

## APPENDIX C7(3): COMMENTS RECIEVED

Comments on Basic Assessment Report  
Review period 04 March 2021 – 06 May 2021  
(C&RR: Point 1)

## Key Stakeholders and Interested & Affected Parties

# Peer review of the bird impact study for the proposed Fronteer Wind Farm in the Grahamstown area of the Eastern Cape Province, South Africa

Andrew Jenkins & Anthony van Zyl, *AVISENSE* Consulting, May 2021

## Introduction

Fronteer (Pty) Ltd is planning to construct and operate a utility-scale wind energy facility (WEF) approximately 12 km north-west of Grahamstown in the Eastern Cape Province, South Africa. The project will comprise up to 38 turbines, spread over an area of about 2600 ha and with a generating capacity of up to 213 MW. The Fronteer project is the western component of the eastern block of a much larger cluster of proposed wind and solar energy projects, under consideration for development by the same parent company – Wind Relic (Pty) Ltd. Fronteer is a second proposed wind farm located immediately adjacent to Wind Garden, making up the eastern component of the eastern development block.

Savannah Environmental was contracted by the developer to conduct environmental impact studies on these Wind Relic projects. The entire cluster of proposed renewable energy developments falls within the Cookhouse Renewable Energy Development Zone (REDZ – Jenkins & du Plessis 2014), and as such is subject to an abbreviated, Basic Assessment process, although this benefit does not materially extend to the requirements for bird impact studies. A collaboration between East Cape Diverse Consultants and Ecology Consultants was contracted by Savannah to conduct a baseline bird study which extended over the entire development cluster. This study ran from June 2019 to August 2020 and has subsequently informed separate avian impact assessments for both the Wind Garden and Fronteer projects, applicable to all of the various development activities associated with each.

*AVISENSE* Consulting was asked in February 2021 by Richard Summers (representing C-SA Properties (Pty) Ltd and a consortium of landowners in the vicinity of the proposed wind farm project) to conduct a peer-review of the East Cape Diverse Consultants/Ecology Consultants bird baseline study and impact assessment for the Fronteer WEF, as part of a formal objection to the construction and operation of this development.

Dr Andrew Jenkins and Anthony van Zyl of *AVISENSE* Consulting compiled the present report on the bird study submitted by East Cape Diverse Consultants/Ecology Consultants. Dr Jenkins is a qualified ornithologist with three decades of experience as a field biologist and as a specialist in avian impact assessment. He has an extensive publication record in peer-reviewed academic journals on aspects of raptor biology and conservation and avian collision ecology, and is the primary author of the BirdLife South Africa/Endangered Wildlife Trust guidelines document for assessing the impacts of wind farms on South African birds (Jenkins *et al.* 2015). He is also the primary author of Phases 1 and 2 Strategic Environmental Assessments (SEAs) for renewable energy development in South Africa (Jenkins & du Plessis 2014, Jenkins 2019). He has worked on screening, scoping, baseline, EIA and post-construction bird studies for >100 wind farm proposals in multiple African countries.

Anthony van Zyl holds an MSc in Zoology from UCT and is a trained project manager. He has 19 years of experience in the oil and gas industry in sub-Saharan Africa, including 5 years of experience of project management. He is an experienced field ornithologist and has been involved in multiple



raptor research and surveys in South and East Africa over the last 30 years. He has co-authored several peer reviewed papers on birds and in particular birds of prey.

For more information on AVISENSE Consulting see <http://www.avisense.co.za/>.

## Methods

This review was conducted in terms of the following approach:

1. A review of the existing data relevant to the bird impact study for the WEF development.
2. An eight-day visit to the Fronteer site, aimed particularly at evaluating the coverage, accuracy and overall adequacy of the field work done to determine the status of cliff- and tree-nesting raptors (key cliff-nesting species being Verreaux's Eagle *Aquila verreauxii* and Lanner Falcon *Falco biarmicus*, key tree-nesting species being Martial Eagle *Polemaetus bellicosus* and Crowned Eagle *Stephanoaetus coronatus*) – by far the highest priority and most impact susceptible species implicated in this assessment. Other species of potential special interest include Cape Vulture *Gyps coprotheres*, Secretarybird *Sagittarius serpentarius*, Black Harrier *Circus maurus*, Black Stork *Ciconia nigra*, Blue Crane *Grus paradisea*, Denham's Bustard *Neotis denhami*, Ludwig's Bustard *Neotis ludwigii*, and Southern Black Korhaan *Afrotis afra*.
3. Field survey work was done by (i) two observers using a single 4x4 vehicle to access as much of the area immediately surrounding the project as possible, using the existing road infrastructure and walking to more remote sites as and when necessary, (ii) three and sometimes four observers using a single 4x4 vehicle to access and check key habitats in the Kwandwe Private Game Reserve, and (iii) two observers and a pilot using a Robinson R44 helicopter to expand the survey to include habitats that proved inaccessible from the ground. Because of currently poor relations between our clients and the landowners contracted into the WEF development, we were not able to work on the ground in the proposed development area itself.
4. Each targeted area of nesting habitat (cliff-lines, well-wooded ravines and patches of mature forest) was surveyed by searching sheer faces or emergent trees for birds, nest structures and other signs of occupation, and by periods of passive observation of the presence and behaviour of target species in the general area. Observations were conducted from suitable look-out points, each with a clear view of the habitat in question, using 10 x 42 binoculars and a 20-60x spotting scope. As many as possible of the nest sites mapped in the study under review were included in our survey work.
5. For the purposes of this study, we defined a definite, large eagle nest site as one which was identified as such by the baseline study and confirmed during our site visit, at least by sighting an adult bird or pair in the near vicinity. A probable large eagle nest site was either one identified as such by the baseline study, located in an area of good habitat but which we were unable to confirm during our site visit, or one with a history of recent sightings combined with good habitat quality and appropriate social spacing, while a possible nest site was one where good habitat was located or predicted (but not surveyed) and the spacing was appropriate for the relevant species. For the remaining species, any combination of pairs of adult birds, nest structures, good habitat, and/or behaviour suggestive of breeding was considered sufficient to consider these as definite nest sites.

6. All spatial information was captured on digital, 1:50 000 topographic maps using the mobile application *Avenza™*. Throughout the time spent in the vicinity of the proposed development area atlas lists were compiled of the bird species encountered per 5' x 5' 'pentad', as per the Southern African Bird Atlas Project 2 (SABAP2) protocols, using the mobile phone-based application *BirdLasser™*. This information provided insight to the nature and composition of the general avifauna of the area for comparison with the results of the East Cape Diverse Consultants/Ecology Consultants study.
7. The results of the field survey are presented here as (i) a GIS-based file mapping all the habitats surveyed, and all the known or suspected nest sites located, and (ii) a corresponding annotated inventory of the threatened, large eagle nest sites confirmed or considered likely to be located within the broader impact area of the proposed wind farm.
8. The results of (1-6) are then used to inform an objective review of the bird impact work done for this development to date. Our review highlights (i) any information gaps, inconsistencies or errors in data presentation, analysis or interpretation, and instances of non-compliance with the accepted national standards for such work, (ii) any inadequacies of the established baseline and/or shortcomings in the listing of avian impacts likely to be associated with the planned development activities, and (ii) deficiencies in assessing the local, regional and national significance of these impacts, and the measures proposed for mitigating impacts to truly sustainable levels.

## Results & Discussion

### *Existing data*

There are no substantial published studies of birds in the Makhanda/Grahamstown area, although there are good quantities of Southern African Bird Atlas Project data (SABAP1 – Harrison *et al.* 1997, and SABAP2 - <http://sabap2.adu.org.za/>) available for the quarter-degree squares or pentads affected by the proposed development envelope (e.g. 186 full protocol SABAP2 cards for the pentads including and surrounding the proposed development area, submitted over the last 10 years). An integrated SABAP1/2 list for the core affected area includes >300 species (Appendix 1), sustained mainly by the extreme heterogeneity of the available habitat. Note that the baseline study under review makes no direct reference to these atlas data.

A desk-top-based description of the likely avifauna and avian habitats of the Cookhouse REDZ (within which the proposed development area is located) is provided in the Phase 1 REDZ report for birds (Jenkins & du Plessis 2014). There is also an unpublished MSc manuscript on the breeding biology of Lanner Falcons in the Grahamstown area (Stephenson 1991), that includes locations of nest sites as surveyed in the mid-late 1990s. The proposed Frontier WEF site is not situated close to any recognized national Important Bird and Biodiversity Areas, with the closest being the Woody Cape Section of the Addo Elephant National Park IBA, about 50 km to the southeast (Marnewick *et al.* 2015). The baseline report draws virtually verbatim on the REDZ document but, again, makes no direct reference to the Lanner Falcon study.

### *Nesting habitat surveys*

The general area of the proposed development was visited from April 20<sup>th</sup> to 27<sup>th</sup> 2021. Over effectively six days spent in the field, two observers managed to cover most (but not all) of the target habitat (Fig. 1), and located (and in some instances characterized and surveyed) 20 cliffs or cliff-lines and a multitude of patches of mature woodland or forest (Fig. 2), all of which constituted possible nesting habitat for large eagles and/or other priority species (Fig. 2).

Fieldwork focused on surveying the valleys and cliff-lines along the northern (Helspoort Pass) and southern (New Year's River valley) edges of the proposed development envelope, where nesting habitat availability for large eagles and other priority species appeared to be greatest. Because the bird impact report gives no definitive indication of where and how nest surveys were conducted, it's not clear to what extent the areas of potential nesting habitat we identified and surveyed had been previously surveyed during the baseline study, with the results used to inform the bird impact assessment.

### *General avifauna*

SABAP2 protocol bird lists were compiled for seven pentads concentrated around the development area during the site visit (containing 25-79 species) and 133 species were recorded overall (Appendix 1). The general nature and composition of the avifauna we observed did not differ significantly from that detailed by the baseline study (Barkhuysen & Percival 2021), although the latter only actually lists a complement of <100 species. This is even though the project team presumably spent at least 8-10 days on site, on four occasions, spread over all seasons of the annual cycle. In our opinion, the richness of the affected avifauna is not fully accounted for in the current baseline study (Barkhuysen & Percival 2021), and may well not be adequately accommodated in the resulting impact assessment.

During our time in the project area, we accumulated 24 sightings of 10 priority species (Fig. 3).

### *Nest surveys*

Although the timing of our survey was not ideal (coinciding with pre- or early-breeding season for Martial and Verreaux's Eagle, and off-season for Crowned Eagle and smaller raptors), we managed to locate six definite, probable or possible nest sites of five species within roughly a 10 km radius of the centre of the Frontier project area (Fig. 4), supplementing those sites already identified by the existing baseline study (Barkhuysen & Percival 2021).

Overall, the community of cliff-and tree-nesting raptors was probably typical for the general area. There is a scarcity of high-quality cliffs, with the best faces located along the main river courses and drainage lines. Intact woodland and forest patches are mostly confined to protected areas and/or areas of higher topographic relief. Most of the smaller cliffs we found, with sheer elements and protective overhangs, were used by resident, breeding pairs of White-necked Raven *Corvus albicollis*, with the space in many instances shared with pairs of Rock Kestrel *Falco rupicolus*.

