# GRAHAMSTOWN WIND ENERGY FACILITY
## EASTERN CAPE


## PLAN8 INFINITE ENERGY

AVIFAUNAL IMPACT ASSESSMENT

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**EXECUTIVE SUMMARY**

This study assesses the potential interactions between birds and the proposed Grahamstown Wind Energy Facility, located 30km from the village of Grahamstown.

The following are key characteristics of the receiving environment:

- » The site is on the plateau of a minor ridge line, with the ground falling away to the north and south. The areas where turbines are currently planned are predominantly relatively flat and with open vegetation. Numerous small drainage lines drain from the plateau down into the valleys. Most of the site is classified as "Bhisho Thornveld"
- » Up to approximately 229 bird species could occur on site (Harrison *et al*, 1997), with 13 of these species being Red Listed by Barnes (2000). Of these species, the following have been selected as the 'target species' for this study, i.e. those species for which there is special concern related to the proposed WEF: African Crowned Eagle *Stephanoaetus coronatus;* African Fish-Eagle *Haliaeetus vocifer;* African Marsh-Harrier *Circus ranivorus;* Black Harrier *Circus maurus;* Black Sparrowhawk *Accipiter melanoleucus;* Black Stork *Ciconia nigra;* Black-shouldered Kite *Elanus caeruleus;* Black-winged Lapwing *Vanellus melanopterus;* Booted Eagle *Aquila pennatus;* Denham's Bustard *Neotis denhami;* Jackal Buzzard *Buteo rufofuscus;* Lanner Falcon *Falco biarmicus;* Marsh Owl *Asio capensis;* Martial Eagle *Polemaetus bellicosus;* Rufous-chested Sparrowhawk *Accipiter rufiventris;* Secretarybird *Sagittarius serpentarius;* Spotted Eagle Owl *Bubo africanus;* Steppe Buzzard *Buteo vulpinus;* Verreaux's Eagle *Aquila verreauxii;* Verreaux's Eagle-Owl *Bubo lacteus;* White Stork *Ciconia ciconia;* White-bellied Korhaan *Eupodotis senegalensis;* Yellow-billed Kite *Milvus migrans;* and African Harrier-Hawk *Polyboroides typus.* There is some doubt as to whether these species all occur on or near the proposed site. Their occurrence will need to be confirmed during the pre-construction monitoring programme.

The expected interactions between birds and the proposed WEF are: disturbance of birds and habitat destruction during construction and maintenance of the facility and associated infrastructure; displacement of birds from the area, or from flying over the area; collision of birds with turbine blades during operation; and collision and electrocution of birds on associated electrical infrastructure. With respect to the assessment of these potential impacts for the Grahamstown project, the following are key findings:

- » The two impacts that are determined to be of medium or higher significance are collision of birds with turbine blades, and collision and electrocution on power lines. Since we have no data on bird abundance and movement on site, our confidence in the assessment of these impacts is relatively low. This could be rectified by obtaining primary data on site. It is therefore essential that a preconstruction bird monitoring program be initiated as soon as possible in order to begin the process of collecting relevant and accurate data on the numbers of birds that could be affected by the project.
- » The remaining impacts such as disturbance and habitat destruction have been judged to be of low significance due to the relatively small amount of habitat destruction that will take place (especially when related to the target species, which mostly have large territories).

- Micro-siting of turbines and other infrastructure within the proposed site remains the foremost means of mitigating impacts on birds. This study has mapped the avifaunal sensitivity of the study area, and classed it into medium and low sensitivity areas. The medium sensitivity areas are mostly the drainage lines, and steep ground immediately adjacent to them. Construction of infrastructure should take place only within the low sensitivity areas. The delineation of these sensitivity zones in this report should be interpreted as indicative. The exact edge of these zones cannot always be drawn as a line on a map, and is better determined on site in the EMP phase if there are any areas of conflict.
- Since the exact position of turbines and other infrastructure has not yet been finalized, a site specific avifaunal Environmental Management Plan is seen as essential.

**DECLARATION OF CONSULTANTS' INDEPENDENCE & QUALIFICATIONS**

Jon Smallie (Avifaunal Specialist – WildSkies Ecological Services) is an independent consultant to Coastal & Environmental Services. Mr Smallie has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work.

Mr. Smallie is registered with The South African Council for Natural Scientific Professionals (400020/06). He has twelve years of experience in the field of bird interactions with electrical and energy infrastructure and has, relevant to this study, conducted avifaunal impact assessments for at least 15 wind energy projects. He is the founder of the Birds and Wind Energy Specialist Group in South Africa. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information.

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# 1. INTRODUCTION

Plan8 Infinite Energy (Plan8) plan to construct a wind energy facility (hereafter referred to as Grahamstown Wind Energy Facility) in the Eastern Cape 30km from the village of Grahamstown. Coastal & Environmental Services (CES) was appointed to conduct the Environmental Impact Assessment study, and subsequently appointed Jon Smallie (WildSkies Ecological Services) to conduct the specialist avifaunal assessment.

This study investigates the potential impacts of the proposed facility on the birds of the area. Typically a wind energy facility of this nature can be expected to impact on avifauna as follows: disturbance of birds; habitat destruction during construction and maintenance of the facility and associated infrastructure; displacement of birds from the area, or from flying over the area; collision of birds with turbine blades during operation; collision and electrocution of birds on associated electrical infrastructure. The likelihood and significance of each of these impacts will be investigated further in this study.

Although a full discussion of the potential pros and cons of different forms of energy production are beyond the scope of this study, it is important to view the current proposed development as exactly what it is, a move away from South Africa's inappropriate dependence on fossil fuel based energy production to date. In the long term, a shift towards reducing greenhouse gas emission will benefit all biodiversity, including birds. Whilst the long term effects of our energy choices should be kept in mind whilst compiling this assessment, it is also critical in the shorter term to minimize direct, impacts on our birds, or for some species with small populations the longer term benefits of renewable energy will come too late.

# 2. STUDY METHODOLOGY

## 2.1. Approach

This study followed the following steps:

- An extensive review of available international literature pertaining to bird interactions with wind energy facilities was undertaken in order to fully understand the issues involved and the current level of knowledge in this field. This international knowledge was then adapted to local conditions and species as far as possible in order to identify important or target species for this study.
- The various data sets listed below, and the study area were examined to determine the likelihood of these relevant species on or near the site.
- The potential impacts of the proposed facility on these species were described and evaluated.
- Sensitive areas within the proposed site, where the above impacts are likely to occur, were identified using various GIS (Geographic Information System) layers and Google Earth.
- Recommendations were made for the management and mitigation of impacts.
- An outline for a pre-construction monitoring programme has been designed.

## 2.2 Data sources used

The following data sources and reports were used in varying levels of detail for this study:

- The Southern African Bird Atlas Project data (SABAP1 - Harrison *et al*, 1997) for the quarter degree square (3326BD) covering the site. The Southern African Bird Atlas Project 2 data was also consulted at http://sabap2.adu.org.za/v1/index.php. Unfortunately coverage of the study area is not yet adequate, for this data to be useful.
- The Important Bird Areas report (IBA - Barnes 1998) was consulted to determine the location of the nearest IBA's and their importance for this study. No IBA's are near the site
- The conservation status of all relevant bird species was determined using Barnes (2000)
- The latest vegetation classification of South Africa (Mucina & Rutherford, 2005) was consulted in order to determine which vegetation types occur on site.

