# TERRESTRIAL FAUNAL AND AVIFAUNAL SPECIES IMPACT ASSESSMENT REPORT FOR THE PROPOSED FLOOD DAMAGE REPAIRS, REHABILITATION AND OTHER MITIGATION MEASURES IN VAN RIEBEECK GARDENS AND CAMPHERSDRIFT, GEORGE, GEORGE MUNICIPALITY

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**September 2023**

**Prepared for:**

Sharples Environmental Services cc (SES)


**Prepared by:**

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## Qualifications

- PhD (Zoology), University of Johannesburg (2015 - 2017)
- MSc (Zoology), Stellenbosch University (2011 - 2013)
- BSc Honours (Zoology) cum laude, Stellenbosch University (2010)
- BSc (Biodiversity and Ecology) cum laude, Stellenbosch University (2007 - 2009)

## Expertise

- 27 years of in-the-field naturalist experience involving all faunal groups
- Zoologist with 16 years of professional experience
- 14 Peer-reviewed publications in high impact national and international scientific journals on the patterns and processes which drive and maintain faunal biodiversity, as well as on aspects of faunal biology and ecology
- Five IUCN Red List assessments

- Involved in the Southern African Bird Atlas Project 2 (SABAP2)
- Contributor on the National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria.

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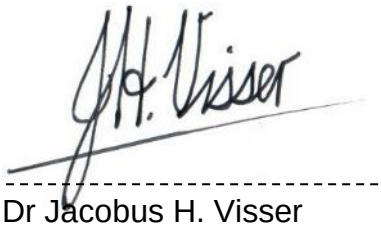
# Declaration of independence by the independent person who compiled a specialist report or undertook a specialist process

I, Dr Jacobus Hendrik Visser, as the appointed independent specialist hereby declare that I:

• act/ed as the independent specialist in this application;
• regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
• do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations and any specific environmental management Act;
• have no and will not have any vested interest in the proposed activity proceeding;
• have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations and any specific environmental management Act;
• am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
• have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
• have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;

• have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
• have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
• am aware that a false declaration is an offence.



22 September 2023

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22 September 2023

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## Executive summary

### Background

Lukhozi Consulting Engineers (Pty) Ltd (on behalf of the George Municipality) is proposing flood damage repairs, rehabilitation and other mitigation measures (hereafter referred to as the “repair areas” or “repair site”) in Van Riebeeck Gardens and Camphersdrift area with the main focus along the Camfersdrift River from north east of Camphersdrift Street down to just south of C.J. Langenhoven Road, George, Western Cape (hereafter referred to as the “study area” or “site”). Blue Skies Research was appointed by Sharples Environmental Services cc (SES) on behalf of the applicant to perform the required terrestrial faunal and avifaunal assessment of the study area.

The DFFE Screening Tool Report generated for the study area identifies the landscape as being of a “High” sensitivity under the “Relative Animal Species Sensitivity Theme”. This follows from the projected and possible occurrence of two mammal, one amphibian, three avifaunal and five invertebrate Species of Conservation Concern (SCC). The current report therefore assesses the presence or likely presence of these mammal, amphibian, avifaunal and one invertebrate SCC (as well as other possible SCC within these faunal groups) within the study area in

accordance with the protocols outlined in the Species Environmental Assessment Guideline.

As such, the aims of this investigation were to:

1.) Assess, define and create a spatial rendering of available faunal habitats across the study area landscape based on information gathered during the field survey as well as through a desktop assessment using the latest satellite imagery,

2.) compile a complete faunal desktop species list (including mammals, amphibians, and avifauna) for the study area based on a thorough desktop assessment so as to assess the presence of any of the listed SCC as well as any additional SCC within these faunal groups,

3.) compile a faunal species list (including mammals, amphibians, avifauna and grasshoppers) within the study area through field surveying so as to assess the possibility of occurrence of the SCC retrieved in the desktop assessment (based on appropriate sampling methods, as well as the presence of suitable habitat for these species), or any additional SCC which are present on the site, and

4.) generate spatial occurrence maps for the recovered faunal species within the study area to assess the spatial extent of areas supporting higher levels of diversity, and SCC subpopulations and habitats which may be of conservation concern.

**Study methodology**

To assess the possible occurrence of the listed as well as any additional mammal, amphibian and avifaunal SCC, a desktop assessment was performed to create a representative desktop species list for these faunal groups. To assess the possible occurrence of the recovered terrestrial faunal or avifaunal SCC, as well as sensitive habitats, the study area was surveyed on foot over a single day on the 9$^{th}$ of September 2023, during the Spring season. Surveying included unconstrained point sampling through search meanders, as well active searching under rocks and debris. Terrestrial faunal species (mammals) were identified by direct visual observation, or

by their tracks, burrows, remains or scat. Amphibian species were identified by direct visual observation, or auditory means and sound recordings. Avifaunal species were identified by visual observation, using a 180x zoom lens, or by auditory means. Finally, the presence or absence of the Yellow-winged Agile Grasshopper was evaluated based on suitable habitat (recently burnt Schlerophyll on south-facing slopes) for this species. All observations were recorded by GPS and the species or evidence of species' presence or activity were photographed using a digital camera (Canon PowerShot SX430 IS, Canon Inc, USA). During surveying, faunal habitats were broadly identified in the field, and thereafter delineated through a desktop assessment of the study area using satellite imagery.

**Habitat types**

The study area is comprised of a single habitat type which of a riverine nature, but with the vegetation largely comprising alien and invasive plant species such as Brambles. Furthermore, the drainage channel bears significant signs of pollution with water quality appearing relatively poor as a result. To this end, the Riverine habitat on the site exists in a degraded state, harbouring an impaired aquatic diversity.

**Faunal and avifaunal components**

The distributions of 65 mammal, 18 amphibian and 240 avifaunal species currently overlap with the study area landscape. Among these, the majority are currently listed as "Least Concern" by the IUCN, with the remaining 17 species representing SCC. These SCC include the following:

1. The Duthie's Golden Mole (*Chlorotalpa duthieae*) classified as "Vulnerable",
2. Fynbos Golden Mole (*Amblysomus corriae*) classified as "Near-Threatened",
3. Leopard (*Panthera pardus*) classified as "Vulnerable",
4. African Clawless Otter (*Aonyx capensis*) classified as "Near-Threatened",
5. Grey Rhebok (*Pelea capreolus*) classified as "Near-Threatened",
6. Long-tailed Forest Shrew (*Myosorex longicaudatus*) classified as "Endangered",
7. White-tailed Rat (*Mystromys albicaudatus*) classified as "Vulnerable",

8. Knysna Leaf-folding Frog (*Afrixalus knysnae*), classified as “Endangered”,
9. Forest Buzzard (*Buteo trizonatus*) classified as “Near-Threatened”,
10. Black Harrier (*Circus maurus*) classified as “Endangered”,
11. African Marsh Harrier (*Circus ranivorus*) classified as “Least Concern”,
12. Martial Eagle (*Polemaetus bellicosus*) classified as “Endangered”,
13. Maccoa Duck (*Oxyura maccoa*) classified as “Endangered”,
14. Blue Crane (*Anthropoides paradiseus*) classified as “Vulnerable”,
15. Protea Canary (*Crithagra leucoptera*) classified as “Near-Threatened”,
16. Knysna Warbler (*Bradypterus sylvaticus*) classified as “Vulnerable”, and
17. Knysna Woodpecker (*Campethera notate*) classified as “Near-Threatened” by the IUCN.

During the field survey, five mammal, two amphibian and 33 avifaunal species were recorded within the study area. While the majority of species are currently classified as “Least Concern” by the IUCN, the study area harbours a small subpopulation of the Duthie's Golden Mole (*Chlorotalpa duthieae*) classified as “Vulnerable” by the IUCN.

Faunal and avifaunal diversity in the study area is largely comprised of relatively common species of “Least Concern”, with the notable exception of a small subpopulation of *C. duthieae* which represents a mammal SCC. Given the urban setting, high levels of daily disturbance (through vibration from vehicles and people) and degraded habitat structure (significant signs of pollution and a high incidence of alien and invasive vegetation), highly mobile avifaunal species are the most abundant faunal group, given their ability to traverse this landscape. Conversely, terrestrial fauna appears scarce with only burrowing species being abundant given that their below-ground lifestyle buffers them from the above-ground impacts. Following from this impaired faunal diversity, the site harbours little in the way of intact predator-prey dynamics with impaired ecosystem dynamics. Even so, the site does provide a green space in an urban setting, and forms a semi-functional albeit degraded ecological link in the study area landscape.

**Species of Conservation Concern (SCC)**

Along with the seven (two mammal, one amphibian, three avifaunal and one invertebrate) SCC listed in the DFFE Screening Tool, the potential occurrence of 12 other (five mammal and seven avifaunal) SCC within the study area was assessed, given their recovery in the desktop assessment. The presence of one mammal SCC was confirmed one the site, but aside from this species, it is unlikely that any of the other considered SCC will occur within the study area given a lack of suitable habitats combined with the degraded nature of on-site habitats and high levels of daily disturbance. These SCC are therefore not further considered in this report.

The only SCC confirmed within the study area landscape pertains to the Duthie's Golden Mole (*Chlorotalpa duthieae*, listed as “Vulnerable” under Criterion B1ab(iii)+2ab(iii)) of which a very small subpopulation is present. Only one individual was confirmed with the Riverine habitat of the site, with two individuals retrieved in the northern lawn area outside of the study area. Although the site does harbour the loamy soils and lawns (outside of the project footprint), the high level of disturbances, degraded nature and urban setting of the site therefore appears to preclude high population numbers. Together with this, the localised spatial extent and short nature of the impacts from the proposed repairs will have a negligible effect on this species.

**Site Ecological Importance (SEI)**

Evaluation of the Site Ecological Importance (SEI) for the habitats of SCC confirmed or possibly occurring in the study area was performed following the methods and criteria outlined in the Species Environmental Assessment Guideline (SANBI, 2020). Evaluation of SEI was performed only for mammals (given that *C. duthieae* was the only SCC confirmed on the site, and that all other SCC have a low likelihood of occurrence).

The study area consists of only a single habitat type which harbours a very small subpopulation of *C. duthieae* (only on individual was found in this habitat). Furthermore, this habitat exists in a degraded state with a high level of daily

disturbances in an urban setting. In conjunction with this, the repair areas will be of a very small spatial extent (>1 hectare), and will focus on the upgrading of existing damaged infrastructure. To this end, the entire site is retrieved as having a “Very low” SEI from a mammal SCC perspective, allowing for development activities of medium to high impact without restoration activities being required.

**Current impacts**

Current impacts within the study area include the following:

- The study area is located within an urban setting and is surrounded by residential areas from where daily noise and vibration is evident (through vehicles and human foot traffic).
- The Riverine habitat on the site appears highly degraded, with major signs of pollution, human foot traffic (vagrancy, as well as from people traversing the site through its entirety), a high incidence of alien and invasive vegetation and poor water quality.
- Repair area footprints will largely be restricted to existing damaged infrastructure and flood damage areas within the river channel.

These impacts are of a major extent, and appear to have heavily impinged on biodiversity patterns and processes within the study area landscape, adding to the degraded nature of ecosystem characteristics

**Anticipated project impacts**

Planned development activities for the study area will include:

1. Refurbish / replace gabion structures;
2. Reinstatement of erosion protection structures;
3. Rehabilitation of eroded areas and implementation of erosion protection structures;

4. Stabilization of riverbanks and beds and implementation of erosion protection structures;
5. Reinstatement of retaining walls;
6. Reconstruction of stormwater pipes, outlets, headwalls, and associated erosion protection;
7. Isolated reconstruction of road areas; and
8. Implementation of new gabion / retaining wall structures / erosion protection structures.

Because these activities will focus on already degraded areas and damaged infrastructure, the only impacts expected during the construction phase will be possible direct morality of fauna and short-term noise and vibration. During the operational phase, impacts will remain similar to what is the case currently.

**Impact management actions**

The project footprint will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. As such, this renders the entire proposed project footprint as developable from a faunal perspective without any mitigation measures being advocated. Even so, every effort should be made to save and relocate any mammal, reptile, amphibian, bird, or invertebrate that cannot flee of its own accord, encountered during site preparation (i.e., to avoid and minimise the direct mortality of faunal species). Because noise and vibration is an unavoidable impact during the construction phase, no impact management actions are advocated to reduce this impact.

**Impact assessment**

The impact assessment for the receiving environment in the current study was performed for the provided layout alternative of flood damage repairs (Alternative 1) considering both the construction and operational phases of the development. The project footprints (i.e., repair areas) will be of a limited spatial extent and impacts will

be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. To this end, no mitigation will be required as impacts on the receiving environment will result in insignificant loss or deterioration of faunal biodiversity in the receiving environment.

**Conclusions**

Taken together, the results of the report indicate the following:

- The study area is comprised of a Riverine habitat, but with the vegetation here largely constituting alien and invasive plant species such as Brambles, and with water quality in the river furthermore appearing poor given a high incidence of pollution (Section 7).
- Faunal and avifaunal diversity in the study area is largely comprised of relatively common species of “Least Concern”, with the notable exception of small subpopulation of *C. duthieae* which represents a mammal SCC (Section 8).
- Habitats within the study area appear highly degraded, with significant signs of daily disturbance (through vibration from vehicles and people) and pollution. To this end, highly mobile avifaunal species are the most abundant faunal group, given their ability to traverse this landscape with terrestrial fauna appearing scarce with only burrowing species being abundant given that their below-ground lifestyle buffers them from the above-ground impacts. Taken together, the site harbours little in the way of intact predator-prey dynamics with impaired ecosystem dynamics, although it does provide a semi-functional albeit degraded ecological link in the study area landscape (Section 8).
- The presence of one mammal SCC was confirmed one the site, but aside from this species, no other SCC are likely to also occur within the study area given a lack of suitable habitats (Section 9).
- The subpopulation of *C. duthieae* is very small is present with only one individual confirmed within the Riverine habitat of the site, with two individuals retrieved in the northern lawn area of the site outside of the project footprint. The localised spatial extent and short nature of the impacts from the proposed repairs will likely have a negligible effect on this species (Section 9).

- The entire site is retrieved as having a “Very low” SEI from a mammal SCC perspective, allowing for development activities of medium to high impact without restoration activities being required (Section 10).
- Current impacts within the study area (its location within an urban area from where daily noise and vibration is evident, highly degraded habitats with major signs of pollution, human foot traffic, a high incidence of alien and invasive vegetation and poor water quality) are of a major extent, and appear to have heavily impinged on biodiversity patterns and processes within the study area landscape, adding to the degraded nature of ecosystem characteristics (Section 11).
- Because the flood damage repair activities will focus on already degraded areas and damaged infrastructure, the only impacts expected during the construction phase will be possible indirect mortality of fauna and short-term noise and vibration. During the operational phase, impacts will remain similar to what is the case currently (Section 11).
- The repair sites will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. As such, this renders the entire proposed project footprint as developable from a faunal perspective only minor impact management actions being advocated. In the case of the current assessment therefore, the “No-Go” alternative was not considered, given the low number of negative impacts from Alternative 1, and the need to balance environmental outcomes with the need for upgrading infrastructure from a municipal perspective (Section 11).
- The results from this report confirm the “High” site sensitivity as identified in the DFFE Screening Tool Report following from the confirmed occurrence of a small subpopulation of *C. duthieae* in the study area landscape. Aside from this single SCC, however, it is unlikely that habitats in the study area will support permanent subpopulations of any other faunal SCC (Section 12).
- Following the ground-truthing phase, it is clear that habitats within the study area are subject to high levels of disturbance and exist in a degraded state and in an urban setting. Notwithstanding the presence of a small subpopulation of *C.*

*duthieae* therefore, the entire site may rather be classified as a degraded ESA2, allowing for the suggested repair activities (Section 12).

Taken together therefore, the proposed repair area footprints will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. Furthermore, impacts on the receiving environment will result in only minor to insignificant loss or deterioration of faunal biodiversity in the receiving environment. To this end, the current development layout and repair activities are supported from a faunal biodiversity perspective.

# 1. Introduction

Lukhozi Consulting Engineers (Pty) Ltd (on behalf of the George Municipality) is proposing flood damage repairs, rehabilitation and other mitigation measures (hereafter referred to as the “repair areas” or “repair site”) in Van Riebeeck Gardens and Camphersdrift area with the main focus along the Camfersdrift River from north east of Camphersdrift Street down to just south of C.J. Langenhoven Road, George, Western Cape (hereafter referred to as the “study area” or “site”).

The general extent of the scope of works applicable to all areas include:

1. Refurbish / replace gabion structures;
2. Reinstatement of erosion protection structures;
3. Rehabilitation of eroded areas and implementation of erosion protection structures;
4. Stabilization of riverbanks and beds and implementation of erosion protection structures;
5. Reinstatement of retaining walls;
6. Reconstruction of stormwater pipes, outlets, headwalls, and associated erosion protection;
7. Isolated reconstruction of road areas; and
8. Implementation of new gabion / retaining wall structures / erosion protection structures.

Blue Skies Research was appointed by Sharples Environmental Services cc (SES) on behalf of the applicant to perform the required terrestrial faunal and avifaunal assessment of the study area (see Sections 2 and 3). The current report represents an Impact Assessment for the site in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment (EIA) Regulations 2014 (Government Notice (GN) 984), as amended.

# 2. Terms of Reference

*2.1. General legislature pertaining to this report*

This terrestrial faunal and avifaunal assessment report is compiled in accordance with the following guidelines:

- *Department of Environmental Affairs and Development Planning (DEA&DP) Guidelines for Involving Biodiversity Specialists in the EIA Process* (Brownlie, 2005).
- *Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes, Government Notice No. 320* (Gazetted 20 March 2020).
- *Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*, *Government Notice No. 1150* (Gazetted 30 October 2020).
- South African National Biodiversity Institute (SANBI). 2020. *Species Environmental Assessment Guideline. Guidelines for the implementation of the terrestrial fauna and terrestrial flora species protocols for environmental impact assessments in South Africa*. South African National Biodiversity Institute, Pretoria. Version 2.1 2021.

*2.2 Other sources consulted*

Other sources pertaining to this report are as follows:

- IUCN. 2021. The IUCN Red List of Threatened Species. Version 2021-3. https://www.iucnlist.org. Accessed on 28 August 2023.
- *National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of critically endangered, endangered, vulnerable and protected species, Government Notice No. 2007* (Gazetted 14 December 2007).

## 3. Reporting protocol

The DFFE Screening Tool Report generated for the study area identifies the landscape as being of a “High” sensitivity under the “Relative Animal Species Sensitivity Theme”. This follows from the projected and possible occurrence of two mammal, one amphibian, three avifaunal and five invertebrate Species of Conservation Concern (SCC) (see Table 1). The current report therefore assesses the presence or likely presence of these mammal, amphibian, avifaunal and one invertebrate SCC (as well as other possible SCC within these faunal groups, see Section 9) within the study area in accordance with the protocols outlined in the Species Environmental Assessment Guideline (SANBI, 2020).

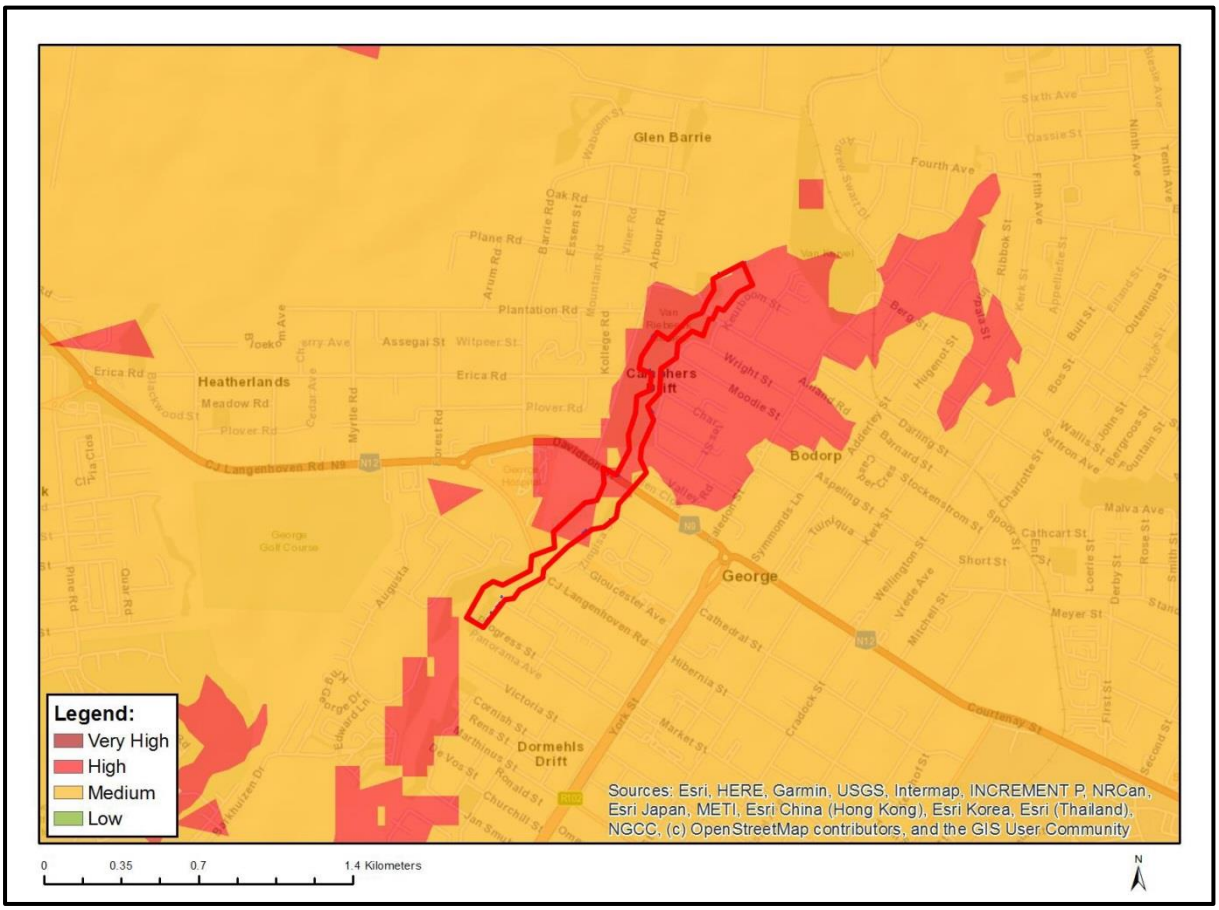



**Figure 1** Relative Animal Species Sensitivity Map retrieved for the study area (Red polygon = Study area) by the DFFE Screening Tool (https://screening.environment.gov.za/screeningtool/).

**Table 1** List of Species of Conservation Concern (SCC) identified in the DFFE Screening Tool Report (https://screening.environment.gov.za/screeningtool/). For each, the listed sensitivity (possibility of occurrence within the study area), scientific name and common name is shown, along with its current IUCN status. The name of "Sensitive Species 8" is purposefully omitted, given the sensitivity of this species.

| Sensitivity | Species | Common name | IUCN status |
|---|---|---|---|
| High | *Afrixalus knysnae* | Knysna Leaf-folding Frog | Endangered |
| High | *Circus ranivorus* | African Marsh-harrier | Least Concern |
| High | *Bradypterus sylvaticus* | Knysna Warbler | Vulnerable |
| Medium | *Afrixalus knysnae* | Knysna Leaf-folding Frog | Endangered |
| Medium | *Neotis denhami* | Denham's Bustard | Near-Threatened |
| Medium | *Chlorotalpa duthieae* | Duthie's Golden Mole | Vulnerable |
| Medium | *Sensitive Species 8* | Sensitive Species 8 | Least Concern |
| Medium | *Aneuryphymus montanus* | Yellow-winged Agile Grasshopper | Vulnerable |
| Medium | *Chumma striata* | Spiny-backed Spider | Rare |
| Medium | *Moggridea terricola* | Banded-legged Trapdoor Spider | Vulnerable |
| Medium | *Ilisoa knysna* | Tree Sheetweb Spider | Vulnerable |
| Medium | *Diores sylvestris* | Ant Spider | Rare |

## 4. Overview of the study area

### *4.1 Geographic location*

The study area is located within the Van Riebeeck Gardens and Camphersdrift areas in George, Western Cape (Figures 2 and 3). Along the Camfersdrift River, 22 sites have been identified which are to be subject to flood damage repairs, rehabilitation and other mitigation measures, with these sites located mostly between the Camphersdrift Road in the north and the Langenhoven Road in the south (Figure 3).