Martial Eagle sites seemed to be associated with tall indigenous and/or alien trees growing in ravines or areas of higher topographic relief. Although we weren't able to absolutely confirm a nest of this species during our April 2021 site visit, we did see individuals of the species on three occasions, involving two juvenile birds and one adult, all seen to the north of the project area (Fig. 3). While we flushed an adult Martial Eagle from the site located by the baseline study to the

southeast of the development area (Fig. 4), and were happy to consider this a definite nesting location, we were unable to find any evidence of Martial Eagle occupation of the site marked to the northeast, despite surveying the immediate area both from the ground and from the helicopter. Given that the baseline study includes a number of flights by Martial Eagle over this area, including adults displaying and carrying food (Barkhuysen & Percival 2021), we strongly suspect that there is a nest site in this general area, but it is probably tucked away in a ravine, a short distance away to the northwest of the presently indicated location.

Verreaux's Eagle nest sites were located on the highest quality cliffs only, which were essentially absent from the immediate area of the Frontier WEF. One possible Verreaux's Eagle nest site was found (Fig.4), about 5 km from the development area.

Crowned Eagle nest sites were apparently confined to more thickly vegetated slopes or ravines, and none were found or suspected within a 10 km radius of the project area (Fig. 4).



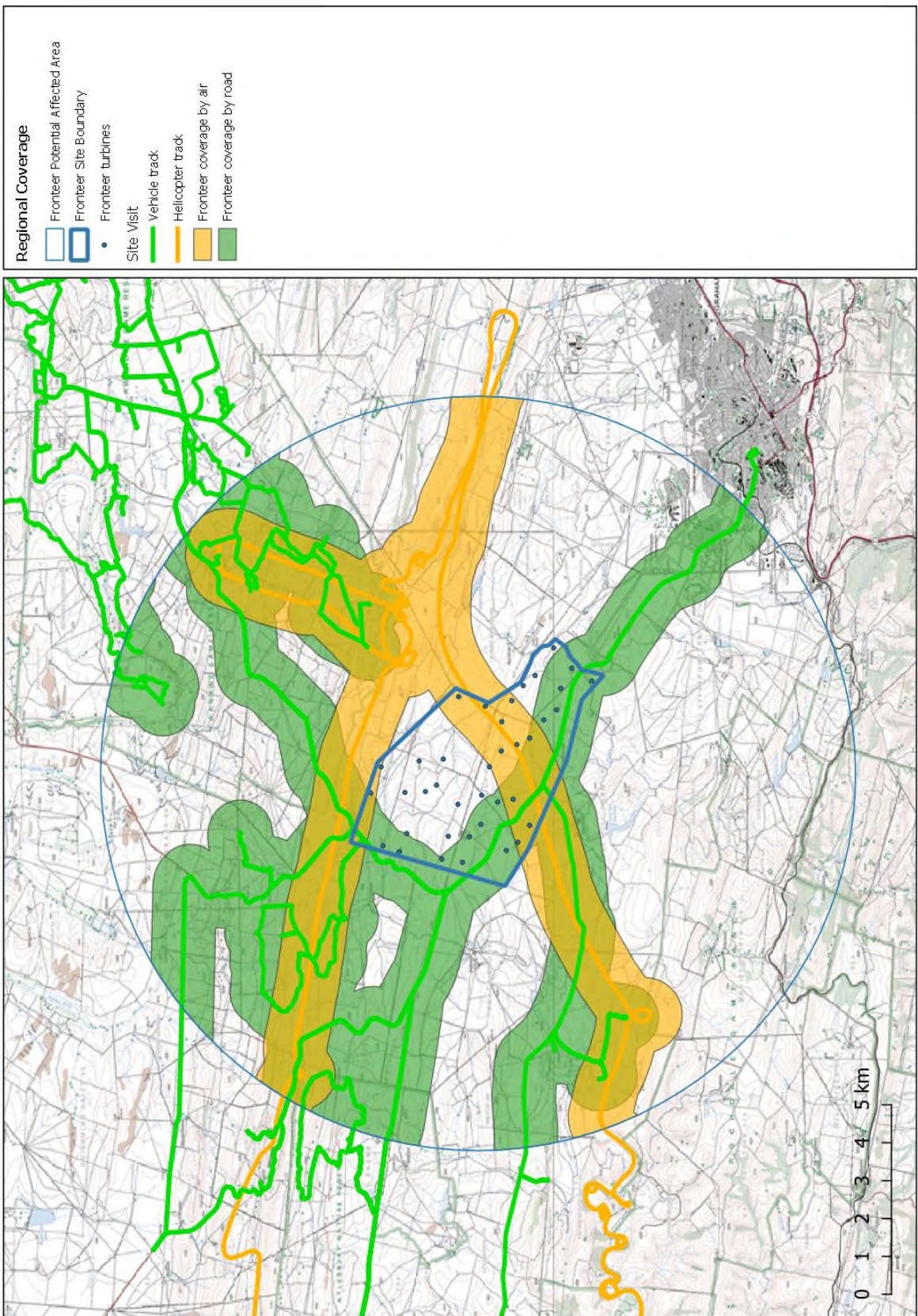
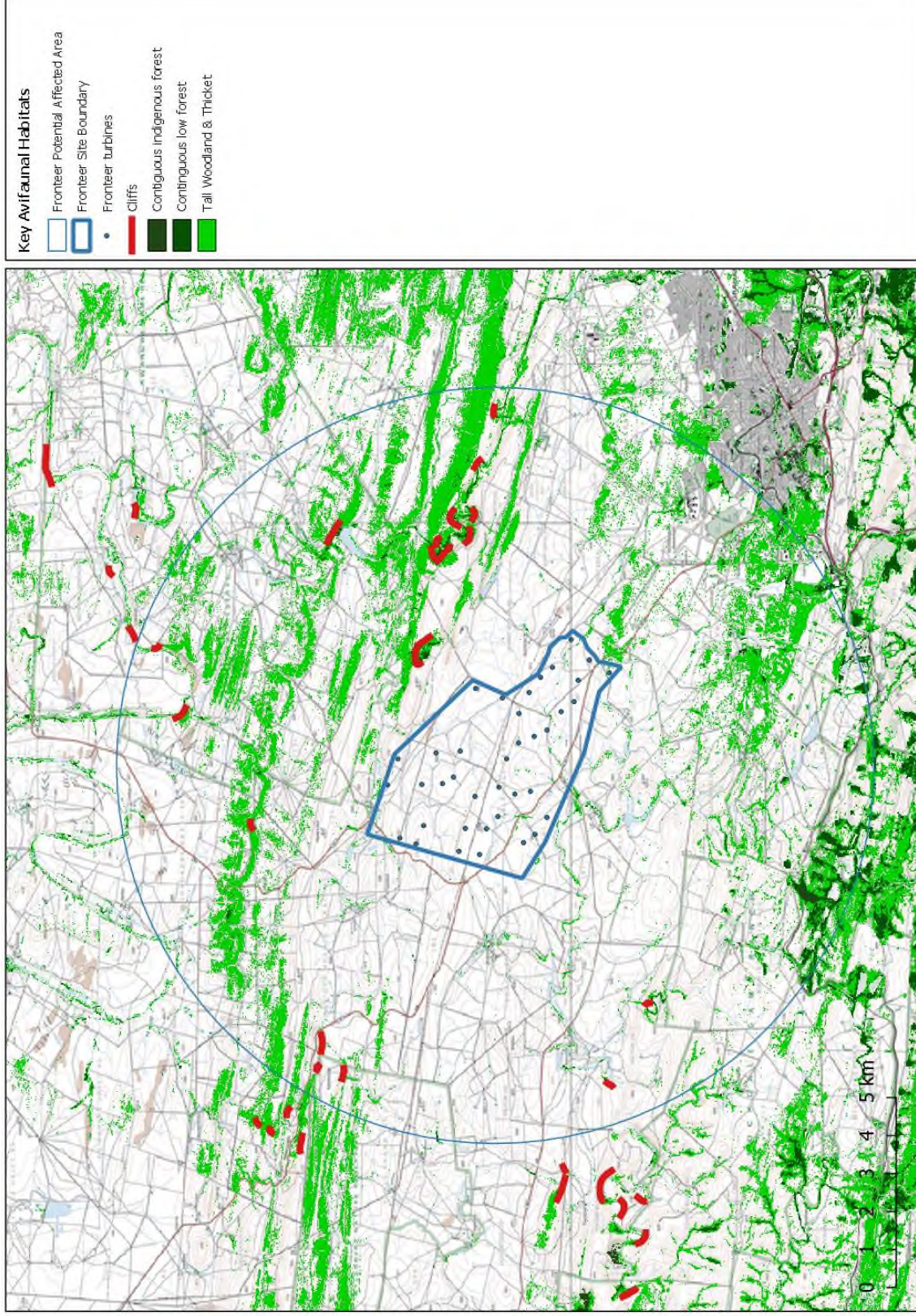