## 2.3 Limitations & assumptions

- Any inaccuracies in the above sources of information could limit this study. In particular, the SABAP1s data is now fairly old (Harrison *et al*, 1997), but no reliable more recent data on bird species presence and abundance in the study area exists, since SABAP2 coverage is not yet adequate.
- This study relies entirely upon secondary data sources with regards to bird abundances such as the SABAP1 (Harrison *et al*, 1997). However, primary information on bird habitat was collected during the site visit and is used directly in determining which species are likely to occur where on site.
- The position of associated infrastructure has not yet been finalized. This did not pose a significant limitation, since this study has identified areas up front where this infrastructure cannot be built.

# 3. BACKGROUND TO THE STUDY

## 3.1 Background to interactions between wind energy facilities and birds

The South African experience of wind energy generation has been extremely limited to date. By necessity, much of what we know about birds and wind energy is based on international literature, primarily from the United States, United Kingdom, European Union, Australia and Canada. Most of the principles that have been learnt internationally can, to a certain extent, be applied locally, with care to adapt existing international knowledge to local bird species and conditions. An additional challenge is that much of the international literature is so called grey literature, i.e. published in proceedings, consultant reports and unpublished reports – not peer reviewed journals. Most literature focuses on the impact of collision of birds with turbines, giving less attention to the impacts of habitat destruction and disturbance or displacement of birds.

A relatively recent summary of the available literature entitled “Wind Turbines and Birds, a background review for environmental assessment” by Kingsley & Whittam (2005) and the Avian Literature Database of the National Renewable Energy Laboratory (www.nrel.gov) have been used extensively in the discussion below.

Concern for the avian impacts of wind energy facilities first arose in the 1980’s when raptor mortalities were detected in California (Altamont Pass - US) and at Tarifa (Spain). The Altamont Pass and Tarifa sites were the site of some extremely high levels of bird mortalities. These mortalities focused attention on the impact of wind energy on birds, and subsequently a large amount of monitoring at various sites has been undertaken. Naturally, as more monitoring was conducted at different sites, a need arose for a standard means of expressing the levels of bird mortalities – in this case, number of mortalities per turbine per year. The resulting collision rates have varied significantly across different countries and sites, from as little as zero to as many as 10 birds per turbine per year. It is also important to note that searcher efficiency (and independence) and scavenger removal rates need to be accounted for. Searcher efficiency refers to the percentage of bird mortalities that are detected by searchers, searcher independence refers to whether the person monitoring has certain objectives of their own which may influence the results of monitoring.

In South Africa to date, only eight wind turbines have been constructed, 3 at a demonstration facility at Klipheuwel in the Western Cape, in 2002 and 2003, 4 at a site near Darling (although access to these for the purpose of monitoring bird impacts has been restricted), and 1 at Coega near Port Elizabeth. A monitoring program, conducted by Jacques Kuyler (2004), was put in place once the 3 Klipheuwel turbines were operational, and found two bird collisions with blades, a Horus Swift *Apus Horus* and a Thick-billed Lark *Rhamphocoris clotbey*, equating to an estimated 1 bird mortality per turbine per year.

### *3.1.1. Factors influencing bird collisions with turbines*

A number of factors influence the number of birds killed at wind farms. These can be classified into three broad groupings: bird related information; site related information and facility related information.

*Bird related information*

Although only one study has so far shown a direct relationship between numbers of birds present in an area and number of collisions (Everaert, 2003, Belgium) it stands to reason that the more birds flying through the area of the turbines, the more chance of collisions occurring. The particular bird species present in the area is also very important as some species are more vulnerable to collision with turbines than others. Bird behaviour and activity differs between species – with certain hunting behaviours rendering certain species more vulnerable. For example a falcon stooping after prey is (possibly) too focused on its prey to notice the presence of infrastructure. There may also be seasonal and temporal differences in behaviour, for example breeding males displaying may be particularly at risk. These factors can all influence the birds’ vulnerability. Birds are believed to be capable of learning to avoid obstacles with sufficient time living in an area.

Whilst all birds face some inherent risk of impact by wind turbines, there are definitely certain groups that are more at risk due to their flight behavior or habitat preferences (Jordan & Smallie, 2010). These authors summarized knowledge from the European Union, United Kingdom, United States, Canada and Australia to identify the following taxonomic groups as being affected most by wind energy facilities: Podicipediformes, Pelicaniformes, Ciconiiformes, Anseriformes, Falconiformes, Charadriformes, Strigiformes, Caprimulgiformes, Gruiformes, Galliformes, Psittaciformes, Passeriformes. In determining which species are likely to be at risk at wind energy facilities in South Africa, the above groups form a useful starting point.

*Site information*

Landscape features can potentially channel or funnel birds towards a certain area, and in the case of raptors, influence their flight and foraging behaviour. Elevation, ridges and slopes are all important factors in determining the extent to which an area is used by birds in flight. High levels of prey will attract raptors, increasing the time spent hunting, and as a result reducing the time spent being observant. Certain sites are also vulnerable to poor weather such as mist, which may influence the bird collision risk. This may be the case at the proposed which appears susceptible to mist.

*Facility information*

According to Kingsley & Whittam (2005), "More turbines will result in more collisions". Although only two mortalities have been recorded at Klipheuwel, the difference between the 3 turbines at Klipheuwel and a potential 30 turbines (approximately) at the proposed Grahamstown Wind Energy Facility is significant and largely renders comparisons and extrapolations meaningless. Larger facilities also have greater potential for disturbance and habitat destruction, and displacement of birds from the area. With newer technology and larger turbines, fewer turbines are needed for the same quantity of power generation, possibly resulting in fewer mortalities per MW of power produced (Erickson *et al*, 1999).

Lighting of turbines and other infrastructure has the potential to attract birds, thereby increasing the risk of collisions with turbines. Erickson *et al* (2001) suggest that lighting is the single most critical attractant leading to collisions with tall structures. Changing constant lighting to intermittent lighting has been shown to reduce attraction (Richardson 2000) and mortality (APLIC, 1994; Jaroslow, 1979; Weir, 1976) and changing white flood light to red flood light resulted in an 80% reduction in mortality (Weir, 1976).

Infrastructure associated with the facility often also impacts on birds. Overhead power lines pose a collision and possibly an electrocution threat to certain bird species. Furthermore, the construction and maintenance of the power lines will result in some disturbance and habitat destruction. New access roads, substations and offices constructed will also have a disturbance and habitat destruction impact.

Collision with power lines is one of the biggest single threats facing birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited maneuverability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001). Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The Red Data species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. The collision risk of the proposed power lines has been assessed elsewhere in this study.

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). The larger bird species are most affected since they are most capable of bridging critical clearances on hardware. The electrocution risk of the proposed 132kV and smaller lines has been assessed below in more detail.

Spacing between turbines at a wind facility can have an effect on the number of collisions. Some authors have suggested that paths need to be left between turbines so that birds can move along these paths, whilst others have argued that these gaps result in more collisions.