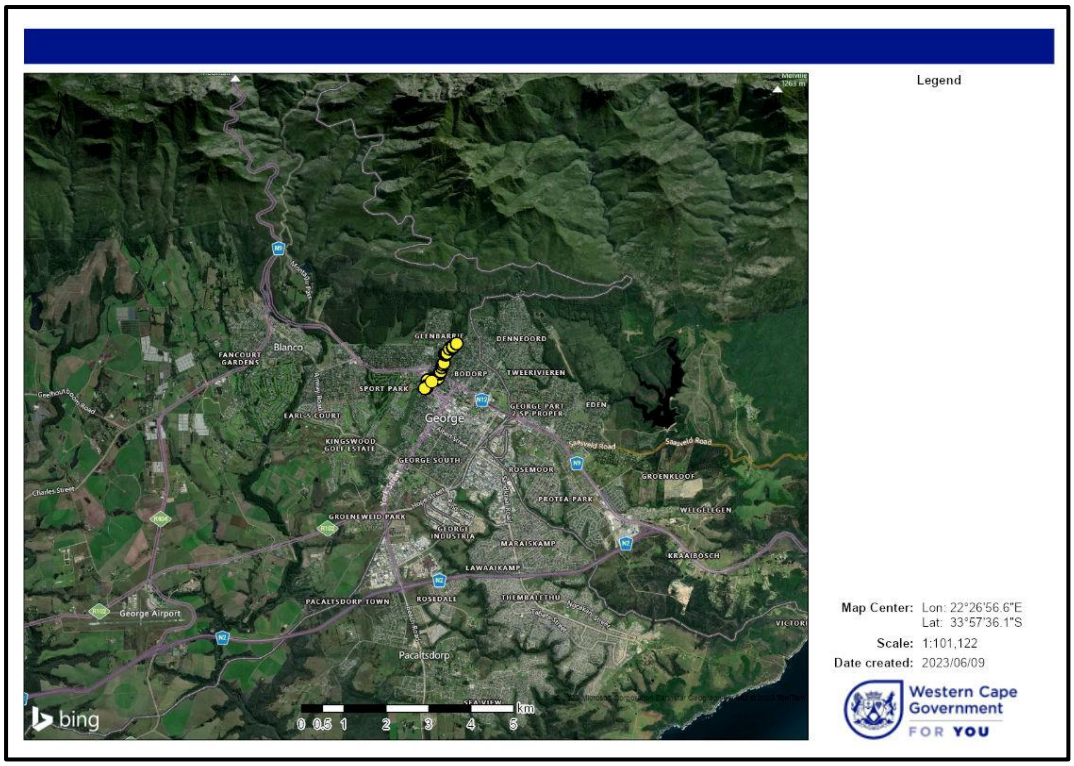



**Figure 2** Spatial location of the repair sites relative to surrounding residential areas and main roads on a broad scale (Yellow dots = Repair sites; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).


**Figure 3** Spatial location of the repair sites relative to surrounding residential areas and main roads at a finer scale (Yellow dots = Repair sites; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

*4.2 Topology*

All repair sites are located within the lower elevation drainage channel of the Camfersdrift River, which is located to the east of an area of higher elevation (Figure 4).

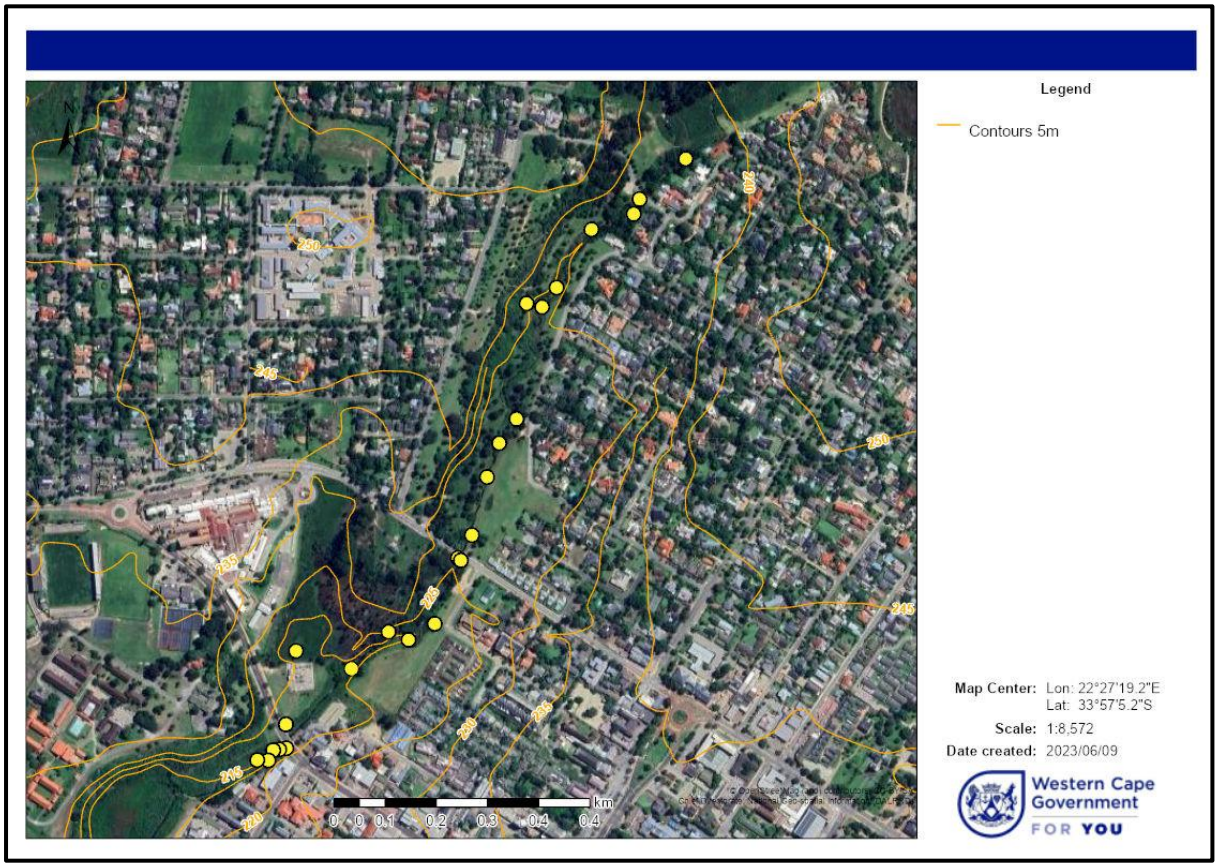



**Figure 4** Topology of the study area showing 5 meter contour lines (Yellow dots = Repair sites; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

*4.3 Wetlands and rivers*

All repair sites are located within the drainage channel of the perennial Camfersdrift River (Figure 5). A channelled valley-bottom wetland is located to the south of the proposed repair areas (National Freshwater Ecosystem Priority Areas, NFEPA, CSIR et al. 2011), and intersects with five of the southernmost repair area footprints (Figure 5).

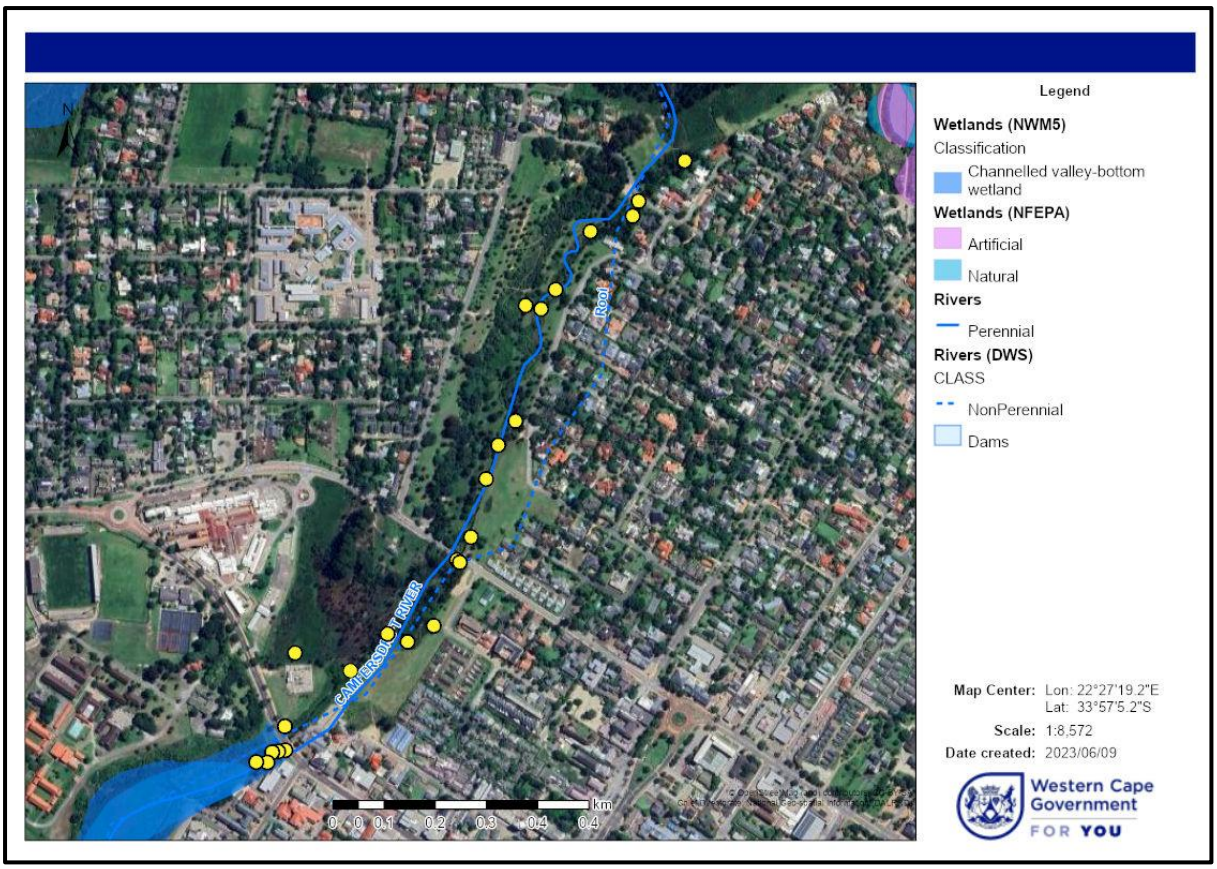



**Figure 5** Distribution of wetlands (NFEPA) and rivers relative to the study area (Yellow dots = Repair sites; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

*4.4 Vegetation*

Vegetation overlapping the larger northern part of the study area would have historically comprised Garden Route Granite Fynbos (VegMap, 2018; Figure 6), however none of this vegetation appears to remain over this section (Section 7). The southern section of the project footprint is located adjacent to, but outside of vegetation classified as Cape Lowland Alluvial Vegetation (Vegmap, 2018; Figure 6) which does appear intact to some degree.

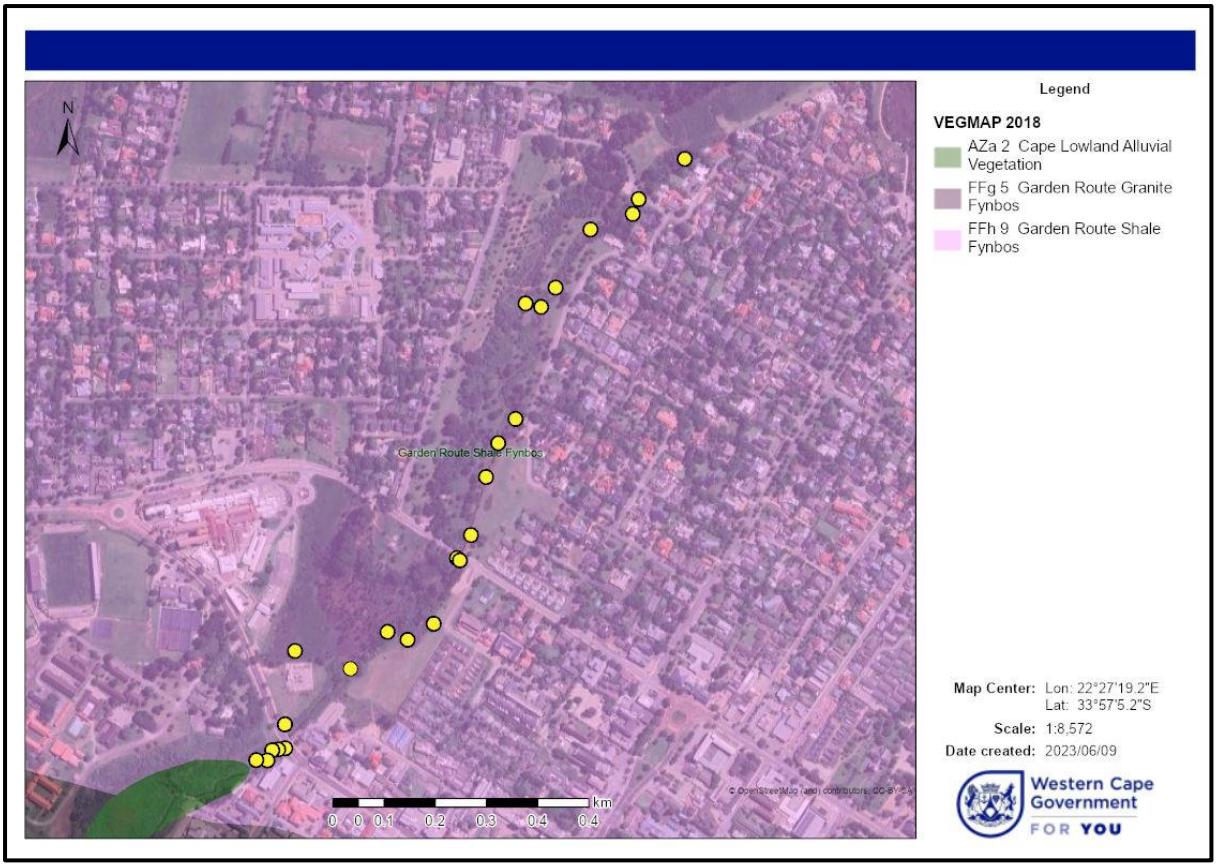



**Figure 6** Vegetation types across the study area (VEGMAP, SANBI 2018; Yellow dots = Repair sites; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

*4.5 Land cover*

Land cover within the study area comprises a mosaic of herbaceous wetlands (previously mapped) and dense forest and woodland (Land Cover 73-class, Department of Environmental Affairs, 2020; Figure 7). Overall, these designations of land cover were found to partly reflect the habitat composition within the study area, but fail to recognize the degraded nature of habitats (Section 7).

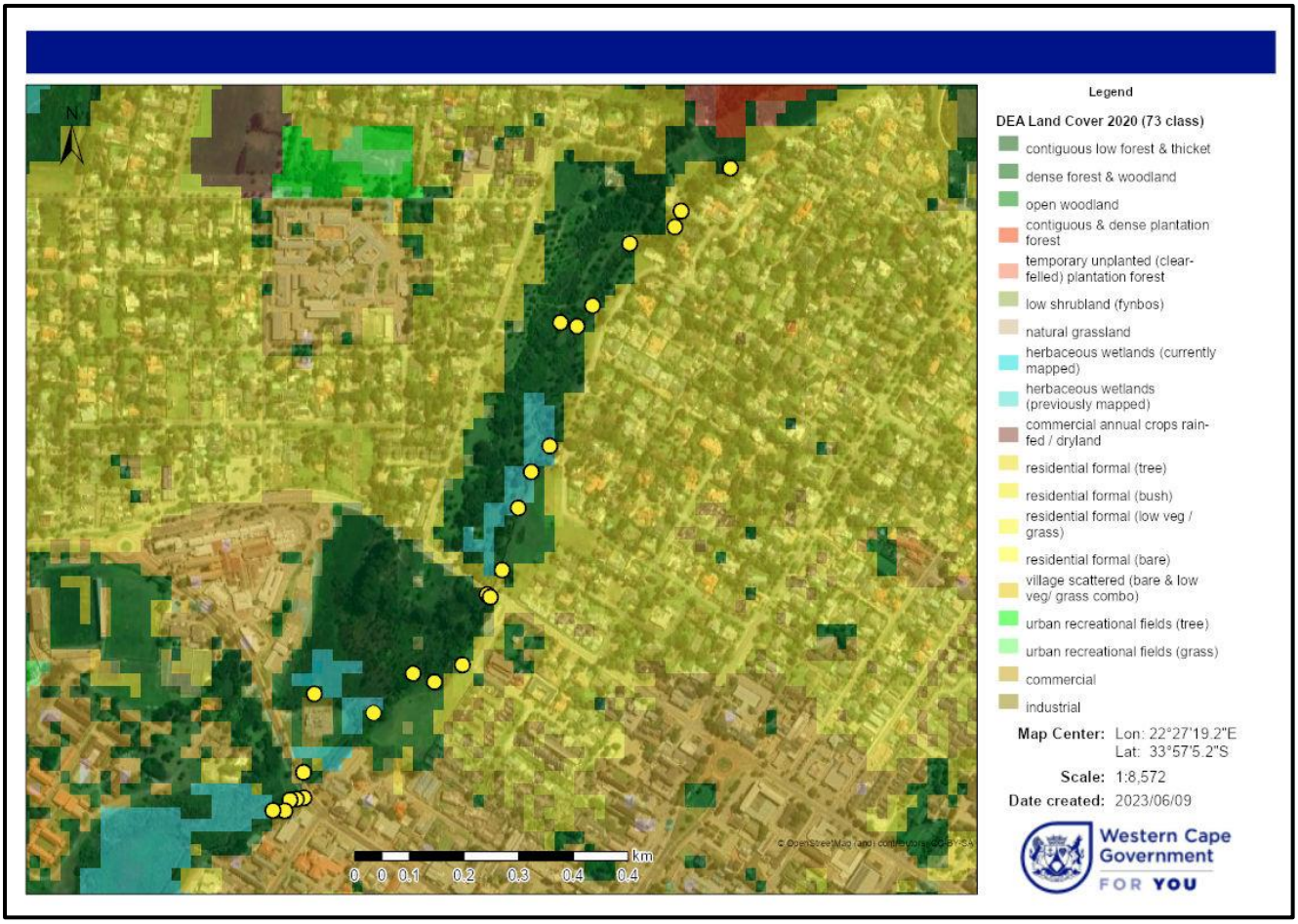



**Figure 7** Land cover (Land Cover 73-class, Department of Environmental Affairs, 2020) within the study area (Yellow dots = Repair sites; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

*4.6 Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)*

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan (Purves and Holmes, 2015). Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services.

Because of their location in the Camfersdrift River drainage channel, a large number of the repair sites overlap with either terrestrial or aquatic Critical Biodiversity Areas (CBAs, Figure 8). Conversely, some of the sites overlap with a degraded Ecological Support Area located to the east of the project footprint (ESA2, Figure 9). The presence and integrity of these CBAs and ESAs are discussed in Section 12.

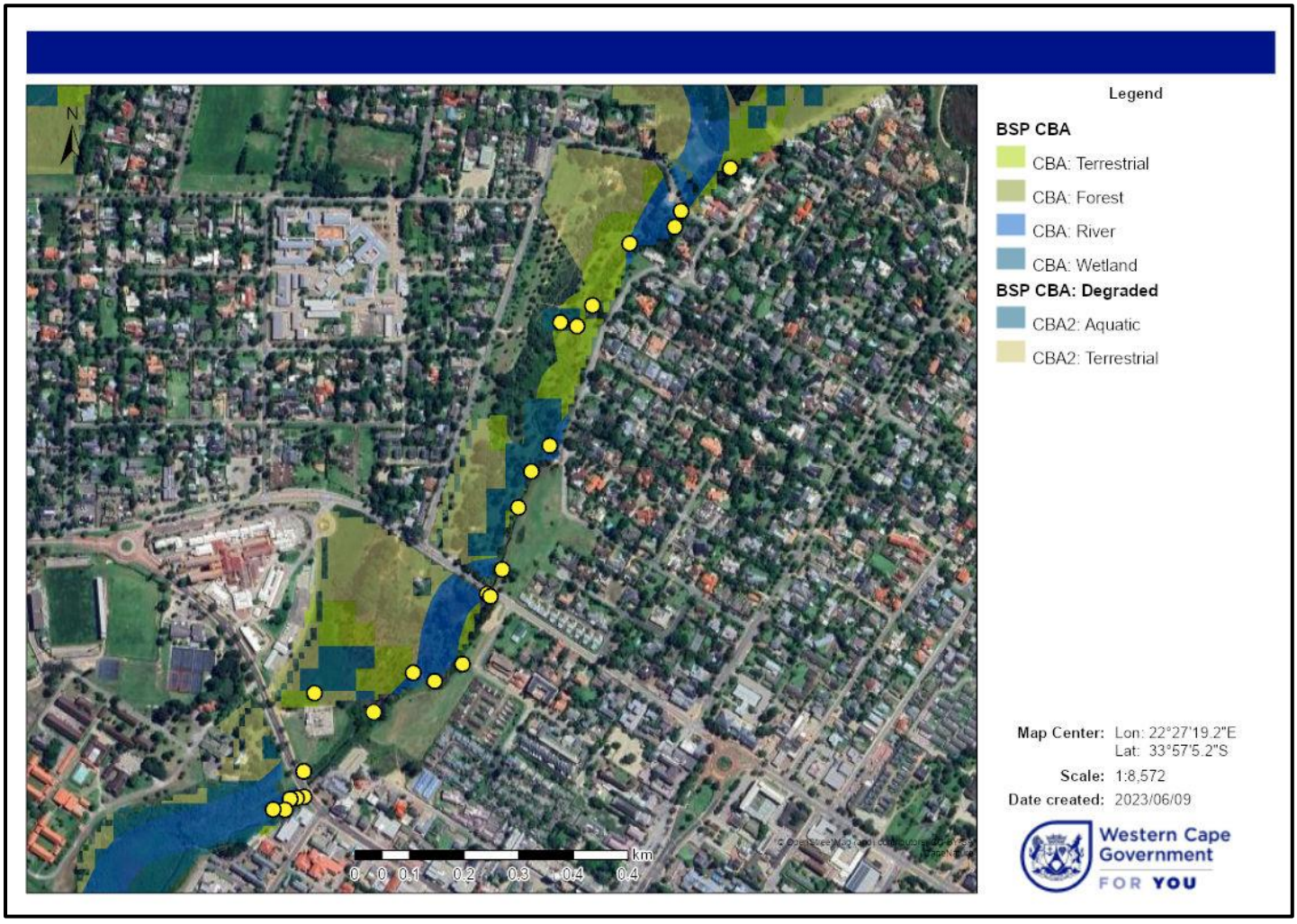



**Figure 8** Spatial locations of Critical Biodiversity Areas (CBAs) overlapping with the study area (Yellow dots = Repair sites; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