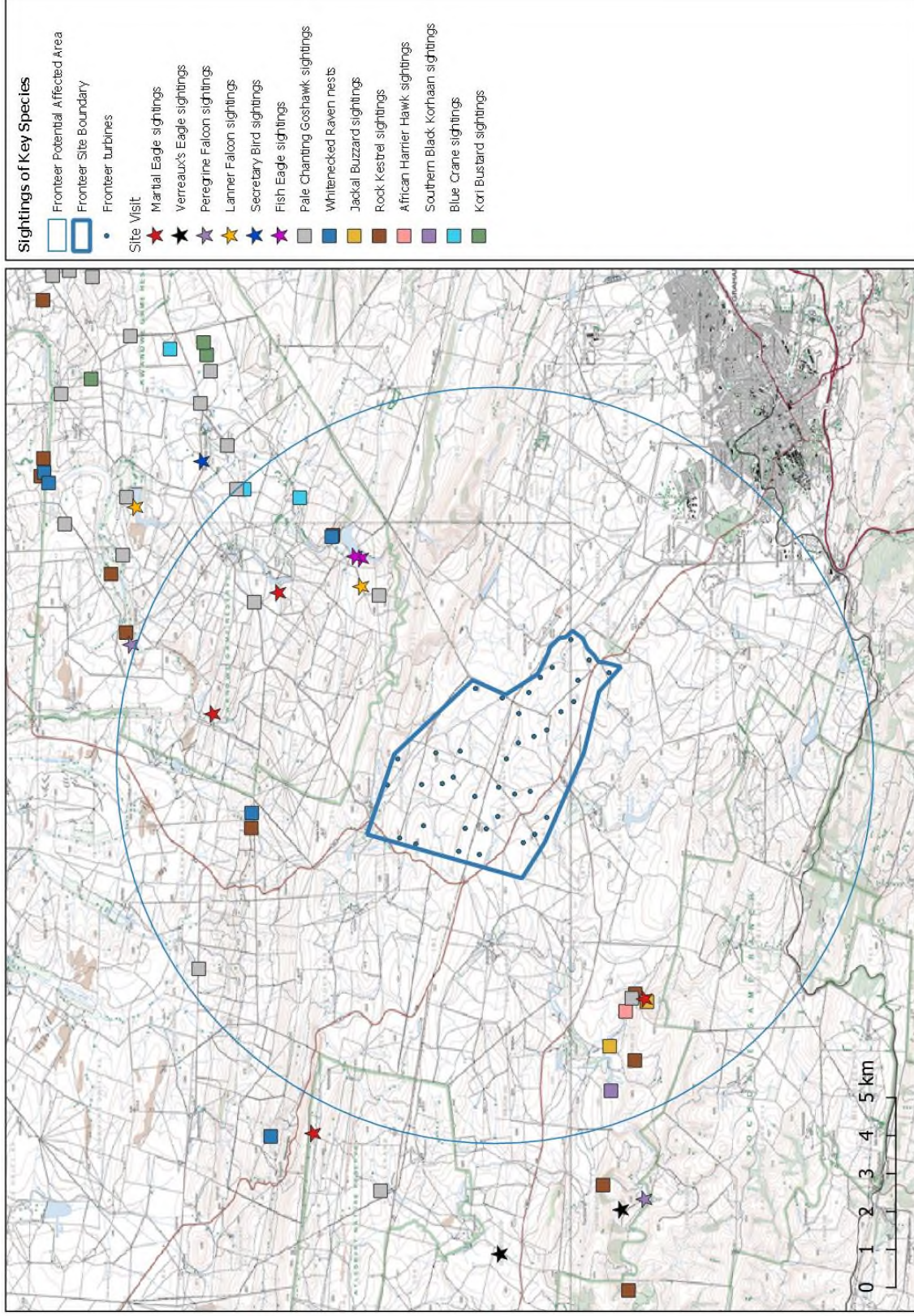
Figure 1. AVISENSE coverage of the target area during a site visit in April 2021.





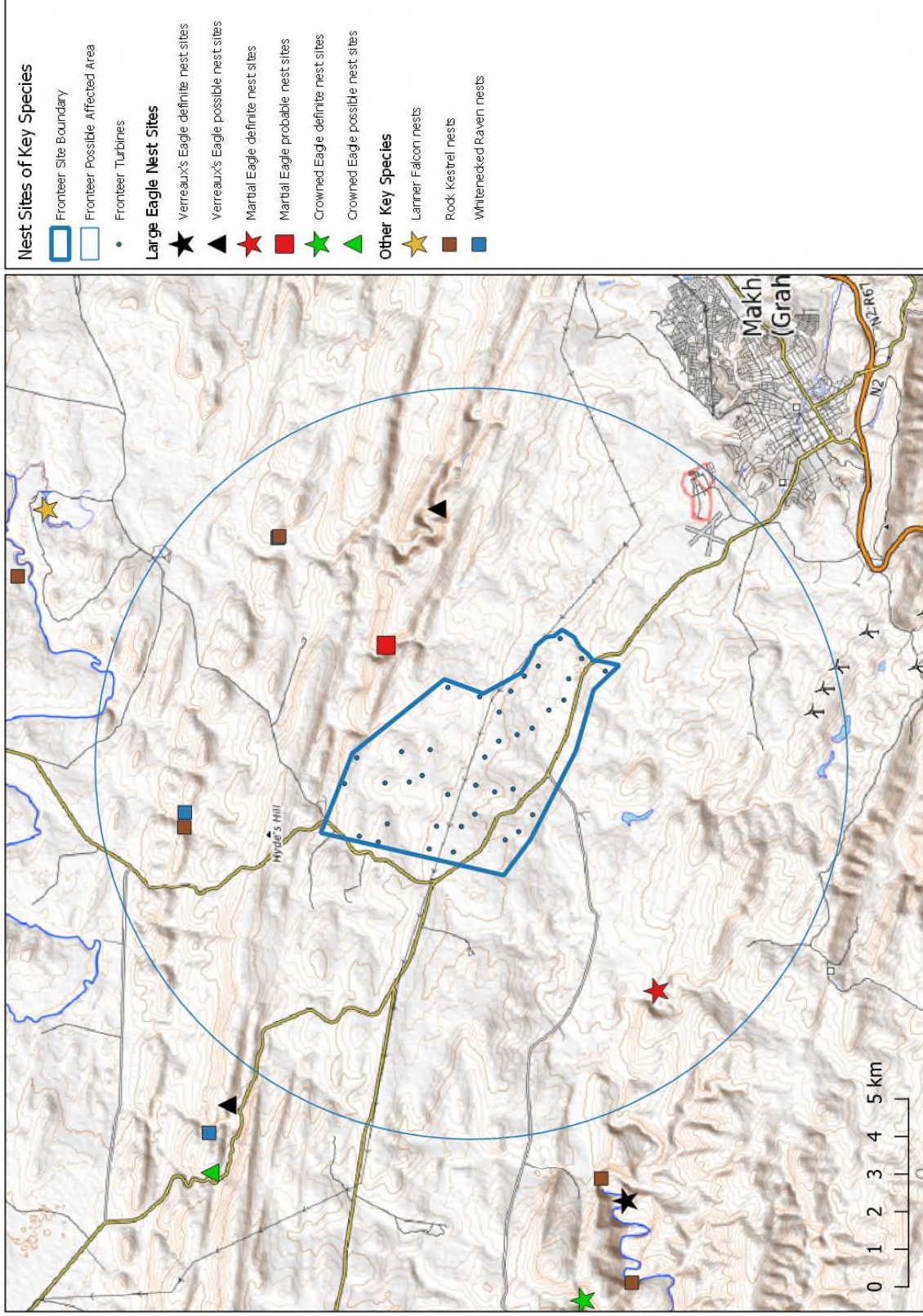
**Figure 2.** Distribution of potential nesting habitat for large eagles and other key species located in the vicinity of the proposed Fronter Wind Farm during the AVISENSE survey in April 2021.





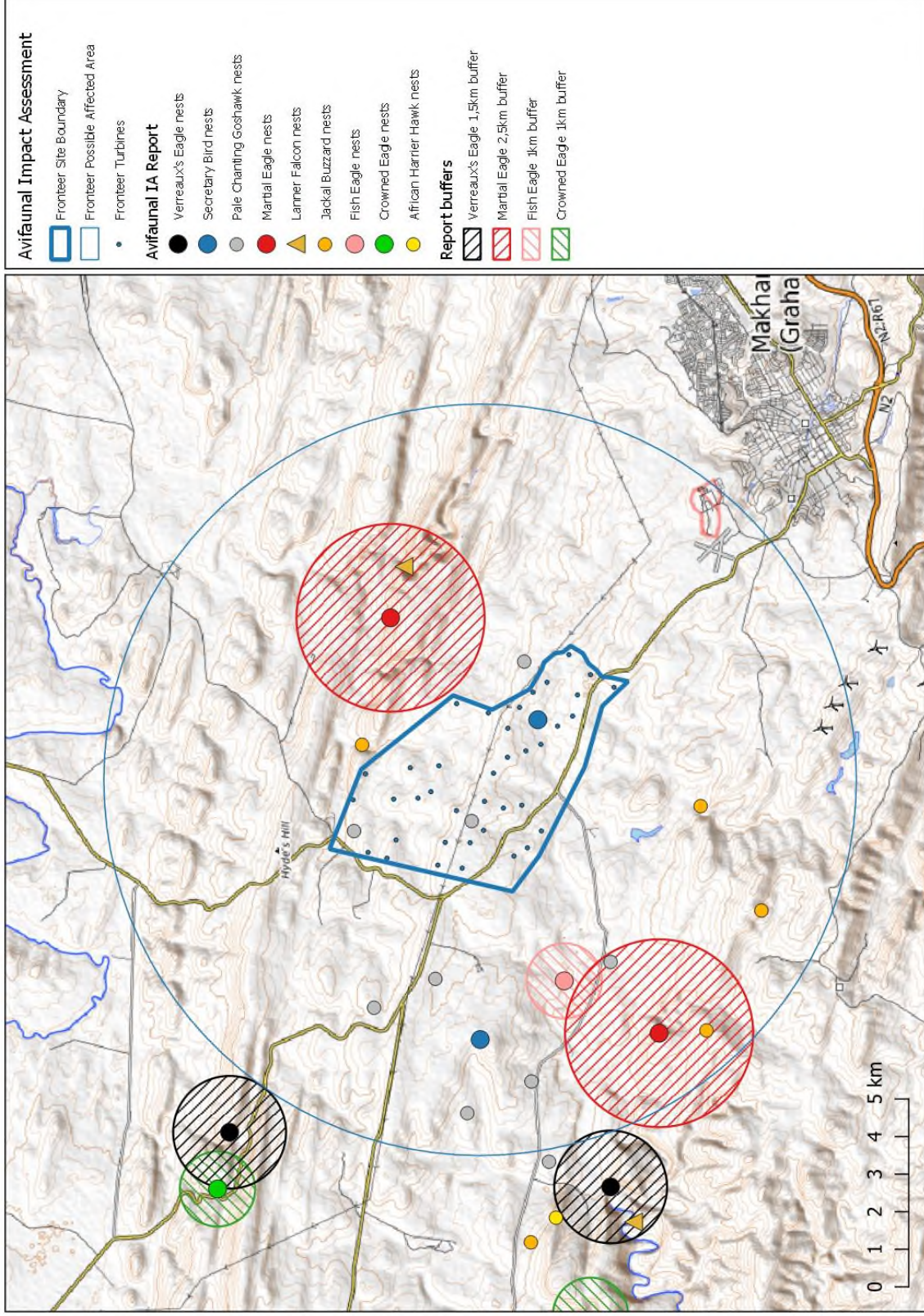
**Figure 3.** Distribution of sightings of key bird species in the vicinity of the proposed Frontier Wind Farm during the AVISENSE survey in April 2021.