#### *3.1.2. Potential explanations for collisions of birds with turbines:*

The three main hypotheses proposed for birds not seeing turbine blades are as follows (Hodos, 2002):

- An inability to divide attention between prey and obstacles. This seems an unlikely explanation as birds have been found to maintain good acuity in the peripheral vision, have different foveal region in the eye for frontal and ground vision and they have various other optical methods for keeping objects at different distances simultaneously in focus.
- The phenomenon of motion smear or retinal blur.
- The angle of approach. If a bird approaches from side on to the turbine, the blades present a very small profile and are even more difficult to detect.

Mitigation measures should therefore focus on solving the problem of motion smear both from front and side angles.

#### *3.1.3. Mitigation measures*

Whilst bird mortalities have been comprehensively documented at numerous sites world-wide, very little has been written about the potential methods of reducing the level of mortalities, perhaps because little mitigation has been implemented post construction. Potential mitigation measures include: alternative turbine designs (such as vertical axis turbines); painting turbine blades (tested only in laboratory conditions to date); anti perching devices; construction of shielding pylons; curtailment of turbines during high risk periods; shutdown of certain high risk turbines; and altering blade height to pose less risk within the birds' preferred height strata. Most of these suggested mitigation measures are either untested, impractical or unlikely to be implemented by the operator post construction. The primary means of mitigating bird impacts therefore remains siting, both of the entire facility, and of the individual turbines themselves.

### 3.2. Description of the proposed wind energy facility

The proposed activity is the establishment of a wind energy facility (WEF) and associated infrastructure. A broader area of approximately 2550 hectares is being considered within which the facility is to be constructed. The proposed facility would include:

- Up to approximately 30 wind turbines with foundations to support the turbine towers;
- Cabling between turbines, to be lain underground where practical;
- A substation to facilitate the connection to the grid
- Overhead power lines feeding into the existing Eskom grid
- Internal access roads to each wind turbine.
- Workshop area for maintenance and storage if required.

At this time there is no alternative site for consideration for the overall wind energy facility. This has been motivated to DEA by Plan8. Alternatives exist within the site for the substation and power line positioning. Figure 1 below shows the location of the proposed site for the Grahamstown Wind Energy Facility.

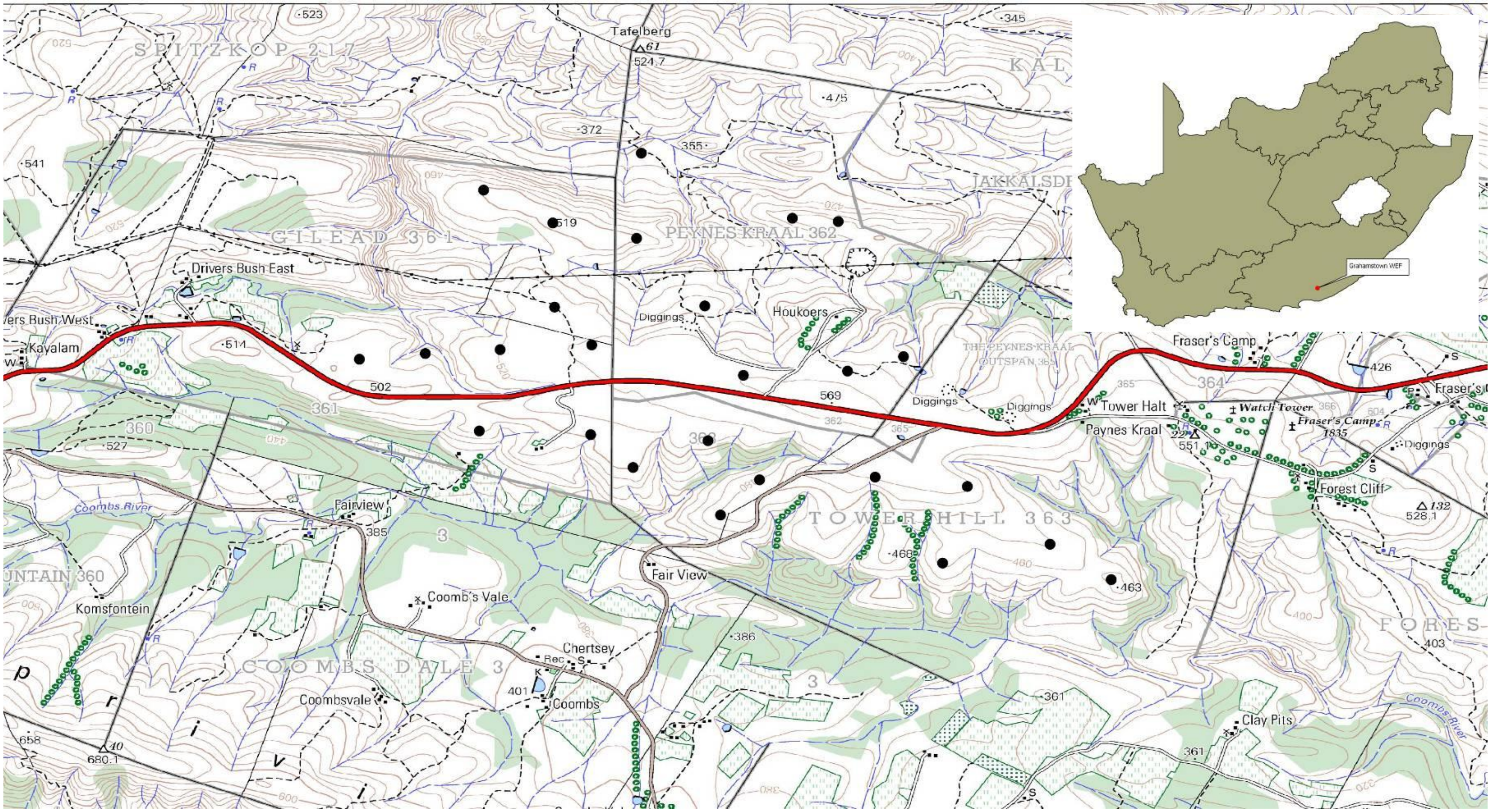


Figure 1. Layout of the study area showing the proposed site for the Grahamstown Wind Energy Facility. Black dots indicate current planned turbine posiitons

## 4. DESCRIPTION OF RECEIVING ENVIRONMENT

### 4.1 Study area vegetation

The following description of the vegetation on the site focuses on the vegetation structure and not species composition. It is widely accepted within ornithological circles that vegetation structure and not species composition is most important in determining which bird species will occur there. The classification of vegetation types below is from Mucina & Rutherford (2005).