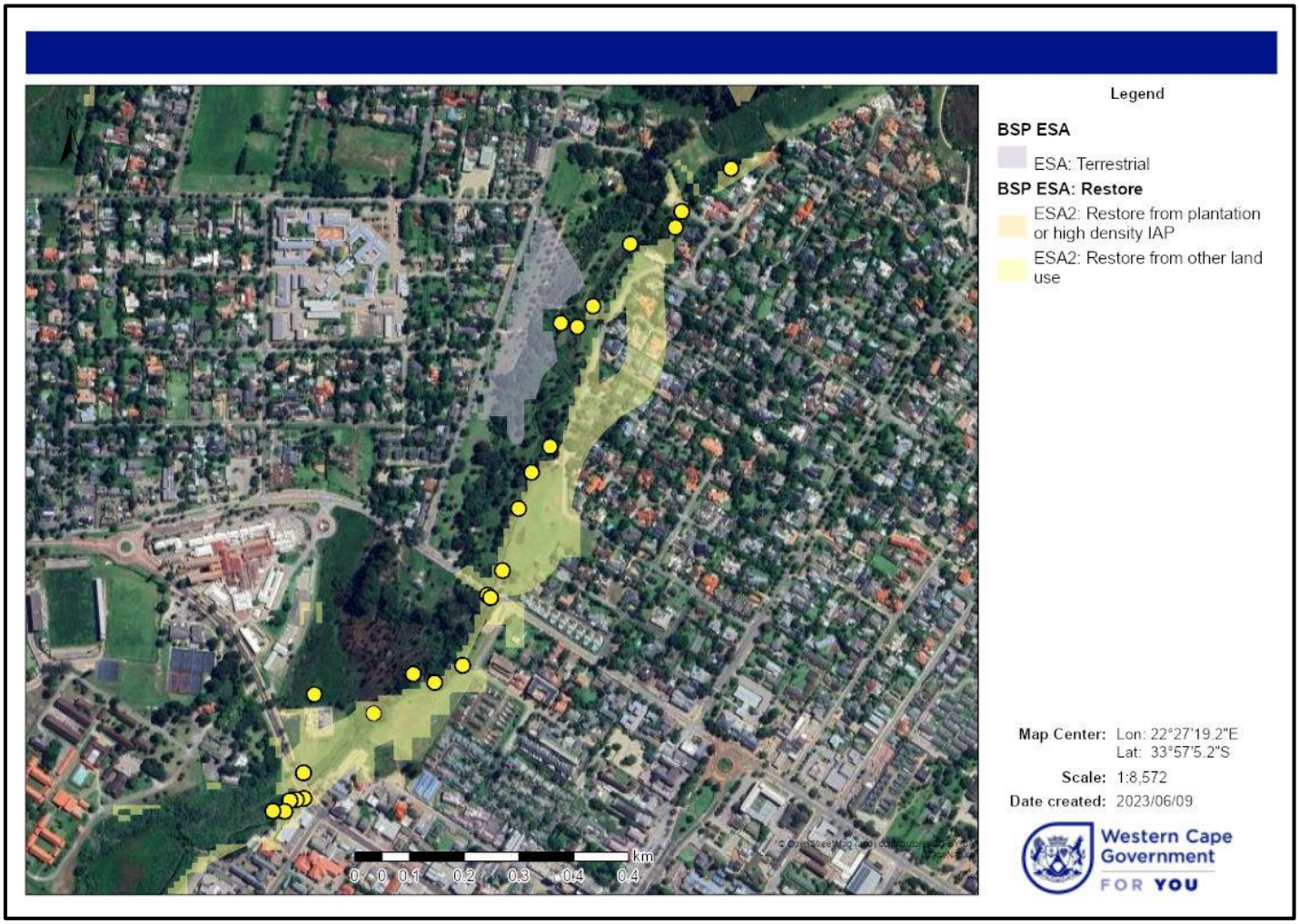



**Figure 9** Spatial locations of Ecological Support Areas (ESAs) overlapping with the study area (Yellow dots = Repair sites; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

*4.7 Ecosystem threat status*

Owing to the historical presence of Garden Route Granite Fynbos, all repair sites intersect an area listed as an “Endangered” ecosystem according to *The National List of Ecosystems that are Threatened and Need of Protection* (Government Gazette, 2011, Figure 10). The southern section of the project footprint is located adjacent to, but ouside of Cape Lowland Alluvial Vegetation which is listed as a “Critically Endangered” ecosystem (Figure 10).

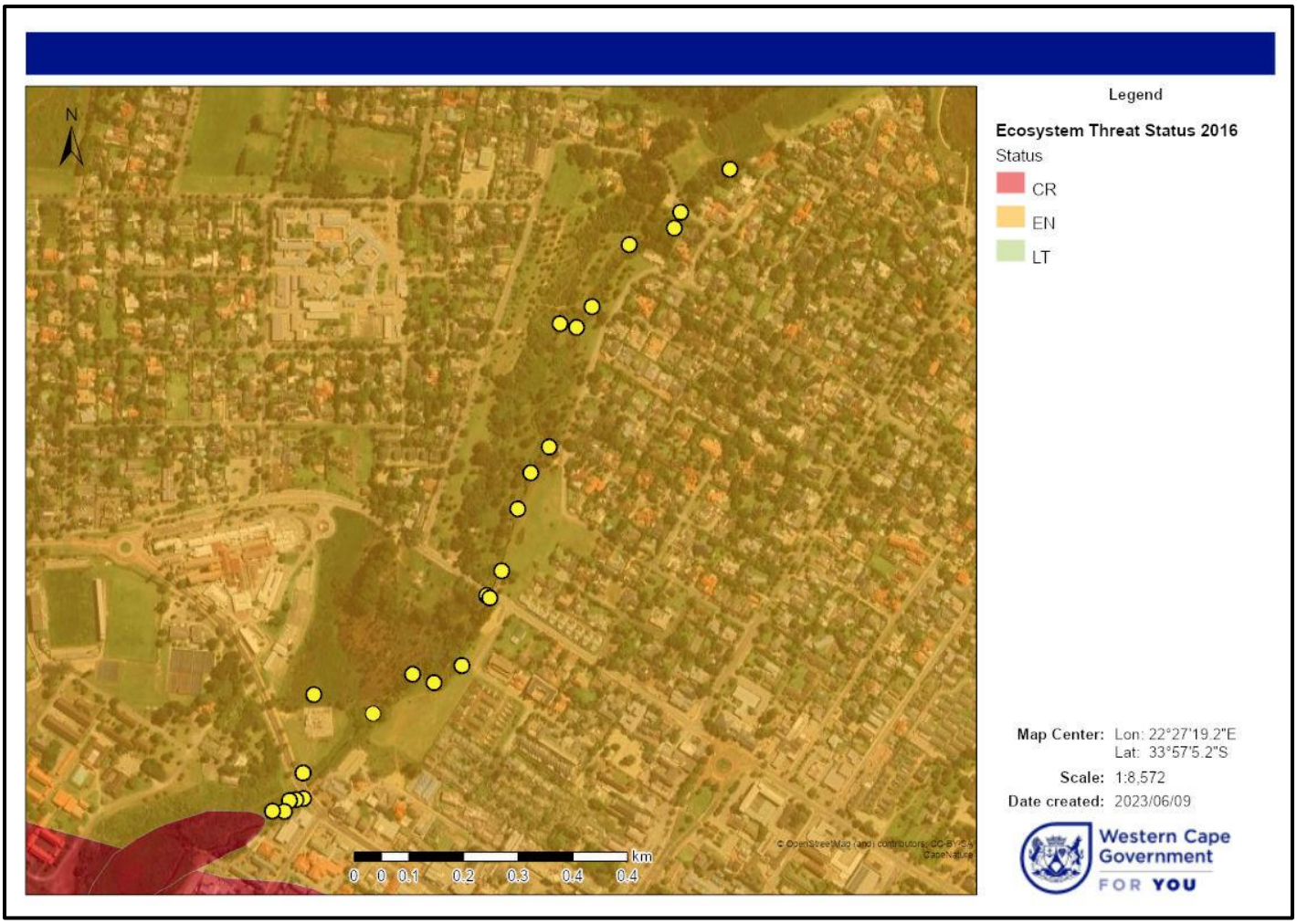



**Figure 10** Spatial location of ecosystems and their threat statuses according to *The National List of Ecosystems that are Threatened and Need of Protection* (Government Gazette, 2011), overlapping with the study area (Yellow dots = Repair sites; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

## 5. Study methodology

### *5.1 Study aims*

This study represents an assessment of the terrestrial faunal and avifaunal diversity and abundances, -habitat composition, ecosystem dynamics and potential occurrence of mammal, amphibians, avifaunal and invertebrate SCC within the study area. As such, the aims of this investigation were to:

1.) Assess, define and create a spatial rendering of available faunal habitats across the study area landscape based on information gathered during the field survey as well as through a desktop assessment using the latest satellite imagery,

2.) compile a complete faunal desktop species list (including mammals, amphibians, and avifauna) for the study area based on a thorough desktop assessment so as to assess the presence of any of the listed SCC (Table 1) as well as any additional SCC within these faunal groups,

3.) compile a faunal species list (including mammals, amphibians, avifauna and grasshoppers) within the study area through field surveying so as to assess the possibility of occurrence of the SCC retrieved in the desktop assessment (based on appropriate sampling methods, as well as the presence of suitable habitat for these species), or any additional SCC which are present on the site, and

4.) generate spatial occurrence maps for the recovered faunal species within the study area to assess the spatial extent of areas supporting higher levels of diversity, and SCC subpopulations and habitats which may be of conservation concern.

*5.2 Desktop assessment*

To assess the possible occurrence of the listed (Table 1) as well as any additional mammal, amphibian and avifaunal SCC, a desktop assessment was performed to create a representative desktop species list for these faunal groups. Given the low number of records for grasshopper species, the presence or absence of the Yellow-winged Agile Grasshopper could only be evaluated during the field survey. Although spiders are listed as one of the SCC groups, this group was not considered during the desktop assessment or the field survey.

5.2.1 Mammals

The desktop species list for mammals (Appendix A) was constructed with reference to the distributional data available in Skinner and Chimimba (2005). This list was further bolstered by referring to the observational records available on the MammalMAP (https://vmus.adu.org.za/) and iNaturalist (www.iNaturalist.org) platforms for the study area landscape (QDGS: 3322BD).

5.2.2 Amphibians

The desktop species list for amphibians (Appendix B) was constructed with reference to the distributional data available in Du Preez and Carruthers (2009). This list was further bolstered by referring to the observational records available on the the FrogMAP (https://vmus.adu.org.za/) and iNaturalist (www.iNaturalist.org) platforms for the study area landscape (QDGS: 3322BD).

5.2.3 Avifauna

The desktop avifaunal species list for the study area was generated by referring to the species records of the South African Bird Atlas Project 2 (SABAP2, https://sabap2.birdmap.africa/) (Appendix C). The study area overlaps with one pentad (see below) which is well-represented in the atlassing cards:

**Pentad: 3355_2225**

Full protocol cards: 313
Ad-hoc protocol cards: 604
Total cards: 917

To create the avifaunal desktop species list for the study area, the species observed were noted, also noting the total number of observations (including both full and ad-hoc protocols) and the latest date that the species was recorded within this pentad (Appendix C).

*5.3 Field survey*

The study area was surveyed on foot over a single day on the 9th of September 2023, during the Spring season. Weather conditions during the surveying period were characterised by relatively warm daily temperatures, no cloud cover and low to moderate wind conditions (Figure 11).

Surveying included unconstrained point sampling through search meanders, as well active searching under rocks and debris. All tracks surveyed were recorded by GPS (Garmin eTrex® 10, Garmin International Inc, USA) and are represented in Figure 12. Terrestrial faunal species (mammals) were identified by direct visual observation, or by their tracks, burrows, remains or scat. Amphibian species were identified by direct visual observation, or auditory means and sound recordings. Avifaunal species were identified by visual observation, using a 180x zoom lens, or by auditory means. Finally, the presence or absence of the Yellow-winged Agile Grasshopper was evaluated based on suitable habitat (recently burnt Schlerophyll on south-facing slopes) for this species. All observations were recorded by GPS and the species or evidence of species' presence or activity were photographed using a digital camera (Canon PowerShot SX430 IS, Canon Inc, USA). A species list for all fauna recorded within the study area is given in Appendix D.

Given relatively optimal weather conditions, faunal and avifaunal species' activity was observed to be high over the surveying period, thereby resulting in 65 recorded observations across the study area (Figure 13, Appendix D), relating to one observation per every 0.08 hectares of study area (the study area is round 5 hectares in extent). During surveying, faunal habitats were broadly identified in the field, and thereafter delineated through a desktop assessment of the study area using satellite imagery (CapeFarmMapper Version 2.6.4, Western Cape Department of Agriculture).

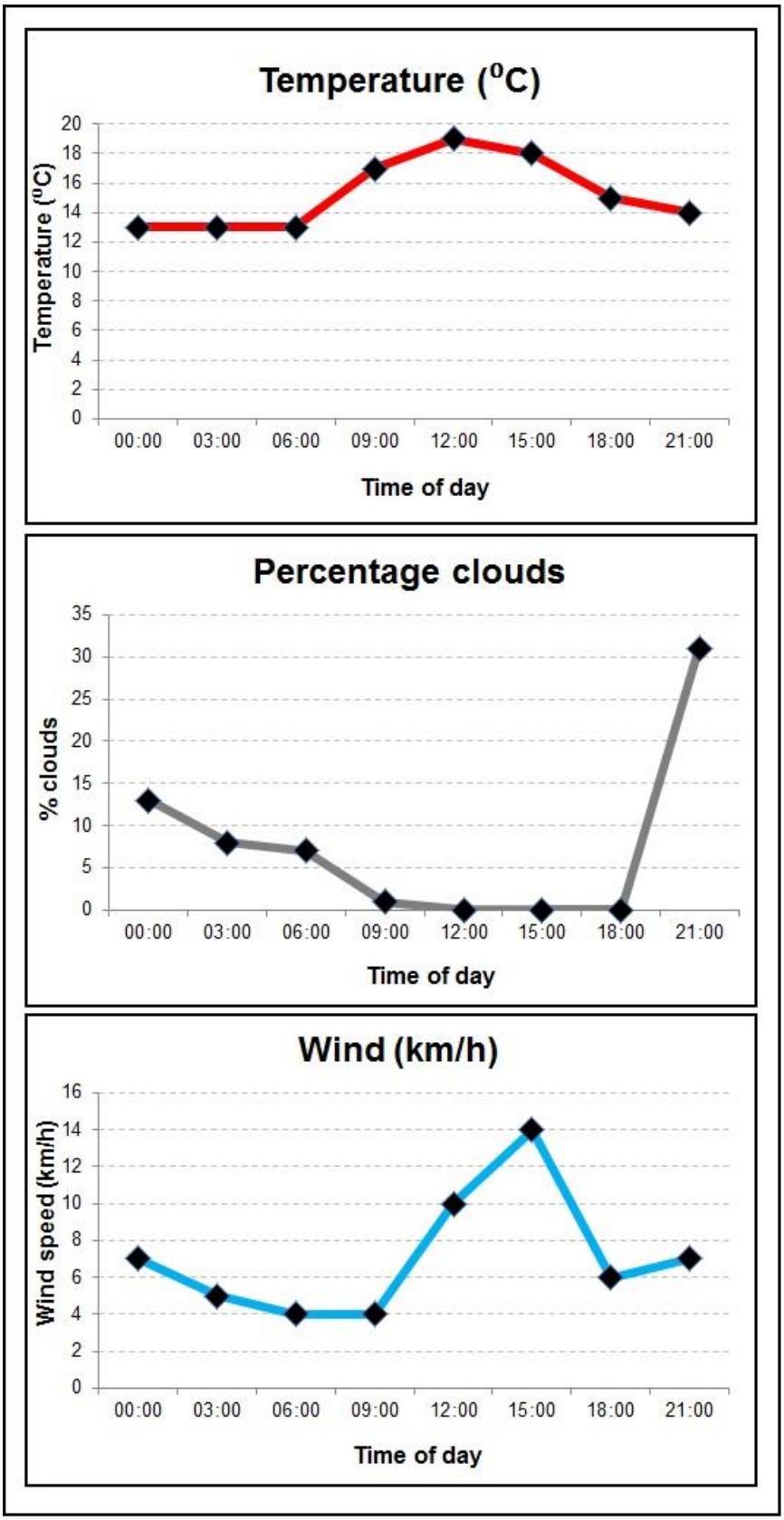



**Figure 11** Weather conditions in the study area over the surveying period (09 September 2023). The time of day is indicated, along with the temperature (in °C), percentage cloud cover and wind speed (in km/h) (weather data sourced from https://www.worldweatheronline.com).


**Figure 12** Spatial tracks recorded by GPS for all the search meanders across the study area over the surveying period.

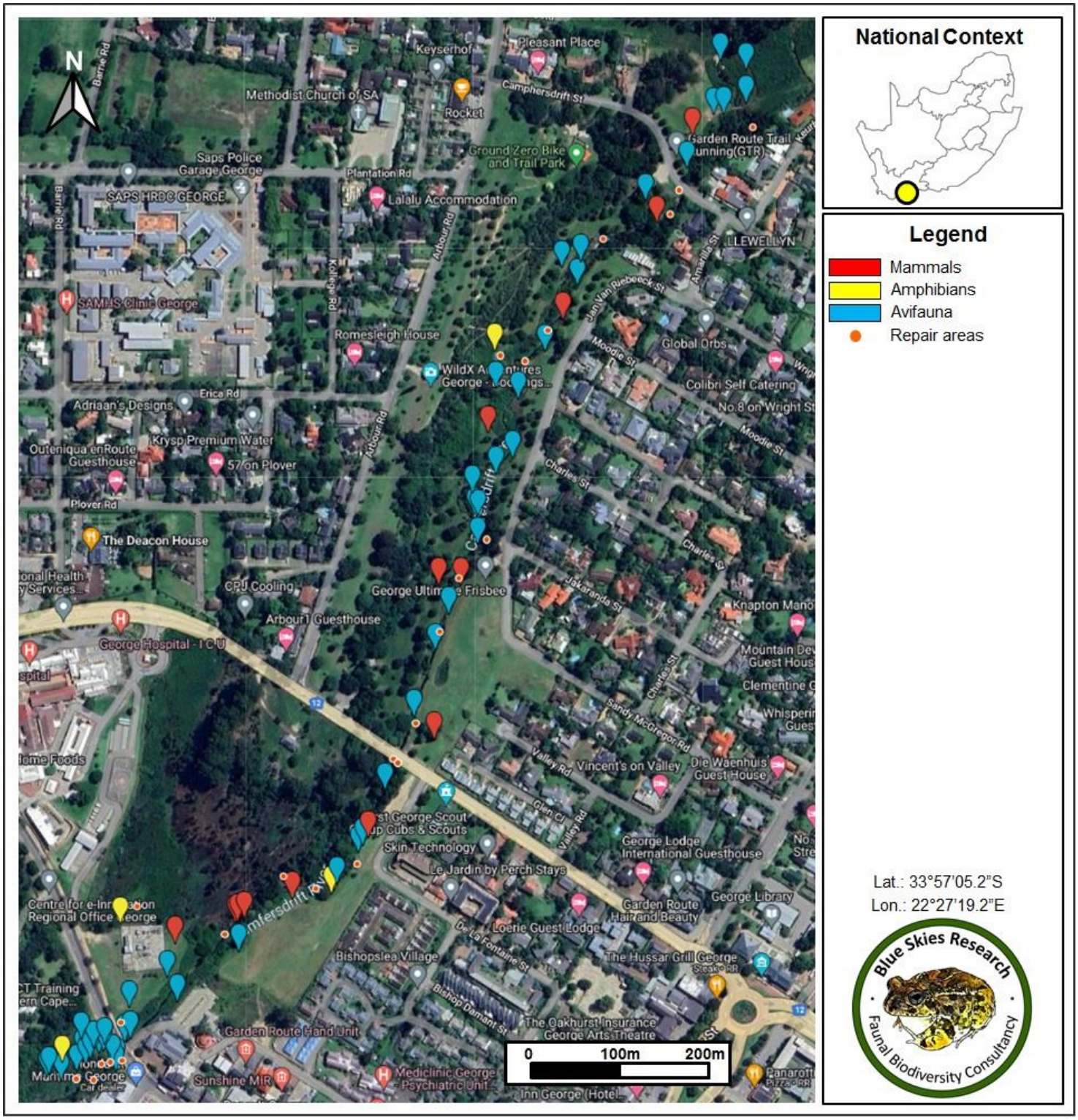



**Figure 13** Spatial locations of all the faunal observations across the study area over the surveying period.

## 6. Assumptions and limitations

Weather conditions during the surveying period were relatively optimal for detecting a representative sample of the terrestrial faunal and avifaunal species diversity across the study area. Even so, not all species could be observed (especially cryptic species), and it is further possible that the surveying period did not correspond to the activity period or activity season of some species. Coupled to this, the thick and impenetrable nature of the Bramble vegetation in the Camfersdrift River drainage channel (see Section 7) hampered sampling efforts as not all areas could be accessed.

Although the observed faunal composition of the study area therefore only partly reflects the species richness of, and faunal abundances within the study area (Appendix D), the inclusion and consideration of SCC was further based on a thorough desktop assessment for the included faunal groups (mammals, amphibians and avifauna; Appendices A to C), meaning that all possibly occurring SCC were considered in the current assessment (Section 9).

## 7. Faunal habitat types within the study area

The study area is comprised of a single habitat type which of a riverine nature, but with the vegetation largely comprising alien and invasive plant species such as Brambles (Figure 14, Table 2). Furthermore, the drainage channel bears significant signs of pollution with water quality appearing relatively poor as a result. To this end, the Riverine habitat on the site exists in a degraded state, harbouring an impaired aquatic diversity (Section 8).