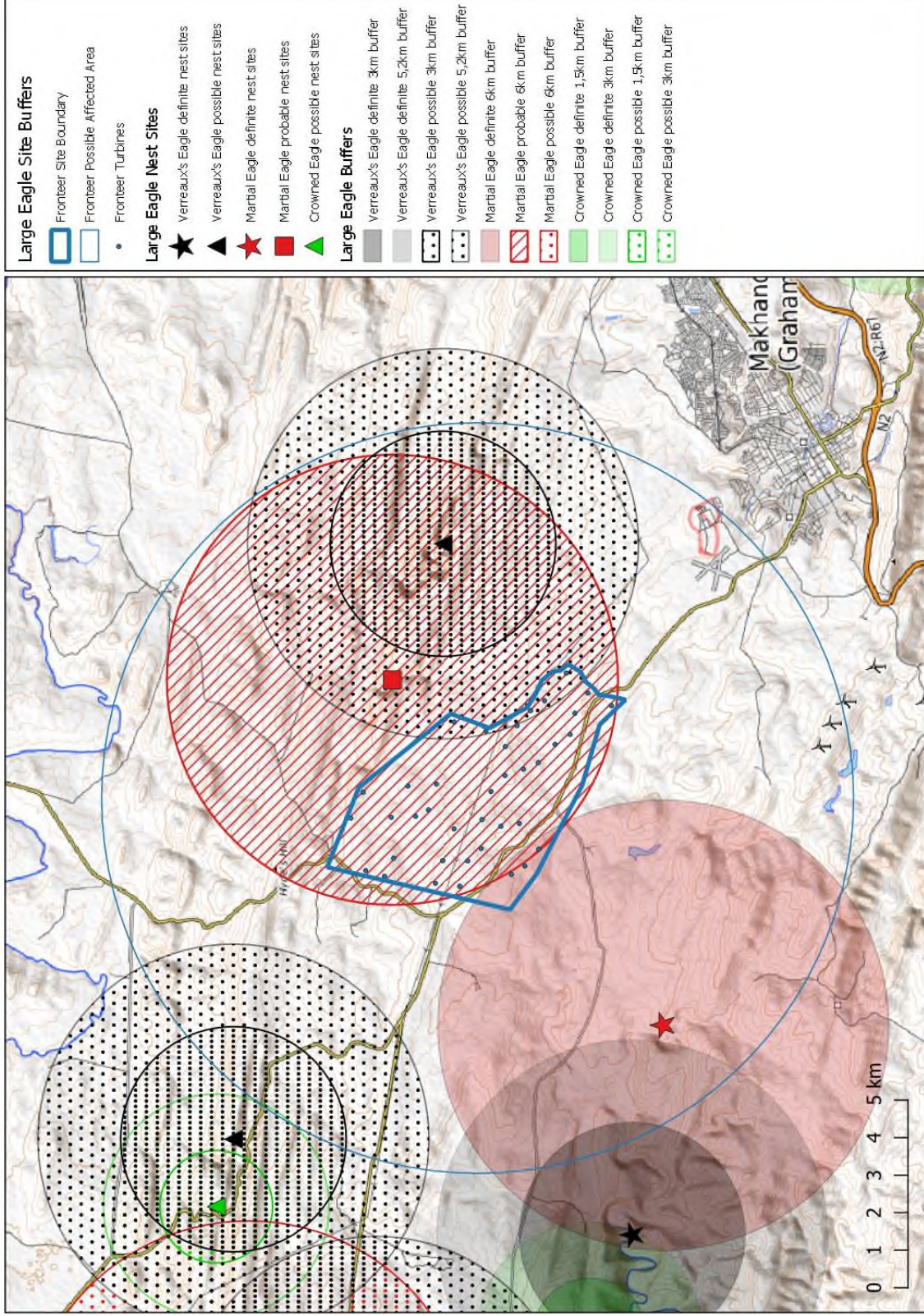
**Figure 4.** Distribution of nest sites of all key species located in the vicinity of the proposed Fronteer Wind Farm during the AVISENSE April 2021 site visit.





**Figure 5.** Large eagle nest sites found in the vicinity of the proposed Fronteer Wind Farm by the baseline and impacts study (Barkhuysen & Percival 2021), with the protective buffers applied to these sites in that report.





**Figure 6.** Definite, probable and possible large eagle nest sites confirmed or found in the vicinity of the proposed Fronteers Wind Farm during the AVISENSE survey in April 2021, with the appropriate protective buffers applied.

## Conclusions

### *Quality of the baseline study*

The baseline bird study for the Frontier Wind Farm is basically sound. It is broadly compliant with national best practice (Jenkins 2015) and provides some level of detail on most of the relevant aspects of the affected avifauna. However, although the framework of the study is adequate for purpose, some important aspects of its execution and detail are deficient.

Some specific problems with the study as presented include:

1. The report refers to and maps sampling sites in a control area located to the southwest of the development area, but the 'Before' data collected here are not presented anywhere in the report, or compared with the equivalent data collected in the WEF area. This denies the reader the opportunity to examine the quantity and nature of these data and to assess their comparability with the on-site data and legitimacy for use in a BACI-type study.
2. While it is clear that the locations of large eagle nest sites in the proximity of the proposed WEF are of critical importance in assessing the potential impacts of the development, only two searches for such nests were conducted over the study period. Both these surveys were conducted in mid-late winter – usefully timed for Verreaux's Eagle and Martial Eagle, but of little use in searches for active Crowned Eagle nests, or in surveying cliff habitat for Lanner Falcon, Peregrine Falcon *Falco peregrinus*, Booted Eagle *Hieraetus pennatus* or Jackal Buzzard nests, all of which are spring/summer breeders. Furthermore, no information is presented on the extent or intensity of these nest surveys – what habitats were targeted, where and how, so there is no way of knowing what habitats have or haven't been searched or how well the searching has been done.
3. Stemming from (2) above, the locations and actual status of at least three of the large eagle nests listed in the baseline report (Barkhuysen & Percival 2021) remain uncertain, we suspect because the nest survey team was unable to access the relevant properties (owned either by the defence force or by landowners in opposition to the development) to do this directly, and reverted to estimation from a distance, based mainly on behavioural evidence. While we are sympathetic to this kind of constraint on the efficiency of fieldwork, in the scheme of a full year of baseline monitoring it is imperative that such obstacles are overcome, and sensitive sites are accurately located and effectively protected from harmful impacts.
4. The complex integration of undulating, rugged terrain, impenetrable thicket and hidden or inaccessible ravines, riparian forest and forest patches is difficult habitat to survey, and we didn't find as much to add to or change the outcome of the large eagle survey work informing the bird impact study as we had expected. However, given the proximity of potentially suitable habitat to the proposed development area and gaps in the spacing of known or suspected breeding pairs, we do not feel that this survey work has been done well enough. In particular, we are concerned that (i) the actual location of the Martial Eagle nest to the northeast of the project remains unknown.
5. The baseline report refers to the likelihood that both Blue Crane and Secretarybird – globally threatened and impact susceptible species (Taylor *et al.* 2015, <https://www.iucnredlist.org/search>) - breed on or close to the development area, and yet no



concerted effort was made to find such sites during the baseline study. Why was this important work not done during the baseline study when it could have made a material difference to the outcomes of the EIA? Secretarybird is now both regionally and globally Endangered, and regularly active nest sites either close to or within the development area would require considerable buffering – applied at the authorization and design stages of the project, rather than during pre-construction - to be fully protected from displacement and mortality impacts.

6. Although the report is dated 2021, references made to the regional and global threat status of key species are outdated. For example, both Martial Eagle and Secretarybird are now globally Endangered – important changes to consider when assigning the significance ratings of negative impacts.

### *Quality of the Impact Assessment*

As expressed above, we feel that the field dataset on which the collision risk modelling and bird impact assessment are based is not of the required standard, with the quality, extent and intensity of the nest survey and monitoring information being particularly poor. Compounding this, we have significant problems with the way in which these data have been used to derive predicted impacts of to be of low significance, providing a favourable outcome for development.

Apart from the distinct possibility that at least one or two important nest sites may have been overlooked, we are also concerned about the way in which small quantities of Vantage Point (VP) data have been used to build statistical models of both collision risk and range use. For example, just four Martial Eagle flights and one Verreaux's Eagle flight at rotor height, recorded during only about 7% of the daylight hours available over the 12-month extent of the full sampling period, are used to generate low collision risk estimates and small, core foraging ranges, the latter being used to justify relatively small protective buffers around each nest. Unfortunately, the capacity of human observers to detect and accurately track bird flights over distance, and particularly those of wide-ranging species like large eagles, is limited, and a number of comparative studies have found that VP observers miss a significant proportion of bird flights that occur during periods of data collection, and plot the detected flight lines with considerable inaccuracy (e.g. Jenkins *et al.* 2018, Becker *et al.* 2020, AR Jenkins, Pers. obs). Hence, when small quantities of such notoriously unreliable data are used to drive predictive statistical treatments, and the outcomes of such treatments are used to influence important development decisions, margins for significant error are wide.

The study's approach to buffering nest sites is also intrinsically problematic and flies in the face of building, empirical evidence that we should be applying much bigger buffers than previously thought. Recent GPS tracking data (e.g. Murgatroyd *et al.* 2016, 2018) used to develop the VERA model usefully define a practical, effective, generic buffer radius to impose around Verreaux's Eagle nest sites. Previously set at 3 km (BirdLife 2017), the most recent analyses suggest that a circular buffer distance of as much as 5.2 km would only exclude 50% of collision fatalities recorded for this species to date (BirdLife 2017, Perold *et al.* 2020, Murgatroyd *et al.* 2020). This is more than triple the no-go buffer distance applied in the present study, with significant implications for the proposed turbine layout (Fig. 5 vs Fig. 6). The same principles apply to Martial Eagle, where recent GPS tracking data for a large sample of territory-holding adults in the Karoo suggest an optimal buffer distance of 6 km (G. Tate, Pers. comm., 2.4 times the buffer used in the Barkhuysen & Percival study). In combination, imposition of these more appropriate buffers around Martial Eagle nests,

based on data-rich analysis of tracked birds in comparable habitats, would substantially reduce the space available for turbine placement in the Frontier development area (Fig. 5 vs Fig. 6).

We also have concerns about the way in which the Barkhuysen & Percival study assesses loss of foraging range for both Verreaux's and Martial Eagles, with figures drawn from studies of high-density populations of both species – Verreaux's Eagle in the Central Karoo (Davies 1994) and Martial Eagle in the Kruger National Park (van Eeden *et al.* 2017) used as proxies for territory size in the Grahamstown area. Given that the densities of breeding pairs of both species are markedly lower around the Frontier development, surely territory sizes of pairs in this area are likely to be proportionally larger? If this is the case, percentage losses of foraging habitat to turbines in each case are likely to be greater, as are proximal and population-level impacts.

Hence, our position is that unmitigated impacts of the proposed development on the local avifauna are potentially far greater than those estimated by Barkhuysen & Percival (2021, in which mortality habitat loss and disturbance/displacement impacts are almost uniformly listed as 'Low'). The primary mitigation option for such impacts is to impose appropriate buffers, far greater in size than those currently imposed, which would effectively exclude most of the indicated area from sustainable development (Fig. 6).

Apart from the use of buffers, the study under review suggests three options for mitigating operational impacts on key species at the Frontier WEF site. Turbine curtailment – via shut-down on demand, mediated either by direct observation or by remote sensing (radar- or camera-driven triggers) is put forward as a back-up should other options prove ineffective. It should be noted that while a number of commercial service providers are offering shut-down on demand systems to address avian collision mitigation, and this has been shown to work in some cases (e.g. de Lucas *et al.* 2012), there is as yet no formally published study that clearly demonstrates the efficacy of such an approach in a situation where the flight behaviour of target species is relatively unpredictable (both spatially and temporally – as opposed to, for example, wind farms situated along migration flyways), and these species are potentially capable of covering ground more rapidly than the shut-down mechanism is able to react. Put simply – “Shutdown should be seen as a mitigation measure of last resort, and not as a substitute for location and design considerations to minimize adverse impacts” (Gove *et al.* 2013).