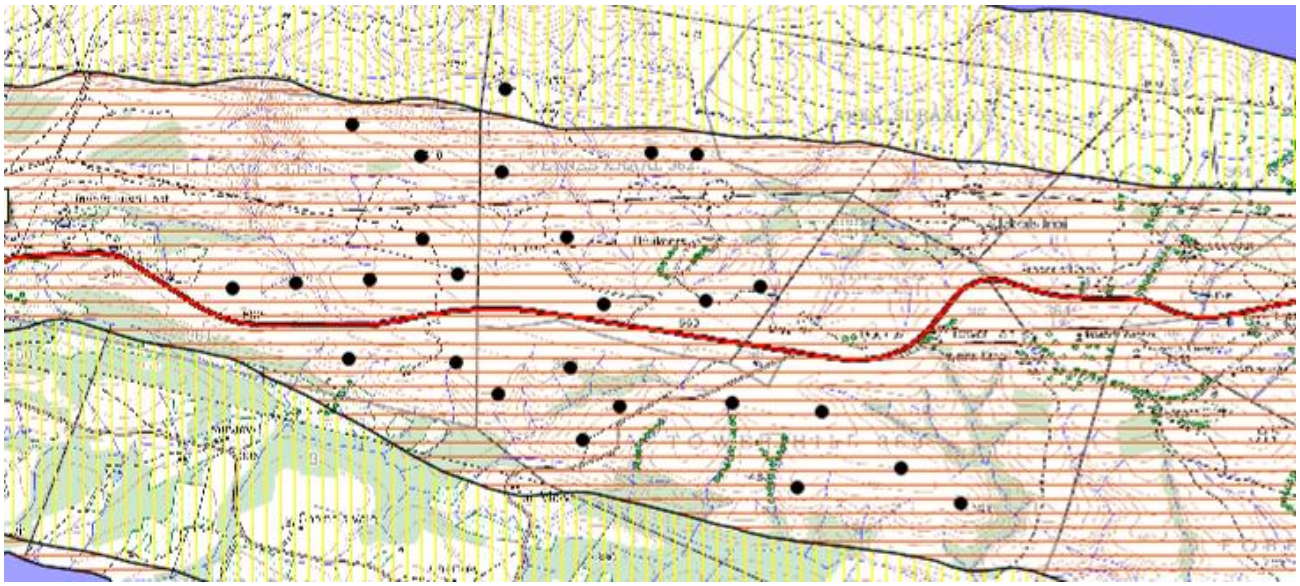

Figure 2. Vegetation classification (Mucina & Rutherford, 2005) for the Grahamstown Wind Energy Facility study area. Red areas are “Bhisho Thornveld” and yellow areas are “Kowie Thicket”. Black dots indicate current planned turbine positions

The majority of the affected area within which turbines are currently positioned is classified as “Bhisho Thornveld”. To the north and south of that there are bands of “Kowie Thicket”, although currently only one of the turbines fall within those areas. Field work revealed that there are also some relatively open areas of ‘grassland’ present. The relevance of this vegetation classification to the avifauna of the area is that a variety of habitat is provided, which can accommodate both the species mostly dependant on shorter grassland, and those dependant on the taller thicket and woodland. This is reflected in the species composition for the study area, shown in Table 1 below. Woodland species such as Martial Eagle *Polamaetus bellicosus* and African Crowned Eagle *Stephanoaetus coronatus*, and grassland species such as Black Harrier *Circus maurus* and White-bellied Korhaan *Eupodotis senegalensis* have been recorded in the broader area.

### 4.2 Bird micro habitats

The above vegetation description partially describes the habitat available and hence the species likely to occur in the study area. However, more detail is required in order to understand exactly where within the study area certain species will occur and how suitable these areas are for the relevant species. The habitats available to birds at a small spatial scale are known as micro habitats. These micro habitats are formed by a combination of factors such as vegetation, land use, anthropogenic factors, topography and others. The species most likely to use each micro habitat within this study area are shown in Table 1. The following micro habitats were identified during the site visit:

**Grassland:** The dominant plants in this biome are grass species, with geophytes and herbs also well represented (Low & Rebelo 1996). Grasslands are maintained mainly by a combination of relatively high summer rainfall, frequent fires, frost and grazing. These factors generally preclude the growth of trees and shrubs in any abundance. This biome has been largely transformed in SA already through various land uses such as afforestation and crop cultivation. However in the current study area, most grassland is still intact, with relatively little transformation.

**Rivers and drainage lines**: Several small drainage lines and streams bisect the study area. These systems are important as they have a different vegetation composition to the remainder of the study area and represent an important flight path for many bird species. These areas have been assigned medium sensitivity in the sensitivity analysis elsewhere in this report.

**Wetland:** Several very small patches of wetland are associated with the various drainage lines in the study area, but no wetlands of significant size exist. Wetlands are characterised by slow flowing water and tall emergent vegetation, and provide habitat for many water birds. The conservation status of many of the bird species that are dependant on wetlands reflects the critical status of wetlands nationally, with many having already been destroyed. Species likely to make use of wetlands in this area include the harriers.

**Dams:** Many thousands of earthen and other dams exist in the southern African landscape and have altered flow patterns of streams and rivers. Several small dams are present on and adjacent to the site. Whilst this has been a detrimental effect for certain bird species through flooding their natural habitat, a number of species have benefited from their construction. The construction of these dams has probably resulted in a range expansion for many water bird species that were formerly restricted to areas of higher rainfall. These include species such as the pelicans, darters and cormorants and many other waterfowl. These areas have been identified as medium sensitivity in the analysis elsewhere in this report.

**Thicket or woodland:** The woodland biome covers most of the northern and eastern parts of southern Africa and is defined as having a grassy under-storey and a woody upper-storey of trees and shrubs. Woodland can be divided into two types: the fine leaved arid, often Acacia dominated woodlands in the drier parts of the country, and the predominantly broadleaved woodlands in the wetter regions. The Woodland bird community is the most species rich community in southern Africa. Complex differences in bird species distribution and abundance are seen between the different woodland types. Most of this study area could probably be classified as woodland.

Figure 3. Relatively open area on the site

Figure 4. Example of valley thicket on the site, and a relatively substantial ridge

Figure 5. An arable land in the broader area (not on site)

Figure 6. A small farm dam in the broader area

Figure 7. Mining activities on the site

Figure 8. Alien trees (wattle) on the site

**Arable or cultivated land:** These areas represent significant feeding areas for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. In this study area there are some small arable lands situated close to the Request homestead. If lands are irrigated, they can also represent almost the only source of "green" and moisture in this landscape for much of the year. This attracts certain species as shown in Table 1. In particular the White Stork has a high affinity with arable lands, with 86% of sightings in South Africa recorded on arable lands (Allan 1985, Allan 1989, Allan 1997 in Hockey, Dean & Ryan 2005). Although there are no arable lands on the actual site, there are some nearby (to the south) and these areas will influence general avifauna in the area.

**Ridges:** Ridges represent important habitat for a number of species due to their favourable air currents. Most relevant to this study are the aerial species such as raptors and swifts/swallows – which favour flying along ridges where there is 'ridge lift' (or orographic lift). Wind that is perpendicular to the ridge line is forced upwards when it meets the ridge, thereby creating lift, long continuous ridges resulting in greater lift. In addition, the air is heated differently by the sun on either side of a ridge, resulting in thermal lift. Birds use this lift to gain altitude, forage or move between locations – all with less effort than would be required elsewhere. Larger soaring species such as storks and vultures will also circle over ridges as they gain height and exploit the conditions. On the lee side of the ridge, several 'waves' may form. Whilst these waves can potentially also favour bird flight, it is probably more likely that the turbulence in this area would be detrimental to birds and probably avoided, particularly by smaller species. Various studies internationally have found higher wind turbine bird mortality rates close to steep ground (including Orloff & Flannery 1992; Howell & Noone, 1992; Thelander & Rugge, 2001). The increased wind speed in these ridge areas may also mean that birds have less control of their own flight and are less able to adjust to avoid obstacles such as wind turbines. It is important to avoid the edge of the ridge when turbines are planned, and this has been done in the sensitivity analysis in this report.

**Exotic trees**: Stands of exotic trees often provide roosting and nesting substrate for various bird species, and as such their importance for avifauna should not be underestimated. Several such stands of trees exist in the study area and could provide refuge for amongst other species: Black Sparrowhawk, and Rufous-chested Sparrowhawk.