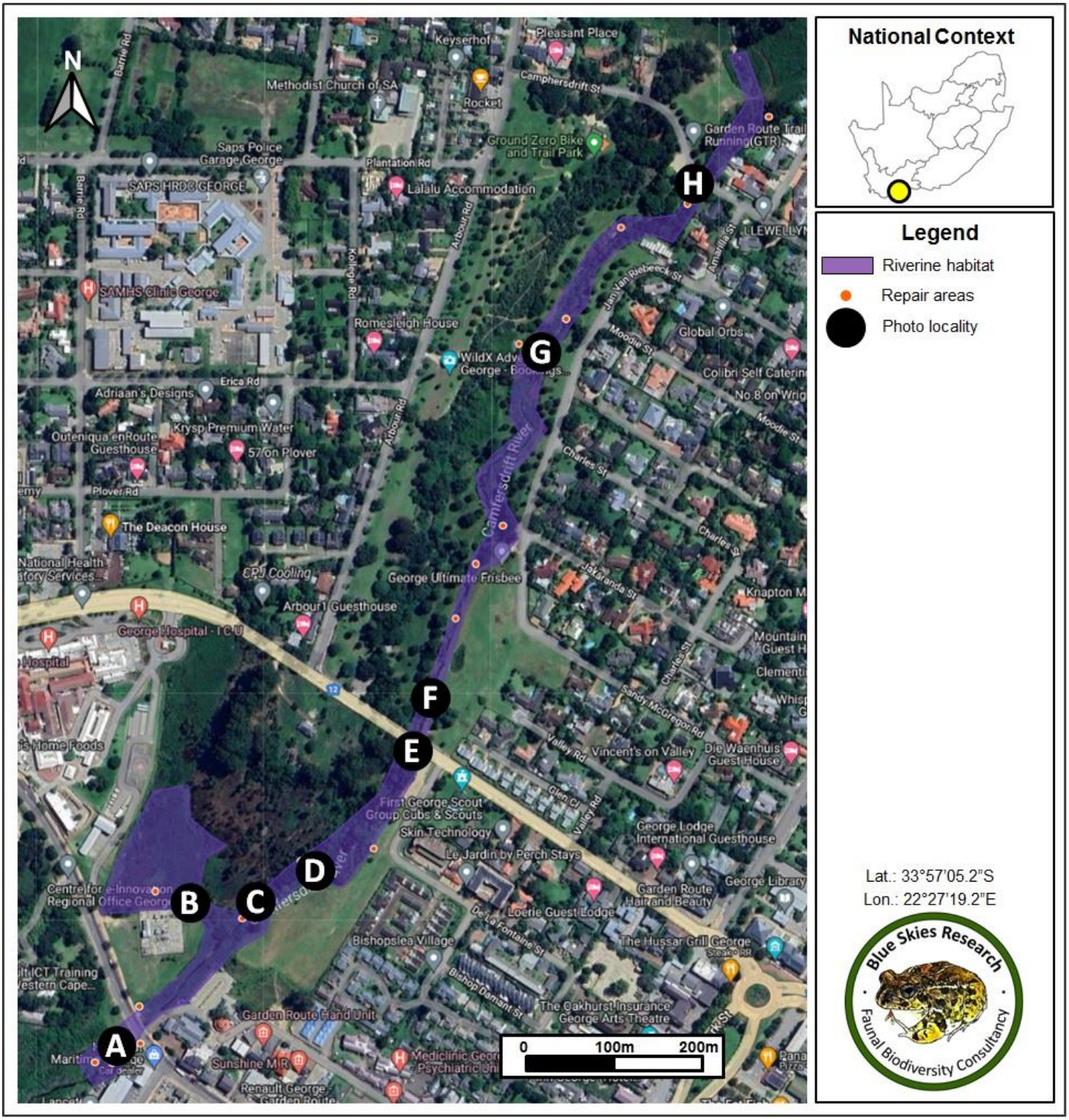



**Figure 14** A broad indication of the spatial extent of the habitat type within the study area. Photo localities (A to H) correspond to the habitat photos in Table 2.

**Table 2** Habitat locations, habitat description and visual representations of the habitat type within the study area. Location designations (A to H) correspond to the photo locations in Figure 14.

| Location | Habitat description | Photo 1 | Photo 2 |
|---|---|---|---|
| **A**<br>-33.95598;<br>22.45154<br><br>**B**<br>-33.95463;<br>22.45239 | **Riverine habitat**<br><br>This habitat constitutes riverine vegetation, but consists largely of alien and invasive plant species such as Brambles with other invasive trees such as Black Wattle also being present. Water quality appears poor within the river, given a high incidence of pollution. |  |  |

**C**
-33.95463;
22.45313

**D**
-33.9544;
22.45381



**E**
-33.95306;
22.45506

**F**
-33.95254;
22.45534


**G**
-33.94901;
22.45678

**H**
-33.94737;
22.45845


# 8. Faunal and avifaunal composition within the study area

## *8.1 Mammals*

### 8.1.1 Desktop assessment

The distributions of 65 mammal species overlap with the study area landscape (Appendix A). Among these, 58 species are currently listed as “Least Concern” by the IUCN (IUCN, 2021), with the remaining seven species representing mammal SCC. These mammal SCC include the following:

1. The Duthie's Golden Mole (*Chlorotalpa duthieae*) classified as “Vulnerable”,
2. Fynbos Golden Mole (*Amblysomus corriae*) classified as “Near-Threatened”,
3. Leopard (*Panthera pardus*) classified as “Vulnerable”,
4. African Clawless Otter (*Aonyx capensis*) classified as “Near-Threatened”,
5. Grey Rhebok (*Pelea capreolus*) classified as “Near-Threatened”,
6. Long-tailed Forest Shrew (*Myosorex longicaudatus*) classified as “Endangered”, and
7. White-tailed Rat (*Mystromys albicaudatus*) classified as “Vulnerable” by the IUCN.

From the observational records available on the MammalMAP (https://vmus.adu.org.za/) and iNaturalist (www.iNaturalist.org) platforms (QDGS: 3322BD), 27 mammal species have been confirmed in the study area landscape (Appendix A) of which 24 are currently listed as “Least Concern” and with three species constituting mammal SCC. These three documented mammal SCC include the:

1. The Duthie's Golden Mole (*Chlorotalpa duthieae*) classified as “Vulnerable”,
2. Fynbos Golden Mole (*Amblysomus corriae*) classified as “Near-Threatened”, and
3. Long-tailed Forest Shrew (*Myosorex longicaudatus*) classified as “Endangered” by the IUCN.

### 8.1.2 Field survey

Evidence of five mammal species were recovered within the study area (Figures 15 and 16), four of which are currently classified as “Least concern” (Appendix D) and one, the Duthie's Golden Mole (*Chlorotalpa duthieae*) classified as “Vulnerable” by the IUCN, and therefore representing a mammal SCC. Three individuals of this species was observed, with one individual being present in the southern part of the project footprint within the Camfersdrift River drainage channel (i.e., within the Riverine habitat), and with two individuals being resident on the lawns within the northern section outside of the study area (Figure 16). The population size of this species appears highly restricted and extralimital, likely given the degraded nature of habitats on the site along with high levels of daily disturbance within this urban setting (Section 11).

Other mammal species on the site constitute the abundant African Mole-rat (*Cryptomys hottentotus*) which also represents a burrowing species restricted to the lawn areas around the study area. Further evidence of the presence of single individuals of the Marsh Mongoose (*Atilax paludinosus*), Cape Grysbok (*Raphicerus melanotis*) and Four-striped Grass Mouse (*Rhabdomys pumilio*) was also noted. Taken together, the site appears depauperate of mammal diversity given the urban setting, high levels of daily disturbance and degraded habitat structure. Only burrowing species are abundant in this context as they are less-easily disturbed by these above-ground impacts.

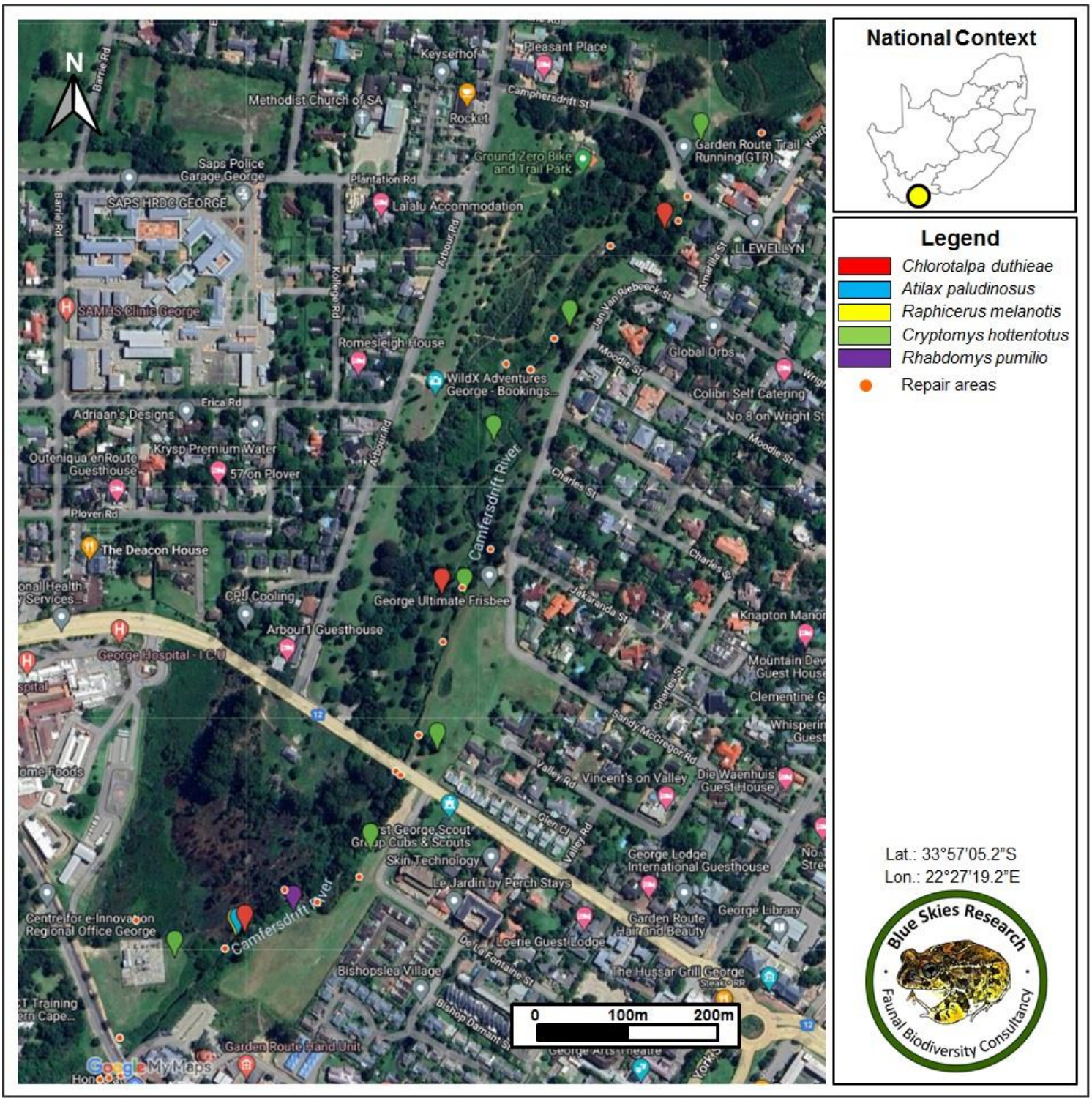



**Figure 15** Spatial locations of the different mammal species recorded within the study area.


**Figure 16** Photographic evidence of the different mammal species recorded in the study area. A) Tunnel of the Duthie's Golden Mole (*Chlorotalpa duthieae*).B) Track of the Marsh Mongoose (*Atilax paludinosus*). C) Track of the Cape Gysbok (*Raphicerus melanotis*). D) Mounds of the African Mole-rat (*Cryptomys hottentotus*). E) Runs (arrowed) of the Four-striped Grass Mouse (*Rhabdomys pumilio*).

*8.2 Amphibians*

8.2.1 Desktop assessment

The distributions of 18 amphibian species overlap with the study area landscape (Appendix A). Among these, 17 species are currently listed as “Least Concern” (IUCN, 2021), with one the Knysna Leaf-folding Frog (*Afrixalus knysnae*), classified as “Endangered” by the IUCN and therefore representing an amphibian SCC.

From the observational records available on the FrogMAP (https://vmus.adu.org.za/) and iNaturalist (www.iNaturalist.org) platforms (QDGS: 3322BD), 12 amphibian species have been confirmed in the study

area landscape (Appendix B), all of which are currently listed as “Least Concern” by the IUCN.

### 8.2.2 Field survey

Two amphibian species were recorded within the study area, both of which are currently classified as “Least concern” (Figure 17, Appendix D). The Clicking Stream Frog (*Strongylopus grayii*) is the most abundant amphibian species along the Camfersdrift River drainage channel (Figure 17), albeit occurring as single individuals instead of colonies, likely owing to the poor water quality here (Section 11). A single individual of the Boettger’s Dainty Frog (*Cacosternum boettgeri*) was also observed vocalising in the wetland habitat to the south of the project footprint.


**Figure 17** Spatial locations of the different amphibian species recorded within the study area.

*8.3 Avifauna*

8.3.1 Desktop assessment

According to the SABAP2 records, 240 bird species have been recorded from the pentad overlapping the study area with 231 species classified as “Least Concern” by the IUCN, and nine species which constitute avifaunal SCC (Appendix C). These avifaunal SCC includes the:

1. Forest Buzzard (*Buteo trizonatus*) classified as “Near-Threatened”,
2. Black Harrier (*Circus maurus*) classified as “Endangered”,
3. African Marsh Harrier (*Circus ranivorus*) classified as “Least Concern”,
4. Martial Eagle (*Polemaetus bellicosus*) classified as “Endangered”,
5. Maccoa Duck (*Oxyura maccoa*) classified as “Endangered”,
6. Blue Crane (*Anthropoides paradiseus*) classified as “Vulnerable”,
7. Protea Canary (*Crithagra leucoptera*) classified as “Near-Threatened”,
8. Knysna Warbler (*Bradypterus sylvaticus*) classified as “Vulnerable”, and
9. Knysna Woodpecker (*Campethera notate*) classified as “Near-Threatened” by the IUCN.

8.3.2 Field survey

In total, 33 bird species were recorded within the study area, all of which are currently classified as “Least concern” by the IUCN (Figures 18 and 19, Appendix D). All avifauna on the site constitutes common vegetation associated species, with a number of birds utilizing the invasive Brambles vegetation in the drainage channel as suitable cover or as perching opportunities. A large number of bird species also utilize the large trees along the site (especially in the northern section) as perching opportunities.

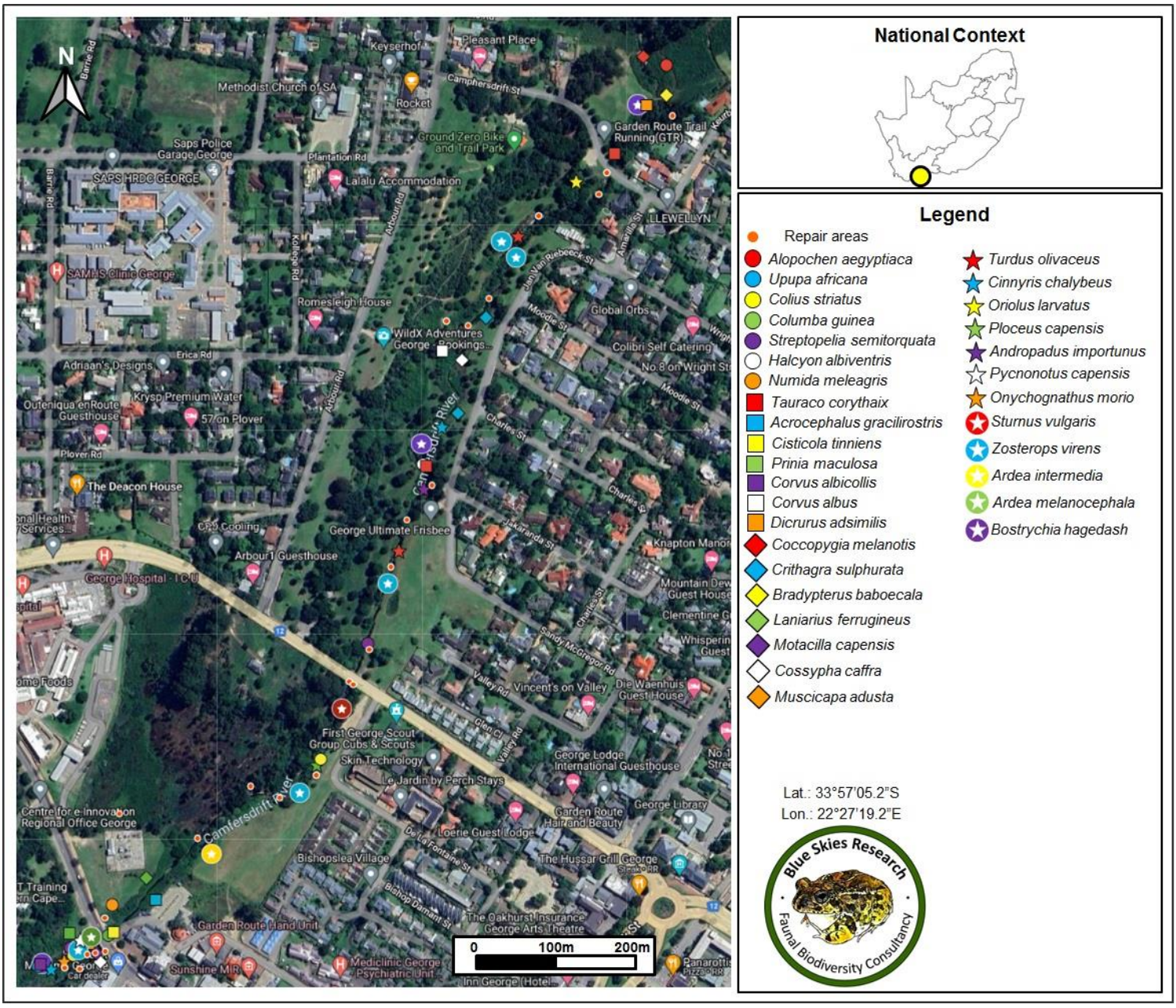
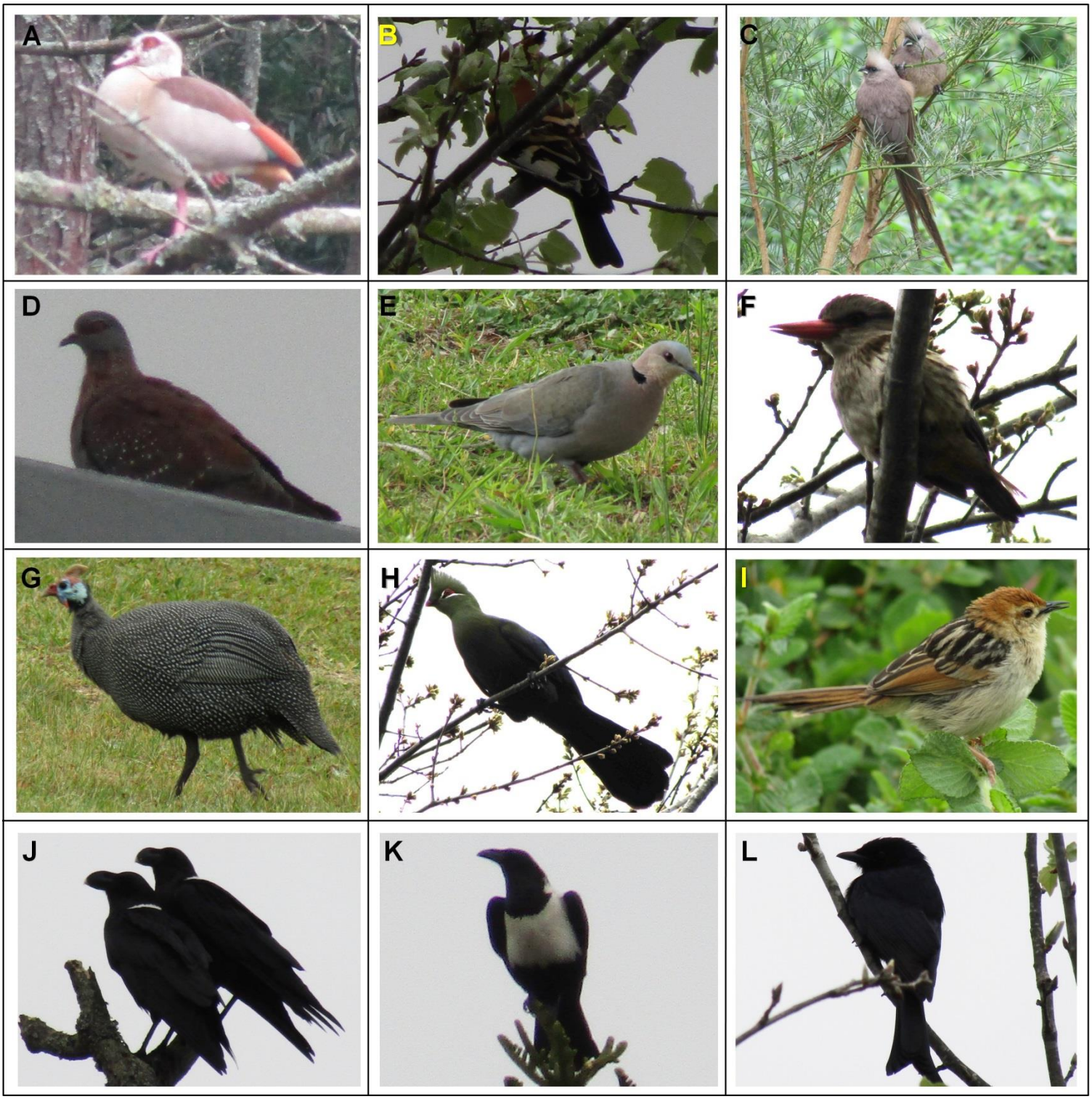



**Figure 18** Spatial locations of the different avifaunal species recorded within the study area.

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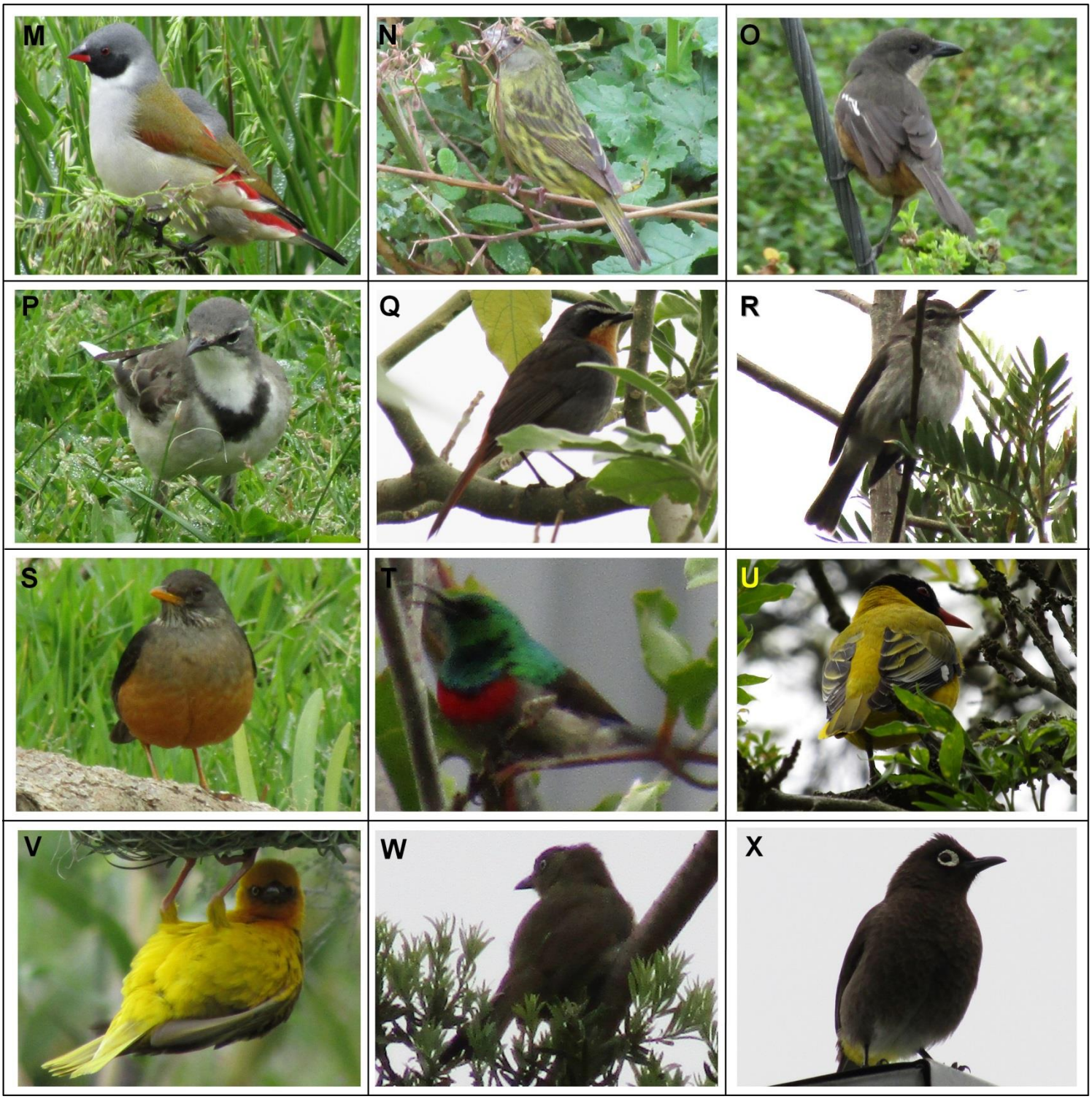


CELL: (083) 453 7916 E-MAIL: BlueSkiesResearch01@gmail.com
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**Figure 19** Photographic evidence of different avifaunal species recorded in the study area. A) Egyptian Goose (*Alopochen aegyptiaca*). B) African Hoopoe (*Upupa africana*). C) Speckled Mousebird (*Colius striatus*). D) Speckled Pigeon (*Columba guinea*). E) Red-eyed Dove (*Streptopelia semitorquata*). F) Brown-hooded Kingfisher (*Halcyon albiventris*). G) Helmeted Guineafowl (*Numida meleagris*). H) Knysna Turaco (*Tauraco corythaix*). I) Levaillant's Cisticola (*Cisticola tinniens*). J) White-necked Raven (*Corvus albicollis*). K) Pied Crow (*Corvus albus*). L) Fork-tailed Drongo (*Dicrurus adsimilis*).