The primary forms of impact mitigation suggested (Percival 2016, Percival *et al.* 2016) involve habitat modification both within the wind farm area (to discourage incursions by raptors by reducing foraging opportunities) and away from the wind farm (to encourage raptors to forage in areas other than the wind farm). Contrary to the assertions made by Percival in his report and subsequently in responses to I&APs, there is no published evidence that such a scheme can be effective. The cited study in Scotland in which pine trees were felled to create extra foraging habitat for Golden Eagles *Aquila chrysaetos* away from a wind farm (Walker *et al.* 2005) involves exceptional circumstances that simply cannot be replicated at the Frontier site. Furthermore, in a subsequent review of interactions between Golden Eagles and wind farms in Scotland, Fielding & Haworth (2010) concluded that “...prey enhancement by habitat modification is unlikely to show rapid benefits for Golden Eagles”. Habitat modification is listed as a theoretically possible mitigation option in recent guidelines documents for Verreaux's Eagle (BirdLife 2017), but caution is encouraged and developers are urged to exhaust other options first.

While confidently putting forward on-site and off-site habitat modification as viable and effective ways to mitigation collision risk for eagles and harriers, Barkhuysen & Percival (2021) provide no detail at all on what these modifications might entail, how they would discourage or attract foraging raptors, how much habitat would have to be modified and where, whether or not modifications required to influence Verreux's Eagle behaviour might conflict with those required to influence Martial Eagle behaviour, and what the impacts of these modifications might be on other components of the local biodiversity. In short, the mitigation alternatives put forward are experimental at best and unlikely to be effective at worst.

All of the above deficiencies, inaccuracies and inappropriate data treatments are compounded when they are brought forward into the assessment of cumulative impacts of the Fronteer proposal in combination with multiple other renewable energy projects built or planned within a 50 km radius (including Fronteer's sister project Wind Garden).

In closing, the key findings of this review can be summarized as follows:

1. The bird impact study for the Fronteer Wind Farm proposal is superficially adequate, but lacks the accuracy, completeness and detail required to fully identify and evaluate the impacts of the proposed development.
2. The survey work on cliff-and tree-nesting raptors contributing to the study was deficient in scope, extent and intensity, possibly resulting in important sites not being detected and therefore not being factored into the impact assessment.
3. The impact assessment underplays the potential severity of the potential impacts of the development on threatened and collision-prone species such as Verreux's Eagle, Martial Eagle, Crowned Eagle (and possibly Secretarybird, Lanner Falcon and Blue Crane), and over-estimates our current ability to mitigate such impacts, resulting in residual impact ratings that are overly lenient on the development proposal. This project-specific failing is compounded and magnified in the report's attempt to evaluate the cumulative impacts of this and other renewable energy projects in the region on local populations of threatened birds.

## References

- Barkhuysen, A. & Percival, S. 2021. Fronteer Wind Farm, Makana Local Municipality, Eastern Cape – Avifaunal Impact Assessment Report. Report Savannah Environmental.
- Becker, F.K., Millikin, R.L. & Leslie, A. 2020. Using radar technology to assess visual monitoring accuracy of Cape Vulture movements. *Ostrich* 91: 83-90.
- Beston, J.A., Diffendorfer, J.E., Loss, S.R. & Johnson, D.H. 2016. Prioritizing avian species for their risk of population-level consequences from wind energy development. *Plos One* 11: e0150813.doi:10.1371/journal.pone.0150813.
- BirdLife South Africa. 2017. Verreaux's Eagle and wind farms: guidelines for impact assessment, monitoring and mitigation. BirdLife South Africa, Johannesburg.
- De Lucas, M., Ferrer, M., Bechard, M.J. & Muñoz, A.R. 2012. Griffon vulture mortality at wind farms in southern Spain: Distribution of fatalities and active mitigation measures. *Biological Conservation* 147: 184-189.
- Drewitt, A.L. & Langston, R.H.W. 2006. Assessing the impacts of wind farms on birds. *Ibis* 148: 29-42.
- Drewitt, A.L. & Langston, R.H.W. 2008. Collision effects of wind-power generators and other obstacles on birds. *Annals of the New York Academy of Science* 1134: 233-266.
- Fielding, A. & Haworth, P. 2010. Golden Eagles and wind farms. Report to Scottish Natural Heritage.
- Gove, B., Langston, R.H.W., McCluskie, A., Pullan, J.D. & Scrase, I. 2013. Wind farms and birds: an updated analysis of the effects of wind farms on birds, and best practice guidance on integrated planning and impact assessment. BirdLife International, UK.
- Jenkins, A.R. 2019. National wind and solar PV SEA report – Phase 2: Avifauna. Report to CSIR.
- Jenkins, A.R. & du Plessis, J. 2014. National wind and solar PV SEA report: Avifauna. Report to CSIR.
- Jenkins, A.R., van Rooyen, C.S., Smallie, J.J., Anderson, M.D. & Smit, H.A. 2015. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa, 4<sup>th</sup> Revision. Endangered Wildlife Trust/BirdLife South Africa, Johannesburg.
- Jenkins, A.R., Reid, T.A., du Plessis, J., Colyn, R., Benn, G. & Millikin, R. 2018. Combining radar and direct observation to estimate pelican collision risk at a proposed wind farm on the Cape west coast, South Africa. *PLoS ONE* 13(2): e0192515. <https://doi.org/10.1371/journal.pone.0192515>
- Malan, G. 2009. Raptor survey and monitoring – a field guide for African birds of prey. Briza, Pretoria.
- Marnewick, M.D., Retief, E.F., Theron, N.T., Wright, D.R & Anderson, T.A. 2015. Important Bird and Biodiversity Areas in South Africa. Johannesburg, BirdLife South Africa. 2<sup>nd</sup> Edition.
- Martínez, J.E., Calco, J.F., Martín, J.A., Zuberogoitia, I., Cerezo, E., Manrique, J., Gómez, G.J., Nevado, J.C., Sánchez, M., Sánchez, R., Bayo, J. Pallarés, A., González, C., Gómez, J.M., Pérez, P. & Motos, J. 2010. Potential impact of wind farms on territories of large eagles in southeastern Spain. *Biodiversity and Conservation* 19: 3757-3767.
- May, R., Nygård, T., Falkdalen, U., Åstrom, J., Hamre, Ø. & Stokke, B.G. 2020. Paint it black: efficacy of increased wind turbine visibility to reduce avian fatalities. *Ecology and Evolution* 10: 8927-8935.
- Mucina, L. & Rutherford, M.C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
- Murgatroyd, M., Underhill, L.G., Bouten, W. & Amar, A. 2016. Ranging behaviour of Verreaux's Eagle during the pre-breeding period determined through the use of High Temporal Resolution Tracking. *Plos One* 11: e0163378.
- Murgatroyd, M., Photopoulou, T., Underhill, L.G., Bouten, W. & Amar, A. 2018. Where eagles soar: fine resolution tracking reveals the spatiotemporal use of differential soaring modes in a large raptor. *Ecology and Evolution* 8: 6788-6799.
- Murgatroyd, M., Bouten, W. & Amar, A. 2020. A predictive model for improving placement of wind turbines to minimize collision risk potential for a large soaring raptor. *Journal of Applied Ecology* 58: 857-868.

Perold, V., Ralston-Paton, S., & Ryan, P. 2020. On a collision course? The large diversity of birds killed by wind turbines in South Africa. *Ostrich* 91: 228-239.

Stephenson, A. 2001. Ecology and breeding biology of Lanner Falcons in the Eastern Cape Province, South Africa. Unpublished MSc Thesis, Rhodes University, Grahamstown.

Taylor, M.R., Peacock, F., and Wanless, R. M. (Eds) 2015. The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.



**Appendix 1.** List of bird species known or expected to occur in the general vicinity of the proposed Frontier Wind Farm and possible adjacent wind energy projects. Species seen during the April 2021 site visit appear in **bold**.

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
<b>Common Ostrich</b>	<b><i>Struthio camelus</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna and karoo</b>
Black-necked Grebe	<i>Podiceps nigricollis</i>	-	-	Uncommon	Nomad	Wetlands
<b>Little Grebe</b>	<b><i>Tachybaptus ruficollis</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetlands</b>
White-breasted Cormorant	<i>Phalacrocorax carbo</i>	-	-	Common	Resident	Wetlands
<b>Reed Cormorant</b>	<b><i>Phalacrocorax africanus</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetlands</b>
African Darter	<i>Anhinga rufa</i>	-	-	Common	Resident	Wetlands
<b>Grey Heron</b>	<b><i>Ardea cinerea</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetlands</b>
<b>Black-headed Heron</b>	<b><i>Ardea melanocephala</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
Goliath Heron	<i>Ardea goliath</i>	-	-	Rare	Visitor	Wetlands
Purple Heron	<i>Ardea purpurea</i>	-	-	Uncommon	Resident	Wetlands
Great Egret	<i>Egretta alba</i>	-	-	Uncommon	Resident	Wetlands
Little Egret	<i>Egretta garzetta</i>	-	-	Common	Resident	Wetlands
<b>Cattle Egret</b>	<b><i>Bubulcus ibis</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
Little Bittern	<i>Ixobrychus minutus</i>	-	-	Uncommon	Resident	Wetlands
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	-	-	Uncommon	Resident	Wetlands
<b>Hamerkop</b>	<b><i>Scopus umbretta</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Wetlands</b>
African Openbill	<i>Anastomus lamelligerus</i>	-	-	Scarce	Vagrant	Wetlands
Yellow-billed Stork	<i>Mycteria ibis</i>	Endangered / Least concern	-	Uncommon	Visitor	Wetlands
Black Stork	<i>Ciconia nigra</i>	Vulnerable / Least concern	-		Resident	Wetlands and cliff-lines
White Stork	<i>Ciconia ciconia</i>	-	-	Common	Summer migrant	Open savanna
African Sacred Ibis	<i>Threskiornis aethiopicus</i>	-	-	Common	Resident	Open savanna
<b>Hadeda Ibis</b>	<b><i>Bostrychia hagedash</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna, thicket and forest</b>
<b>African Spoonbill</b>	<b><i>Platalea alba</i></b>	-	-	<b>Uncommon</b>	<b>Visitor</b>	<b>Wetlands</b>
Lesser Flamingo	<i>Phoenicopterus minor</i>	Near threatened / Near threatened	-	Uncommon	Visitor	Wetlands
<b>Spur-winged Goose</b>	<b><i>Plectropterus gambensis</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetlands</b>

