution of the species occurs over the sites but the specific habitat, roosting and/or food requirements are absent or sparse on site, but are present in the greater area. Species are not likely to reside on site, but may forage over or traverse the site. Species population is at low density over site.
- Unlikely: Distribution is on the edge of site and habitat, roosting and/or food requirements are absent or sparse in the sites and surrounds. Species population is at low density and erratic over site or no recent records in the area.

2.5 Biodiversity Characterisation and Fauna Sensitivity Mapping

A sensitivity assessment is completed, which focusses largely on the findings of Table 1; CBAs and ESAs forming the main back-bone of the sensitivity assessment in relation to site findings as relevant specifically to the terrestrial fauna.

No Site Ecological Importance assessment was completed as no adequate habitat was noted for the relevant trigger SCCs (none of the areas will be critical to the survival or conservation of SCC populations) and no other SCC populations were identified as likely to occur within the proposed areas.

2.6 Fauna Impact Assessment

Impact assessment is a predictive tool to identify aspects of a development that need to be prevented, altered or controlled in a manner to reduce the impact to

the receiving environment, or determine where remediation activities will need to be incorporated into the overall development / activity plan. This does not mean that the impact will occur at the predicted significance.

The impact assessment methodology used is based on NEMA requirements (Appendix 3 of the EIA Regulations) and is presented under the impact assessment section. The following has been included:

- Impact assessment in terms of the activities / development on terrestrial fauna biodiversity and species, including discussion on cumulative and residual impacts where relevant.
- Presentation of mitigation measures for identified impacts. The mitigation actions considered the following:
 - STOP: These are activities that cannot continue until the necessary additional authorisations / legal requirements are obtained / met or the necessary operating procedures are compiled. Also includes activities that are considered fatal flaws where stipulated as such. These **MUST** be implemented.
 - MODIFY: These are development / activity aspects that must be considered for alteration or modification in order to reduce the impact on fauna.
 - CONTROL: These are mitigation actions that must be implemented to reduce the overall impact significance on fauna.
 - REMEDY: These are mitigation measures that focus on remedying impacts that may inadvertently occur on site.
- Terrestrial fauna monitoring plan where this is relevant.
- Concluding remarks and pertinent recommendations.

2.7 Limitations

Specialist studies are conducted to certain levels of confidence, and in all instances known and accepted methodologies have been used and confidence levels are generally high. This means that in most cases the situation described in the report is accurate at high certainty levels, but there exists a low probability that some aspects have not been identified / captured during the studies. Such situations cannot be avoided simply due to the nature of field work.

The proposed access road has been assessed on a desktop level as a compliance statement from photographs. Considering the road is proposed along existing mine roads, gravel roads and along tracks within disturbed areas (natural grasslands have been disturbed by grazing and bailing), this is considered adequate.

Habitat units identified in this report are approximations extrapolated from Google Earth satellite imagery. It must be kept in mind that changes between habitat units are gradual with transitional zones rather than hard edges.

The animal species guidelines (SANBI, 2020) requires assessment of potential areas of influence. Although visual assessment is completed of neighbouring open space areas, this reports does explore larger areas of influence where

relevant (for example downstream and catchment level impacts to potential fauna habitats and ecological corridors, or the migration / dispersion pathways of animals from conservation areas). Working with various fauna means the area of influence varies, but the discussion within this report is deemed to more than adequately address the areas of potential influence, although they are not necessarily mapped.

The Animal Species Guidelines (SANBI, 2020) only requires the assessment of SCCs (largely IUCN species), which excludes many of our nationally protected and Red-listed species. This report therefore also includes a synopsis of other potential TOP species that may be relevant to site based on citizen science databases, distribution data and broader habitat requirements.

The animal species protocols require academic-level information on species population demographics which is not possible with mobile animals that are startled by, and run away from, observers. Where such information is readily available, or can be collected during field surveys, this will be done in accordance with the protocols.

It must be stressed that the survey area is a much smaller area within the larger QDGS areas utilised for desktop species, and species presented in these databases may not have been recorded at the specific site.

Larger herbivores have not been fully evaluated within this report as these species are actively fenced in and managed within selected areas. Where they are historically recorded TOP species they are included in the relevant tables, but are not further discussed at length. This is further extended to large carnivore predators of such species (e.g. Lion and Cheetah). Rhinos and elephants are completely excluded due to sensitivity of information. As these species are largely restricted to reserves and farms this is not seen as a significant omission.

Some species are confirmed through signs rather than actual sightings. This is not always ideal as the age of the signs are not always known and many species have similar scat / tracks / marks on the environment and species cannot always be fully determined. The more signs the more confidence in the identification of the animal. This limitation must be kept in mind where species are discussed based on signs.

There are inherent errors in mapping programmes which must be considered with all mapping information presented.

Citizen Science projects were used for animal (ADU) baseline data. When utilising data from Citizen Science projects, the following must be kept in mind:

- Public interest in sites may be fickle, and may wane and increase, which could have a direct effect on the number of records available and therefore the number of species recorded.
- Populated areas or popular tourist destinations may have more participants and therefore higher biodiversity data than less populated areas.

- Misidentification of species by the public cannot be excluded, but is not seen as a major problem as this is likely to be a consistent issue from year to year, and a degree of vetting does take place.
- It must also be considered that animals observed in captivity may be recorded by citizens. Such animals should not be considered part of the natural biodiversity but as the data provided by citizen science sites do not make such distinctions, it cannot be separated from the biodiversity data presented in this report.

Due to the low resolution of some distribution maps and the mobility of animals, distribution data utilised to present animal lists are not 100% accurate. Proper distribution data for the TOP invertebrates is scant and it is difficult to conclusively state if every species does or does not occur in the area.

3. Results

The historical activities that have taken place within the area means that there is very little likelihood of grassland representing TOP ecosystems (to be confirmed by the flora specialists) occurring in proposed Phase 2 development areas. From Table 1, the only other significant desktop features relevant to terrestrial fauna included the streams, CBAs and ESAs, largely associated with the streams and adjacent ecological buffer areas.

The fauna survey carried out for Phase 1 assessment confirmed that the bulk of the Phase 1 project area was developed, supported infrastructure or was completely denuded or supported disturbed grasslands (historically impacted by mining or crop farming). Some fauna species still utilise such areas, but tend to be species that are highly tolerant of human activity and generalists species with wide habitat tolerances or very common species widely distributed in mosaic crop-lands of the Highveld. Most of the AI species (birds and rats) would also occupy such areas as most are closely linked to human settlements and areas of activity. More sensitive habitats within the Phase 1 project area were limited to, and associated with, the riverine areas and undisturbed grasslands and often correlated with the CBAs and ESAs.

Phase 2 areas were surveyed on the 25 March 2022 and the weather was warm and sunny, ideal for fauna surveys. Areas showed similar habitat characteristics to Phase 1 area (Table 2), with the bulk of the areas historically disturbed mine dumps / stockpile areas (either actively rehabilitated or left to naturally revegetate) or utilised as pastures and actively bailed. The proposed areas are adjacent to some wetland habitats (listed as moist grasslands in Plan 5 and Plan 6) and streams, but the site assessment indicated much of these areas to be highly disturbed and of minor value to sensitive fauna populations as habitat or ecological corridors.

The access road, along existing roads and tracks, was formalised after the final preferred site was selected, and has been included as a desktop evaluation in

this report. The photographs of the proposed road were taken on the 26 August 2022.

The complete desktop fauna lists as extracted from the various citizen science sites are included in Appendix B. The TOP and endemic species extracted from this list are further discussed below. Each faunal vertebrate group discusses, as relevant, the TOP species, endemic and restricted species and the AIS, focussing on species that are highly likely to occur on site for extended periods and therefore most likely to be exposed to the development and potential impacts. Invertebrates are discussed more generally.

Table 2: Site habitat characterisation

Phase 2 area - Extension of Phase 1 Area	
	
<p>Photograph 1: Phase 1 area overlooking onto Phase 2 area - homogeneous grassland of the rehabilitated mine dump</p>	<p>Photograph 2: Phase 2 homogeneous grassland; a continuation of Phase 1 area</p>
	
<p>Photograph 3: Disturbed and silt-laden stream on the northern boundary of Phase 2 area</p>	<p>Photograph 4: Disturbed areas denuded of vegetation</p>
<p>The bulk of the Phase 2 area is on a historical mine dump which appears to have been actively rehabilitated in the past through seeding, but the grassland is fairly homogeneous. Interspersed within the area are areas denuded of vegetation where rehabilitation may have failed, or soils may be compacted from historical activities (old roads). The stream to the north of the site (south of the Phase 2 Preferred Expansion Area) is disturbed and canalised (suspected to be due to old storm water drainage or water diversion infrastructure associated with the historical mine dump) and provides limited natural habitat and has limited value as an ecological corridor (active mine area is upstream) to terrestrial fauna. The reed beds dominate in the silt-laden channels and streams and provide adequate cover.</p>	

Phase 2 Preferred Expansion Area



Photograph 5: Disturbed grassland and small stand of alien invasive and exotic trees



Photograph 6: Old excavation and exotic and alien invasive vegetation (bailing in background)



Photograph 7: Disturbed grassland and vehicular tracks / old road across the site



Photograph 8: Bailing of grasslands

The Preferred area is north of the Phase 2 Expansion Area and enclosed by reedy vegetation of the disturbed and canalised reed beds in the south (as discussed above), a stream and wetland to the north and disturbed mine areas (old excavations and stockpile areas, and old rehabilitated areas) to the east. The Preferred area is dominated by disturbed grasslands that are utilised for pastures and bailing of the grasslands were taking place at the time of the site assessment.