M) Swee Waxbill (*Coccopygia melanotis*). N) Brimstone Canary (*Crithagra sulphurata*). O) Southern Boubou (*Laniarius ferrugineus*). P) Cape Wagtail (*Motacilla capensis*). Q) Cape Robin-Chat (*Cossypha caffra*). R) African Dusky Flycatcher (*Muscicapa adusta*). S) Olive Thrush (*Turdus olivaceus*). T) Southern Double-collared Sunbird (*Cinnyris chalybeus*). U) Eastern Black-headed Oriole (*Oriolus larvatus*). V) Cape Weaver (*Ploceus capensis*). W) Sombre Greenbul (*Andropadus importunus*). X) Cape Bulbul (*Pycnonotus capensis*).

Y) Red-winged Starling (*Onychognathus morio*). Z) Common Starling (*Sturnus vulgaris*). 1) Cape White-eye (*Zosterops virens*). 2) Intermediate Egret (*Ardea intermedia*). 3) Black-headed Heron (*Ardea melanocephala*). 4) Hadada Ibis (*Bostrychia hagedash*).

*8.4 Grasshoppers*

The presence of the Yellow-winged Agile Grasshopper was evaluated based on suitable habitat (recently burnt Schlerophyll on south-facing slopes) for this species - a habitat type which is not present on the site. To this end, suitable habitat for the Yellow-winged Agile Grasshopper is not present on the site, and it is highly unlikely that this species will occur here.

*8.5 Faunal and avifaunal diversity within the study area*

Faunal and avifaunal diversity in the study area is largely comprised of relatively common species of “Least Concern” (IUCN, 2021), with the notable exception of a small subpopulation of *C. duthieae* which represents a mammal SCC. Given the urban setting, high levels of daily disturbance (through vibration from vehicles and people) and degraded habitat structure (significant signs of pollution and a high incidence of alien and invasive vegetation), highly mobile avifaunal species are the most abundant faunal group, given their ability to traverse this landscape. Conversely, terrestrial fauna appears scarce with only burrowing species being abundant given that their below-ground lifestyle buffers them from the above-ground impacts. Following from this impaired faunal diversity, the site harbours little in the way of intact predator-prey dynamics (as is evidenced by a general lack of mammal and avifaunal predators), with impaired ecosystem dynamics. Even so, the site does provide a green space in an urban setting, and forms a semi-functional albeit degraded ecological link in the study area landscape.

## 9. Species of Conservation Concern

Along with the seven (two mammal, one amphibian, three avifaunal and one invertebrate) SCC listed in the DFFE Screening Tool (Table 1), the potential occurrence of 12 other (five mammal and seven avifaunal) SCC within the study area was assessed (Table 3), given their recovery in the desktop assessment (see Section 8). The probability of occurrence of each specific SCC within the study area landscape was assessed based on the following criteria:

**Confirmed** - The species was confirmed as present within the study area during the field survey.

**High** - The species was not confirmed as present within the study area during the field survey but has been recorded in the overlapped QDGS in the case of mammals. In the case of avifauna, the species has been recorded in the overlapped pentad recently (less than 2 years ago) and in high number (>10 times) and is therefore likely to also occur in the study area, given suitable habitat characteristics.

**Medium** - The species was not confirmed as present within the study area during the field survey, and has not been recorded in the overlapped QDGS in the case of mammals. In the case of avifauna, the species has been recorded a number of times (<10 times) in the overlapped pentad recently (less than 2 years ago). Suitable habitat for the species is also present in the study area.

**Low** - No suitable habitat for the species is present in the study area. Further, in the case of avifauna, the species has been recorded a low number of times (<2 times) or more than five years ago in the overlapped pentad.

The presence of one mammal SCC was confirmed one the site, but aside from this species, it is unlikely that any of the other considered SCC will occur within the study area given a lack of suitable habitats combined with the degraded nature of on-site habitats and high levels of daily disturbance (Table 4). These SCC are therefore not further considered in this report.

**Table 3** Probability of occurrence of specific SCC in the study area. For each species, the taxonomic Family, scientific name and common name is shown, along with its current classification under the IUCN Red List of Threatened Species (IUCN, 2021). In addition, the species' preferred habitat and the probability that the species occurs within the study area is given, along with a justification for listing this probability.

| Order | Family | Species | Common name | Status | Habitat | Probability of occurrence in the study area | Justification of probability |
|---|---|---|---|---|---|---|---|
| Sensitive Species 8 | Sensitive Species 8 | *Sensitive Species 8* | *Sensitive Species 8* | - | - | Low | The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. It is unlikely that this species will occur on the site, given a lack of suitable habitat characteristics, a degraded habitat structure along with high levels of disturbance in this urban landscape. |
| Afrosoricida | Chrysochloridae | *Chlorotalpa duthieae* | Duthie's Golden Mole | Vulnerable | The species occurs on alluvial sands and sandy loams in Southern Cape Afrotemperate forests (especially coastal platform and scarp forest patches) in the Fynbos and Moist Savanna biomes (Bronner, 2015). The species also thrives in cultivated areas and gardens. | Confirmed | The presence of the species was confirmed in a small southern patch of Riverine habitat, as well as in the northern lawn area outside of the study area. Only three individuals were noted, and the subpopulation appears very small. Although the site does harbour the loamy soils and lawns (outside of the project footprint), the high level of disturbances, degraded nature and urban setting of the site therefore appears to preclude high population numbers. |
| Afrosoricida | Chrysochloridae | *Amblysomus corriae* | Fynbos Golden Mole | Near-Threatened | The species prefers sandy soils and soft loams in Mountain Fynbos, Grassy Fynbos and Renosterveld of South West Cape (Bronner and Mynhardt, 2015). Also in Afromontane forest and southern African moist savanna along the southern Cape coast. The species furthermore thrives in gardens, cultivated lands, golf courses and livestock paddocks, and is also present in exotic plantations, but apparently at lower densities (Bronner, 2013). | Low | The species was not confirmed during the field survey, but it has been recorded in the study area landscape. Even so, the site does not harbour the sandy soils and soft loams preferred by this species, and it is highly unlikely to occur in the study area. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Carnivora | Felidae | *Panthera pardus* | Leopard | Vulnerable | The species occurs in the widest range of habitats among any of the Old World Cats, including the larger part of Africa and Asia (Nowell and Jackson 1996). Generally, Leopards prefer medium-sized ungulate prey (10- 40 kgs) where available (Hayward et al. 2006). They have a highly varied diet, however, feeding on insects, reptiles, birds and small mammals up to large ungulates. | Low | The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Furthermore, the high level of disturbances, degraded nature and urban setting of the site makes it is highly unlikely that this species will be present within the study area. |
| Carnivora | Mustelidae | *Aonyx capensis* | African Clawless Otter | Near-Threatened | The species occupies aquatic freshwater areas and is seldom found far from water. It may occur in many seasonal or episodic rivers provided suitable-sized pools persist (Nel and Somers, 2007, Somers and Nel, 2013). | Low | The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Furthermore, although aquatic habitats are available on the site, these appear highly degraded and along with the high level of disturbances, degraded nature and urban setting of the site, it is highly unlikely that this species will be present within the study area. |
| Eulipotyphla | Soricidae | *Myosorex longicaudatus* | Long-tailed Forest Shrew | Endangered | The species is found in forests, forests edges, fynbos and boggy grassland, and depends on moist microhabitats (typically above the 800 mm isohyet). It is restricted to pristine primary habitat that has not been degraded (Baxter et al. 2020). | Low | The species was not confirmed during the field survey, but it has been recorded in the study area landscape. Given that none of the habitats on the site exist in a pristine primary state, however, it is highly unlikely that this species will occur here. |
| Rodentia | Nesomyidae | *Mystromys albicaudatus* | White-tailed Rat | Vulnerable | The species' habitat requirements are not well known, but it appears associated with calcrete soils within grasslands. The species can occur in disturbed areas (heavily grazed, D. MacFadyen pers. obs.) and in sparse grasslands (Kuyler, 2000; Kaiser, 2006; Avenant and Cavallini, 2007; Avenant and Schulze, 2012; Morwe 2013), but does not occur in transformed habitat (croplands, fallow fields, or old fields). In the Blaauwberg Conservation Area (BCA), Western Cape Province it may occur in Dune Thicket on sloped clay soils. | Low | The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Furthermore, suitable calcrete soils or sloped clay soils in Dune Thicket are not present on the site, and along with the high level of disturbances, degraded nature and urban setting of the site, it highly is highly unlikely that this species will be present within the study area landscape. |
| Anura | Hyperoliidae | *Afrixalus knysnae* | Knysna Leaf-folding Frog | Endangered | The species occurs in a coastal mosaic of vegetation types, including mountain fynbos heathland and forest. It breeds in small dams and shallow semi-permanent water with much emergent vegetation, and even in well vegetated ornamental garden ponds. It is suspected that this species requires high water quality for breeding. | Low | The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Although the site does contain aquatic habitats, the water quality here appears very poor owing to a high incidence of pollution and it is highly unlikely that this species will occur in the study area. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Accipitriformes | Accipitridae | *Buteo trizonatus* | Forest Buzzard | Near-Threatened | This species inhabits native temperate forests from sea level up to 1,000 m, and rarely to 1,500 m (Ferguson-Lees and Christie 2001). It can also be found in plantations, though usually near to areas of native forest (Ferguson-Lees and Christie 2001). | Medium | The species was not confirmed during the field survey, but has been recorded a high number of times (279 times) in the study area landscape, with the latest observation in August 2023 (Appendix C). Even so, the site does not support any native forests and is of a relatively open riverine nature. It is unlikely that this species will be permanently associated to the site itself, and would likely be restricted to surrounding forested areas. |
| Accipitriformes | Accipitridae | *Circus maurus* | Black Harrier | Endangered | The species occurs in coastal and montane Fynbos, highland grasslands, Karoo subdesert scrub, open plains with low shrubs and croplands (Curtis *et al*. 2004). In the Western Cape of South Africa it is most abundant in coastal and montane fynbos (Curtis *et al*. 2004), and loose colonies may aggregate around wetland areas. The Black Harrier prefers open ground with low vegetation for hunting, where it feeds mainly on small mammals, especially *Otomys* and *Rhabdomys* species, although its diet may also include birds and reptiles (Garcia-Heras *et al*. 2017). The main diet of the Black Harrier however constitutes the Four-striped Grass Mouse, *Rhabdomys pumilio* (Garcia-Heras *et al*. 2017). The species breeds close to coastal and upland marshes (damp sites, near vleis, marshes or streams are preferred for breeding), but may also nest in montane habitats, preferring south-facing slopes (Brown *et al*. 1982; Curtis *et al*. 2004). Nests are built on the ground in tall vegetation such as shrubs or reeds (Brown *et al*. 1982, Curtis *et al*. 2004). The species does not breed in transformed and cultivated lands, although it may forage in these environments (Curtis *et al*. 2004). | Low | The species was not confirmed during the field survey, and has been recorded only three times in the study area landscape more than five years ago (March 2018, Appendix C). It is therefore highly unlikely that this species will be present on or near the site. |
| Accipitriformes | Accipitridae | *Circus ranivorus* | African Marsh Harrier | Least Concern | The species breeds in wetlands, foraging primarily over reeds and lake margins (Harrison *et al*. 1997). Its diet consists largely of small mammals, particularly striped mouse *Rhabdomys pumilio* (Kemp and Dean, 1988). | Low | The species was not confirmed during the field survey, but has been recorded a low number of times (five times) in the study area landscape more than three years ago (October 2020, Appendix C). Suitable wetland habitats for this species are also not available on the site, and It is therefore highly unlikely that this species will be present. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Accipitriformes | Accipitridae | *Polemaetus bellicosus* | Martial Eagle | Endangered | The species inhabits open woodland, wooded savanna, bushy grassland, thornbush and, in southern Africa, more open country and even subdesert, from sea level to 3,000 m but mainly below 1,500 m (Ferguson-Lees and Christie, 2001). The main prey is sizeable mammals, birds and reptiles (Ferguson-Lees and Christie, 2001). | Low | The species was not confirmed during the field survey, and has been recorded only once in the study area landscape more than five years ago (April 2015, Appendix C). In addition, the high level of disturbances, degraded nature and urban setting of the site makes it is highly unlikely that this species will be present within the study area landscape |
| Anseriformes | Anatidae | *Oxyura maccoa* | Maccoa Duck | Endangered | During the breeding season the species inhabits small temporary and permanent inland freshwater lakes (Berruti *et al*. 2005, 2007), preferring those that are shallow and nutrient-rich (Johnsgard,1978, Johnsgard and Carbonell, 1996) with extensive emergent vegetation such as reeds (*Phragmites* spp.) and cattails (*Typha* spp.) (Johnsgard and Carbonell, 1996) on which it relies for nesting. It prefers areas with a bottom of mud or silt and minimal amounts of floating vegetation, since this provides the best foraging conditions (Johnsgard and Carbonell, 1996). It also breeds on man-made habitats, such as small farm wetlands, and sewage-farm basins (Johnsgard, 1978, Johnsgard and Carbonell, 1996). Outside the breeding season it will wander over larger, deeper lakes and brackish lagoons (del Hoyo *et al*. 1992, Berruti *et al*. 2005, 2007). It is thought to find refuge on the larger lakes while moulting (Berruti *et al*. 2005, 2007). The species tends to nest over deeper water among emergent vegetation (Berruti *et al*. 2005, 2007). The nest is usually constructed from reeds and cattails that have been bent down to form a basin (Johnsgard and Carbonell, 1996), although old nests of Red-knobbed Coots *Fulica cristata* may sometimes be used | Low | The species was not confirmed during the field survey, but has been recorded a number of times (six times) in the study area landscape more than five years ago (November 2021, Appendix C). Even so, habitats on the site are not characteristic of the open water conditions required by this species, and it is therefore highly unlikely it will be present on or near the site. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Galliformes | Gruidae | *Anthropoides paradiseus* | Blue Crane | Vulnerable | This species breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short (Barnes, 2000). Occasionally it will breed in or near wetland areas (Barnes, 2000), in pans or on islands in dams (Hockey *et al*. 2005). Particularly in the Western Cape of South Africa, it also uses lowland agricultural areas, particularly pasture, fallow fields and cereal crop fields as stubble becomes available after harvest (Barnes, 2000, Hockey *et al*. 2005). During the non-breeding season the species inhabits short, dry, natural grasslands, as well as the Karoo and fynbos biomes (Barnes, 2000). In fynbos it occurs almost exclusively in cultivated habitats, largely avoiding the natural vegetation (Barnes, 2000), although this habitat may provide important cover for juveniles (Bidwell *et al*. 2006). The agricultural habitats that it uses include pastures, croplands, particularly where cereal crops are grown (Barnes, 2000), and fallow fields. It is intolerant of intensively grazed and burnt grassland (Hockey *et al*. 2005). It roosts in shallow wetlands (Barnes, 2000, Hockey *et al*. 2005). | Low | The species was not confirmed during the field survey, and has been recorded only three times in the study area landscape more than three years ago (January 2020, Appendix C). Given a lack of suitable habitat along with the high level of disturbances, degraded nature and urban setting of the site, it is highly unlikely that this species will be present within the study area. |
| Passeriformes | Fringillidae | *Crithagra leucoptera* | Protea Canary | Near-Threatened | The species is predominantly found in mature Fynbos, but can be found in large numbers in areas of recent burning as a result of seed release by *Protea* species (Lee and Barnard, 2014). The species may also be found in other habitats such as tall shrubs, semi-arid scrub and woodland patches (Clement and Sharpe, 2017). | Low | The species was not confirmed during the field survey and has been recorded only three times in the study area landscape, albeit recently (August 2023, Appendix C). Even so, the site does not harbour the required Fynbos vegetation or *Protea* species preferred by this species, and along with the high level of disturbances, degraded nature and urban setting of the site, it is highly unlikely that this species will be present within the study area. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Otidiformes | Otididae | *Neotis denhami* | Denham's Bustard | Near-Threatened | The species inhabits grasslands, grassy *Acacia*-studded dunes, fairly dense shrubland, light woodland, farmland, crops, dried marsh and arid scrub plains, also grass-covered ironstone pans and burnt savanna woodland in Sierra Leone and high rainfall sour grassveld, planted pastures and cereal croplands in fynbos in South Africa (del Hoyo et al. 1996). It feeds on insects, small vertebrates and plant material (Collar, 1996). | Low | The species was not confirmed during the field survey, and has never been recorded within the study area landscape. Furthermore, the high level of disturbances, degraded nature and urban setting of the site makes it is highly unlikely that this species will be present within the study area. |
| Passeriformes | Locustellidae | *Bradypterus sylvaticus* | Knysna Warbler | Vulnerable | The species occurs in thick, tangled vegetation along the banks of watercourses, or covering drainage lines in fynbos forest patches, or on the edges of afromontane forest. It breeds in dense understorey vegetation (Pryke et al. 2010). | Medium | The species was not confirmed during the field survey, but has been recorded a high number of times (146 times) in the study area landscape recently (September 2023, Appendix C). Although habitats on the site are highly degraded, this species does sometimes occur in the invasive Brambles which are present on the site. Even so, the presence of this species on the site is likely ephemeral, and it is unlikely to occur in high numbers. |
| Piciformes | Picidae | *Campethera notata* | Knysna Woodpecker | Near-Threatened | The species is confined to coastal areas of forest, woodland, dense bush, Euphorbia scrub, or open country with large trees. | Medium | The species was not confirmed during the field survey, but has been recorded a number of times (39 times) in the study area landscape, with the latest observation in March 2023 (Appendix C). Even so, the site is largely devoid of woodland habitat, and the presence of this species on the site is likely ephemeral, and it is unlikely to occur in high numbers. |
| Orthoptera | Acrididae | *Aneuryphymus montanus* | Yellow-winged Agile Grasshopper | Vulnerable | The species is associated with fynbos vegetation, where it has been collected "amongst partly burnt stands of evergreen Sclerophyll in rocky foothills" (Brown 1960). It prefers south-facing cool slopes (Kinvig 2005). | Low | The site is devoid of any of the Fynbos vegetation required by this species, and it is highly unlikely to occur on or near the site. |

*9.1 Conservation status and on-site habitats of SCC in the study area*

The only SCC confirmed within the study area landscape pertains to the Duthie's Golden Mole (*Chlorotalpa duthieae*, listed as “Vulnerable” under Criterion B1ab(iii)+2ab(iii)) of which a very small subpopulation is present. Only one individual was confirmed with the Riverine habitat of the site, with two individuals retrieved in the northern lawn area outside of the study area. Although the site does harbour the loamy soils and lawns (outside of the project footprint), the high level of disturbances, degraded nature and urban setting of the site therefore appears to preclude high population numbers. Together with this, the localised spatial extent and short nature of the impacts from the proposed repairs will have a negligible effect on this species.

# 10. Evaluation of Site Ecological Importance (SEI)

*10.1 Evaluating SEI for habitats in the study area*

Evaluation of the Site Ecological Importance (SEI) for the habitats of SCC confirmed in the study area was performed following the methods and criteria outlined in the Species Environmental Assessment Guideline (SANBI, 2020). Evaluation of SEI was performed only for mammals (given that *C. duthieae* was the only SCC confirmed on the site, and that all other SCC have a low likelihood of occurrence, Table 3). In short, SEI is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/faunal community or habitat type present on the site) and its resilience to impacts (Receptor Resilience, RR) as follows: SEI = BI + RR. Biodiversity Importance (BI) is in turn a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows: BI = CI + FI.

To calculate the Conservation Importance (CI) and Functional Integrity (FI) of each habitat within the study area, the criteria outlined in Table 4 and Table 5 were respectively used.

According to the Species Environmental Assessment Guideline, Conservation Importance (CI) may defined as follows:

Conservation Importance (CI): "*The importance of a site for supporting biodiversity features of conservation concern present, e.g. populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.*"

**Table 4** Conservation importance (CI) criteria (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

| Conservation Importance (CI) | Fulfilling Criteria |
|---|---|
| Very high | Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 $km^2$.<br><br>Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type.<br><br>Globally significant populations of congregatory species (> 10% of global population). |
| High | Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 $km^2$. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining.<br><br>Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type.<br><br>Presence of Rare species.<br><br>Globally significant populations of congregatory species (> 1% but < 10% of global population). |
| Medium | Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals.<br><br>Any area of natural habitat of threatened ecosystem type with status of VU.<br><br>Presence of range-restricted species.<br><br>> 50% of receptor contains natural habitat with potential to support SCC. |
| Low | No confirmed or highly likely populations of SCC.<br><br>No confirmed or highly likely populations of range-restricted species.<br><br>< 50% of receptor contains natural habitat with limited potential to support SCC. |
| Very low | No confirmed and highly unlikely populations of SCC.<br>No confirmed and highly unlikely populations of range-restricted species.<br>No natural habitat remaining. |

According to the guideline, Functional Integrity (FI) is defined as:

Functional integrity (FI): "*The receptors' current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions. Simply stated, FI is: 'A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts.*"

**Table 5** Functional integrity (FI) criteria (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

| Functional Integrity (FI) | Fulfilling Criteria |
|---|---|
| Very high | Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types.<br><br>High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.<br><br>No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing). |
| High | Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types.<br><br>Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches.<br><br>Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential. |
| Medium | Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types.<br><br>Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches.<br><br>Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential. |
| Low | Small (> 1 ha but < 5 ha) area.<br><br>Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential.<br><br>Several minor and major current negative ecological impacts. |
| Very low | Very small (< 1 ha) area.<br><br>No habitat connectivity except for flying species or flora with wind-dispersed seeds.<br><br>Several major current negative ecological impacts. |

Based on assessments of CI and FI for habitats within the study area, the Biodiversity Importance (BI) of each habitat was calculated using the matrix in Table 6 (based on the formula: BI = CI + FI). As Biodiversity Importance (BI) is a function of Conservation Importance (CI) and the Functional Integrity (FI) of a receptor, BI can be derived from a simple matrix of CI and FI as follows:

**Table 6** Matrix for calculating Biodiversity Importance (BI) (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

| **Biodiversity Importance (BI)** | | **Conservation Importance (CI)** | | | | |
|---|---|---|---|---|---|---|
| | | Very high | High | Medium | Low | Very low |
| **Functional Integrity (FI)** | Very high | Very high | Very high | High | Medium | Low |
| | High | Very high | High | Medium | Medium | Low |
| | Medium | High | Medium | Medium | Low | Very low |
| | Low | Medium | Medium | Low | Low | Very low |
| | Very low | Medium | Low | Very low | Very low | Very low |

Finally, the Receptor Resilience for each habitat was evaluated following the criteria listed in Table 7. According to the Species Assessment Guidelines, Receptor resilience (RR) may defined as follows:

Receptor resilience (RR): "*The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention.*"

**Table 7** Receptor Resilience (RR) criteria (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

| **Receptor Resilience (RR)** | **Fulfilling Criteria** |
|---|---|
| Very high | Habitat that can recover rapidly (~ less than 5 years) to restore > 75%28 of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed. |
| High | Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed. |
| Medium | Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed. |
| Low | Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed. |
| Very low | Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed. |

Taken together, the Site Ecological Importance (SEI) was calculated for each habitat within the study area using the formula: SEI = BI + RR, and following the matrix outlined in Table 8. The interpretation of the development actions allowed for each SEI category are outlined in Table 9.