**Mining activities:** Due to the human activity and disturbance levels, mining areas are not attractive micro habitats to most bird species. Several such areas do exist in the study area however, and are worth mentioning.

### 4.3 Bird presence in the study area

Table 1 lists the Red Data bird species recorded by the SABAP1 (Harrison *et al*, 1997) in the quarter degree square covering the study area, i.e. 3326BD. The total number of all species recorded and the number of cards (counts) submitted per square is also shown. An approximate total of 229 species could occur in the area, based on what has been recorded by Harrison *et al* (1997). The number of cards can be used as an indicator of our confidence in that particular report rate. If lots of cards have been submitted our confidence in the data is higher, and vice versa. This square has been relatively thoroughly counted (87 cards). Report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted. It is important to note that this data provides an indication of which species *could* occur on the proposed site. The species in Table 1 were recorded in the entire quarter degree square in each case, and may not actually have been recorded on the proposed site for this study.

In total 13 Red Listed bird species were recorded across the square, comprising 5 Vulnerable and 8 Near-threatened species. In addition, the White Stork *Ciconia ciconia* was included here as it is afforded protection internationally under the Bonn Convention on Migratory Species. The Hamerkop *Scopus umbretta* was also included as recent bird atlas data revealed that its range has declined substantially.

The likelihood of each species actually occurring on or close to the proposed site has also been specified in Table 1, based on ornithological experience and assessment of available habitat on site. Many of the species recorded in the quarter degree square have at least a possibility of occurring on site, but the site is anticipated to be of low importance for national populations of all of these species. The possible exception to this would be if any of the large raptors in particular were found breeding on site, in which case the site would assume greater importance. The relatively short site visit has not allowed for a thorough search of all potential nesting sites for all species. This will be achieved as part of the pre-construction monitoring programme.

Importantly, the species in Table 1 represent many of the broad groupings of bird species i.e. large terrestrial birds (Denham's Bustard and Secretarybird), raptors (Martial and African Crowned Eagles, Lanner Falcon, Black Harrier), small grassland/shrubland species (Black-winged Lapwing). Assessing the impacts on the species in Table 2 therefore potentially covers impacts on other species from these groupings that were not recorded but may occur on the site. This study concentrates on assessing the impacts on the Red Data species as these are the species of most conservation concern, and are often the species most sensitive to any artificial impacts. However, impacts on non Red Data species that are believed to be relevant to this study are also considered. In particular, non Red Data species groups such as raptors, owls, lapwings, waterfowl, and thick-knees. Swallows, swifts and martins will also be relevant to this study due to the amount of time they spend in the air, which increases the chances of collisions.

Table 1. Red Data species recorded in the quarter degree square (3226 BD) covering the study area during the Southern African Bird Atlas Project (Harrison *et al,* 1997)

| Roberts # | Common Name | *Scientific Name* | Cons status | 3326BD Report rate (87 cards) | Preferred micro habitat | Likelihood of occurring on site | Relative importance of site |
|---|---|---|---|---|---|---|---|
| 81 | Hamerkop | *Scopus umbretta* | ** | 0.1034 (10.3%) | Open water sources | Possible | Low |
| 83 | White Stork | *Ciconia ciconia* | BONN | 0.0230 (2.3%) | Arable land, wetland, grassland | Possible | Low |
| 84 | Black Stork | *Ciconia nigra* | NT | 0.0115 | Riverine, cliffs | Possible | Low |
| 118 | Secretarybird | *Sagittarius serpentarius* | NT | 0.0805 | Open woodland, grassland | Possible | Low |
| 141 | African Crowned Eagle | *Stephanoaetus coronatus* | NT | 0.0575 | Woodland, forest | possible | Low |
| 168 | Black Harrier | *Circus maurus* | NT | 0.0920 | Grassland, wetland | Possible | Medium |
| 172 | Lanner Falcon | *Falco biarmicus* | NT | 0.0230 | Grassland, arable land, open woodland | Possible | Low |
| 257 | Black-winged Lapwing | *Vanellus melanopterus* | NT | 0.0690 | Short grassland | Possible | Low |
| 430 | Half-collared Kingfisher | *Alcedo semitorquata* | NT | 0.0345 | Riverine woodland | Unlikely | Low |
| 484 | Knysna Woodpecker | *Campethera notata* | NT | 0.0230 | Woodland | Possible | Low |
| 140 | Martial Eagle | *Polemaetus bellicosus* | V | 0.0230 | Woodland | Possible | Low |
| 165 | African Marsh-Harrier | *Circus ranivorus* | V | 0.0575 | Grassland, wetland | Possible | Low |
| 229 | African Finfoot | *Podica senegalensis* | V | 0.0115 | Riverine | Unlikely | Low |
| 231 | Denham's Bustard | *Neotis denhami* | V | 0.0460 | Grassland, arable land | Unlikely | Low |
| 233 | White-bellied Korhaan | *Eupodotis senegalensis* | V | 0.0460 | grassland | Possible | Low |

V = Vulnerable; NT = Near-threatened; BONN = Protected Internationally under the Bonn Convention on Migratory Species; ** Species of recent conservation concern due to declining range recorded by Southern African Bird Atlas 2 project.

The more recent Southern African Bird Atlas 2 data was also consulted to shed light on more recently recorded bird abundance in the area. Unfortunately the coverage by counters in this area has not been good to date. There has been one card submitted for each of the two pentads covering the proposed site, i.e. 3315_2645 and 3315_2650. The species recorded on these two counts is shown in Appendix 3. None of the above Red Listed species were recorded.

**Target species for this study**

Determining the target species for this study, i.e. the most important species to be considered, is a three step process. The above data (SABAP1 and SABAP2) represents the first step, i.e. which species occur or could occur in the area at significant abundances, and the importance of the study area for those species. Secondly, the recent document "A briefing document on best practice for pre-construction assessment of the impacts of onshore wind farms on birds" (Jordan & Smallie, 2010) was consulted to determine which groups of species could possibly be impacted on by wind farms. This document summarises which taxonomic groups of species have been found to be vulnerable to collision with wind turbines in the USA, UK, EU, Australia and Canada. The taxonomic groups that have been found to be vulnerable in two or more of these regions are as follows: Pelicaniformes (pelicans, gannets, cormorants); Ciconiiformes (storks, herons, ibises, spoonbills); Anseriformes (swans, ducks, geese); Falconiformes (birds of prey); Charadriiformes (gulls, terns, waders); Strigiformes (owls); Caprimulgiformes (nightjars); Gruiformes (cranes, bustards, rails); Galliformes (pheasants, grouse, francolins); and Passeriformes (songbirds). The third step is to consider the species conservation status or other reasons for protecting the species. This involved primarily consulting the Red List bird species (Barnes 2000) as in Table 1.