Phase 2 Alternative Expansion Area



Photograph 9: Disturbed grassland dominating the eastern part of the area



Photograph 10: On-site stockpile remnants



Photograph 11: Old mine dam in the south-western corner of the area



Photograph 12: Man-made aquatic environments in water-filled depressions and shallow excavations

The Alternative area is south-west of the Phase 2 area and along the powerline route approved during Phase 1. The area is on old mine stockpile / tailings area and remnant stockpiles lie on and south of the area, including an old mine dam, most likely used to contain runoff from the stockpile area. The uneven surface has created artificial aquatic environments on site. A vlei area lies east of the area and some rocky habitat was found east of the vlei area, all outside the proposed Alternative expansion area.

Access to Phase 2 (DESKTOP)



Photograph 13: Mine infrastructure area and alien invasive trees along the existing road (Plan 5 - Point 1)



Photograph 14: Existing gravel road and adjacent disturbed grassland and alien invasive trees (Plan 5 - Point 2)

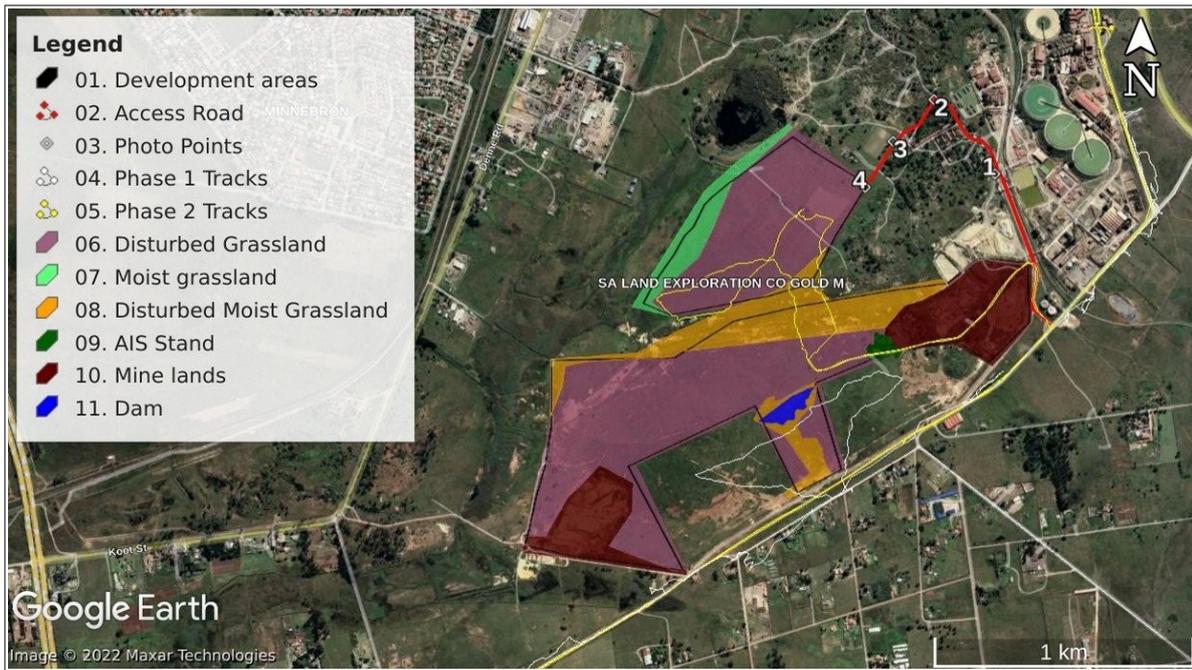


Photograph 15: Existing gravel road proposed for formal access and adjacent disturbed habitat (Plan 5 - Point 3)



Photograph 16: Tracks proposed for formal access development within the disturbed grasslands (overgrazed and bailing in the background) (Plan 5 - Point 4)

The proposed access road is along existing mine roads and tracks within man-made and disturbed habitats.



Plan 5: Habitat units overlaid onto Google Earth image (March 2022) with GPS tracks for Phase 2 and Preferred expansion area; access road photo locations indicated



Plan 6: Habitat units overlaid onto Google Earth image (March 2022) with GPS tracks for Alternative expansion area

The complete desktop fauna list as extracted from the various citizen science sites is included in Appendix B. The TOP and endemic species extracted from this list are further discussed below. Each faunal vertebrate group discusses, as relevant, the SCCs, other TOP species, endemic species and the AIS, focussing on species that are highly likely to occur on site for extended periods and therefore

most likely to be exposed to the development and potential impacts. Invertebrates are discussed more generally.

3.1 Mammals

In terms of the ADU list and historical species (Appendix B), the following is relevant:

- Unidentified species on the ADU list have not been included.
- Species names are indicated as per the latest mammal Red-Lists (Child et al., 2016).
- *Rhabdomys pumilio* does not have a distribution within Gauteng and *Rhabdomys dilectus* is included in Appendix B instead.
- *Mastomys natalensis* and *Mastomys coucha* represent the ADU *Mastomys* species in Appendix B.

3.1.1 Site Species

The Yellow Mongoose (*Cynictis penicillata*), Common Duiker (*Sylvicapra grimmia*) and Pretoria Mole-rat (*Cryptomys pretoriae*) are considered as confirmed species for the Phase 1 project area. All are tolerant of man-modified habitats and common in rural settings.

In addition, paw prints of a large cat were observed in the Alternative expansion area. It is suspected to belong to the Caracal (*Caracal caracal*) due to the size of the prints.

3.1.2 Historical & Likely TOP & Endemic Species

The previously recorded TOP and endemic mammals for the area and those with distributions across the area are indicated in Table 3. All previously recorded TOP species are antelope which are not likely to occur on site unless deliberately stocked on site and are not further discussed.

Of the two listed SCCs the following can be said:

- Oribi (*Ourebia ourebia*) (GN151 Endangered; RL Endangered). The buck utilises more natural, undisturbed grasslands as part of its territory (Shrader et al., 2016), and may occur in natural grasslands in the area, but are considered as possible species (may traverse or briefly forage) in the proposed Phase 2 development areas as none of the areas provide pristine grassland and human activity is fairly high in the areas (particularly Phase 2 area and Preferred expansion area).
- Spotted-necked Otter (*Hydrictis maculicollis*) (GN151 Protected; RL Vulnerable). The Spotted-necked Otter has a preference for large rivers, permanent pools, lakes, dams and well-watered swamps (Ponsonby et al., 2016), and has been considered only as a possible species for the development areas due to lack of adequate primary habitat.

The following TOP and endemic species are listed as likely to occur in the Phase 2 project area and surrounds; the wetland species are principally discussed as

small sections of appropriate wetland areas occur along the northern boundary of the Preferred expansion area:

- Serval (*Leptailurus serval*) (GN151 Protected). Main threats include loss and degradation of wetlands and associated grasslands. Wetlands generally harbour high rodent densities compared with other habitat types, and form the core areas of Serval home ranges; disruption to such habitats reduces prey-base (Ramesh *et al.*, 2016).
- Southern Reedbuck (*Redunca arundinum*) (GN151 Protected). Impacted in the past by habitat transformation and degradation associated with agricultural activities and settlements. On agricultural land, they are subjected to possible persecution due to damage to pastures and crops. Also susceptible to hunting, snaring and poaching (du Plessis *et al.*, 2016).
- Southern African Hedgehog (*Atelerix frontalis*) (GN151 Protected). Main threats include habitat loss, degradation and fragmentation from urban sprawl and agriculture. Also threatened by illegal harvesting from the wild for food, or for sale as pets and for traditional medicine (Light *et al.*, 2016).

3.1.3 Alien & Exotic Species

No exotic or AI species were recorded for the QDGS. Cats (*Felis catus*) were noted in the area and dogs (*Canis familiaris*) were heard around site during Phase 1 assessments. The area is also an agricultural area and utilised for stock grazing. Cattle and chickens are confirmed and it is also suspected that sheep occur in the area based on scat and tracks observed during Phase 1 site assessments.

3.1.4 Ecological Services

The various ecosystem services provided by the historically recorded species and likely TOP fauna are fairly typical and include:

- Prey-base for predators / raptors.
- Control of potential vermin, pests and AI species, including potential vectors for disease.
- Seed dispersal.
- Ecosystem engineers:
 - Bulk grazers facilitate the presence of more selective, smaller grazers by inducing productive grasslands for these species.
 - Burrowers (for refuge, habitat or simply digging for tubers / roots). Diggings and burrows affect flow of resources, trapping materials that change soil chemical, physical nature and moisture, creating a mosaic of varied and regenerating habitat patches.