**Table 8** Matrix for calculating Site Ecological Importance (SEI) (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

| Site Ecological Importance (SEI) | | Biodiversity Importance (BI) | | | | |
|---|---|---|---|---|---|---|
| | | Very high | High | Medium | Low | Very low |
| Receptor Resilience (RR) | Very high | Very high | Very high | High | Medium | Low |
| | High | Very high | Very high | High | Medium | Very low |
| | Medium | Very high | High | Medium | Low | Very low |
| | Low | High | Medium | Low | Very low | Very low |
| | Very low | Medium | Low | Very low | Very low | Very low |

**Table 9** Guidelines for interpreting SEI in the context of the proposed development activities (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

| Site Ecological Importance (SEI) | Interpretation in relation to proposed development activities |
|---|---|
| Very high | Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains. |
| High | Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities. |
| Medium | Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities. |
| Low | Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities. |
| Very low | Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required. |

*10.2 SEI for mammal SCC habitats in the study area*

The SEI results for mammal SCC habitats within the study area are given in Table 10 with the spatial representation for this habitat and its concomitant SEI category portrayed in Figure 20. The study area consists of only a single habitat type which harbours a very small subpopulation of *C. duthieae* (only on individual was found in this habitat). Furthermore, this habitat exists in a degraded state with a high level of daily disturbances in an urban setting. In conjunction with this, the repair areas will be of a very small spatial extent (>1 hectare), and will focus on the upgrading of existing damaged infrastructure. To this end, the entire site is retrieved as having a "Very low" SEI from a mammal SCC perspective, allowing for development activities of medium to high impact without restoration activities being required (Table 9).

**Table 10** Evaluation of SEI for mammal SCC habitats within the study area. BI = Biodiversity Importance, RR = Receptor Resilience.

| Habitat type | Conservation Importance | Functional Integrity | Receptor Resilience | Site Ecological Importance |
|---|---|---|---|---|
| Riverine | **High** - Confirmed presence of a small subpopulation of *C. duthieae* listed as "Vulnerable" under Criterion B. | **Very low** - Repair area footprints will encompass a very small area (<1 hectare), and will be focussed in areas with several minor and major current negative ecological impacts (existing damaged infrastructure and / or a high incidence of pollution and alien invasive vegetation with poor water quality). | **Very high** - Because the proportion of this habitat impacted over the repair area footprints is very small (<1 hectare), it is unlikely that the resident subpopulation of *C. duthieae* will be adversely affected. As such, it is highly likely that this species will remain in the area when the impact is occurring, and will also remain here once disturbances have ceised. | **Very low** - BI = Low; RR = Very high |


**Figure 20** Spatial representation of the SEI of mammal SCC habitats within the study area.

# 11. Current impacts, project-related impacts, mitigation measures and impact assessment

*11.1 Current impacts*

Current impacts within the study area include the following:

- The study area is located within an urban setting and is surrounded by residential areas from where daily noise and vibration is evident (through vehicles and human foot traffic).
- The Riverine habitat on the site appears highly degraded, with major signs of pollution, human foot traffic (vagrancy, as well as from people traversing the site through its entirety), a high incidence of alien and invasive vegetation and poor water quality.
- Repair area footprints will largely be restricted to existing damaged infrastructure and flood damage areas within the river channel.

These impacts are of a major extent, and appear to have heavily impinged on biodiversity patterns and processes within the study area landscape, adding to the degraded nature of ecosystem characteristics (see Subsection 8.5).

*11.2 Anticipated project impacts*

Planned development activities for the study area will include:

1. Refurbish / replace gabion structures;
2. Reinstatement of erosion protection structures;
3. Rehabilitation of eroded areas and implementation of erosion protection structures;
4. Stabilization of riverbanks and beds and implementation of erosion protection structures;
5. Reinstatement of retaining walls;

6. Reconstruction of stormwater pipes, outlets, headwalls, and associated erosion protection;
7. Isolated reconstruction of road areas; and
8. Implementation of new gabion / retaining wall structures / erosion protection structures.

Because these activities will focus on already degraded areas and damaged infrastructure, the only impacts expected during the construction phase will be possible direct morality of fauna and short-term noise and vibration. During the operational phase, impacts will remain similar to what is the case currently.

*11.3 Impact management actions and mitigation measures*

The project footprint will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. As such, this renders the entire proposed project footprint as developable from a faunal perspective (Figure 21) without any mitigation measures being advocated.

Even so, every effort should be made to save and relocate any mammal, reptile, amphibian, bird, or invertebrate that cannot flee of its own accord, encountered during site preparation (i.e., to avoid and minimise the direct mortality of faunal species). These animals should be relocated to a suitable habitat area immediately outside the project footprint, but under no circumstance to an area further away. Because noise and vibration is an unavoidable impact during the construction phase, no impact management actions are advocated to reduce this impact.

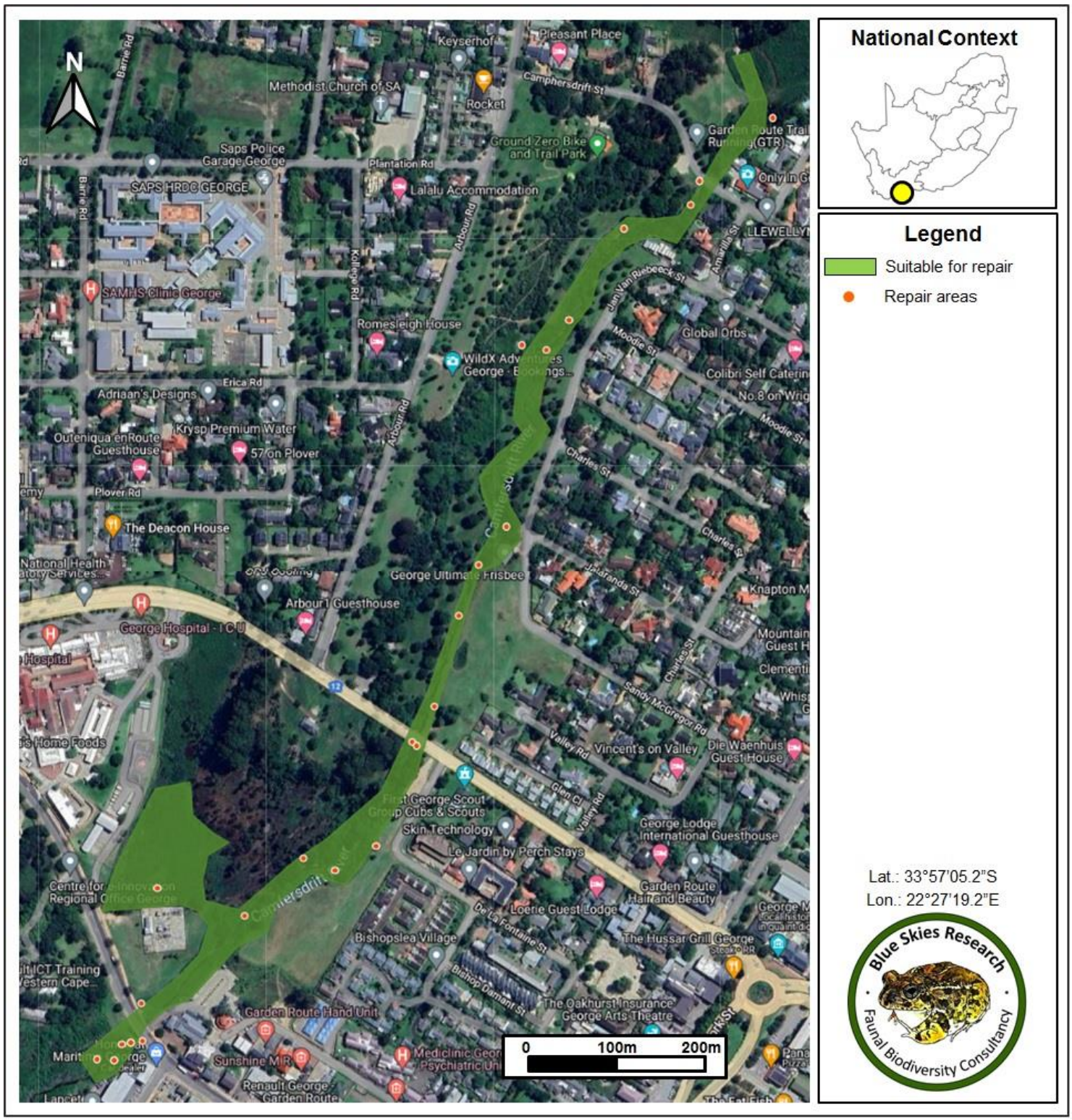



**Figure 21** "Constraints and Opportunities" map of the study area landscape showing areas which are suitable for potential development (i.e., flood damage repair).

*11.5 Impact assessment*

11.5.1 Methodology

The assessment criteria for this impact assessment were based on, and adapted from, the Guideline on Impact Significance, Integrated Environmental Management Information Series 5, Department of Environmental Affairs and Tourism (DEAT, 2002) and the Guideline 5: Assessment of Alternatives and Impacts in Support of the Environmental Impact Assessment Regulations (DEAT, 2006). In short, the following criteria was used for this assessment:

**Determination of Extent (Scale):**

| | |
|---|---|
| **Site specific** | On site or within 100 m of the site boundary, but not beyond the property boundaries. |
| **Local** | The impacted area includes the whole or a measurable portion of the site and property, but could affect the area surrounding the development, including the neighbouring properties and wider municipal area. |
| **Regional** | The impact would affect the broader region (e.g., neighbouring towns) beyond the boundaries of the adjacent properties. |
| **National** | The impact would affect the whole country (if applicable). |

**Determination of Duration:**

| | |
|---|---|
| **Temporary** | The impact will be limited to the construction phase. |
| **Short term** | The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than 8 months after the completion of the construction phase. |
| **Medium term** | The impact will last up to the end of the construction phase, where after it will be entirely negated in a period shorter than 3 years after the completion of construction activities. |
| **Long term** | The impact will continue for the entire operational lifetime of the development but will be mitigated by direct human action or by natural processes thereafter. |
| **Permanent** | This is the only class of impact that will be non-transitory. Such impacts are regarded to be irreversible, irrespective of what mitigation is applied. |

**Determination of Consequence significance:**

| | |
|---|---|
| ***Negligible*** | The impact would result in negligible to no consequences |
| ***Low*** | The impact would result in insignificant consequences |
| ***Medium*** | The impact would result in minor consequences |
| ***High*** | The impact would result in significant consequences |

**Determination of Probability:**

| | |
|---|---|
| **Improbable** | The possibility of the impact occurring is very low, due either to the circumstances, design or experience. |
| **Probable** | There is a possibility that the impact will occur to the extent that provisions must therefore be made. |
| **Highly probable** | It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up to mitigate the activity before the activity commences. |
| **Definite** | The impact will take place regardless of any prevention plans. |

**Determination of Loss of Resources:**

| | |
|---|---|
| **No loss of resource** | The impact will not result in the loss of any resources |
| **Marginal loss of resource** | The impact will result in marginal loss of resources |
| **Significant loss of resources** | The impact will result in significant loss of resources |
| **Complete loss of resources** | The impact will result in a complete loss of all resources |

**Determination of Reversibility:**

| | |
|---|---|
| **Completely Reversible** | The impact is reversible with implementation of minor mitigation measures |
| **Partly Reversible** | The impact is partly reversible but more intense mitigation measures |
| **Barely Reversible** | The impact is unlikely to be reversed even with intense mitigation measures |

| | |
|---|---|
| **Irreversible** | The impact is irreversible, and no mitigation measures exist |

**Determination of Degree to which an Impact can be Mitigated:**

| | |
|---|---|
| **Can be mitigated** | The impact is reversible with implementation of minor mitigation measures |
| **Can be partly mitigated** | The impact is partly reversible but more intense mitigation measures |
| **Can be barely mitigated** | The impact is unlikely to be reversed even with intense mitigation measures |
| **Not able to mitigate** | The impact is irreversible, and no mitigation measures exist |

**Determination of Cumulative Impact:**

| | |
|---|---|
| ***Negligible*** | The impact would result in negligible to no cumulative effects |
| ***Low*** | The impact would result in insignificant cumulative effects |
| ***Medium*** | The impact would result in minor cumulative effects |
| ***High*** | The impact would result in significant cumulative effects |

**Determination of Significance (without mitigation):**

| | |
|---|---|
| **No significance** | The impact is not substantial and does not require any mitigation action. |
| **Low** | The impact is of little importance but may require limited mitigation. |
| **Medium** | The impact is of sufficient importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels. |
| **Medium-High** | The impact is of high importance and is therefore considered to have a negative impact. Mitigation is required to manage the negative impacts to acceptable levels. |
| **High** | The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential. |
| **Very High** | The impact is critical. Mitigation measures cannot reduce the impact to acceptable levels. As such the impact renders the proposal unacceptable. |

**Determination of Significance (with mitigation):**

| | |
|---|---|
| **No significance** | The impact will be mitigated to the point where it is regarded to be insubstantial. |
| **Low** | The impact will be mitigated to the point where it is of limited importance. |
| **Medium** | Notwithstanding the successful implementation of the mitigation measures, the impact will remain of significance. However, taken within the overall context of the project, such a persistent impact does not constitute a fatal flaw. |
| **High** | Mitigation of the impact is not possible on a cost-effective basis. The impact continues to be of great importance, and taken within the overall context of the project, is considered to be a fatal flaw in the project proposal. |

11.5.2 Impact assessment

The impact assessment for the receiving environment in the current study was performed for the provided layout alternative of flood damage repairs (Alternative 1) considering both the construction and operational phases of the development (Table 11). The project footprints (i.e., repair areas) will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. To this end, no mitigation will be required as impacts on the receiving environment will result in insignificant loss or deterioration of faunal biodiversity in the receiving environment. In the case of the current assessment therefore, the “No-Go” alternative was not considered, given the low number of negative impacts from Alternative 1, and the need to balance environmental outcomes with the need for upgrading infrastructure from a municipal perspective.

**Table 11** Impact assessment of provided development layout (considering both the construction and operational phases of the project).

| **Alternative:** | Alternative 1 (Current layout) |
|---|---|
| **PHASE:** | Construction phase |
| **Potential impact and risk:** | Direct morality of fauna; Vibration and noise |
| Nature of impact: | Direct morality of fauna; Vibration and noise |
| Extent and duration of impact: | These impacts will be site specific and largely restricted to the proposed repair areas. These impacts will also be temporary, and will cease at the end of the construction phase. |
| Consequence of impact or risk: | Negligible - The impact would result in negligible to no consequences |
| Probability of occurrence: | The possibility of the impact occurring is very low, as it will be restricted to the proposed repair areas and should not overly impinge on adjacent areas. |
| Degree to which the impact may cause irreplaceable loss of resources: | Marginal loss of resource - These impacts will result in marginal loss of resources (a very small impacted area and possible destruction of single individuals of species). |
| Degree to which the impact can be reversed: | Completely Reversible - These impacts are reversible and will cease at the end of the construction phase. |
| Indirect impacts: | None identified. |
| Cumulative impact prior to mitigation: | Negligible - The impact would result in negligible to no cumulative effects. |
| Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High): | No significance - The impact is not substantial and does not require any mitigation action. |
| Degree to which the impact can be avoided: | N/A |
| Degree to which the impact can be managed: | N/A |

| | |
|---|---|
| Degree to which the impact can be mitigated: | High - Given that the proposed footprint is already relatively small, these impacts should not be severe or to the detriment of the study area landscape. |
| Proposed mitigation: | Every effort should be made to save and relocate any mammal, reptile, amphibian, bird, or invertebrate that cannot flee of its own accord, encountered during site preparation (i.e., to avoid and minimise the direct mortality of faunal species). These animals should be relocated to a suitable habitat area immediately outside the project footprint, but under no circumstance to an area further away. Vibration and noise through machinery, vehicles and people are unavoidable during the construction and no mitigation measures are suggested. |
| Residual impacts: | None identified. |
| Cumulative impact post mitigation: | None identified. |
| Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High): | No significance - The impact is not substantial and does not require any mitigation action. |
| **Alternative:** | Alternative 1 (Current layout) |
| **PHASE:** | Operational phase |
| **Potential impact and risk:** | None identified. |
| Nature of impact: | No impacts are expected during the operational phase, other than the existing impacts in the environment. |
| Extent and duration of impact: | None identified. |
| Consequence of impact or risk: | Negligible |
| Probability of occurrence: | Improbable |
| Degree to which the impact may cause irreplaceable loss of resources: | No loss of resource |
| Degree to which the impact can be reversed: | Completely Reversible |
| Indirect impacts: | None identified. |

| | |
|---|---|
| Cumulative impact prior to mitigation: | Negligible |
| Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High): | No significance |
| Degree to which the impact can be avoided: | N/A |
| Degree to which the impact can be managed: | N/A |
| Degree to which the impact can be mitigated: | N/A |
| Proposed mitigation: | None identified. |
| Residual impacts: | None identified. |
| Cumulative impact post mitigation: | None identified. |
| Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High): | No significance |

# 12. Conclusion

*12.1 Listed sensitivity in the DFFE Screening Tool Report*

The results from this report confirm the “High” site sensitivity as identified in the DFFE Screening Tool Report (Figure 1, Section 3). This follows from the confirmed occurrence of a small subpopulation of *C. duthieae* in the study area landscape - one of the mammal SCC listed in the Screening Tool Report (Table 1). Aside from this single SCC, however, it is unlikely that habitats in the study area will support permanent subpopulations of any other faunal SCC (Section 9).

*12.2 Overlap with Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)*

Because of their location in the Camfersdrift River drainage channel, a large number of the repair sites overlap with either terrestrial or aquatic CBA, with some of the sites overlapping a degraded ESA2 located to the east of the project footprint (Subsection 4.6). Following the ground-truthing phase, it is clear that habitats within the study area are subject to high levels of daily disturbance and exist in a degraded state and in an urban setting. Notwithstanding the presence of a small subpopulation of *C. duthieae* therefore, the entire site may rather be classified as a degraded ESA2 which is defined as “*Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services*”. Management objectives for such ESA2 include: *“Restore and/or manage to minimize impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and to allow for faunal movement*”. To this end, the repairs listed under the current project (especially the removal of alien and invasive vegetation) are in line with the suggested management objectives for this ESA2 category.

*12.3 Conclusion*

This report provides a representative faunal and avifaunal assessment of the study area considering facets of:

- Terrestrial faunal and avifaunal habitat composition (Section 7),
- terrestrial faunal and avifaunal components (Section 8),
- the presence of any terrestrial faunal and avifaunal SCC on the site (Section 9),
- the conservation status and on-site habitats of these SCC (Section 9),
- the SEI of habitats within the study area, with associated acceptable development activities (Section 10),
- a “Constraints and opportunities” map of the site (Section 11), and
- an impact assessment (considering both the construction and operational phases) for the provided development layout (Alternative 1) (Section 11).

Taken together, the results of the report indicate the following:

- The study area is comprised of a Riverine habitat, but with the vegetation here largely constituting alien and invasive plant species such as Brambles, and with water quality in the river furthermore appearing poor given a high incidence of pollution (Section 7).
- Faunal and avifaunal diversity in the study area is largely comprised of relatively common species of “Least Concern”, with the notable exception of small subpopulation of *C. duthieae* which represents a mammal SCC (Section 8).
- Habitats within the study area appear highly degraded, with significant signs of daily disturbance (through vibration from vehicles and people) and pollution. To this end, highly mobile avifaunal species are the most abundant faunal group, given their ability to traverse this landscape with terrestrial fauna appearing scarce with only burrowing species being abundant given that their below-ground lifestyle buffers them from the above-ground impacts. Taken together, the site harbours little in the way of intact predator-prey dynamics with impaired ecosystem dynamics, although it does provide a semi-functional albeit degraded ecological link in the study area landscape (Section 8).

- The presence of one mammal SCC was confirmed one the site, but aside from this species, no other SCC are likely to also occur within the study area given a lack of suitable habitats (Section 9).
- The subpopulation of *C. duthieae* is very small is present with only one individual confirmed within the Riverine habitat of the site, with two individuals retrieved in the northern lawn area of the site outside of the project footprint. The localised spatial extent and short nature of the impacts from the proposed repairs will likely have a negligible effect on this species (Section 9).
- The entire site is retrieved as having a “Very low” SEI from a mammal SCC perspective, allowing for development activities of medium to high impact without restoration activities being required (Section 10).
- Current impacts within the study area (its location within an urban area from where daily noise and vibration is evident, highly degraded habitats with major signs of pollution, human foot traffic, a high incidence of alien and invasive vegetation and poor water quality) are of a major extent, and appear to have heavily impinged on biodiversity patterns and processes within the study area landscape, adding to the degraded nature of ecosystem characteristics (Section 11).
- Because the flood damage repair activities will focus on already degraded areas and damaged infrastructure, the only impacts expected during the construction phase will be possible indirect mortality of fauna and short-term noise and vibration. During the operational phase, impacts will remain similar to what is the case currently (Section 11).
- The repair sites will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. As such, this renders the entire proposed project footprint as developable from a faunal perspective only minor impact management actions being advocated. In the case of the current assessment therefore, the “No-Go” alternative was not considered, given the low number of negative impacts from Alternative 1, and the need to balance environmental outcomes with the need for upgrading infrastructure from a municipal perspective (Section 11).

- The results from this report confirm the “High” site sensitivity as identified in the DFFE Screening Tool Report following from the confirmed occurrence of a small subpopulation of *C. duthieae* in the study area landscape. Aside from this single SCC, however, it is unlikely that habitats in the study area will support permanent subpopulations of any other faunal SCC (Section 12).
- Following the ground-truthing phase, it is clear that habitats within the study area are subject to high levels of disturbance and exist in a degraded state and in an urban setting. Notwithstanding the presence of a small subpopulation of *C. duthieae* therefore, the entire site may rather be classified as a degraded ESA2, allowing for the suggested repair activities (Section 12).

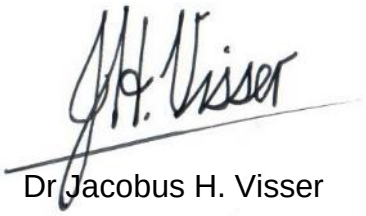
Taken together therefore, the proposed repair area footprints will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. Furthermore, impacts on the receiving environment will result in only minor to insignificant loss or deterioration of faunal biodiversity in the receiving environment. To this end, the current development layout and repair activities are supported from a faunal biodiversity perspective.