In addition to the above sources of information, the recent document entitled "Avian Wind Farm Sensitivity Map for South Africa" (Retief, Diamond, Anderson, Smit, Jenkins & Brooks 2011) combines all three above steps in order to identify sensitive areas of the country. The methods used by this project are far more thorough and comprehensive than is possible during the scope of an EIA, and in particular includes assessment of non Red Listed bird species, which may be important to focus on for other reasons. The current study has therefore used the list of sensitive species developed by Retief *et al* (2011) as the basis for the **final target species list for the Grahamstown WEF, as follows: African Crowned Eagle *Stephanoaetus coronatus;* African Fish-Eagle *Haliaeetus vocifer;* African Marsh-Harrier *Circus ranivorus;* Black Harrier *Circus maurus;* Black Sparrowhawk *Accipiter melanoleucus;* Black Stork *Ciconia nigra;* Black-shouldered Kite *Elanus caeruleus;* Black-winged Lapwing *Vanellus melanopterus;* Booted Eagle *Aquila pennatus;* Denham's Bustard *Neotis denhami;* Jackal Buzzard *Buteo rufofuscus;* Lanner Falcon *Falco biarmicus;* Marsh Owl *Asio capensis;* Martial Eagle *Polemaetus bellicosus;* Rufous-chested Sparrowhawk *Accipiter rufiventris;* Secretarybird *Sagittarius serpentarius;* Spotted Eagle Owl *Bubo africanus;* Steppe Buzzard *Buteo vulpinus;* Verreaux's Eagle *Aquila verreauxii;* Verreaux's Eagle-Owl *Bubo lacteus;* White Stork *Ciconia ciconia;* White-bellied Korhaan *Eupodotis senegalensis;* Yellow-billed Kite *Milvus migrans;* and African Harrier-Hawk *Polyboroides typus.*** There is some doubt as to whether these species all occur on or near the proposed site, and also whether the site is of importance for the species, as expressed in Table 1 above. Species such as Black Stork, Denham's Bustard, Secretarybird, and White-bellied Korhaan are unlikely to occur on site with any frequency. Booted, Martial and Verreaux's Eagles could visit occasionally to forage on the site but are more likely to frequent the areas to the north where there is greater relief, and lower disturbance levels from the tar road traffic. However, in order to be cautious and inclusive the above species are all included as target species at this stage. Their occurrence will need to be confirmed during the pre-construction monitoring programme during which time this list will probably be refined.

## 5. ASSESSMENT OF IMPACTS OF PROPOSED FACILITY

The potential impacts of the proposed Grahamstown WEF and associated infrastructure have been assessed and rated in the tables below. APPENDIX 1 describes the criteria (supplied by CES) and applied for this assessment. In each case the NO-GO option was also considered as an alternative. The NO-GO option however results in no impacts whatsoever, and all of the criteria become non applicable. Since this information is so simple, this has not been repeated throughout the tables below.

### *5.1.1. Wind energy facility and associated infrastructure*

No alternative sites were considered, although there is opportunity to influence the micro siting of turbines within the proposed site. The impacts have therefore been assessed in the tables below for only the proposed alternative, i.e. the project as described earlier in this report. Unfortunately, there is not sufficient data on bird species abundance, density and flight behavior on the site for this assessment to carry high confidence (i.e. high certainty of the assessment being accurate). In order to rectify this situation, primary data collection on site is needed. As mentioned elsewhere in this report this should be achieved through a pre-construction monitoring programme, which should ideally commence as soon as possible.

Table 2. Assessment of disturbance of birds during operation of the Wind Energy Facility

| OPERATION PHASE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **GENERAL AND SPECIALIST STUDY IMPACTS** | **SPATIAL SCALE** | **TEMPORAL SCALE (DURATION)** | **CERTAINTY SCALE (LIKELIHOOD)** | **SEVERITY/ BENEFICIAL SCALE** | **SIGNIFICANCE PRE-MITIGATION** | **MITIGATION MEASURES** | **SIGNIFICANCE POST-MITIGATION** |
| **ISSUE: Avifauna** | | | | | | | |
| **IMPACT: Bird collision & electrocution on overhead power lines, Impact on Red Listed and other species** | | | | | | | |
| DIRECT IMPACTS | | | | | | | |
| | National – populations of Red Data species affected | Permanent | Probable | Moderately severe | Moderately negative | Bury all 'on site' power line underground. On power lines to grid, mark certain sections of the line with anti collision marking devices on the earth wire to increase the visibility of the line and reduce likelihood of collisions. High risk sections of line can only be identified once the route of the power lines is available. Bird friendly pole/pylon designs should be used to prevent electrocutions. | Low negative |
| **ISSUE: Avifauna** | | | | | | | |
| **IMPACT: Bird disturbance and displacement from area as result of wind turbines and other infrastructure** | | | | | | | |
| DIRECT IMPACTS | | | | | | | |
| | National – populations of Red Data species affected | Permanent | Possible | Moderately severe | Low negative | It is very difficult to mitigate for this. Disturbance can be reduced to some extent by following general environmental best practice in terms of managing people, machines and equipment during operations and | Low negative |

| OPERATION PHASE | | | | | | | |
|---|---|---|---|---|---|---|---|
| GENERAL AND SPECIALIST STUDY IMPACTS | SPATIAL SCALE | TEMPORAL SCALE (DURATION) | CERTAINTY SCALE (LIKELIHOOD) | SEVERITY/ BENEFICIAL SCALE | SIGNIFICANCE PRE-MITIGATION | MITIGATION MEASURES | SIGNIFICANCE POST-MITIGATION |
| | | | | | | maintenance. Pre-construction monitoring will establish baseline data against which this impact can be evaluated. | |
| **ISSUE: Avifauna** | | | | | | | |
| **IMPACT: Bird collision with turbine blades** | | | | | | | |
| DIRECT IMPACTS | | | | | | | |
| | National – populations of Red Data species affected | Permanent | Possible | Moderately severe | Moderately negative | This is extremely difficult to mitigate for post construction. Sensitivity mapping and pre-construction monitoring should inform the final turbine layout in order to proactively mitigate for this. If key species are found to collide in significant numbers post construction then mitigation options such as painting turbine blades, blade height adjustment and curtailment will need to be implemented. | Moderately negative |

Table 3. Assessment of disturbance of birds during construction of the Wind Energy Facility

| CONSTRUCTION PHASE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **GENERAL AND SPECIALIST STUDY IMPACTS** | **SPATIAL SCALE** | **TEMPORAL SCALE (DURATION)** | **CERTAINTY SCALE (LIKELIHOOD)** | **SEVERITY/ BENEFICIAL SCALE** | **SIGNIFICANCE PRE-MITIGATION** | **MITIGATION MEASURES** | **SIGNIFICANCE POST-MITIGATION** |
| **IMPACT: Disturbance of birds, Impact on Red Listed and other species during construction** | | | | | | | |
| DIRECT IMPACTS | | | | | | | |
| | Localised | Short term | Probable | Slight – to moderate if species breeding | Low negative –moderate negative if any target species breeding | Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate fully for this as some disturbance is inevitable. If pre-construction monitoring discovers any breeding target species, the specialist will develop case specific recommendations for management of the situation | Low negative |
| **IMPACT: Destruction or alteration of bird habitat, Impact on Red Listed and other species** | | | | | | | |
| INDIRECT IMPACTS: | | | | | | | |
| | Localised | Permanent | Probable | Slight – relatively small footprint | Low negative | Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate fully for this as some habitat destruction is inevitable. Existing roads should be used as much as possible, as well as avoiding sensitive areas | Low negative |

| CONSTRUCTION PHASE | | | | | | | |
|---|---|---|---|---|---|---|---|
| GENERAL AND SPECIALIST STUDY IMPACTS | SPATIAL SCALE | TEMPORAL SCALE (DURATION) | CERTAINTY SCALE (LIKELIHOOD) | SEVERITY/ BENEFICIAL SCALE | SIGNIFICANCE PRE-MITIGATION | MITIGATION MEASURES | SIGNIFICANCE POST-MITIGATION |
| | | | | | | identified by this study. | |