Table 3: TOP and Endemic Mammals (trigger SCCs as per the Environmental Screening Report indicated in bold)

Family	Common name	Scientific name	Endemism	SA GN151	SA Red-list	IUCN
Site species						
Carnivora	Caracal (tracks)	<i>Caracal caracal</i>				
Carnivora	Mongoose, Yellow	<i>Cynictis penicillata</i>				
Cetartiodactyla	Duiker, Common (scat & tracks)	<i>Sylvicapra grimmia</i>				
Rodentia	Mole-rat, Pretoria (mounds)	<i>Cryptomys pretoriae</i>				
TOP and Endemic Species historically recorded within the greater area / QDGS						
Cetartiodactyla	Wildebeest, Black	<i>Connochaetes gnou</i>	Endemic	Protected		
Cetartiodactyla	Blesbok	<i>Damaliscus pygargus phillipsi</i>	Endemic		NT	
Likely TOP and Endemic species						
Carnivora	Serval	<i>Leptailurus serval</i>		Protected	NT	
Cetartiodactyla	Reedbuck, Southern	<i>Redunca arundinum</i>		Protected		
Eulipotyphla	Hedgehog, Southern African	<i>Atelerix frontalis</i>		Protected	NT	
Eulipotyphla	Shrew, Forest	<i>Myosorex varius</i>	Endemic			
Possible TOP and Endemic Species						
Carnivora	Otter, Spotted-necked	<i>Hydrictis maculicollis</i>		Protected	Vulnerable	NT
Carnivora	Hyaena, Brown	<i>Parahyaena brunnea</i>		Protected	NT	NT
Cetartiodactyla	Oribi	<i>Ourebia ourebi</i>		Endangered	Endangered	
Cetartiodactyla	Rhebok, Grey	<i>Pelea capreolus</i>	Endemic		NT	NT
Cetartiodactyla	Reedbuck, Southern Mountain	<i>Redunca fulvorufula</i>			Endangered	Endangered
Unlikely TOP and Endemic Species						
Carnivora	Cat, Black-footed	<i>Felis nigripes</i>		Protected	Vulnerable	Vulnerable
Carnivora	Honey Badger (Ratel)	<i>Mellivora capensis</i>		Protected		
Carnivora	Leopard	<i>Panthera pardus</i>		Vulnerable	Vulnerable	Vulnerable
Carnivora	Fox, Cape	<i>Vulpes chama</i>		Protected		
Rodentia	Mouse (Rat), White-tailed	<i>Mystromys albicaudatus</i>			Vulnerable	Endangered

CR: Critically Endangered; EN: Endangered; VU: Vulnerable; PR: Protected; NT: Near Threatened

3.2 Herpetofauna

In terms of the ADU list (Appendix B) the following is relevant:

- Omitted species are excluded from this report.
- The species names used in this report are as per Bates *et al.* (2014) and du Preez and Carruthers (2009).
- The ADU list includes *Leptotyphlops* sp. *Leptotyphlops scutifrons* has a corresponding distribution and is included in Appendix B.

3.2.1 Site Species

Only one species of frog was confirmed for site during Phase 1 site assessments and was also previously recorded in the larger QDGS:

- Giant Bullfrog (*Pyxicephalus adspersus*) (GN151 Protected). Species is threatened by loss and degradation of its wetland and neighbouring terrestrial habitat.

A juvenile Giant Bullfrog was observed during Phase 1 assessments, on the move near the Rietspruit Tributary further south of the Phase 2 project area, outside all Phase 2 development areas. The Giant Bullfrog has been reported to be declining and is listed nationally as Near Threatened and effort must be made to conserve the species by way of maintaining the natural habitats and ecological corridors remaining in the area. In terms of the Phase 2 areas, the main potential area would be the wetland in the north and north-west of the project area associated with the CBA area and largely excluded from the development areas proposed for Phase 2.

3.2.2 Historical & Likely TOP & Endemic Species

No other TOP species (other than the Giant Bullfrog) have been recorded or are expected in the area (Table 4).

Endemic species that have been recorded for the QDGS or considered likely in the area are not restricted species and the area is not a site of endemism for reptiles or frogs.

3.2.3 Alien & Exotic Species

No AIS or exotic species were identified from ADU lists or iNaturalist.

3.2.4 Ecological Services

Many of the herpetofauna species feed on arthropods and will cumulatively contribute to control of invertebrate numbers, including aquatic invertebrates that may be vectors for disease. Many reptiles and frogs are also food source to many birds and mammals, as well as other reptile species.

Table 4: TOP and Endemic Herpetofauna (No SCCs as per the Environmental Screening Report)

Family	Common name	Scientific name	Endemism	SA GN151	SA Red-list	IUCN
Site species						
Pyxicephalidae	Bullfrog, Giant	<i>Pyxicephalus adspersus</i>		Protected	NT	
TOP and Endemic Species historically recorded within the greater area / QDGS						
Agamidae	Agama, Eastern Ground	<i>Agama aculeata distanti</i>	Endemic			
Cordylidae	Lizard, Common Crag	<i>Pseudocordylus melanotus melanotus</i>	Endemic			
Gekkonidae	Gecko, Transvaal Thick-toed	<i>Pachydactylus affinis</i>	Endemic			
Lamprophiidae	Snake, Aurora House	<i>Lamprophis aurora</i>	Endemic			
Scincidae	Skink, Thin-tailed Legless	<i>Acontias gracilicauda</i>	Endemic			
Pyxicephalidae	Bullfrog, Giant	<i>Pyxicephalus adspersus</i>		Protected	NT	
Bufo	Toad, Raucous	<i>Amietophrynus rangeri</i>	Endemic			
Likely TOP and Endemic species						
Lacertidae	Lizard, Delalande's Sandveld	<i>Nucras lalandii</i>	Endemic			
Lamprophiidae	Snake, Spotted Harlequin	<i>Homoroselaps lacteus</i>	Endemic			
Lamprophiidae	Snake, Olive Ground	<i>Lycodonomorphus inornatus</i>	Endemic			
Hyperoliidae	Frog, Rattling	<i>Semnodactylus wealii</i>	Endemic			
Possible TOP and Endemic Species						
Cordylidae	Lizard, Coppery Grass	<i>Chamaesaura aenea</i>	Endemic		NT	
Lamprophiidae	Slug-eater, Common	<i>Duberria lutrix lutrix</i>	Endemic			
Lamprophiidae	Snake, Striped Harlequin	<i>Homoroselaps dorsalis</i>	Endemic		NT	
Unlikely TOP and Endemic Species						
Cordylidae	Lizard, Cape Grass	<i>Chamaesaura anguina anguina</i>	Endemic			

CR: Critically Endangered; EN: Endangered; VU: Vulnerable; PR: Protected; NT: Near Threatened

3.3 Invertebrates

One SCC butterfly has distribution near the area and has been recorded for the QDGS (October 2015) and includes:

- *Aloeides dentatis dentatis* (Lepidoptera: Nymphalidae) (RL Endangered; IUCN Vulnerable). Host plant, *Hermannia depressa*, was confirmed scattered throughout the grasslands along the power line route surveyed during Phase 1. The other known host plant, *Lotononis eriantha* was not confirmed on site. The species is mapped in the Gauteng conservation plan and is known from three localities in Gauteng Province, all within protected areas (i.e. Ruimsig Entomological Reserve, Klipriviersberg Nature Reserve, Suikerbosrand Nature Reserve). The species is therefore unlikely on site (Gauteng C-Plan technical report).

Butterflies were specifically noted on site during the surveys, but no *Aloeides dentatis dentatis* or similar, potentially confusing, species were noted on site, despite Phase 1 surveys being within a peak flight period of the species and supporting patches of appropriate habitat. Phase 2 development areas are not considered to provide ideal habitat for the species.

Other TOP ADU species confirmed for the QDGS include the Baboon Spider, *Harpactira hamiltoni* (Araneae: Theraphosidae); it is a nocturnal burrowing species unlikely to be confirmed during diurnal surveys, but cannot be excluded from the more natural habitats in the greater area. The historically disturbed nature of Phase 2 development areas makes the species unlikely within these areas.

The following butterflies were confirmed for the site during Phase 1 and Phase 2 assessments:

- *Junonia orithya madagascariensis* (Lepidoptera: Nymphalidae) (Eyed Pansy).
- *Junonia hierta cebrene* (Lepidoptera: Nymphalidae) (Yellow Pansy).
- *Danaus chrysippus* (Lepidoptera: Nymphalidae) (African Monarch).
- *Pontia helice helice* (Lepidoptera: Pieridae) (Meadow White).
- *Eurema brigitta brigitta* (Lepidoptera: Pieridae) (Broad-bordered Grass Yellow).
- *Catopsilia florella* (Lepidoptera: Pieridae) (African / Common Vagrant).
- *Tarucus sybaris* (Lepidoptera: Lycaenidae) (Dotted Blue).