## 13. Conditions to which this statement is subjected

The content of this report is based on the author’s best scientific and professional knowledge as well as available information. Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage which is not listed in this report. As such, the conclusions and recommendations made in this report are done in good faith based on information gathered at the time of the investigation.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of the report, which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this

investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.



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## Appendix A

**Appendix A** Desktop species list of the mammal species which have a distribution overlapping with the study area (constructed with reference to Skinner and Chimimba, 2005). Species in bold have been previously recorded within the study area landscape (QDGS: 3322BD, MammalMAP, https://vmus.adu.org.za/; iNaturalist, www.iNaturalist.org). For each species, the taxonomic Order, Family, species binomial name and common name is shown, along with the current IUCN Red List classification of the species.

| Mammals Desktop Species List | | | | |
|---|---|---|---|---|
| **Order** | **Family** | **Species** | **Common name** | **Status** |
| Afrosoricida | Chrysochloridae | ***Chlorotalpa duthieae*** | **Duthie's Golden Mole** | **Vulnerable** |
| | | ***Amblysomus corriae*** | **Fynbos Golden Mole** | **Near-Threatened** |
| | | *Amblysomus hottentotus* | Hottentot Golden Mole | Least Concern |
| Carnivora | Canidae | *Canis mesomelas* | Black-backed Jackal | Least Concern |
| | | ***Otocyon megalotis*** | **Bat-eared Fox** | **Least Concern** |
| | | *Vulpes chama* | Cape Fox | Least Concern |
| | Felidae | ***Caracal caracal*** | **Caracal** | **Least Concern** |
| | | *Felis silvestris* | African Wild Cat | Least Concern |
| | | *Leptailurus serval* | Serval | Least Concern |
| | | *Panthera pardus* | Leopard | Vulnerable |
| | Hyaenidae | *Proteles cristata* | Aardwolf | Least Concern |
| | Herpestidae | ***Atilax paludinosus*** | **Marsh Mongoose** | **Least Concern** |
| | | *Cynictis penicillata* | Yellow Mongoose | Least Concern |
| | | ***Herpestes ichneumon*** | **Egyptian Mongoose** | **Least Concern** |
| | | ***Herpestes pulverulentus*** | **Cape Grey Mongoose** | **Least Concern** |
| | Mustelidae | *Aonyx capensis* | African Clawless Otter | Near-Threatened |
| | | *Ictonyx striatus* | Zorilla | Least Concern |
| | | *Mellivora capensis* | Honey Badger | Least Concern |

| | | | | |
|---|---|---|---|---|
| | | *Poecilogale albinucha* | African Striped Weasel | Least Concern |
| | Viverridae | *Genetta genetta* | Common Genet | Least Concern |
| | | ***Genetta tigrina*** | **Cape Genet** | **Least Concern** |
| Cetartiodactyla | Bovidae | ***Oreotragus oreotragus*** | **Klipspringer** | **Least Concern** |
| | | *Pelea capreolus* | Grey Rhebok | Near-Threatened |
| | | *Philantomba monticola* | Blue Duiker | Least Concern |
| | | ***Raphicerus campestris*** | **Steenbok** | **Least Concern** |
| | | *Raphicerus melanotis* | Cape Grysbok | Least Concern |
| | | *Sylvicapra grimmia* | Common Duiker | Least Concern |
| | | ***Tragelaphus scriptus*** | **Southern Bushbuck** | **Least Concern** |
| | Suidae | **Potamochoerus larvatus** | **Bushpig** | **Least Concern** |
| Chiroptera | Molossidae | *Tadarida aegyptiaca* | Egyptian Free-tailed Bat | Least Concern |
| | Nycteridae | *Nycteris thebaica* | Cape Long-eared Bat | Least Concern |
| | Pteropodidae | **Epomophorus wahlbergi** | **Wahlberg's Epauletted Fruit Bat** | **Least Concern** |
| | | *Rousettus aegyptiacus* | Egyptian Fruit Bat | Least Concern |
| | Rhinolophidae | *Rhinolophus capensis* | Cape Horseshoe Bat | Least Concern |
| | | ***Rhinolophus clivosus*** | **Geoffroy's Horseshoe Bat** | **Least Concern** |
| | Vespertilionidae | *Myotis tricolor* | Temminck's Hairy Bat | Least Concern |
| | | ***Neoromicia capensis*** | **Cape Bat** | **Least Concern** |
| Eulipotyphla | Soricidae | *Crocidura cyanea* | Reddish-grey Musk Shrew | Least Concern |
| | | ***Crocidura flavescens*** | **Greater Red Musk Shrew** | **Least Concern** |
| | | ***Myosorex longicaudatus*** | **Long-tailed Forest Shrew** | **Endangered** |
| | | ***Myosorex varius*** | **Forest Shrew** | **Least Concern** |
| | | ***Suncus infinitesimus*** | **Least Dwarf Shrew** | **Least Concern** |
| | | *Suncus varilla* | Lesser Dwarf Shrew | Least Concern |
| Hyracoidea | Procaviidae | ***Procavia capensis*** | **Rock Hyrax** | **Least Concern** |
| Lagomorpha | Leporidae | *Lepus saxatilis* | Cape Scrub Hare | Least Concern |
| | | *Pronolagus saundersiae* | Hewitt's Red Rock Hare | Least Concern |
| Primates | Cercopithecidae | ***Chlorocebus pygerythrus*** | **Vervet Monkey** | **Least Concern** |

| | | | | |
|---|---|---|---|---|
| | | ***Papio ursinus*** | **Chacma Baboon** | **Least Concern** |
| Rodentia | Bathyergidae | *Bathyergus suillus* | Cape Dune Mole-rat | Least Concern |
| | | ***Cryptomys hottentotus*** | **African Mole-rat** | **Least Concern** |
| | | ***Georychus capensis*** | **Cape Mole-rat** | **Least Concern** |
| | Gliridae | *Graphiurus murinus* | Woodland Dormouse | Least Concern |
| | Hystricidae | ***Hystrix africaeaustralis*** | **Cape Porcupine** | **Least Concern** |
| | Muridae | *Acomys subspinosus* | Cape Spiny Mouse | Least Concern |
| | | *Gerbillurus paeba* | Hairy-footed Gerbil | Least Concern |
| | | *Micaelamys namaquensis* | Namaqua Rock Rat | Least Concern |
| | | *Mus minutoides* | Pygmy Mouse | Least Concern |
| | | *Myomyscus verreauxii* | Verreaux's Mouse | Least Concern |
| | | ***Otomys irroratus*** | **Southern African Vlei Rat** | **Least Concern** |
| | | ***Rhabdomys pumilio*** | **Four-striped Grass Mouse** | **Least Concern** |
| | Nesomyidae | *Dendromus melanotis* | Grey Climbing Mouse | Least Concern |
| | | *Dendromus mesomelas* | Brant's Climbing Mouse | Least Concern |
| | | *Mystromys albicaudatus* | White-tailed Rat | Vulnerable |
| | | *Saccostomus campestris* | Pouched Mouse | Least Concern |
| | | *Steatomys krebsii* | Krebs' Fat Mouse | Least Concern |

## Appendix B

**Appendix B** Desktop species list of the amphibian species which have a distribution overlapping with the study area (constructed with reference to Preez and Carruthers, 2009). Species in bold have been previously recorded within the study area landscape (QDGS: 3322BD, FrogMAP, https://vmus.adu.org.za/; iNaturalist, www.iNaturalist.org). For each species, the taxonomic Order, Family, species binomial name and common name is shown, along with the current IUCN Red List classification of the species.

| Amphibians Desktop Species List | | | | |
|---|---|---|---|---|
| **Order** | **Family** | **Species** | **Common name** | **Status** |
| Anura | Brevicipitidae | ***Breviceps fuscus*** | **Plain Rain Frog** | **Least Concern** |
| | Bufonidae | ***Sclerophrys capensis*** | **Raucous Toad** | **Least Concern** |
| | | *Sclerophrys pardalis* | Eastern Leopard Toad | Least Concern |
| | | *Vandijkophrynus angusticeps* | Cape Sand Toad | Least Concern |
| | Heleophrynidae | ***Heleophryne regis*** | **Royal Ghost Frog** | **Least Concern** |
| | Hyperoliidae | *Afrixalus knysnae* | Knysna Leaf-folding Frog | Endangered |
| | | ***Hyperolius horstockii*** | **Horstock's Reed Frog** | **Least Concern** |
| | | ***Hyperolius marmoratus*** | **Painted Reed Frog** | **Least Concern** |
| | | *Semnodactylus wealii* | Rattling Frog | Least Concern |
| | Pipidae | ***Xenopus laevis*** | **African Clawed Frog** | **Least Concern** |
| | Pyxicephalidae | ***Amietia delalandii*** | **Delalande's River Frog** | **Least Concern** |
| | | ***Amietia fuscigula*** | **Dark-throated River Frog** | **Least Concern** |
| | | *Cacosternum boettgeri* | Boettger's Dainty Frog | Least Concern |
| | | ***Cacosternum nanum*** | **Bronze Caco** | **Least Concern** |
| | | ***Strongylopus bonaespei*** | **Banded Stream Frog** | **Least Concern** |
| | | ***Strongylopus fasciatus*** | **Striped Stream Frog** | **Least Concern** |
| | | ***Strongylopus grayii*** | **Clicking Stream Frog** | **Least Concern** |
| | | *Tomopterna delalandii* | Cape Sand Frog | Least Concern |

## Appendix C

**Appendix C** Desktop species list of the avifaunal species which have been recorded in the pentad (3355_2225) which overlaps the study area (the South African Bird Atlas Project 2, https://sabap2.birdmap.africa/). To create this species list, the species observed in this pentad was included, noting the total number of observations and the latest date the species was recorded (both shown). Furthermore, for each species, the taxonomic Order, Family, species binomial name and common name is shown, along with the current IUCN Red List classification of the species. Species in bold represent avifaunal species of conservation concern (SCC).

| Avifauna Desktop Species List | | | | | | |
|---|---|---|---|---|---|---|
| **Order** | **Family** | **Species** | **Common name** | **IUCN status** | **Number of observations** | **Latest record** |
| Accipitriformes | Accipitridae | *Accipiter melanoleucus* | Black Sparrowhawk | Least Concern | 113 | 2023/09/01 |
| | | *Accipiter minullus* | Little Sparrowhawk | Least Concern | 19 | 2022/07/01 |
| | | *Accipiter rufiventris* | Rufous-breasted Sparrowhawk | Least Concern | 5 | 2021/10/24 |
| | | *Accipiter tachiro* | African Goshawk | Least Concern | 91 | 2023/09/01 |
| | | *Aviceda cuculoides* | African Cuckoo-hawk | Least Concern | 8 | 2022/07/01 |
| | | *Aquila verreauxii* | Verreaux's Eagle | Least Concern | 2 | 2013/12/07 |
| | | *Buteo buteo* | Common Buzzard | Least Concern | 24 | 2022/10/04 |
| | | *Buteo rufofuscus* | Jackal Buzzard | Least Concern | 142 | 2023/05/09 |
| | | ***Buteo trizonatus*** | **Forest Buzzard** | **Near-Threatened** | **279** | **2023/08/20** |
| | | *Circaetus cinereus* | Brown Snake-eagle | Least Concern | 1 | 2022/02/26 |
| | | ***Circus maurus*** | **Black Harrier** | **Endangered** | **3** | **2018/03/30** |
| | | ***Circus ranivorus*** | **African Marsh Harrier** | **Least Concern** | **5** | **2020/10/06** |
| | | *Elanus caeruleus* | Black-winged Kite | Least Concern | 76 | 2023/05/09 |
| | | *Haliaeetus vocifer* | African Fish Eagle | Least Concern | 36 | 2023/08/09 |
| | | *Hieraaetus pennatus* | Booted Eagle | Least Concern | 5 | 2017/03/25 |
| | | *Lophaetus occipitalis* | Long-crested Eagle | Least Concern | 30 | 2022/07/29 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | *Melierax canorus* | Pale Chanting-goshawk | Least Concern | 1 | 2019/03/01 |
| | | *Milvus aegyptius* | Yellow-billed Kite | Least Concern | 33 | 2023/01/22 |
| | | *Pernis apivorus* | European Honey-buzzard | Least Concern | 7 | 2022/03/04 |
| | | ***Polemaetus bellicosus*** | **Martial Eagle** | **Endangered** | **1** | **2015/04/23** |
| | | *Polyboroides typus* | African Harrier-Hawk | Least Concern | 60 | 2023/09/01 |
| Anseriformes | Anatidae | *Alopochen aegyptiaca* | Egyptian Goose | Least Concern | 312 | 2023/09/01 |
| | | *Anas capensis* | Cape Teal | Least Concern | 42 | 2022/07/01 |
| | | *Anas erythrorhyncha* | Red-billed Teal | Least Concern | 48 | 2022/07/01 |
| | | *Anas platyrhynchos* | Mallard | Least Concern | 13 | 2023/01/12 |
| | | *Anas sparsa* | African Black Duck | Least Concern | 19 | 2022/07/27 |
| | | *Anas undulata* | Yellow-billed Duck | Least Concern | 98 | 2023/09/01 |
| | | *Anser anser* | Greylag Goose | Least Concern | 1 | 2012/12/21 |
| | | *Cairina moschata* | Muscovy Duck | Least Concern | 1 | 2022/05/12 |
| | | *Dendrocygna viduata* | White-faced Whistling Duck | Least Concern | 48 | 2023/03/25 |
| | | *Netta erythrophthalma* | Southern Pochard | Least Concern | 3 | 2018/01/01 |
| | | ***Oxyura maccoa*** | **Maccoa Duck** | **Endangered** | **6** | **2015/11/28** |
| | | *Plectropterus gambensis* | Spur-winged Goose | Least Concern | 30 | 2021/04/24 |
| | | *Spatula smithii* | Cape Shoveler | Least Concern | 42 | 2022/07/01 |
| | | *Tadorna cana* | South African Shelduck | Least Concern | 2 | 2021/09/04 |
| | | *Thalassornis leuconotus* | White-backed Duck | Least Concern | 4 | 2017/09/19 |
| Bucerotiformes | Phoeniculidae | *Phoeniculus purpureus* | Green Woodhoopoe | Least Concern | 122 | 2023/08/27 |
| | Upupidae | *Upupa africana* | African Hoopoe | Least Concern | 42 | 2023/08/14 |
| Caprimulgiformes | Apodidae | *Apus affinis* | Little Swift | Least Concern | 50 | 2023/05/20 |
| | | *Apus apus* | Common Swift | Least Concern | 9 | 2021/01/16 |
| | | *Apus barbatus* | African Black Swift | Least Concern | 27 | 2023/07/01 |
| | | *Apus caffer* | White-rumped Swift | Least Concern | 88 | 2022/04/06 |
| | | *Apus horus* | Horus Swift | Least Concern | 8 | 2015/11/12 |
| | | *Cypsiurus parvus* | African Palm Swift | Least Concern | 33 | 2023/09/01 |
| | | *Tachymarptis melba* | Alpine Swift | Least Concern | 32 | 2023/07/23 |

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|---|---|---|---|---|---|---|
| | Caprimulgidae | *Caprimulgus pectoralis* | Fiery-necked Nightjar | Least Concern | 132 | 2023/09/01 |
| Charadriiformes | Burhinidae | *Burhinus capensis* | Spotted Thick-knee | Least Concern | 138 | 2023/09/01 |
| | | *Burhinus vermiculatus* | Water Thick-knee | Least Concern | 2 | 2022/01/21 |
| | | *Charadrius hiaticula* | Common Ringed Plover | Least Concern | 2 | 2015/11/05 |
| | | *Charadrius pecuarius* | Kittlitz's Plover | Least Concern | 18 | 2020/11/24 |
| | | *Charadrius tricollaris* | Three-banded Plover | Least Concern | 44 | 2022/07/01 |
| | | *Vanellus armatus* | Blacksmith Lapwing | Least Concern | 194 | 2023/08/27 |
| | | *Vanellus coronatus* | Crowned Lapwing | Least Concern | 157 | 2023/09/01 |
| | Charadriidae | *Vanellus melanopterus* | Black-winged Lapwing | Least Concern | 38 | 2023/06/16 |
| | Haematopodidae | *Haematopus moquini* | African Oystercatcher | Least Concern | 1 | 2020/05/01 |
| | Jacanidae | *Actophilornis africanus* | African Jacana | Least Concern | 5 | 2021/09/04 |
| | Laridae | *Larus cirrocephalus* | Grey-headed Gull | Least Concern | 9 | 2021/12/23 |
| | | *Larus dominicanus* | Kelp Gull | Least Concern | 62 | 2023/05/25 |
| | Recurvirostridae | *Himantopus himantopus* | Black-winged Stilt | Least Concern | 7 | 2014/11/13 |
| | Scolopacidae | *Actitis hypoleucos* | Common Sandpiper | Least Concern | 3 | 2015/11/28 |
| | | *Calidris minuta* | Little Stint | Least Concern | 1 | 2013/12/07 |
| | | *Calidris pugnax* | Ruff | Least Concern | 2 | 2015/02/22 |
| | | *Gallinago nigripennis* | African Snipe | Least Concern | 25 | 2022/07/01 |
| | | *Tringa glareola* | Wood Sandpiper | Least Concern | 3 | 2013/12/07 |
| | Stercorariidae | *Ciconia ciconia* | White Stork | Least Concern | 15 | 2021/04/23 |
| Ciconiiformes | Ciconiidae | *Leptoptilos crumenifer* | Marabou | Least Concern | 1 | 2012/06/23 |
| Coliiformes | Coliidae | *Colius striatus* | Speckled Mousebird | Least Concern | 301 | 2023/09/01 |
| | | *Urocolius indicus* | Red-faced Mousebird | Least Concern | 17 | 2022/06/29 |
| Columbiformes | Columbidae | *Columba arquatrix* | African Olive Pigeon | Least Concern | 215 | 2023/09/01 |
| | | *Columba guinea* | Speckled Pigeon | Least Concern | 324 | 2023/09/01 |
| | | *Columba larvata* | Lemon Dove | Least Concern | 44 | 2023/03/17 |
| | | *Columba livia* | Rock Dove | Least Concern | 132 | 2023/08/20 |
| | | *Spilopelia senegalensis* | Laughing Dove | Least Concern | 374 | 2023/09/01 |
| | | *Streptopelia capicola* | Cape Turtle Dove | Least Concern | 205 | 2023/08/04 |

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|---|---|---|---|---|---|---|
| | | *Streptopelia semitorquata* | Red-eyed Dove | Least Concern | 474 | 2023/09/01 |
| | | *Turtur tympanistria* | Tambourine Dove | Least Concern | 45 | 2023/05/08 |
| Coraciiformes | Alcedinidae | *Alcedo semitorquata* | Half-collared Kingfisher | Least Concern | 6 | 2023/05/26 |
| | | *Ceryle rudis* | Pied Kingfisher | Least Concern | 7 | 2022/07/03 |
| | | *Corythornis cristatus* | Malachite Kingfisher | Least Concern | 32 | 2023/08/27 |
| | | *Halcyon albiventris* | Brown-hooded Kingfisher | Least Concern | 154 | 2023/09/01 |
| | | *Megaceryle maxima* | Giant Kingfisher | Least Concern | 7 | 2021/06/29 |
| Cuculiformes | Cuculidae | *Centropus burchellii* | Burchell's Coucal | Least Concern | 147 | 2023/09/01 |
| | | *Chrysococcyx caprius* | Diederik Cuckoo | Least Concern | 69 | 2023/01/01 |
| | | *Chrysococcyx cupreus* | African Emerald Cuckoo | Least Concern | 38 | 2023/09/01 |
| | | *Chrysococcyx klaas* | Klaas's Cuckoo | Least Concern | 104 | 2023/09/01 |
| | | *Cuculus clamosus* | Black Cuckoo | Least Concern | 65 | 2023/01/22 |
| | | *Cuculus solitarius* | Red-chested Cuckoo | Least Concern | 154 | 2022/12/26 |
| Falconiformes | Falconidae | *Falco biarmicus* | Lanner Falcon | Least Concern | 3 | 2017/01/07 |
| | | *Falco peregrinus* | Peregrine Falcon | Least Concern | 40 | 2023/08/15 |
| | | *Falco rupicolus* | Rock Kestrel | Least Concern | 29 | 2023/08/27 |
| Galliformes | Gruidae | ***Anthropoides paradiseus*** | **Blue Crane** | **Vulnerable** | **3** | **2020/01/28** |
| | Numididae | *Numida meleagris* | Helmeted Guineafowl | Least Concern | 254 | 2023/09/01 |
| | Phasianidae | *Coturnix coturnix* | Common Quail | Least Concern | 13 | 2021/07/04 |
| | | *Pavo cristatus* | Indian Peafowl | Least Concern | 66 | 2023/05/20 |
| | | *Pternistis afer* | Red-necked Francolin | Least Concern | 61 | 2023/08/20 |
| | | *Pternistis capensis* | Cape Spurfowl | Least Concern | 15 | 2023/05/23 |
| | | *Scleroptila levaillantii* | Red-winged Francolin | Least Concern | 4 | 2022/07/01 |
| | Rallidae | *Fulica cristata* | Red-knobbed Coot | Least Concern | 83 | 2023/01/12 |
| | | *Gallinula chloropus* | Common Moorhen | Least Concern | 108 | 2023/08/27 |
| | | *Rallus caerulescens* | African Rail | Least Concern | 26 | 2021/03/13 |
| | | *Zapornia flavirostra* | Black Crake | Least Concern | 121 | 2023/09/01 |
| Gruiformes | Rallidae | *Sarothrura affinis* | Striped Flufftail | Least Concern | 3 | 2022/02/20 |
| | | *Sarothrura elegans* | Buff-spotted Flufftail | Least Concern | 32 | 2023/09/01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | *Sarothrura rufa* | Red-chested Flufftail | Least Concern | 61 | 2023/07/23 |
| Musophagiformes | Musophagidae | *Tauraco corythaix* | Knysna Turaco | Least Concern | 240 | 2023/08/27 |
| Passeriformes | Acrocephalidae | *Acrocephalus baeticatus* | African Reed Warbler | Least Concern | 14 | 2021/12/12 |
| | | *Acrocephalus gracilirostris* | Lesser Swamp Warbler | Least Concern | 40 | 2023/05/27 |
| | | *Acrocephalus palustris* | Marsh Warbler | Least Concern | 8 | 2023/01/22 |
| | Alaudidae | *Calandrella cinerea* | Red-capped Lark | Least Concern | 3 | 2022/07/01 |
| | Campephagidae | *Campephaga flava* | Black Cuckooshrike | Least Concern | 8 | 2022/02/27 |
| | | *Ceblepyris caesius* | Grey Cuckooshrike | Least Concern | 108 | 2023/08/15 |
| | Cisticolidae | *Apalis thoracica* | Bar-throated Apalis | Least Concern | 284 | 2023/08/27 |
| | | *Camaroptera brachyura* | Bleating Camaroptera | Least Concern | 127 | 2023/08/20 |
| | | *Cisticola fulvicapilla* | Neddicky | Least Concern | 80 | 2023/08/15 |
| | | *Cisticola juncidis* | Zitting Cisticola | Least Concern | 44 | 2023/01/06 |
| | | *Cisticola subruficapilla* | Grey-backed Cisticola | Least Concern | 3 | 2021/04/22 |
| | | *Cisticola tinniens* | Levaillant's Cisticola | Least Concern | 164 | 2023/09/01 |
| | | *Prinia maculosa* | Karoo Prinia | Least Concern | 207 | 2023/08/15 |
| | Corvidae | *Corvus albicollis* | White-necked Raven | Least Concern | 124 | 2023/09/01 |
| | | *Corvus albus* | Pied Crow | Least Concern | 306 | 2023/09/01 |
| | | *Corvus capensis* | Cape Crow | Least Concern | 24 | 2022/04/23 |
| | Dicruridae | *Dicrurus adsimilis* | Fork-tailed Drongo | Least Concern | 305 | 2023/09/01 |
| | Emberizidae | *Emberiza capensis* | Cape Bunting | Least Concern | 2 | 2016/12/02 |
| | | *Emberiza flaviventris* | Golden-breasted Bunting | Least Concern | 7 | 2022/07/22 |
| | Estrildidae | *Coccopygia melanotis* | Swee Waxbill | Least Concern | 228 | 2023/08/27 |
| | | *Estrilda astrild* | Common Waxbill | Least Concern | 205 | 2023/08/27 |
| | | *Lagonosticta rubricata* | African Firefinch | Least Concern | 25 | 2022/07/27 |
| | | *Ortygospiza atricollis* | African Quailfinch | Least Concern | 3 | 2022/04/10 |
| | | *Spermestes bicolor* | Black-and-white Mannikin | Least Concern | 11 | 2023/05/24 |
| | Fringillidae | *Crithagra albogularis* | White-throated Canary | Least Concern | 2 | 2022/01/21 |
| | | *Crithagra flaviventris* | Yellow Canary | Least Concern | 14 | 2021/03/07 |
| | | *Crithagra gularis* | Streaky-headed Seedeater | Least Concern | 189 | 2023/09/01 |