## 6. SENSITIVITY MAPPING FOR THE PROPOSED SITE

Avoiding areas of high bird use or sensitivity is the most important means of mitigating the effects of wind turbines (and associated infrastructure) on birds. At this proposed site, it is difficult to identify any areas of truly high sensitivity. With the exception of the small drainage lines, which sometimes contain small dams and wetlands, as well as pristine thicket and woodland, the site is relatively uniform in sensitivity. This study has classed the study area into medium and low sensitivity areas (Figure 9). The medium sensitivity areas are mostly the drainage lines, and steep ground immediately adjacent to them. Construction of infrastructure should take place only within the low sensitivity areas. The delineation of these sensitivity zones in this report should be interpreted as indicative only. The exact edge of these zones cannot always be drawn as a line on a map, and is better determined on site in the EMP phase if there are any areas of conflict. Several current turbine positions fall within the medium sensitivity areas, but only slightly. These turbines should ideally be moved into low sensitivity areas, although this would best be done during the EMP, or after pre-construction monitoring has produced some useful data in order to inform the new placement.

## 7. PRE-CONSTRUCTION BIRD MONITORING PROGRAMME

As discussed elsewhere in this report, it is essential that a thorough independent bird monitoring programme be implemented on site as per the "Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa" (Jenkins, van Rooyen, Smallie, Anderson & Smit; 2011). These guidelines require 12 months of data to be collected by the monitoring programme prior to environmental authorization of projects. The following is an outline of the methodology that should be followed with the monitoring programme for this project. This overview is summarized from Jenkins *et al* (2011) and tailor made for this site.

*Stage 1: Reconnaissance*

This has been completed during the initial scoping and EIA process.

*Stage 2: Pre-construction monitoring*

The primary aims of pre-construction monitoring are:

(i) To estimate the <u>number/density of birds</u> regularly present or resident within the broader impact area of the WEF before its construction.
(ii) To document <u>patterns of bird movements</u> in the vicinity of the proposed WEF before its construction (e.g. Erickson *et al.* 1999).
(iii) To estimate <u>predicted collision risk</u> (the frequency with which individuals or flocks fly through the future rotor swept area of the proposed WEF – Morrison 1998, Band *et al.* 2007) for key species.
(iv) To inform comments on the merits of avifaunal impact assessment report in terms of points (i) to (iii) above
(v) To establish a pre impact baseline of bird numbers, distributions and movements
(vi) To mitigate impacts by informing the final design, construction and management strategy of the development.

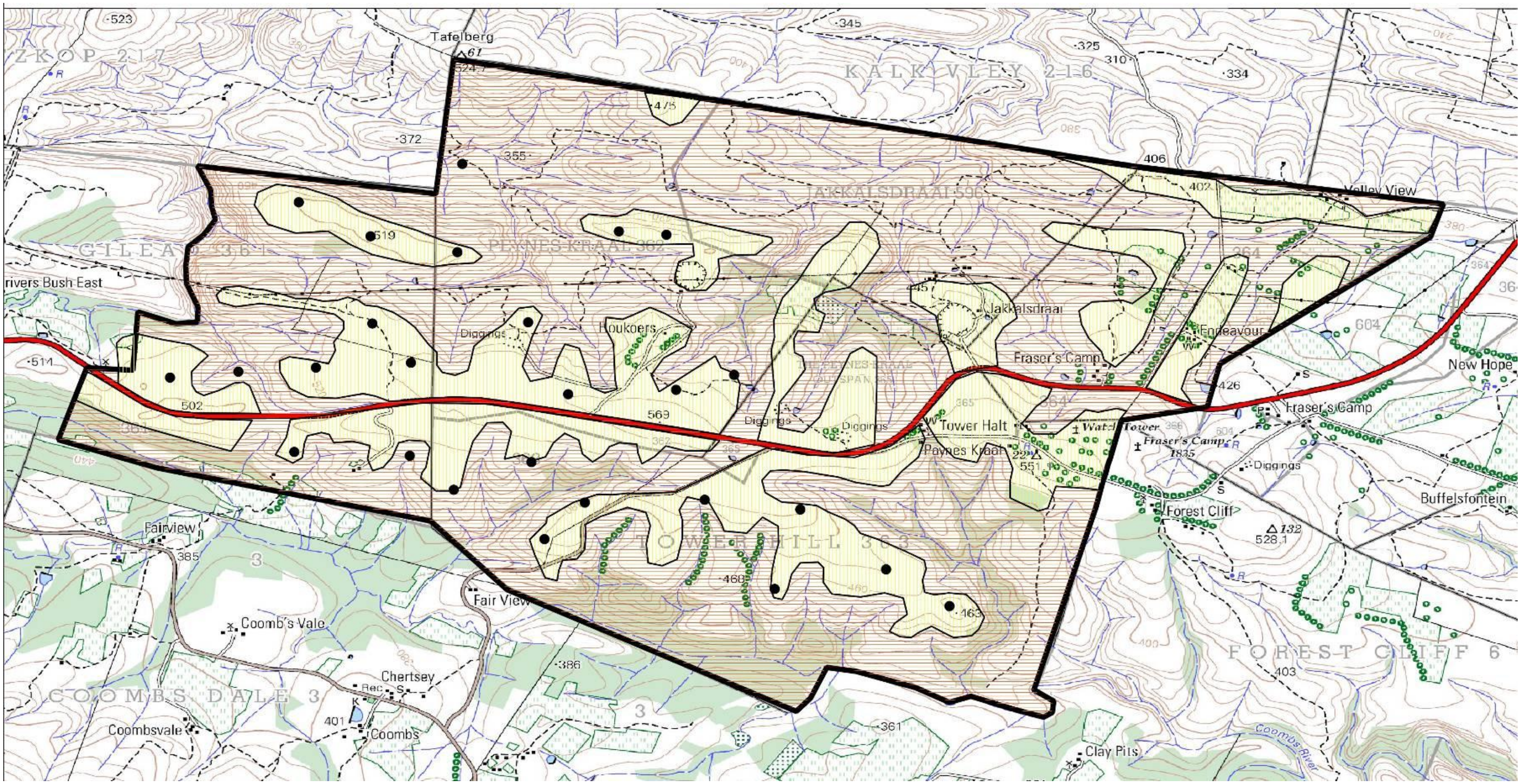


Figure 9. Sensitivity map for the Grahamstown WEF study area. Orange areas are Medium sensitivity, and yellow area's indicate Low sensitivity.

More specifically, at the Grahamstown site, the following activities will be undertaken:

*a. Sample counts of small terrestrial species*

Approximately 4-6 walked transects on the main site and 2-3 on a control site.

*b. Counts of large terrestrial species and raptors*

Approximately 2-3 vehicle based road count routes on main site and 1 on a control site.

*c. Focal site surveys and monitoring*

Any cliff-lines, quarry faces, power lines, stands of large trees, marshes, wetlands, nest sites and drainage lines will be surveyed using documented protocol in the initial stages of the monitoring project. Any identified features will be surveyed atleast once on each site visit thereafter.