Ecological services provided by the invertebrates are too numerous to mention. Some of the more relevant services to the area include:

- Their enormous biomass makes them a significant food source in the food chain and many species feed exclusively on invertebrates.
- Decomposers of all biological matter (including animal matter, plant matter, faecal matter) and therefore significantly contribute to nutrient recycling and the prevention of aquatic / terrestrial eutrophication / nitrification.

4. Terrestrial Biodiversity and Fauna Species

This section must be read together with the floral sensitivity plan to ensure a comprehensive terrestrial biodiversity sensitivity plan.

4.1 Terrestrial Biodiversity

Table 5 summarises the terrestrial fauna biodiversity findings as required under the terrestrial biodiversity protocol.

Table 5: Terrestrial fauna biodiversity features and preliminary impact statements

Aspect	Fauna findings
Ecological processes	<p>The main ecological process is the plant-based primary production of 'food' through photosynthesis and forms the principal base of the food-chain in a terrestrial environment. Secondly, the associated contribution to the water cycle through evapotranspiration is also a significant ecological process provided by the plant life. Another important process is that of natural fires. As the natural fire cycles in South Africa's grassland and savanna have already been impacted by humans, this is not evaluated further.</p> <p><u>Impact:</u> The removal of vegetation will result in loss of the primary production and primary food base provided by plants. Phase 2 area is an extension of the homogeneous grassland of Phase 1 and constitutes a rehabilitated mine dump and the impact is not seen as significant in terms of terrestrial fauna. In terms of the two alternative sites, the preferred site is bailed regularly for the large part and the alternative site constitutes more disturbed land (old mine stockpiles) where vegetation is lacking or highly disturbed; both constitute disturbed vegetation where processes are already impacted. The access road is proposed over existing mine roads and tracks; the latter will result in minimal removal of vegetation where processes will be marginally affected. Where vegetation is retained these processes will continue.</p>
Ecological drivers: climate change, AIS infestation & habitat changes.	<p>The Phase 2 area can be considered a homogeneous habitat with only the drainage line and dam providing some diversity in the area. The Alternative expansion area is disturbed and although habitat within the area is diversified, it constitutes disturbed and man-made habitats which will not support significant populations of sensitive terrestrial fauna species. The Preferred expansion area was also dominated by disturbed grasslands but incorporated more natural habitat along the streams, although anthropogenic activity in the area was high and the site was near to the operational processing plant and mine offices. None of the areas were observed to, or expected to, support any significant terrestrial fauna populations.</p> <p><u>Impact:</u> The construction of the PV panels will result in the loss of the habitat, but the value of the habitat in terms of sensitive terrestrial fauna is negligible. There is also limited difference in value of the two alternative sites as habitat for sensitive faunal species. The most significant habitats lie adjacent to the sites and are associated with the tributary to the north of the Preferred area and the wetland area to the east of the Alternative area; both wetlands must be managed in accordance to the wetland specialist's recommendations. The access road is proposed over existing mine roads and tracks; the latter will result in minimal removal of vegetation; no significant loss of fauna habitat is expected. The development is not expected to significantly alter the AI species around</p>

Aspect	Fauna findings
Ecological services	<p>the project area.</p> <p>No special or critical ecological services provided by fauna were identified for the area and were largely related to the usual services provided by fauna (prey-base in food chain, pest control, pollination and seed dispersal). <u>Impact:</u> It is expected that the limited faunal populations on site will move off to neighbouring areas where they will persist and provide their ecological services. Some services will cease in the immediate panel development areas but will continue in the surrounds and impact is not considered highly significant.</p>
Ecological Corridors	<p>The aquatic ecological corridors are limited to the non-perennial tributary (flows north of the Preferred area and north-west of the Phase 2 area) and the Rietspruit Tributary (more than 1.5km south of the alternative area), the latter being the least impacted in the project area, with moist and terrestrial grassland units interconnected with the riverine corridor. This corridor extends to the east (its origins) and flows west, to confluence with the Rietspruit.</p> <p>The non-perennial tributary has been heavily impacted and modified by the various historical mining activities in the area. Nonetheless the tributary still contributes to local ecological corridors and is directly connected to the Rietspruit tributary in the south. <u>Impact:</u> No direct impacts are expected to these corridors which should remain intact. As all are riverine corridors, indirect impacts by way of silt-loaded or contaminated runoff from the development areas must be prevented. Also, the wetland and buffers around these streams (focus is on the wetland areas extending across the northern boundary of the Preferred area) must be managed in accordance with the recommendations of the wetland specialist.</p>
CBAs and ESAs	<p>No CBAs intersect the Phase 2 area; only limited ESAs intersect the eastern and northern border. None of the ESAs are critical in terms of habitat provision or ecological corridors to significant terrestrial fauna (largely disturbed landscapes), and serve a limited ecological buffering function to the CBA corridor north-west of the area and associated with the non-perennial tributary.</p> <p>CBAs extend across most of the Preferred areas borders, largely associated with the wetlands around the site and ESA buffer zones encroach onto most of the area. The proposed road also transect the eastern CBA to access the site, along existing tracks. The bulk of the CBAs are disturbed and provide limited habitat or service as ecological corridors to significant terrestrial fauna. The CBA and ESA associated with the northern non-perennial tributary at the Preferred site are considered to correspond to natural habitat that may support some TOPS species in the area and retain their status in terms of terrestrial fauna.</p> <p>The bulk of the Alternative area is designated as an ESA with a narrow CBA west of site extending into the western boundary of the area. The CBA within this area is highly disturbed (old mine dumps, paddocks and gravel road) and has little value in terms of terrestrial fauna habitat. The value of the site as an ESA is also limited in terms of terrestrial fauna; the ESA overlapping the wetland east of site being more critical in terms of terrestrial fauna. <u>Impact:</u> The northern non-perennial tributary and associated wetland area is the most significant habitat unit associated with the proposed development areas and retains value as a CBA/ESA in terms of terrestrial fauna. This stream originates in the area and value as an ecological corridor is limited. Development in this part of the area should be limited and managed as per the wetland specialist recommendations.</p>
International	The Blesbokspruit RAMSAR Wetlands occur approximately 12km east of site.

Aspect	Fauna findings
Conservation	<u>Impact:</u> No impacts will occur to these wetlands which are in a different sub-catchment.
PAs	The formally protected Suikerbosrand Provincial Nature Reserve is the only Protected Area within 10km of site (<10km south of site). <u>Impact:</u> No impacts are expected to this or other PAs.
NPAES	No NPAES occur within 10km of site. <u>Impact:</u> No impacts are expected on NPAESs.
SWSA	The Eastern Karst Belt SWSA occurs just over 2km north-east of the project area. <u>Impact:</u> Groundwater falls outside the scope of the fauna assessment, but any contamination to water resources must be curbed as fauna and the faunal habitats are reliant on water.
NFEPA features	The site is not within a NFEPA Catchment. A non-perennial tributary flows just within the north and north-west boundary of the project area and flows south into the Rietspruit Tributary (>1.5km south of the Alternative expansion area), which is a NFEPA river with an unacceptable ecological state (river condition has not been assessed). The Rietspruit Tributary eventually conflues with the Rietspruit (unacceptable ecological state and river condition) 5.3km further west. The wetlands associated with this non-perennial tributary and with the mine area and other nearby wetlands are Rank 5 and 6 NFEPA wetlands, which provide little in terms of habitat for TOP species (cranes, TOP water birds and frogs). The aquatic habitats are impaired and unlikely to have significant value for sensitive riverine and wetland terrestrial fauna species. <u>Impact:</u> Further impacts to any of these surface water systems could further impair ecological connectivity and the remaining natural habitats associated with these systems. In addition, any contaminated runoff from site or sedimentation will reach these systems very quickly due to their proximity to the development areas and impact downstream areas and associated aquatic ecosystems; runoff from development sites must be managed.
Gauteng Ridges	No classified ridges occur on or near site. Three very small Class 4 (lowest ridge classification) ridges occur within 4-11km of site. No rocky habitats were identified within the development areas. <u>Impact:</u> Classified Gauteng Ridges will not be impacted. No destruction of rocky habitats will occur.