| | | | | | |
|---|---|---|---|---|---|
| | ***Crithagra leucoptera*** | **Protea Canary** | **Near-Threatened** | **3** | **2023/08/15** |
| | *Crithagra scotops* | Forest Canary | Least Concern | 251 | 2023/08/27 |
| | *Crithagra sulphurata* | Brimstone Canary | Least Concern | 130 | 2023/09/01 |
| | *Crithagra totta* | Cape Siskin | Least Concern | 16 | 2023/03/25 |
| | *Serinus canicollis* | Cape Canary | Least Concern | 140 | 2023/09/01 |
| Hirundinidae | *Cecropis cucullata* | Greater Striped Swallow | Least Concern | 92 | 2023/04/18 |
| | *Delichon urbicum* | Common House Martin | Least Concern | 2 | 2018/11/22 |
| | *Hirundo albigularis* | White-throated Swallow | Least Concern | 64 | 2023/08/15 |
| | *Hirundo dimidiata* | Pearl-breasted Swallow | Least Concern | 2 | 2023/01/12 |
| | *Hirundo rustica* | Barn Swallow | Least Concern | 94 | 2023/03/25 |
| | *Psalidoprocne pristoptera* | Black Saw-wing | Least Concern | 202 | 2023/08/27 |
| | *Ptyonoprogne fuligula* | Rock Martin | Least Concern | 51 | 2023/08/15 |
| | *Riparia cincta* | Banded Martin | Least Concern | 2 | 2015/02/22 |
| | *Riparia paludicola* | Brown-throated Martin | Least Concern | 18 | 2023/02/01 |
| Laniidae | *Lanius collaris* | Southern Fiscal | Least Concern | 434 | 2023/08/27 |
| | *Lanius collurio* | Red-backed Shrike | Least Concern | 1 | 2021/12/05 |
| Locustellidae | *Bradypterus baboecala* | Little Rush Warbler | Least Concern | 180 | 2023/09/01 |
| | ***Bradypterus sylvaticus*** | **Knysna Warbler** | **Vulnerable** | **146** | **2023/09/01** |
| Macrosphenidae | *Cryptillas victorini* | Victorin's Warbler | Least Concern | 149 | 2023/08/20 |
| | *Sphenoeacus afer* | Cape Grassbird | Least Concern | 122 | 2023/08/15 |
| Malaconotidae | *Chlorophoneus olivaceus* | Olive Bushshrike | Least Concern | 70 | 2023/09/01 |
| | *Dryoscopus cubla* | Black-backed Puffback | Least Concern | 151 | 2023/08/27 |
| | *Laniarius ferrugineus* | Southern Boubou | Least Concern | 241 | 2023/09/01 |
| | *Tchagra tchagra* | Southern Tchagra | Least Concern | 3 | 2018/11/11 |
| | *Telophorus zeylonus* | Bokmakierie | Least Concern | 21 | 2022/04/10 |
| Monarchidae | *Terpsiphone viridis* | African Paradise Flycatcher | Least Concern | 134 | 2023/04/01 |
| | *Trochocercus cyanomelas* | Southern Crested-flycatcher | Least Concern | 142 | 2023/08/27 |
| Motacillidae | *Anthus cinnamomeus* | African Pipit | Least Concern | 33 | 2022/07/01 |
| | *Anthus leucophrys* | Plain-backed Pipit | Least Concern | 14 | 2022/07/01 |

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|---|---|---|---|---|---|
| | *Macronyx capensis* | Cape Longclaw | Least Concern | 56 | 2022/07/01 |
| | *Motacilla aguimp* | African Pied Wagtail | Least Concern | 1 | 2009/11/08 |
| | *Motacilla capensis* | Cape Wagtail | Least Concern | 238 | 2023/09/01 |
| Muscicapidae | *Cossypha caffra* | Cape Robin-Chat | Least Concern | 355 | 2023/09/01 |
| | *Cossypha dichroa* | Chorister Robin-chat | Least Concern | 176 | 2023/09/01 |
| | *Melaenornis silens* | Fiscal Flycatcher | Least Concern | 90 | 2023/08/27 |
| | *Monticola rupestris* | Cape Rock Thrush | Least Concern | 1 | 2012/02/21 |
| | *Muscicapa adusta* | African Dusky Flycatcher | Least Concern | 183 | 2023/09/01 |
| | *Muscicapa striata* | Spotted Flycatcher | Least Concern | 2 | 2016/02/08 |
| | *Oenanthe pileata* | Capped Wheatear | Least Concern | 2 | 2021/12/12 |
| | *Pogonocichla stellata* | White-starred Robin | Least Concern | 58 | 2023/08/20 |
| | *Saxicola torquatus* | African Stonechat | Least Concern | 139 | 2023/08/27 |
| | *Turdus olivaceus* | Olive Thrush | Least Concern | 330 | 2023/09/01 |
| | *Tychaedon coryphoeus* | Karoo Scrub Robin | Least Concern | 1 | 2009/04/25 |
| Nectariniidae | *Anthobaphes violacea* | Orange-breasted Sunbird | Least Concern | 41 | 2023/08/15 |
| | *Chalcomitra amethystina* | Amethyst Sunbird | Least Concern | 319 | 2023/09/01 |
| | *Cinnyris afer* | Greater Double-collared Sunbird | Least Concern | 355 | 2023/09/01 |
| | *Cinnyris chalybeus* | Southern Double-collared Sunbird | Least Concern | 330 | 2023/09/01 |
| | *Cyanomitra verreauxii* | Mouse-coloured Sunbird | Least Concern | 109 | 2023/08/27 |
| | *Hedydipna collaris* | Collared Sunbird | Least Concern | 33 | 2023/08/27 |
| | *Nectarinia famosa* | Malachite Sunbird | Least Concern | 67 | 2023/03/25 |
| Oriolidae | *Oriolus larvatus* | Eastern Black-headed Oriole | Least Concern | 394 | 2023/09/01 |
| | *Oriolus oriolus* | Eurasian Golden Oriole | Least Concern | 4 | 2021/12/30 |
| Passeridae | *Passer diffusus* | Southern Grey-headed Sparrow | Least Concern | 173 | 2023/09/01 |
| | *Passer domesticus* | House Sparrow | Least Concern | 143 | 2023/09/01 |
| | *Passer melanurus* | Cape Sparrow | Least Concern | 30 | 2023/07/23 |
| Phylloscopidae | *Phylloscopus ruficapilla* | Yellow-throated Woodland-warbler | Least Concern | 114 | 2023/08/20 |
| | *Phylloscopus trochilus* | Willow Warbler | Least Concern | 7 | 2017/02/18 |
| Platysteiridae | *Batis capensis* | Cape Batis | Least Concern | 193 | 2023/09/01 |

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|---|---|---|---|---|---|---|
| | Ploceidae | *Euplectes capensis* | Yellow Bishop | Least Concern | 101 | 2023/05/26 |
| | | *Euplectes orix* | Southern Red Bishop | Least Concern | 89 | 2023/08/20 |
| | | *Ploceus capensis* | Cape Weaver | Least Concern | 378 | 2023/09/01 |
| | | *Ploceus velatus* | Southern Masked Weaver | Least Concern | 27 | 2022/04/04 |
| | | *Quelea quelea* | Red-billed Quelea | Least Concern | 1 | 2016/07/14 |
| | Promeropidae | *Promerops cafer* | Cape Sugarbird | Least Concern | 80 | 2023/08/15 |
| | Pycnonotidae | *Andropadus importunus* | Sombre Greenbul | Least Concern | 401 | 2023/09/01 |
| | | *Phyllastrephus terrestris* | Terrestrial Brownbul | Least Concern | 154 | 2023/08/27 |
| | | *Pycnonotus capensis* | Cape Bulbul | Least Concern | 387 | 2023/09/01 |
| | Sturnidae | *Creatophora cinerea* | Wattled Starling | Least Concern | 3 | 2018/01/13 |
| | | *Notopholia corusca* | Black-bellied Starling | Least Concern | 123 | 2023/09/01 |
| | | *Onychognathus morio* | Red-winged Starling | Least Concern | 264 | 2023/09/01 |
| | | *Sturnus vulgaris* | Common Starling | Least Concern | 396 | 2023/09/01 |
| | Sylviidae | *Curruca subcoerulea* | Chestnut-vented Warbler | Least Concern | 1 | 2017/04/07 |
| | Viduidae | *Vidua macroura* | Pin-tailed Whydah | Least Concern | 177 | 2023/09/01 |
| | Zosteropidae | *Zosterops virens* | Cape White-eye | Least Concern | 505 | 2023/09/01 |
| Pelecaniformes | Ardeidae | *Ardea cinerea* | Grey Heron | Least Concern | 52 | 2023/09/01 |
| | | *Ardea intermedia* | Intermediate Egret | Least Concern | 1 | 2016/04/27 |
| | | *Ardea melanocephala* | Black-headed Heron | Least Concern | 151 | 2023/09/01 |
| | | *Ardea purpurea* | Purple Heron | Least Concern | 8 | 2022/02/27 |
| | | *Ardeola ralloides* | Squacco Heron | Least Concern | 1 | 2021/05/24 |
| | | *Bubulcus ibis* | Western Cattle Egret | Least Concern | 243 | 2023/08/20 |
| | | *Egretta garzetta* | Little Egret | Least Concern | 14 | 2020/01/03 |
| | | *Ixobrychus minutus* | Little Bittern | Least Concern | 7 | 2023/04/01 |
| | | *Nycticorax nycticorax* | Black-crowned Night Heron | Least Concern | 14 | 2021/08/02 |
| | Scopidae | *Scopus umbretta* | Hamerkop | Least Concern | 8 | 2022/08/22 |
| | Threskiornithidae | *Bostrychia hagedash* | Hadada Ibis | Least Concern | 501 | 2023/09/01 |
| | | *Platalea alba* | African Spoonbill | Least Concern | 10 | 2022/07/01 |
| | | *Plegadis falcinellus* | Glossy Ibis | Least Concern | 5 | 2015/01/14 |

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|---|---|---|---|---|---|---|
| | | *Threskiornis aethiopicus* | African Sacred Ibis | Least Concern | 128 | 2023/08/15 |
| Piciformes | Indicatoridae | *Indicator indicator* | Greater Honeyguide | Least Concern | 1 | 2017/07/01 |
| | | *Indicator minor* | Lesser Honeyguide | Least Concern | 25 | 2021/08/21 |
| | | *Indicator variegatus* | Scaly-throated Honeyguide | Least Concern | 47 | 2023/07/23 |
| | Lybiidae | *Lybius torquatus* | Black-collared Barbet | Least Concern | 21 | 2023/08/27 |
| | | *Tricholaema leucomelas* | Acacia Pied Barbet | Least Concern | 3 | 2022/04/04 |
| | Picidae | ***Campethera notata*** | **Knysna Woodpecker** | **Near-Threatened** | **39** | **2023/03/25** |
| | | *Dendropicos fuscescens* | Cardinal Woodpecker | Least Concern | 4 | 2021/01/21 |
| | | *Dendropicos griseocephalus* | Olive Woodpecker | Least Concern | 185 | 2023/08/20 |
| Podicipediformes | Podicipedidae | *Podiceps nigricollis* | Black-necked Grebe | Least Concern | 2 | 2016/11/26 |
| | | *Tachybaptus ruficollis* | Little Grebe | Least Concern | 68 | 2023/09/01 |
| Sphenisciformes | Spheniscidae | *Bubo africanus* | Spotted Eagle-Owl | Least Concern | 77 | 2023/09/01 |
| Strigiformes | Strigidae | *Bubo capensis* | Cape Eagle-owl | Least Concern | 4 | 2012/01/17 |
| | | *Bubo lacteus* | Verreaux's Eagle-owl | Least Concern | 3 | 2022/07/03 |
| | | *Strix woodfordii* | African Wood-owl | Least Concern | 8 | 2023/05/09 |
| | Tytonidae | *Tyto alba* | Common Barn-owl | Least Concern | 38 | 2023/05/20 |
| Struthioniformes | Struthionidae | *Struthio camelus* | Common Ostrich | Least Concern | 1 | 2021/08/02 |
| Suliformes | Anhingidae | *Anhinga rufa* | African Darter | Least Concern | 73 | 2023/09/01 |
| | Phalacrocoracidae | *Microcarbo africanus* | Reed Cormorant | Least Concern | 88 | 2023/08/20 |
| | | *Phalacrocorax lucidus* | White-breasted Cormorant | Least Concern | 21 | 2023/05/25 |
| Trogoniformes | Trogonidae | *Apaloderma narina* | Narina Trogon | Least Concern | 48 | 2022/07/22 |

## Appendix D

**Appendix D** Species list of the faunal species recovered within the study area during the field survey. For each, the taxonomic Order, Family, species binomial name and species common name are shown, along with the current IUCN Red List classification of the species, and the number of records of the species during the surveying period. Species in bold represent Species of Conservation Concern (SCC).

| **Mammals** | | | | | |
|---|---|---|---|---|---|
| **Order** | **Family** | **Species** | **Common name** | **IUCN status** | **Number of observations** |
| Afrosoricida | Chrysochloridae | ***Chlorotalpa duthieae*** | **Duthie's Golden Mole** | **Vulnerable** | **3** |
| Carnivora | Herpestidae | *Atilax paludinosus* | Marsh Mongoose | Least Concern | 1 |
| Cetartiodactyla | Bovidae | *Raphicerus melanotis* | Cape Grysbok | Least Concern | 1 |
| Rodentia | Bathyergidae | *Cryptomys hottentotus* | African Mole-rat | Least Concern | 7 |
| | Muridae | *Rhabdomys pumilio* | Four-striped Grass Mouse | Least Concern | 1 |
| **Amphibians** | | | | | |
| **Order** | **Family** | **Species** | **Common name** | **IUCN status** | **Number of observations** |
| Anura | Pyxicephalidae | *Cacosternum boettgeri* | Boettger's Dainty Frog | Least Concern | 1 |
| | | *Strongylopus grayii* | Clicking Stream Frog | Least Concern | 3 |
| **Avifauna** | | | | | |
| **Order** | **Family** | **Species** | **Common name** | **IUCN status** | **Number of observations** |
| Anseriformes | Anatidae | *Alopochen aegyptiaca* | Egyptian Goose | Least Concern | 1 |
| Bucerotiformes | Upupidae | *Upupa africana* | African Hoopoe | Least Concern | 1 |
| Coliiformes | Coliidae | *Colius striatus* | Speckled Mousebird | Least Concern | 2 |
| Columbiformes | Columbidae | *Columba guinea* | Speckled Pigeon | Least Concern | 1 |
| | | *Streptopelia semitorquata* | Red-eyed Dove | Least Concern | 2 |
| Coraciiformes | Alcedinidae | *Halcyon albiventris* | Brown-hooded Kingfisher | Least Concern | 1 |
| Galliformes | Numididae | *Numida meleagris* | Helmeted Guineafowl | Least Concern | 1 |

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|---|---|---|---|---|---|
| Musophagiformes | Musophagidae | *Tauraco corythaix* | Knysna Turaco | Least Concern | 2 |
| Passeriformes | Acrocephalidae | *Acrocephalus gracilirostris* | Lesser Swamp Warbler | Least Concern | 1 |
| | Cisticolidae | *Cisticola tinniens* | Levaillant's Cisticola | Least Concern | 1 |
| | | *Prinia maculosa* | Karoo Prinia | Least Concern | 1 |
| | Corvidae | *Corvus albicollis* | White-necked Raven | Least Concern | 1 |
| | | *Corvus albus* | Pied Crow | Least Concern | 1 |
| | Dicruridae | *Dicrurus adsimilis* | Fork-tailed Drongo | Least Concern | 1 |
| | Estrildidae | *Coccopygia melanotis* | Swee Waxbill | Least Concern | 1 |
| | Fringillidae | *Crithagra sulphurata* | Brimstone Canary | Least Concern | 2 |
| | Locustellidae | *Bradypterus baboecala* | Little Rush Warbler | Least Concern | 1 |
| | Malaconotidae | *Laniarius ferrugineus* | Southern Boubou | Least Concern | 1 |
| | Motacillidae | *Motacilla capensis* | Cape Wagtail | Least Concern | 1 |
| | Muscicapidae | *Cossypha caffra* | Cape Robin-Chat | Least Concern | 2 |
| | | *Muscicapa adusta* | African Dusky Flycatcher | Least Concern | 1 |
| | | *Turdus olivaceus* | Olive Thrush | Least Concern | 3 |
| | Nectariniidae | *Cinnyris chalybeus* | Southern Double-collared Sunbird | Least Concern | 2 |
| | Oriolidae | *Oriolus larvatus* | Eastern Black-headed Oriole | Least Concern | 1 |
| | Ploceidae | *Ploceus capensis* | Cape Weaver | Least Concern | 2 |
| | Pycnonotidae | *Andropadus importunus* | Sombre Greenbul | Least Concern | 1 |
| | | *Pycnonotus capensis* | Cape Bulbul | Least Concern | 1 |
| | Sturnidae | *Onychognathus morio* | Red-winged Starling | Least Concern | 1 |
| | | *Sturnus vulgaris* | Common Starling | Least Concern | 1 |
| | Zosteropidae | *Zosterops virens* | Cape White-eye | Least Concern | 5 |
| Pelecaniformes | Ardeidae | *Ardea intermedia* | Intermediate Egret | Least Concern | 1 |
| | | *Ardea melanocephala* | Black-headed Heron | Least Concern | 1 |
| | Threskiornithidae | *Bostrychia hagedash* | Hadada Ibis | Least Concern | 3 |

**Appendix E**

# Curriculum Vitae of Jacobus Hendrik Visser

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## Qualifications

- PhD (Zoology), University of Johannesburg (2015 - 2017)
- MSc (Zoology), Stellenbosch University (2011 - 2013)
- BSc Honours (Zoology) cum laude, Stellenbosch University (2010)
- BSc (Biodiversity and Ecology) cum laude, Stellenbosch University (2007 - 2009)

## Scientific publications

- **Visser J.H.** (2013). Gene-flow in the rock hyrax (*Procavia capensis*) at different spatial scales. MSc thesis, Stellenbosch University, Stellenbosch, South Africa. https://core.ac.uk/download/pdf/37420485.pdf
- **Visser J.H.** (2017). Evolution of the South African Bathyergidae: patterns and processes. PhD dissertation, University of Johannesburg, Johannesburg, South Africa.

- **Visser J.H.**, Bennett N.C., Jansen van Vuuren B. (2014). Local and regional scale genetic variation in the Cape dune mole-rat, *Bathyergus suillus*. PLos ONE 9(9):e107226. https://doi.org/10.1371/journal.pone.0107226
- **Visser J.H.**, Bennett N.C., Jansen van Vuuren B. (2017). Distributional range, ecology and mating system of the Cape mole-rat, *Georychus capensis* family Bathyergidae. Canadian Journal of Zoology 95 (10): 713-726. https://doi.org/10.1139/cjz-2017-0016
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**List of fauna reports**


- **Visser, J.H.** Terrestrial Animal Species Compliance Statement Report For A Portion of Remainder of Farm 630, Rawsonville, Breede Valley Municipality. November 2021. Prepared for inClover Environmental Consulting.
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Compliance Statement Report for a Portion of Brazil 329, Nama Khoi Municipality, Namakwa District. April 2022. Prepared for WNel Environmental Consulting Services.
- **Visser, J.H.** Terrestrial Faunal And Avifaunal Species Scoping Report for the Proposed Waste Management Facility at Portions 1 and 6 of Farm 32 Brakkefontein, City of Cape Town. April 2022. Prepared for SLR Consulting.
- **Visser, J.H.** Terrestrial Faunal And Avifaunal Species Impact Assessment Report for a Portion of Riet Valleij (Somerset Vale, Farm Portion RE/150), Estelm Boerdery, Swellendam Municipality, Overberg District. June 2022. Prepared for PHS Consulting.
- **Visser, J.H.** Site Sensitivity Verification Report for Remainder of Farm De Draay No 563, Overstrand Municipality. August 2022. Prepared for PHS Consulting.
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Impact Assessment Report for Remainder of Farm Rooilandia No. 472, Breede Valley Municipality. October 2022. Prepared for McGregor Environmental Services.
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Impact Assessment Report for Portion 3 of Farm 781, Theewaterskloof Local Municipality. December 2022. Prepared for PHS Consulting.
- **Visser, J.H.** Terrestrial Faunal Species Compliance Statement Report for Farm Portion 49, Hansmoeskraal Farm 202, George Local Municipality. April 2023. Prepared for Sharples Environmental Services cc (SES).
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Compliance Statement Report for Farm 153 Vissershok (C1038: Upgrading of TR11/1), City of Cape

Town Municipality. May 2023. Prepared for Sharples Environmental Services cc (SES).

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- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Compliance Statement Report for the Upgrade of the Schaapkop Sewer Rising Main on Remainder of Erf 464 and Erf 13486, George Local Municipality. July 2023. Prepared for Sharples Environmental Services cc (SES).
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- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Impact Assessment Report for the Upgrading of Herold’s Bay Sewer Pump Station and Associated Rising Main on Remainder of Farm Brakfontein 236, Portion 10 of Farm Brakfontein 236 and Erven RE/95 and 116, Herholds Bay, George Municipality. September 2023. Prepared for Sharples Environmental Services cc (SES).

**Other projects**

- Southern African Bird Atlas Project 2 (SABAP2)
- Endemism, genetic variance and conservation priorities in the highlands of south-western Africa.

- Biodiversity and ecology of scorpions in the Cape Floristic Region.
- National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria.

**Conferences**

- Presenter at the 2017 conference of the South African Wildlife Management Association (Presentation title: The influence of commercial game farming on maintaining genetic diversity in the sable antelope (*Hippotragus niger*) and roan antelope (*Hippotragus equinus*)
- Presenter at the 2017 conference of the Zoological Society of Southern Africa (Presentation title: Evolution of the South African Bathyergidae: Patterns and processes)
- Presenter at the 2010 conference of the Zoological Society of Southern Africa (Presentation title: Local and regional scale genetic variation in the Cape dune mole-rat, *Bathyergus suillus*