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Egyptian Goose	<i>Alopochen aegyptiacus</i>	-	-	Common	Resident	Wetlands
South African Shelduck	<i>Tadorna cana</i>	-	Endemic	Common	Resident	Wetlands
Cape Shoveler	<i>Anas smithii</i>	-	Endemic	Common	Resident	Wetlands
African Black Duck	<i>Anas sparsa</i>	-	-	Uncommon	Resident	Wetlands
Yellow-billed Duck	<i>Anas undulata</i>	-	-	Common	Resident	Wetlands
Red-billed Teal	<i>Anas erythrorhyncha</i>	-	-	Common	Resident	Wetlands
Cape Teal	<i>Anas capensis</i>	-	-	Uncommon	Resident	Wetlands
Hottentot Teal	<i>Anas hottentota</i>	-	-	Scarce	Visitor	Wetlands
White-faced Duck	<i>Dendrocygna viduata</i>	-	-	Uncommon	Visitor	Wetlands
Fulvous Duck	<i>Dendrocygna bicolor</i>	-	-	Uncommon	Visitor	Wetlands
Southern Pochard	<i>Netta erythrophthalma</i>	-	-	Uncommon	Resident	Wetlands
Maccoa Duck	<i>Oxyura maccoa</i>	Near threatened / Vulnerable	-	Uncommon	Visitor	Wetlands
White-backed Duck	<i>Thalassornis leuconotus</i>	-	-	Uncommon	Visitor	Wetlands
Secretarybird	<i>Sagittarius serpentarius</i>	-	-	Uncommon	Resident	Open savanna and karoo
Peregrine Falcon	<i>Falco peregrinus</i>	-	-	Uncommon	Resident	Cliff-lines, thicket and forest
Lanner Falcon	<i>Falco biarmicus</i>	Vulnerable / Least concern	-	Uncommon	Resident	Cliff-lines, thicket and open savanna
Amur Falcon	<i>Falco amurensis</i>	-	-	Uncommon	Summer migrant	Open savanna
Rock Kestrel	<i>Falco rupicolus</i>	-	-	Common	Resident	Open savanna
Lesser Kestrel	<i>Falco naumanni</i>	-	-	Uncommon	Summer migrant	Open savanna and karoo
Yellow-billed Kite	<i>Milvus aegyptius</i>	-	-	Common	Summer migrant	Open savanna, thicket and forest
Black-shouldered Kite	<i>Elanus caeruleus</i>	-	-	Common	Resident	Open savanna
European Honey-buzzard	<i>Pernis apivorus</i>	-	-	Uncommon	Summer migrant	Thicket and forest
Long-crested Eagle	<i>Lophaelagus occipitalis</i>	-	-	Uncommon	Resident	Open savanna and forest
Booted Eagle	<i>Aquila pennatus</i>	-	-	Uncommon	Summer breeder	Cliff-lines, thicket, open savanna and karoo

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
<b>Martial Eagle</b>	<i>Polemaetus bellicosus</i>	Endangered / Vulnerable	-	Rare	Resident	Thicket, open savanna and karoo
<b>African Crowned Eagle</b>	<i>Stephanoaetus coronatus</i>	Vulnerable / Near threatened	-	Rare	Resident	Thicket and forest
<b>African Fish-eagle</b>	<i>Haliaeetus vocifer</i>	-	-	Uncommon	Resident	Wetlands
<b>Jackal Buzzard</b>	<i>Buteo rufofuscus</i>	-	Near endemic	Uncommon	Resident	Cliff-lines, open savanna and thicket
<b>Steppe Buzzard</b>	<i>Buteo vulpinus</i>	-	-	Common	Summer migrant	Open savanna, thicket and karoo
<b>Forest Buzzard</b>	<i>Buteo trizonatus</i>	Least concern / Near threatened	Near endemic	Uncommon		Thicket and forest
<b>Rufous-chested Sparrowhawk</b>	<i>Accipiter rufiventris</i>	-	-	Uncommon	Resident	Forest, thicket and open savanna
<b>Little Sparrowhawk</b>	<i>Accipiter minullus</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Black Sparrowhawk</b>	<i>Accipiter melanoleucus</i>	-	-	Uncommon	Resident	Forest, thicket and open savanna
<b>African Goshawk</b>	<i>Accipiter tachiro</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Gabar Goshawk</b>	<i>Melierax gabar</i>	-	-	Uncommon	Resident	Open savanna and karoo
<b>Southern Pale Chanting Goshawk</b>	<i>Melierax canorus</i>	-	Near endemic	Common	Resident	Open savanna and karoo
<b>African Marsh-harrier</b>	<i>Circus ranivorus</i>	Endangered / Least concern	-	Rare	Resident	Wetlands
<b>Black Harrier</b>	<i>Circus maurus</i>	Endangered / Endangered	Near endemic	Rare	Resident / visitor	Fynbos, wetlands open savanna and karoo
<b>African Harrier-Hawk</b>	<i>Polyboroides typus</i>	-	-	Uncommon	Resident	Open savanna, thicket and forest
<b>Red-winged Francolin</b>	<i>Scleroptila levaillantii</i>	-	-	Uncommon	Resident	Open savanna
<b>Red-necked Spurfowl</b>	<i>Pternistis afer</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Common Quail</b>	<i>Coturnix coturnix</i>	-	-	Common	Summer migrant	Open savanna
<b>Helmeted Guineafowl</b>	<i>Numida meleagris</i>	-	-	Common	Resident	Open savanna
<b>African Rail</b>	<i>Rallus caerulescens</i>	-	-	Rare	Resident	Wetlands

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Baillon's Crane	<i>Porzana pusilla</i>	-	-	Rare	Resident	Wetlands
Black Crane	<i>Amaurornis flavirostris</i>	-	-	Uncommon	Resident	Wetlands
Red-chested Flufftail	<i>Sarothrura rufa</i>	-	-	Uncommon	Resident	Wetlands
Buff-spotted Flufftail	<i>Sarothrura elegans</i>	-	-	Uncommon	Resident	Wetlands
Striped Flufftail	<i>Sarothrura affinis</i>	Vulnerable / Least concern	Endemic	Rare	Resident	Fynbos and wetland
African Purple Swamphen	<i>Porphyrio madagascariensis</i>	-	-	Uncommon	Resident	Wetlands
Common Moorhen	<i>Gallinula chloropus</i>	-	-	Common	Resident	Wetlands
<b>Red-knobbed Coot</b>	<b><i>Fulica cristata</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetlands</b>
African Finfoot	<i>Podica senegalensis</i>	Vulnerable / Least concern	-	Rare	Resident	Wetlands
<b>Blue Crane</b>	<b><i>Anthropoides paradiseus</i></b>	<b>Near threatened / Vulnerable</b>	<b>Near endemic</b>	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna and karoo</b>
<b>Kori Bustard</b>	<b><i>Ardeotis kori</i></b>	<b>Near threatened / Near threatened</b>	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna and karoo</b>
Ludwig's Bustard	<i>Neotis ludwigii</i>	Endangered / Endangered	Near endemic	Uncommon	Visitor	Open savanna and karoo
Denham's Bustard	<i>Neotis denhami</i>	Vulnerable / Near threatened	-	Uncommon	Visitor	Open savanna
White-bellied Korhaan	<i>Eupodotis senegalensis</i>	Vulnerable / Least concern	-	Uncommon	Resident	Open savanna
Greater Painted-snipe	<i>Rostratula benghalensis</i>	Near threatened / Least concern	-	Rare	Resident	Wetlands
Common Ringed Plover	<i>Charadrius hiaticula</i>	-	-	Uncommon	Summer migrant	Wetlands
Kittlitz's Plover	<i>Charadrius pecuarius</i>	-	-	Uncommon	Resident	Wetlands
<b>Three-banded Plover</b>	<b><i>Charadrius tricollaris</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetlands</b>
<b>Crowned Lapwing</b>	<b><i>Vanellus coronatus</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Blacksmith Lapwing</b>	<b><i>Vanellus armatus</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetlands</b>
African Snipe	<i>Gallinago nigripennis</i>	-	-	Uncommon	Resident	Wetlands
Curlew Sandpiper	<i>Calidris ferruginea</i>	- / Near threatened	-	Uncommon	Summer migrant	Wetlands
Little Stint	<i>Calidris minuta</i>	-	-	Uncommon	Summer migrant	Wetlands
Ruff	<i>Philomachus pugnax</i>	-	-	Uncommon	Summer migrant	Wetlands

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Common Sandpiper	<i>Actitis hypoleucos</i>	-	-	Uncommon	Summer migrant	Wetlands
Marsh Sandpiper	<i>Tringa stagnatilis</i>	-	-	Uncommon	Summer migrant	Wetlands
Common Greenshank	<i>Tringa nebularia</i>	-	-	Uncommon	Summer migrant	Wetlands
Wood Sandpiper	<i>Tringa glareola</i>	-	-	Uncommon	Summer migrant	Wetlands
Black-winged Stilt	<i>Himantopus himantopus</i>	-	-	Uncommon	Resident	Wetlands
Water Thick-knee	<i>Burhinus vermiculatus</i>	-	-	Uncommon	Resident	Wetlands
<b>Spotted Thick-knee</b>	<b><i>Burhinus capensis</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
Grey-headed Gull	<i>Larus cirrocephalus</i>	-	-	Uncommon	Visitor	Wetlands
Caspian Tern	<i>Sterna caspia</i>	Vulnerable / Least concern	-	Uncommon	Visitor	Wetlands
Whiskered Tern	<i>Chlidonias hybrida</i>	-	-	Uncommon	Summer breeder	Wetlands
<b>Speckled Pigeon</b>	<b><i>Columba guinea</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Cliff-lines and open savanna</b>
<b>African Olive-pigeon</b>	<b><i>Columba arquatrix</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Red-eyed Dove</b>	<b><i>Streptopelia semitorquata</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Cape Turtle-dove</b>	<b><i>Streptopelia capicola</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and karoo</b>
<b>Laughing Dove</b>	<b><i>Streptopelia senegalensis</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Namaqua Dove</b>	<b><i>Oena capensis</i></b>	-	-	<b>Uncommon</b>		<b>Open savanna and karoo</b>
Tambourine Dove	<i>Turtur tympanistria</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Emerald-spotted Wood-dove</b>	<b><i>Turtur chalcospilus</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Thicket and forest</b>
Lemon Dove	<i>Aplopelia larvata</i>	-	-	Uncommon	Resident	Thicket and forest
African Green-pigeon	<i>Treron calvus</i>	-	-	Uncommon	Resident	Thicket and forest
Red-chested Cuckoo	<i>Cuculus solitarius</i>	-	-	Common	Summer migrant	Thicket and forest
Black Cuckoo	<i>Cuculus clamosus</i>	-	-	Common	Summer migrant	Thicket and forest
<b>Jacobin Cuckoo</b>	<b><i>Clamator jacobinus</i></b>	-	-	<b>Uncommon</b>	<b>Summer migrant</b>	<b>Open savanna</b>
Klaas's Cuckoo	<i>Chrysococcyx klaas</i>	-	-	Uncommon	Summer migrant	Thicket and open savanna
Diderick Cuckoo	<i>Chrysococcyx caprius</i>	-	-	Common	Summer migrant	Open savanna