4.2 Fauna Species

The following is relevant in terms of vertebrate fauna species:

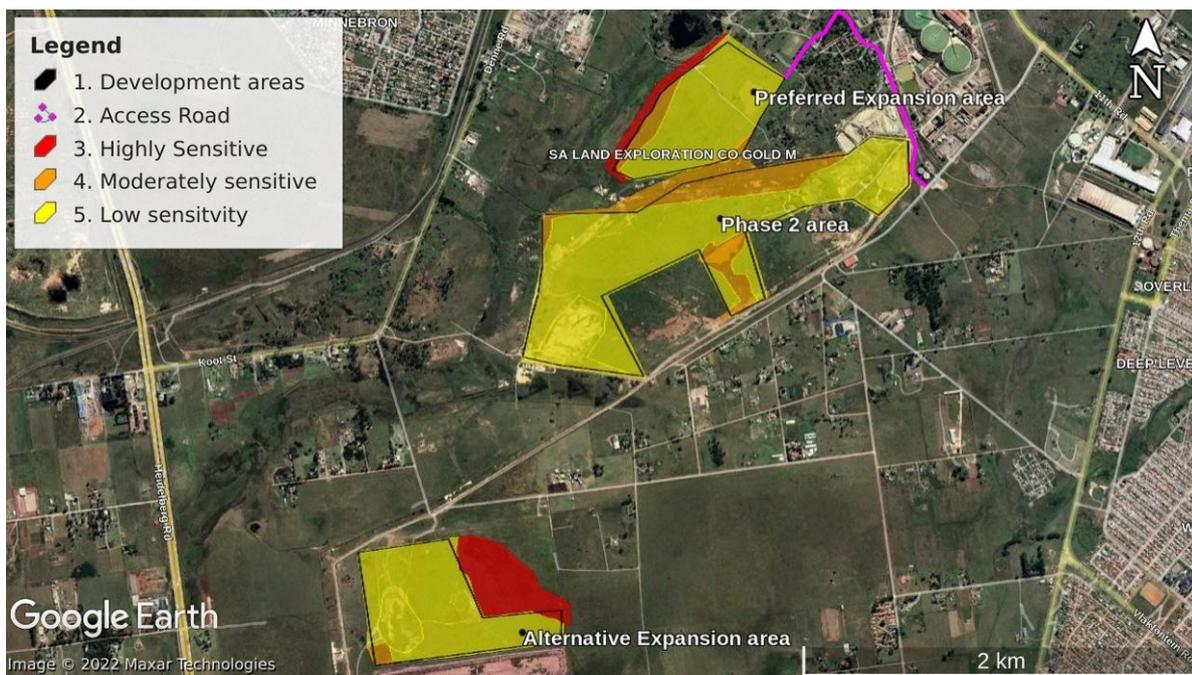
- In terms of the mammals:
 - SCCs (Oribi and Spotted-necked Otter) are unlikely to occur within the project area for any length of time but may be present in the less disturbed surrounding habitats and may traverse the project area from time to time; considered possible species in the development areas. They are mobile species likely to move away from noise and human activity and unlikely to experience direct impact.

- Three TOP species are maintained as likely to occur on site:
 - The Serval and Southern Reedbuck are linked to wetland habitats and associated reedbeds neighbouring the main development sites.
 - The disturbed nature of the terrestrial habitats reduces the likelihood of significant populations of the Southern African Hedgehog, but active monitoring for the species is required during the construction phase.
- In terms of herpetofauna:
 - No significant TOP herpetofauna populations are expected on the property.
 - The Giant Bullfrog, was the only TOP herpetofauna confirmed in the area along the Rietspruit Tributary, south of the alternative site. The species is threatened by loss and degradation of its wetland and neighbouring terrestrial habitat and effort must be made to conserve the species by way of maintaining the natural habitats and ecological corridors remaining in the area. In terms of the Phase 2 areas, the main potential area would be the wetland in the north and north-west of the project area which must be managed in accordance to the recommendations of the wetland specialist. Active monitoring must be undertaken for the species during construction phase.
- In terms of invertebrates
 - The Protected Baboon Spiders cannot be excluded from site, but it is expected that they would occupy the less disturbed habitats around site.
 - Despite several butterflies being confirmed on site, no *Aloeides dentatis dentatis* or similar species were noted on site. Populations of the butterfly are not expected to occur on the development sites.

4.2.1 Site Ecological Importance & Site Sensitivity

No Site Ecological Importance assessment was completed as no adequate habitat was noted for the relevant trigger SCCs (none of the areas will be critical to the survival or conservation of SCC populations) and no other SCC populations were identified as likely to occur within the proposed development areas.

In general, the overall site sensitivity is in partial agreement with the Gauteng conservation plan, in terms of terrestrial fauna (Plan 7). Where CBAs overlap natural habitat units, wetlands and areas most likely utilised by the more sensitive terrestrial fauna, these have been designated as highly sensitive areas. Where CBAs / ESAs have intersected disturbed habitat areas, then these have been designated as moderately sensitive areas where ecological function is still provided to terrestrial fauna (habitat provision, ecological corridor or water provision). The bulk of the sites are designated as low sensitivity due to the modified and / or disturbed nature of the areas.



Plan 7: Site Sensitivity

5. Fauna Impact Assessment

In terms of the fauna biodiversity and animal species findings above, the following impacts could be significant during construction phase and have been assessed further:

- Destruction of fauna habitat, specifically potential TOPS habitat (designated highly sensitive areas in Plan 7).
- Hindering or interfering with TOP fauna species that may traverse through the project area.
- Contaminated or silt-loaded runoff to on-site and nearby aquatic ecosystems within the project area.

Impact assessment criteria considered include:

The duration of the impact		
Score	Duration	Description
1	Temporary	0 - 1 years
2	Short to medium term	2 - 5 years
3	Medium term	5 - 15 years
4	Medium to long term	15+ years
5	Permanent	Permanent
The extent of the impact		
Score	Extent	Description
1	Site specific	Within the site boundary
2	Local	Affects immediate surrounding areas
3	Regional	Extends substantially beyond the site boundary
4	National	Extends to almost entire province or larger region
5	International	Affects country or possibly world
The magnitude (severe or beneficial) of the impact		
Score	Severe/beneficial	Description

	effect	
0	None	No effect - No disturbance/benefit
2	Slight	Little effect - negligible disturbance/benefit
4	Slight to moderate	Effects observable - environmental impacts reversible with time
6	Moderate	Effects observable - impacts reversible with rehabilitation
8	Moderate to high	Extensive effects - irreversible alteration to the environment
10	High	Extensive permanent effects with irreversible alteration
The probability of the impact		
Score	Rating	Description
1	Very Improbable	Probably won't occur
2	Improbable	Low likelihood of occurring
3	Probable	Distinct possibility of occurring
4	Highly Probable	Very likely to occur
5	Definite	Will occur, regardless of any intervention
The Significance = (Magnitude + Spatial Scale + Duration) x Probability		
Low (score of 1 to 29)		Impact will not significantly change fauna biodiversity and requires no significant mitigation measures.
Moderate (score of 30 to 60)		Impact will change fauna biodiversity and requires some mitigation measures.
High (Score of 61 to 100)		Impact will significantly change fauna biodiversity and significant mitigation measures and management is required. Potential fatal flaw.

Activity:	Solar Panel Construction and to a lesser extent edge affects during Operational Phase				
Impact:	<p>1) Nature: Potential destruction of sensitive fauna habitat</p> <p>For areas designated as low sensitivity the impact is not significant in terms of fauna. The highly and moderately sensitive areas provide less disturbed habitats, improve habitat diversity and provisions for fauna; activities in these areas must be reduced and / or managed.</p>				
Significance rating Construction:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium (3)	Local (2)	Moderate-high (8)	Probable (4)	Moderate (52)
Post-Mitigation	Short (1)	Site specific (1)	Slight (2)	Improbable (2)	Low (8)
Significance rating Operation:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium (3)	Site specific (1)	Slight to moderate (4)	Improbable (2)	Low (16)
Post-Mitigation	Short (1)	Site specific (1)	Slight (2)	Improbable (2)	Low (8)
Is the Impact Reversible?	Reversible: Requires some mitigation and rehabilitation to ensure reversibility, but most areas are disturbed				
Mitigation Measures:	<p>STOP: No activities are to commence within the waterways until authorisations are obtained under the National Water Act (NWA) and NEMA.</p> <p>No activities are to take place in areas designated as highly sensitive as per Plan 7, pending the recommendations of the wetland specialist and until the authorisations are obtained under the National Water Act (NWA) and NEMA.</p> <p>MODIFY: Low sensitivity areas must be targeted for all supporting infrastructure / facilities. Medium sensitivity areas should be targeted for open space and green spaces with reduced development footprints (<50%) in these areas (utilise for panels, as grassy drainage areas / paths, etc.).</p> <p>Where fencing around structures is required, these must enclose the discrete footprints of infrastructure areas and not sever connectivity within and between highly sensitive areas. Any fences (including Clearvu) or walls can be considered for enclosing discrete footprint areas (immediately around the infrastructure). Fencing across open spaces and across wetland areas must be palisade or similar fencing that allows the free movement animals (Clearvu not considered appropriate in terms of this) and not wire mesh or barbed wire (materials which could ensnare animals).</p> <p>The gravel road crossing the Rietspruit Tributary should not be utilised by any construction vehicles during the rainy season if the bullfrogs are observed to be active near the area (as per Environmental Control Officer’s monitoring duties).</p> <p>Plan and implement a proper storm-water management plan from the onset to prevent excessive runoff and associated erosion and sedimentation in downstream habitats.</p> <p>CONTROL: Peg out and demarcate areas for development and no-go areas before commencing with any activities. No activity whatsoever should occur in no-go areas.</p> <p>REMEDY: Where areas not targeted for development are inadvertently impacted and / or damaged, clear any material dumped and rehabilitate the site as soon as possible.</p>				
Cumulative impacts:	Generally, the cumulative loss of habitat will reduce species richness and biodiversity. In this highly disturbed area the impact is not seen as significant as long as undisturbed areas remain in their current state.				

Residual impacts:	Although only a single TOP species was confirmed, it is possible that the natural habitat units support some TOP species. Therefore, the loss of remaining undisturbed habitats within the area may mean a decrease and potential loss of TOP species in the area.
Climate Change:	Climate change status for Gauteng is not expected to change significantly due to the proposed development, although carbon emissions may be reduced due to the proposed development. No additional regional or national climate change impacts expected on terrestrial fauna.

Activity:	Solar Panel Construction and to a lesser extent Operational Phase				
Impact:	2) Nature: Hindrance, trapping, killing of fauna, focussing on potential TOP species in the project area TOP species may wonder into the project area periodically.				
Significance rating Construction:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Short-medium (2)	Local (2)	Moderate (6)	Probable (3)	Moderate (30)
Post-Mitigation	Short-medium (2)	Local (2)	Slight-moderate (4)	Improbable (2)	Low (16)
Significance rating Operation:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium (3)	Local (2)	Slight to moderate (4)	Improbable (2)	Low (18)
Post-Mitigation	Short (1)	Local (2)	Slight (2)	Improbable (2)	Low (10)
Is the Impact Reversible?	Moderately Reversible: Requires mitigation and rehabilitation to ensure reversibility				
Mitigation Measures:	<p>STOP: No poisons against fauna are to be brought on site; where this is not possible any substance that could be toxic to fauna will be stored and handled in a manner that will prevent exposure of the substance to the environment. No deliberate killing or trapping of indigenous fauna is allowed on site.</p> <p>CONTROL: Environmental awareness training must include the prohibition of any harm or hindrance to any indigenous fauna species and the consequences of such actions.</p> <p>Ensure safe speed limits and safe working conditions in the project area.</p> <p>REMEDY: Contracts with contractors must specify actions that will be taken against contractors who do not conduct activities in line with the EMPr.</p> <p>Should any fauna be trapped within the development area (specifically the South African Hedgehog), activities will cease and adaptive management applied (allow animals to freely leave the area); specialists will be brought in to safely remove the animals from site in line with the Gauteng Nature Conservation Ordinance if deemed necessary.</p> <p>Monitor TOPS observed to enter the site, specifically the areas around the non-perennial tributary and Rietspruit Tributary during rainfalls for Giant Bullfrog activity. Should monitoring indicate that aspects of the development are posing a risk to these species, then activity will be ceased or management must be adapted to protect these species. Any requirements of the Gauteng Nature Conservation Ordinance will be complied with regarding handling of such species.</p>				
Cumulative impacts:	Local extinctions that could be caused by cumulative destruction of TOPS will alter the faunal community structure (for example the prey-base may bloom, or competitive predator numbers could decline). Predicting the extent and significance of such changes is not possible, although is not expected to be severe in terms of this area.				
Residual impacts:	Destruction of any TOPS (or prey-base of TOPS) could cause a cascade affect on populations and, in extreme circumstances, local extinctions.				
Climate Change:	No climate-change related impacts expected.				

Activity:	Solar Panel Construction and to a lesser extent Operational Phase				
Impact:	3) Nature: Contamination of fauna environment The proximity of the project area to various water bodies and tributaries means that any contamination in the project area will find its way into the streams and aquatic environments during a rainfall event.				
Significance rating Construction:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium (3)	Local (2)	Moderate (6)	Definite (5)	Moderate (55)
Post-Mitigation	Short-medium (2)	Site specific (1)	Slight-moderate (4)	Improbable (2)	Low (14)
Significance rating Operation:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium-long (4)	Local (2)	Slight to moderate (4)	Improbable (2)	Low (20)
Post-Mitigation	Medium-long (4)	Site specific (1)	Slight to moderate (4)	Improbable (2)	Low (18)
Is the Impact Reversible?	Moderately Reversible: Requires mitigation and rehabilitation to ensure reversibility				
Mitigation Measures:	<p>STOP: Discontinue use of all faulty machinery / equipment on site until properly repaired. No activities are to commence within the streams, wetlands and buffers until the necessary authorisations are obtained under the National Water Act (NWA). Ensure a waste management plan has been compiled in line with the National Environmental Management: Waste Act (NEM:WA) before any activities commence on site.</p> <p>MODIFY: Due to proximity of petrol stations, hydrocarbon storage on site should be limited to daily needs only. Plan and implement a proper storm-water management plan from the onset. Facilities will be provided for storage of all hazardous substances and waste to prevent the exposure of these substances to the environment. The aim is to PREVENT exposure of fauna to any potential toxin.</p> <p>CONTROL: All equipment / machinery will be serviced and maintained within operating specifications to prevent the risks of leaks. Repairs to vehicles will be conducted off-site. All substances including waste must be properly stored and handled according to prescribed manner / standards and must not be exposed to the environment and sheltered from environmental elements. Any cars, machinery or equipment parked on site will either be parked on a concrete slab or have pans placed under them to collect all drips and potential leaks. Manage all waste in line with the waste management plan. Cement bags will be stored under a tarpaulin and on an impervious sheet. Cement mixing will take place within a designated area only.</p> <p>REMEDY: All hydrocarbons spills on bare ground will be cleared immediately. Inspect and clear all litter and waste from the site and surrounds. All dry and wet cement spills on bare ground will be cleared immediately.</p>				
Cumulative impacts:	Any additional development will add to the potential of contamination to the area and down-slope areas. Large spills or continuous cumulative leaks and waste dumping that are not cleaned up will enter the environment through run-off or				

Activity:	Solar Panel Construction and to a lesser extent Operational Phase
	leachate and contaminate the environment.
Residual impacts:	If toxic substances and waste are not properly managed or spills not cleared immediately, the environment will suffer extended residual impacts, particularly if toxins seep into the soils or are washed to downstream environments. No impacts with proper on-site management.
Climate Change:	Although there will be an initial increase in diesel-powered vehicles and machinery contributing to elevated carbon emissions, this will be temporary, and overall long-term carbon emissions may be reduced in the area due to the proposed development.

6. Fauna Management & Monitoring Plan

The objectives of the management plan are as follows:

- To prevent the unnecessary destruction of natural habitat and animal life within the development area and to maintain ecological connectivity to neighbouring sites and, where possible, to regional ecological corridors.
- Not to unnecessarily or deliberately alienate or hinder the movement of fauna in the area or to harm any animal life found on the property.
- To maintain existing fauna biodiversity and prevent the skewing of fauna communities as far as possible.

A monitoring plan and an adaptive management approach must be implemented in order to ensure effective mitigation measures are applied at all times. The specific mitigation measures are highlighted in the impact assessment tables above and the monitoring plan is indicated in Table 6.

In addition to the mitigation measures in the various impact tables above, the following general measures must also be applied during the construction and operation of the development:

- All species status is not likely to be impaired or altered, but activities on site must be managed to prevent attracting such species to site or cause population explosions of existing species on site.
 - Maintaining and improving local indigenous populations could assist in reducing alien species numbers on site through competition. Therefore maintain indigenous landscapes in and around the project area where any landscaping is conducted (possibly in and around the panel development area).
 - Compile and implement an alien invasive management plan in line with the municipal management plan, which must include measures to prevent attracting additional alien animals to site. This should include not feeding wild life and ensuring that all food and food waste, including domestic waste, is placed in sealed containers and not exposed on site. Ensure that the outside areas are kept clean and tidy and provide adequate waste removal services to prevent the attraction of rats and other alien scavenging species to the site.
- General activities that generate noise, dust and vibration will be nuisance impacts to fauna. The status of the site means these impacts are already taking place, but these should not be exacerbated as far as possible.
 - Utilise quieter equipment where feasible (keep equipment serviced and within operational specifications).
 - Ensure dust suppression, through water sprinkling, is applied at time of high dust generation.
 - Noisy point-sources should be enclosed and equipment / machinery fitted with silencers and serviced and maintained within operating specifications to prevent excessive noise.
 - Enforce speed limits (no more than 40km/h day time and 30km/h night time) along the access road.

- Ensure all operational and maintenance activities proceed in an environmentally responsible manner as per the recommendations in this report and the environmental management plan.

An Environmental Control Officer (ECO) must be appointed to ensure construction activities are in line with environmental management programme and authorisation requirements, including the mitigation and management measures stipulated within this report. Inspection, records of issues, corrective measures and sign-off will form part of the ECO's responsibilities.

Table 6: Monitoring plan to be undertaken by ECO

Monitoring Action	Frequency
Ensure all proposed mitigation measures detailing proposed activity modifications have been fully considered and incorporated into the final design plan and operational procedures and sign off on final plans and procedures.	Once-off
Inspect and sign-off on placement of demarcation pegs marking out no-go areas and specific activity areas.	Once-off
Inspect highly sensitive areas (no activity) and moderately sensitive areas (only pylon construction) in and around the project areas and ensure no unauthorised activity, dumping, excavations, obstructions to fauna mobility within these areas.	Weekly
Monitor TOPS observed to enter the site, specifically areas around the streams and tributary during rainfalls for Giant Bullfrog activity and development sites for the South African Hedgehog. Cease any activity that could be harmful or adapt activity to prevent harm to these species. Requirements of the Gauteng Nature Conservation Ordinance must be complied with regarding handling of such species.	Rietspruit Tributary area will be monitored during every rainfall event in the morning and at close of business day. Staff and contractors will be made aware to report sightings of hedgehogs as construction activities proceed on a daily basis.
Apply monitoring and auditing requirements stipulated in NWA & NEMA authorisations as relevant.	Every 6 months

6.1 Invasive Species

The Alien and Invasive Species Regulations published under GNR1020 (2020) list aliens under various categories, including:

- Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of NEM:BA as species which must be eradicated.
- Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of NEM:BA as species which must be controlled.
- Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of NEM:BA as species which require a permit to carry out a restricted activity within an area specified in the Notice or an

area specified in the permit, as the case may be. If no permit for these species, then they are to be treated as Category 1 species.

- Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of NEM:BA, as species which are subject to exemptions (regarding possession of such species) in terms of section 71(3) and prohibitions (importing, transporting, handling, breeding, releasing) in terms of section 71A of Act, as specified in the Notice.

In terms of the findings, no AIS species have been confirmed at site.

7. Conclusion and Recommendations

The only significant desktop features included the streams and tributaries and CBAs and ESAs, largely associated with the streams and adjacent areas. Where these intersect natural undisturbed habitat they have been retained as highly sensitive areas and designated as no go areas; as all these areas are associated with wetlands, the final assessment of these sites lies with the wetland specialist and areas should be managed as per the wetland specialists' recommendations.

Most of the development areas have been disturbed in the past and / or are being impacted by current activity and are not significant habitats for terrestrial fauna.

Only very limited TOP species are likely to traverse the development areas due to the lack of significant natural habitats. Being mobile they can move away from the development once it commences, and return after activities are completed, as long as the highly sensitive areas are maintained where the species can persist and form source populations. Significant direct impacts to fauna species are therefore not anticipated, but must be actively monitored with adaptive management as needed (cessation of activities until species move away / relocation of species by permitted specialists).

Impacts have been identified to be, at most, of moderate significance and can all be mitigated to low impact with vigilant activity and good house-keeping practices on site. The access road is proposed over existing mine roads and tracks; the latter will result in minimal removal of vegetation; no significant loss of fauna habitat is expected, limited to marginal impact to the edges, dominated by disturbed and modified habitats (as per photographic evidence).

In terms of the two alternative sites, the preferred site has more natural habitat units than the alternative site and is closer to areas designated as highly sensitive areas (should be avoided pending wetland specialist findings), making it marginally more important in terms of terrestrial fauna than the alternative site. However, developing the preferred site with panels will keep development clustered (closer to the main Phase 2 panel area and existing active mine areas) and maintain the impact footprint and associated anthropogenic activity (traffic, maintenance work) to a consolidated area; it will also result in maintaining the

open spaces within and around the alternative site which is within the less disturbed Rietspruit Tributary catchment area. Therefore, in terms of terrestrial fauna, either alternative site is considered appropriate for development.

In terms of terrestrial fauna biodiversity, no additional faunal assessments or studies are deemed necessary. There is no reason for not authorising the activity as long as the following recommendations are adhered to:

- Recommendations of the flora and wetland specialist must be implemented on site.
- Any areas designated as highly sensitive by the flora and wetland specialists should be considered as highly sensitive in terms of fauna (unique and unmodified fauna habitat provision) and should be considered no-go areas.
- Staff and contractors must be made aware of the potential activity of SCCs (Spotted-necked Otter, Oribi and *Aloeides dentatis dentatis*) and the confirmed TOPS (Giant Bullfrog) and likely TOPS (Southern Reedbuck and Serval) in the surrounds and highly likely TOPS (South African Hedgehog) in the development areas and report sightings of these species to the Environmental Control Officer.
- The mitigation measures in this report and that of the flora report and wetland report must be included within the environmental management programme and implemented on site.

8. References & Bibliography

8.1 Literature

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., and Alexander, G.J. & De Villiers, M.S. (Eds) (2014). **Atlas and red list of the reptiles of South Africa, Lesotho and Swaziland**. Suricata 1. South African National Biodiversity Institute, Pretoria.

Child, M. F.; Raimondo, D.; Do Linh San, E.; Roxburgh, L.; Davies-Mostert, H. (2016). **The Red List of Mammals of South Africa, Swaziland and Lesotho**. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Dippenaar-Schoeman A.S.; Haddad C.R. ; Foord S.; Lyle R.; Lotz L.; Helberg L.; Mathebula S.; van den Berg A; Marais P.; van den Berg A.M. ; Van Niekerk E. & Jocqué R. (2010): **First Atlas of the Spiders of South Africa (Arachnida: Araneae)**. South African National Survey of Arachnida Technical Report 2010: version 1.

du Plessis J, Peel M, Child MF. (2016). **A conservation assessment of *Redunca arundinum***. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. **The Red List of Mammals of South Africa, Swaziland and Lesotho**. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

du Preez, L.; Carruthers, V. 2009. **A Complete Guide to the Frogs of Southern Africa**. Struik Nature: Cape Town. ISBN 978 1 77007 446 0.

Leeming, J. (2019). Scorpions of Southern Africa. Struik Nature: Cape Town. ISBN 978 1 77584 652 9.

Light J, Pillay N, Avenant NL, Child MF 2016. **A conservation assessment of *Atelerix frontalis***. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. **The Red List of Mammals of South Africa, Swaziland and Lesotho**. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Mecenero, S., Ball, J. B., Edge, D. A., Hamer, M. L., Henning, G. A., Kruger, M., Williams, M. C. (2013). **Conservation assessment of butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas**. Safronics (Pty) Ltd., Johannesburg and Animal Demography Unit, Cape Town.

Minter, L.R., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J. and 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.

Monadjem, A.; Taylor, P.J.; Cotterill, F.P.D.; Schoeman, M.C. 2010a. **Bats of Southern and Central Africa: A biogeographic and Taxonomic Synthesis.** Wits University Press: Johannesburg. ISBN 978 1 86814 508 9.

Monadjem, A.; Taylor, P.J.; Denys, C.; Cotterill, F.P.D. 2010b. **Rodents of Sub-Saharan Africa: A biogeographic and Taxonomic Synthesis.** de Gruyter: Berlin. ISBN 978 3 11 038923 4.

Murray, K. (2011). **Scatalogue.** Struik Nature: Cape Town. ISBN 978 1 77007 955 7

Ponsonby DW, Rowe-Rowe D, Power RJ, Somers MJ. (2016). **A conservation assessment of *Hydrictis maculicollis*.** In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. **The Red List of Mammals of South Africa, Swaziland and Lesotho.** South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Picker, M.; Griffiths, C. 2011. **Alien & Invasive Animals: A South African Perspective.** Struik Nature: Cape Town. ISBN 978 1 77007 823 9.

Picker, M.; Griffiths, C.; Weaving, A. 2012. **Field Guide to Insects of South Africa.** Struik Nature: Cape Town. ISBN 978 1 92057 225 9.

Ramesh T, Downs CT, Power RJ, Laurence S, Matthews W, Child MF. (2016). **A conservation assessment of *Leptailurus serval*.** In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. **The Red List of Mammals of South Africa, Swaziland and Lesotho.** South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Samways, M.J. & Simaika, J.P. 2016. **Manual of Freshwater Assessment for South Africa: Dragonfly Biotic Index.** Suricata 2. South African National Biodiversity Institute, Pretoria.

SANBI (South African National Biodiversity Institute). 2020. **Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa.** South African National Biodiversity Institute, Pretoria. Version 1.0.

Shrader AM, Little I, Coverdale B, Patel T. (2016). **A conservation assessment of *Ourebia ourebi ourebi*.** In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. **The Red List of Mammals of South Africa, Swaziland and Lesotho.** South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Stuart, C.; Stuart, M. 2013. **A field Guide to the Tracks & Signs of Southern, Central & East African Wildlife.** Struik Nature: Cape Town. ISBN 9781770073609.

Stuart, C.; Stuart, M. 2015. **Stuarts' Field Guide to Mammals of Southern Africa including Angola, Zambia & Malawi**. 5th Edition. Struik Nature: Cape Town. ISBN 978 1 77584 111 1.

Tolley, K.; Burger, M. 2012. **Chameleons of Southern Africa**. Struik Nature: Cape Town. ISBN 978 1 92057 286 0.

Woodhall, S. (2005). **Field guide to butterflies of South Africa**. Cape Town: Struik Nature. ISBN 978 1 92054 481 2.