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
<b>Barn Owl</b>	<i>Tyto alba</i>	-	-	Uncommon	Resident	Cliff-lines and open savanna
African Scops-owl	<i>Otus senegalensis</i>	-	-	Uncommon	Resident	Open savanna
Cape Eagle-owl	<i>Bubo capensis</i>	-	-	Uncommon	Resident	Cliff-lines and open savanna
<b>Spotted Eagle-owl</b>	<i>Bubo africanus</i>	-	-	Uncommon	Resident	Open savanna and thicket
<b>Fiery-necked Nighthjar</b>	<i>Caprimulgus pectoralis</i>	-	-	Common	Resident	Open savanna and thicket
African Black Swift	<i>Apus barbatus</i>	-	-	Common	Resident	Cliff-lines
White-rumped Swift	<i>Apus caffer</i>	-	-	Common	Summer migrant	Open savanna
<b>Horus Swift</b>	<i>Apus horus</i>	-	-	Uncommon	Resident	Open savanna
Little Swift	<i>Apus affinis</i>	-	-	Common	Resident	Open savanna
Alpine Swift	<i>Tachymarptis melba</i>	-	-	Common	Resident	Cliff-lines
African Palm-swift	<i>Cypsiurus parvus</i>	-	-	Uncommon	Resident	Open savanna
<b>Speckled Mousebird</b>	<i>Colius striatus</i>	-	-	Common	Resident	Thicket and forest
<b>Red-faced Mousebird</b>	<i>Urocolius indicus</i>	-	-	Common	Resident	Open savanna
Narina Trogon	<i>Apaloderma narina</i>	-	-	Uncommon	Resident	Thicket and forest
Pied Kingfisher	<i>Ceryle rudis</i>	-	-	Common	Resident	Wetlands
<b>Giant Kingfisher</b>	<i>Megaceryle maximus</i>	-	-	Uncommon	Resident	Wetlands
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	Near threatened / Least concern	-	Rare	Resident	Wetlands
Malachite Kingfisher	<i>Alcedo cristata</i>	-	-	Uncommon	Resident	Wetlands
African Pygmy-Kingfisher	<i>Ispidina picta</i>	-	-	Uncommon	Resident	Open savanna
<b>Brown-hooded Kingfisher</b>	<i>Halcyon albiventris</i>	-	-	Common	Resident	Open savanna
European Roller	<i>Coracias garrulus</i>	Near threatened / Least concern	-	Uncommon		Open savanna
<b>African Hoopoe</b>	<i>Upupa africana</i>	-	-	Common	Resident	Open savanna and karoo
<b>Green Wood-hoopoe</b>	<i>Phoeniculus purpureus</i>	-	-	Common	Resident	Thicket and forest
Trumpeter Hornbill	<i>Bycanistes bucinator</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Crowned Hornbill</b>	<i>Tockus albotoerminatus</i>	-	-	Uncommon	Resident	Thicket and forest

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Southern Ground-hornbill	<i>Bucorvus leadbeateri</i>	Endangered / Vulnerable	-	Rare	Resident?	Thicket and forest
<b>Black-collared Barbet</b>	<i>Lybius torquatus</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Acacia Pied Barbet</b>	<i>Tricholaema leucomelas</i>	-	<b>Endemic</b>	<b>Common</b>	<b>Resident</b>	<b>Open savanna, karoo and thicket</b>
<b>Red-fronted Tinkerbird</b>	<i>Pogoniulus pusillus</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Greater Honeyguide</b>	<i>Indicator indicator</i>	-	-	<b>Uncommon</b>		<b>Thicket and forest</b>
Scaly-throated Honeyguide	<i>Indicator variegatus</i>	-	-	Uncommon		Thicket and forest
Lesser Honeyguide	<i>Indicator minor</i>	-	-	Uncommon		Thicket and forest
Brown-backed Honeybird	<i>Prodotiscus regulus</i>	-	-	Uncommon		Open savanna and thicket
Knysna Woodpecker	<i>Campethera notata</i>	Near threatened / Near threatened	Endemic	Uncommon	Resident	Thicket and forest
<b>Cardinal Woodpecker</b>	<i>Dendropicos fuscescens</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and thicket</b>
<b>Olive Woodpecker</b>	<i>Dendropicos griseocephalus</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Red-throated Wryneck</b>	<i>Jynx ruficollis</i>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Rufous-naped Lark</b>	<i>Mirafra africana</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
Spike-heeled Lark	<i>Chersomanes albofasciata</i>	-	-	Common	Resident	Open savanna and karoo
Grey-backed Sparrowlark	<i>Eremopterix verticalis</i>	-	Endemic	Uncommon	Visitor	Open savanna and karoo
<b>Red-capped Lark</b>	<i>Calandrella cinerea</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and karoo</b>
<b>Barn Swallow</b>	<i>Hirundo rustica</i>	-	-	<b>Common</b>	<b>Summer migrant</b>	<b>Open savanna</b>
White-throated Swallow	<i>Hirundo albigularis</i>	-	-	Common	Summer migrant	Wetlands and open savanna
Pearl-breasted Swallow	<i>Hirundo dimidiata</i>	-	-	Common	Summer migrant	Open savanna
<b>Greater Striped Swallow</b>	<i>Hirundo cucullata</i>	-	-	<b>Common</b>	<b>Summer migrant</b>	<b>Open savanna</b>
Lesser Striped Swallow	<i>Hirundo abyssinica</i>	-	-	Common	Summer migrant	Open savanna
<b>Rock Martin</b>	<i>Hirundo fuligula</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Cliff-lines</b>
Common House-martin	<i>Delichon urbicum</i>	-	-	Uncommon		Open savanna



Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
<b>Brown-throated Martin</b>	<i>Riparia paludicola</i>	-	-	<b>Common</b>		<b>Wetlands and open savanna</b>
Black Saw-wing	<i>Psalidoprocne holomelaena</i>	-	-	Common	Resident	Thicket and forest
<b>Black Cuckoo-shrike</b>	<i>Campephaga flava</i>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Thicket and forest</b>
Grey Cuckoo-shrike	<i>Coracina caesia</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Fork-tailed Drongo</b>	<i>Dicrurus adsimilis</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Black-headed Oriole</b>	<i>Oriolus larvatus</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Pied Crow</b>	<i>Corvus albus</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Cape Crow</b>	<i>Corvus capensis</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
<b>White-necked Raven</b>	<i>Corvus albicollis</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Cliff-lines, thicket and open savanna</b>
<b>Southern Black Tit</b>	<i>Parus niger</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and thicket</b>
Cape Penduline-tit	<i>Anthoscopus minutus</i>	-	Endemic	Uncommon	Resident	Open savanna and karoo
Bush Blackcap	<i>Lioptilus nigricapillus</i>	Vulnerable / Vulnerable	Endemic	Uncommon	Resident	Thicket and forest
African Red-eyed Bulbul	<i>Pycnonotus nigricans</i>	-	Endemic	Uncommon	Resident	Open savanna and karoo
<b>Dark-capped Bulbul</b>	<i>Pycnonotus tricolor</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and thicket</b>
Terrestrial Brownbul	<i>Phyllastrephus terrestris</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Sombre Greenbul</b>	<i>Andropadus importunus</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Cape Rock-thrush</b>	<i>Monticola rupestris</i>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna and cliff-lines</b>
Sentinel Rock-thrush	<i>Monticola explorator</i>	-	-	Uncommon	Resident	Open savanna and cliff-lines
Buff-streaked Chat	<i>Oenanthe bifasciata</i>	-	Endemic	Uncommon	Resident	Open savanna and cliff-lines
<b>Familiar Chat</b>	<i>Cercomela familiaris</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and karoo</b>
<b>Mocking Cliff-chat</b>	<i>Thamnolaea cinnamomeiventris</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and cliff-lines</b>



Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
<b>Anteater Chat</b>	<i>Myrmecocichla formicivora</i>	-	Near endemic	Common	Resident	Open savanna and karoo
<b>African Stonechat</b>	<i>Saxicola torquatus</i>	-	-	Common	Resident	Open savanna
Chorister Robin-chat	<i>Cossypha dichroa</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Cape Robin-chat</b>	<i>Cossypha caffra</i>	-	-	Common	Resident	Open savanna and thicket
<b>Karoo Scrub-robin</b>	<i>Cercotrichas coryphoeus</i>	-	Endemic	Common	Resident	Open savanna and karoo
Brown Scrub-robin	<i>Cercotrichas signata</i>	-	-	Uncommon	Resident	Thicket and forest
<b>White-browed Scrub-robin</b>	<i>Cercotrichas leucophrys</i>	-	-	Common	Resident	Open savanna
White-starred Robin	<i>Pogonocichla stellata</i>	-	-	Uncommon	Resident	Thicket and forest
Willow Warbler	<i>Phylloscopus trochilus</i>	-	-	Uncommon	Summer migrant	Open savanna and thicket
Lesser Swamp-warbler	<i>Acrocephalus gracilirostris</i>	-	-	Common	Resident	Wetland
African Reed-warbler	<i>Acrocephalus baeticatus</i>	-	-	Uncommon	Summer migrant	Wetland
Marsh Warbler	<i>Acrocephalus palustris</i>	-	-	Uncommon	Migrant	Wetland
Little Rush-warbler	<i>Bradypterus baboecala</i>	-	-	Common	Resident	Wetland
Barratt's Warbler	<i>Bradypterus barratti</i>	-	Endemic	Uncommon	Resident	Fynbos and thicket
Cape Grassbird	<i>Sphenoeacus afer</i>	-	Endemic	Common	Resident	Open savanna
<b>Long-billed Crombec</b>	<i>Sylvietta rufescens</i>	-	-	Common	Resident	Open savanna and karoo
<b>Bar-throated Apalis</b>	<i>Apalis thoracica</i>	-	-	Common	Resident	Open savanna and thicket
Yellow-breasted Apalis	<i>Apalis flavida</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Green-backed Camaroptera</b>	<i>Camaroptera brachyura</i>	-	-	Common	Resident	Thicket and forest
Grey-backed Camaroptera	<i>Camaroptera brevicaudata</i>	-	-	Uncommon	Resident	Thicket and forest
Zitting Cisticola	<i>Cisticola juncidis</i>	-	-	Common	Resident	Open savanna and karoo
Cloud Cisticola	<i>Cisticola textrix</i>	-	Endemic	Common	Resident	Open savanna
Wing-snapping Cisticola	<i>Cisticola ayresii</i>	-	Endemic	Common	Resident	Open savanna and fynbos