8.2 Internet Sources

- ewt.org.za/reddata: Endangered Wildlife Trust for information pertaining to Red-listed mammals.
- inaturalist.org: For supplementary information on species distribution (accessed 2021-02-16).
- iucnredlist.org: For the IUCN Red List status of species.
- SANBI.org.za: For geographic information related to protected and sensitive ecosystems and environments, such as National Freshwater Priority Areas (NFEPA), Fish Sanctuaries and important catchments under NFEPA, Biodiversity and Conservation Plans.
- saramsar.com: For information on SA RAMSAR sites
- vmus.adu.org.za/: Animal Demography Unit, Virtual Museum:
 - FitzPatrick Institute of African Ornithology (2021). FrogMAP Virtual Museum. Accessed at <http://vmus.adu.org.za/?vm=FrogMAP> on 2021-01-07
 - FitzPatrick Institute of African Ornithology (2021). LepiMAP Virtual Museum. Accessed at <http://vmus.adu.org.za/?vm=LepiMAP> on 2021-01-07
 - FitzPatrick Institute of African Ornithology (2021). MammalMAP Virtual Museum. Accessed at <http://vmus.adu.org.za/?vm=MammalMAP> on 2021-01-07
 - FitzPatrick Institute of African Ornithology (2021). OdonataMAP Virtual Museum. Accessed at <http://vmus.adu.org.za/?vm=OdonataMAP> on 2021-01-07
 - FitzPatrick Institute of African Ornithology (2021). ReptileMAP Virtual Museum. Accessed at <http://vmus.adu.org.za/?vm=ReptileMAP> on 2021-01-07
 - FitzPatrick Institute of African Ornithology (2021). ScorpionMAP Virtual Museum. Accessed at <http://vmus.adu.org.za/?vm=ScorpionMAP> on 2021-01-07
 - FitzPatrick Institute of African Ornithology (2021). SpiderMAP Virtual Museum. Accessed at <http://vmus.adu.org.za/?vm=SpiderMAP> on 2021-01-07
- whc.unesco.org: for information on SA World Heritage Sites

Appendix A: CV, Qualification, SACNASP registration

Curriculum Vitae: BARBARA KASL

- 2010 – current: SACNASP Professional Environmental and Ecological Scientist
- 1999, 2001 & 2008 – current: Entomological Society of South Africa
- E-mail: bk.zoology@gmail.com;

Tertiary Education

University of the Witwatersrand

- 2002-2004: PhD (Animal, Plant and Environmental Sciences)
- 1999-2001: MSc (upgraded to PhD)
- 1998: B.Sc. Hon. (Zoology and Botany)
- 1995-1998: BSc (Zoology and Botany)

Professional Experience - ±15 years

02/2017 - Current: Self-employed as fauna specialist & environmental consultant

- Fauna impact assessments and management plans.
- Fauna assessment / input into a variety of environmental projects (SOE, EMPr, EMFs)
- Environmental consulting.

01/2008 - 02/2017: CABANGA CONCEPTS:

- Environmental Scientist / Principal Consultant & shareholder in Cabanga Concepts.
- Overall project manager and principal report reviewer.
- Experience with World Bank Standards, IFC Equator Principals.
- Compilation of various environmental applications and documents, including various audit reports.
- Stay current with environmental legislation and standards and norms.
- Review and comment on draft environmental legislation related to environmental sector.

09/2004 - 11/2007: DIGBY WELLS & ASSOCIATES (DIGBY WELLS ENVIRONMENTAL)

- Unit Manager for the Ecology Unit including management of a flora and wetland specialist.
- Acting Department Head and management of the Biophysical Department which included the Ecology Unit and Atmospheric Environment Unit.
- Responsible in completion of fauna assessments and managing ecological projects.
- Various South African and African environmental application and management projects.

Other Professional activities (details can be provided on request)

Mentorship programmes & tutelage

- Field-based tutelage to you professional zoologists.
- High level mentor in the MISA Mentorship Programme for SACNASP candidates.

Participation in legislative processes

- Review and comment on the alien invasive species legislation.
- Review and comment on the environmental themes legislation, specifically the terrestrial biodiversity and animal species protocols and associated guidelines.

Courses / Workshops / Conferences

- February 2022: SANBI Animal Species Guidelines Webinar: Invertebrate Focus Group
- December 2021: South African Science Forum. Attended.
- May 2020: IAIA Species Environmental Assessment Guideline: Webinar for the introduction of the SANBI species assessment guidelines for the animal and plant species protocols. 21 May 2020
- December 2018: South African Science Forum. Attended.
- December 2017: South African Science Forum. Attended.
- April 2017: Alien invasive species identification and management.
- June 2014: Waste Management Law Workshop.
- October 2010: NEM: Air Quality Act Workshop.
- August 2009: NEMA and NEMWA Workshop.
- November 2007: Environmental Impact Assessment Training.
- February/March 2007: Project Management.
- September 2006: Introduction to Managing Environmental Water Quality.
- September 2005: Non-credited course in River health and SASS5.
- May 2005: Snake Identification and Snakebite Treatment Course.
- July 2001: Entomological Society of Southern Africa (2-5 July 2001) Attended & presented talk.
- July 1999: Entomological Society of Southern Africa Conference (12-15 July 1999) Attended & presented poster
- July 1998: Zoological Society of Southern Africa Conference (6-10 July 1998) Attended & presented poster.



herewith certifies that
Barbara Kasl
Registration Number: 400257/09
is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)
Ecological Science (Professional Natural Scientist)
Environmental Science (Professional Natural Scientist)

Effective **11 November 2009** Expires **31 March 2023**



Batha
Chairperson

R. J. ...
Chief Executive Officer

To verify this certificate scan this code



UNIVERSITY OF THE WITWATERSRAND,
JOHANNESBURG

At a congregation of the University
held on 25 November 2004

Barbara Kasl
was admitted to the Degree of
Doctor of Philosophy

[Signature]
Dean, Faculty of Science

AFRIKAANSE POLISDIENIS
KLIENTE DIENS SENTRUM
2010-03-22
CLIENT SERVICE CENTRE
Johannesburg
SOUTH AFRICAN POLICE SERVICE

[Signature]
Vice-Chancellor and Principal

[Signature]
Registrar



Appendix B: Desktop fauna records (mainly from ADU, SABAP2 and iNaturalist)

Family	Common name	Taxon name
MAMMALS		
Carnivora	Otter, Cape Clawless	<i>Aonyx capensis</i>
Cetartiodactyla	Blesbok	<i>Damaliscus pygargus phillipsi</i>
Cetartiodactyla	Duiker, Common	<i>Sylvicapra grimmia</i>
Cetartiodactyla	Eland, Common	<i>Tragelaphus oryx</i>
Cetartiodactyla	Hartebeest, Red	<i>Alcelaphus buselaphus caama</i>
Cetartiodactyla	Springbok	<i>Antidorcas marsupialis</i>
Cetartiodactyla	Wildebeest, Black	<i>Connochaetes gnou</i>
Chiroptera	Bat, Mauritian Tomb	<i>Taphozous mauritanus</i>
Eulipotyphla	Shrew, Swamp Musk	<i>Crocidura mariquensis</i>
Perissodactyla	Zebra, Plains	<i>Equus quagga</i>
Rodentia	Gerbil, Bushveld	<i>Gerbilliscus leucogaster</i>
Rodentia	Mouse, Mesic Four-striped Grass	<i>Rhabdomys dilectus</i>
Rodentia	Mouse, Namaqua Rock	<i>Micaelamys namaquensis</i>
Rodentia	Mouse, Natal Multimammate	<i>Mastomys natalensis</i>
Rodentia	Mouse, Southern Multimammate	<i>Mastomys coucha</i>
Rodentia	Rat, Vlei	<i>Otomys auratus</i>
REPTILES		
Agamidae	Agama, Eastern Ground	<i>Agama aculeata distanti</i>
Agamidae	Agama, Southern Rock	<i>Agama atra</i>
Colubridae	Egg-eater, Common	<i>Dasypeltis scabra</i>
Cordylidae	Lizard, Common Girdled	<i>Cordylus vittifer</i>
Cordylidae	Lizard, Common Crag	<i>Pseudocordylus melanotus melanotus</i>
Gekkonidae	Gecko, Cape	<i>Pachydactylus capensis</i>
Gekkonidae	Gecko, Transvaal Thick-toed	<i>Pachydactylus affinis</i>
Lamprophiidae	Centipede-eater, Black-headed	<i>Aparallactus capensis</i>
Lamprophiidae	Snake, Aurora House	<i>Lamprophis aurora</i>
Lamprophiidae	Snake, Brown House	<i>Boaedon capensis</i>
Lamprophiidae	Snake, Common (Brown) Water	<i>Lycodonomorphus rufulus</i>
Leptotyphlopidae	Snake, Peters' Thread	<i>Leptotyphlops scutifrons</i>
Scincidae	Skink, Speckled Rock	<i>Trachylepis punctatissima</i>
Scincidae	Skink, Thin-tailed Legless	<i>Acontias gracilicauda</i>
Testudinidae	Tortoise, Leopard / Mountain	<i>Stigmochelys pardalis</i>
FROGS		
Pyxicephalidae	Bullfrog, Giant	<i>Pyxicephalus adspersus</i>
Pyxicephalidae	Caco, Boettger's	<i>Cacosternum boettgeri</i>
Hyperoliidae	Kassina, Bubbling	<i>Kassina senegalensis</i>
Pipidae	Platanna, Common	<i>Xenopus laevis</i>
Bufonidae	Toad, Raucous	<i>Amietophrynus rangeri</i>
Bufonidae	Toad, Red	<i>Schismaderma carens</i>