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
<b>Neddicky</b>	<i>Cisticola fulvicapilla</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and fynbos</b>
<b>Grey-backed Cisticola</b>	<i>Cisticola subruficapilla</i>	-	<b>Endemic</b>	<b>Common</b>	<b>Resident</b>	<b>Open savanna and fynbos</b>
Wailing Cisticola	<i>Cisticola lais</i>	-	-	Uncommon	Resident	Open savanna and karoo
Levaillant's Cisticola	<i>Cisticola tinniens</i>	-	-	Common	Resident	Wetland
Lazy Cisticola	<i>Cisticola aberrans</i>	-	-	Uncommon	Resident	Open savanna
Tawny-flanked Prinia	<i>Prinia subflava</i>	-	-	Common	Resident	Open savanna
Spotted Flycatcher	<i>Muscicapa striata</i>	-	-	Uncommon	Summer migrant	Thicket and forest
African Dusky Flycatcher	<i>Muscicapa adusta</i>	-	-	Common	Summer migrant	Thicket and forest
<b>Chestnut-vented Tit-babbler</b>	<i>Parisoma subcaeruleum</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna and karoo</b>
Southern Black Flycatcher	<i>Melaenornis pammelaina</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Fiscal Flycatcher</b>	<i>Sigelus silens</i>	-	<b>Endemic</b>	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
Yellow-throated Woodland-warbler	<i>Phylloscopus ruficapilla</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Cape Batis</b>	<i>Batis capensis</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Chinstrap Batis</b>	<i>Batis molitor</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
Blue-mantled Crested-flycatcher	<i>Trochocercus cyanomelas</i>	-	-	Uncommon	Resident	Thicket and forest
African Paradise-flycatcher	<i>Terpsiphone viridis</i>	-	-	Common		Thicket and forest
African Pied Wagtail	<i>Motacilla aguimp</i>	-	-	Uncommon	Resident	Wetland
<b>Cape Wagtail</b>	<i>Motacilla capensis</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetland and open savanna</b>
Mountain Wagtail	<i>Motacilla clara</i>	-	-	Uncommon	Resident	Wetland and forest
<b>African Pipit</b>	<i>Anthus cinnamomeus</i>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Long-billed Pipit</b>	<i>Anthus similis</i>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna</b>
Plain-backed Pipit	<i>Anthus leucophrys</i>	-	-	Uncommon	Resident	Open savanna
Buffy Pipit	<i>Anthus vaalensis</i>	-	-	Uncommon	Resident	Open savanna
Yellow-breasted Pipit	<i>Anthus chloris</i>	Vulnerable / Vulnerable	Endemic	Rare	Resident	Open savanna

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Cape Longclaw	<i>Macronyx capensis</i>	-	-	Common	Resident	Open savanna and fynbos
<b>Common (Southern) Fiscal</b>	<i>Lanius collaris</i>	-	-	Common	Resident	Open savanna
Red-backed Shrike	<i>Lanius collurio</i>	-	-	Uncommon	Resident	Open savanna
<b>Southern Boubou</b>	<i>Laniarius ferrugineus</i>	-	-	Common	Resident	Thicket and forest
Black-backed Puffback	<i>Dryoscopus cubla</i>	-	-	Common	Resident	Thicket and forest
<b>Southern Tchagra</b>	<i>Tchagra tchagra</i>	-	Endemic	Uncommon	Resident	Fynbos
Black-crowned Tchagra	<i>Tchagra senegalus</i>	-	-	Uncommon	Resident	Open savanna and thicket
Olive Bush-shrike	<i>Telophorus olivaceus</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Orange-breasted Bush-shrike</b>	<i>Telophorus sulfureopectus</i>	-	-	Uncommon	Resident	Open savanna and thicket
Bokmakierie	<i>Telophorus zeylonus</i>	-	Endemic	Common	Resident	Open savanna and karoo
<b>Grey-headed Bush-shrike</b>	<i>Malaconotus blanchoti</i>	-	-	Common	Resident	Open savanna and thicket
<b>Common Starling</b>	<i>Sturnus vulgaris</i>	-	-	Common	Resident	Urban
Wattled Starling	<i>Creatophora cinerea</i>	-	-	Uncommon	Visitor	Open savanna and karoo
Violet-backed Starling	<i>Cinnyricinclus leucogaster</i>	-	-	Uncommon	Resident	Open savanna
<b>Cape Glossy Starling</b>	<i>Lamprotornis nitens</i>	-	-	Common	Resident	Open savanna
Black-bellied Starling	<i>Lamprotornis corruscus</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Red-winged Starling</b>	<i>Onychognathus morio</i>	-	-	Common	Resident	Cliff-lines and open savanna
<b>Pied Starling</b>	<i>Spreo bicolor</i>	-	Endemic	Common	Resident	Savanna, fynbos, open savanna and karoo
<b>Red-billed Oxpecker</b>	<i>Buphagus erythrorhynchus</i>	-	-	Uncommon	Resident	Open savanna
Cape Sugarbird	<i>Promerops cafer</i>	-	Endemic	Uncommon	Resident	Fynbos
Gurney's Sugarbird	<i>Promerops gurneyi</i>	-	Endemic	Uncommon	Resident	Fynbos and open savanna

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Malachite Sunbird	<i>Nectarinia famosa</i>	-	-	Common	Resident	Fynbos, open savanna and karoo
Greater Double-collared Sunbird	<i>Cinnyris afer</i>	-	-	Uncommon	Resident	Open savanna and thicket
Southern Double-collared Sunbird	<i>Cinnyris chalybeus</i>	-	Endemic	Common	Resident	Thicket, fynbos, open savanna and karoo
Grey Sunbird	<i>Cyanomitra veroxii</i>	-	-	Uncommon	Resident	Thicket and forest
Collared Sunbird	<i>Hedyalipna collaris</i>	-	-	Uncommon	Resident	Thicket and forest
Amethyst Sunbird	<i>Chalcomitra amethystina</i>	-	-	Common	Resident	Thicket and forest
House Sparrow	<i>Passer domesticus</i>	-	-	Common	Resident	Urban
Cape Sparrow	<i>Passer melanurus</i>	-	Near endemic	Common	Resident	Open savanna and karoo
Yellow-throated Petronia	<i>Petronia supercilialis</i>	-	-	Uncommon	Resident	Open savanna and thicket
Dark-backed Weaver	<i>Ploceus bicolor</i>	-	-	Uncommon	Resident	Thicket and forest
Spectacled Weaver	<i>Ploceus ocellularis</i>	-	-	Uncommon	Resident	Thicket and forest
Village Weaver	<i>Ploceus cucullatus</i>	-	-	Uncommon	Resident	Open savanna
Cape Weaver	<i>Ploceus capensis</i>	-	Endemic	Common	Resident	Open savanna
Yellow Weaver	<i>Ploceus subaureus</i>	-	-	Uncommon	Resident	Wetland
Southern Masked-weaver	<i>Ploceus velatus</i>	-	Endemic	Common	Resident	Open savanna
Thick-billed Weaver	<i>Amblyospiza albifrons</i>	-	-	Uncommon	Resident	Wetland
Red-billed Quelea	<i>Quelea quelea</i>	-	-	Common	Visitor	Open savanna
Southern Red Bishop	<i>Euplectes orix</i>	-	Endemic	Common	Resident	Wetland and open savanna
Yellow Bishop	<i>Euplectes capensis</i>	-	-	Uncommon	Resident	Fynbos and Open savanna
Red-collared Widowbird	<i>Euplectes ardens</i>	-	-	Common	Resident	Open savanna
Fan-tailed Widowbird	<i>Euplectes axillaris</i>	-	-	Uncommon	Resident	Wetland and open savanna
Long-tailed Widowbird	<i>Euplectes progne</i>	-	-	Uncommon	Resident	Wetland and open savanna

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Bronze Mannikin	<i>Spermestes cucullatus</i>	-	-	Common	Resident	Thicket and forest
Swee Waxbill	<i>Coccygia melanotis</i>	-	-	Common	Resident	Open savanna, thicket and forest
<b>African Firefinch</b>	<b><i>Lagonosticta rubricata</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Thicket and forest</b>
<b>Common Waxbill</b>	<b><i>Estrilda astrild</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Wetland and open savanna</b>
<b>African Quailfinch</b>	<b><i>Ortygospiza atricollis</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Pin-tailed Whydah</b>	<b><i>Vidua macroura</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Dusky Indigobird</b>	<b><i>Vidua funerea</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Thicket and forest</b>
Cape Canary	<i>Serinus canicollis</i>	-	-	Common	Resident	Open savanna and fynbos
Forest Canary	<i>Crithagra scotops</i>	-	-	Uncommon	Resident	Thicket and forest
<b>Yellow-fronted Canary</b>	<b><i>Crithagra mozambicus</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Brimstone Canary</b>	<b><i>Crithagra sulphuratus</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna, fynbos and thicket</b>
White-throated Canary	<i>Crithagra albogularis</i>	-	Near endemic	Common	Resident	Open savanna and karoo
Yellow Canary	<i>Crithagra flaviventris</i>	-	Near endemic	Common	Resident	Open savanna and karoo
<b>Streaky-headed Seedeater</b>	<b><i>Crithagra gularis</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Lark-like Bunting</b>	<b><i>Emberiza impetuani</i></b>	-	-	<b>Common</b>	<b>Visitor</b>	<b>Open savanna and karoo</b>
<b>Cinnamon-breasted Bunting</b>	<b><i>Emberiza tahapisi</i></b>	-	-	<b>Uncommon</b>	<b>Resident</b>	<b>Open savanna</b>
<b>Cape Bunting</b>	<b><i>Emberiza capensis</i></b>	-	-	<b>Common</b>	<b>Resident</b>	<b>Open savanna</b>
Golden-breasted Bunting	<i>Emberiza flaviventris</i>	-	-	Uncommon	Resident	Open savanna
Rock Dove	<i>Columba livia</i>	-	-	Common	Resident	Urban and cliff-lines
Karoo Thrush	<i>Turdus smithi</i>	-	Endemic	Common	Resident	Open savanna, and karoo and thicket
Olive Thrush	<i>Turdus olivaceus</i>	-	-	Common	Resident	Thicket and forest
<b>Cape White-eye</b>	<b><i>Zosterops virens</i></b>	-	<b>Near endemic</b>	<b>Common</b>	<b>Resident</b>	<b>Open savanna and thicket</b>

Common name	Scientific name	Threat status - Regional / Global	Endemism	Relative abundance	Residency	Habitat
Eastern Clapper Lark	<i>Mirafra fasciolata</i>	-	Endemic	Uncommon	Resident	Open savanna and karoo
Burchell's Coucal	<i>Centropus burchellii</i>	-	-	Uncommon	Resident	Wetland and thicket
Knysna Turaco	<i>Tauraco corythaix</i>	-	Endemic	Uncommon	Resident	Thicket and forest
Southern Black Korhaan	<i>Afrotis afra</i>	Vulnerable / Vulnerable	Endemic	Uncommon	Resident	Fynbos, open savanna and karoo
Karoo Prinia	<i>Prinia maculosa</i>	-	Endemic	Common	Resident	Open savanna
Cape Clapper Lark	<i>Mirafra apiata</i>	-	Endemic	Uncommon	Resident	Open savanna and karoo
Southern Grey-headed Sparrow	<i>Passer difffusus</i>	-	-	Common	Resident	Open savanna