*d. Incidental observations*

All other, incidental sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or flight paths) within the broader study area will be carefully plotted and documented. Where necessary, these features may be developed as focal sites as described above in (c).

*e. Direct observation of bird movements*

This will be done through counts at approximately 2 vantage points on the main site and 1 on a control site. The exact positioning of these vantage points will need to be refined during the first site visit, based on various factors, including access. A total of 12hrs of observation will be conducted at each vantage point on each site visit, resulting in a total of 24hrs direct observation per site visit on the main site, and 12hrs on the control site. This data will be collected in 3hr sessions at vantage points, to manage for observer fatigue. Sessions will be conducted at each vantage point in the early morning, late morning, early afternoon and late afternoon – to provide coverage of all daylight hours.

*Control sites*

A suitable control site will need to be identified and established early in the project. The best practice guidelines state that a control site should be approximately half of the size of the main site, and hence approximately half the monitoring effort. Experience has shown that the developer can play a key role in the identification of potential control sites, since they have already invested significant time in the area, and may have contact with other landowners or have alternate or future sites.

A brief report should be submitted on the findings of each of the 4 monitoring site visits within one month of completion of each site visit. These interim reports should provide an indication of patterns and trends in data but not a full statistical analysis. The focus of these reports will be on operations, logistics, progress, lessons learnt in the monitoring process, and necessary refinement of approach. At the conclusion of the pre-construction monitoring, i.e. after the fourth site visit a final report should be compiled, within one month of completion of the site visit. This report should contain full statistical analysis of the findings.

## 8. IMPACT STATEMENT

In conclusion, the proposed development could impact on birds predominantly through collision with turbines, and electrocution and collision on associated power lines. Since we have no data on bird abundance and movement on site, our confidence in the assessment of these impacts is relatively low. This could be rectified by obtaining primary data on site. It is therefore recommended that a preconstruction bird monitoring program be initiated as soon as possible in order to begin the process of collecting relevant and accurate data on the numbers of birds that could be affected by the project.

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**APPENDIX 1- Environmental Impact Assessment criteria – supplied by CES**

| Significance Rating Table | |
|---|---|
| **Temporal Scale**<br>**(The duration of the impact)** | |
| Short term | Less than 5 years (Many construction phase impacts are of a short duration). |
| Medium term | Between 5 and 20 years. |
| Long term | Between 20 and 40 years (From a human perspective almost permanent). |
| Permanent | Over 40 years or resulting in a permanent and lasting change that will always be there. |
| **Spatial Scale**<br>**(The area in which any impact will have an affect)** | |
| **Individual** | Impacts affect an individual. |
| **Localized** | Impacts affect a small area of a few hectares in extent. Often only a portion of the project area. |
| **Project Level** | Impacts affect the entire project area. |
| **Surrounding Areas** | Impacts that affect the area surrounding the development |
| **Municipal** | Impacts affect either BCM, or any towns within them. |
| **Regional** | Impacts affect the wider district municipality or the province as a whole. |
| **National** | Impacts affect the entire country. |
| **International/Global** | Impacts affect other countries or have a global influence. |
| **Will definitely occur** | Impacts will definitely occur. |
| **Degree of Confidence or Certainty**<br>(The confidence with which one has predicted the significance of an impact) | |
| **Definite** | More than 90% sure of a particular fact. Should have substantial supportive data. |
| **Probable** | Over 70% sure of a particular fact, or of the likelihood of that impact occurring. |
| **Possible** | Only over 40% sure of a particular fact or of the likelihood of an impact occurring. |
| **Unsure** | Less than 40% sure of a particular fact or of the likelihood of an impact occurring. |

| Impact severity<br>(The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party) | |
|---|---|
| Very severe | Very beneficial |
| An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land. | A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality. |
| Severe | Beneficial |
| Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation. | A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy. |
| Moderately severe | Moderately beneficial |
| Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value. | A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality. |
| Slight | Slightly beneficial |
| Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction. | A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these. |
| No effect | Don't know/Can't know |
| The system(s) or party(ies) is not affected by the proposed development. | In certain cases it may not be possible to determine the severity of an impact. |

| Overall Significance<br>(The combination of all the above criteria as an overall significance) | |
|---|---|
| **VERY HIGH NEGATIVE** | **VERY BENEFICIAL** |
| These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in **severe** or **very severe** effects, or **beneficial** or **very beneficial** effects.<br>**Example:** The loss of a species would be viewed by informed society as being of VERY HIGH significance.<br>**Example:** The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance. | |

| HIGH NEGATIVE | BENEFICIAL |
|---|---|
| These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.<br>**Example:** The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.<br>**Example:** The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH. | |
| **MODERATE NEGATIVE** | **SOME BENEFITS** |
| These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial.<br>**Example:** The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant. | |
| **LOW NEGATIVE** | **FEW BENEFITS** |
| These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.<br>**Example:** The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.<br>**Example:** The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away. | |
| **NO SIGNIFICANCE** | |
| There are no primary or secondary effects at all that are important to scientists or the public.<br>**Example:** A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context. | |
| **DON'T KNOW** | |
| In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information.<br>**Example:** The effect of a particular development on people's psychological perspective of the environment. | |

**APPENDIX 2. Bird species recorded in the area**

| No | Common Name | *Scientific Name* | Cons status | 3326BD Report rate (87 cards) | Seen on site visit |
|---|---|---|---|---|---|
| 1 | Common Ostrich | *Struthio camelus* | | 0.0115 | |
| 8 | Little Grebe | *Tachybaptus ruficollis* | | 0.2184 | |
| 55 | White-breasted Cormorant | *Phalacrocorax lucidus* | | 0.0230 | |
| 58 | Reed Cormorant | *Phalacrocorax africanus* | | 0.1264 | |
| 60 | African Darter | *Anhinga melanogaster* | | 0.0345 | |
| 62 | Grey Heron | *Ardea cinerea* | | 0.1609 | |
| 63 | Black-headed Heron | *Ardea melanocephala* | | 0.4828 | Yes |
| 67 | Little Egret | *Egretta garzetta* | | 0.0230 | |
| 71 | Cattle Egret | *Bubulcus ibis* | | 0.4023 | |
| 76 | Black-crowned Night-Heron | *Nycticorax nycticorax* | | 0.0115 | |
| 81 | Hamerkop | *Scopus umbretta* | ** | 0.1034 | |
| 83 | White Stork | *Ciconia ciconia* | BONN | 0.0230 | |
| 84 | Black Stork | *Ciconia nigra* | NT | 0.0115 | |
| 91 | African Sacred Ibis | *Threskiornis aethiopicus* | | 0.0690 | Yes |
| 94 | Hadeda Ibis | *Bostrychia hagedash* | | 0.6897 | Yes |
| 95 | African Spoonbill | *Platalea alba* | | 0.0805 | |
| 102 | Egyptian Goose | *Alopochen aegyptiaca* | | 0.4138 | |
| 103 | South African Shelduck | *Tadorna cana* | | 0.0345 | |
| 104 | Yellowbilled Duck | *Anas undulata* | | 0.4253 | |
| 105 | African Black Duck | *Anas sparsa* | | 0.0690 | |
| 108 | Redbilled Teal | *Anas erythrorhyncha* | | 0.0575 | |
| 112 | Cape Shoveler | *Anas smithii* | | 0.0115 | |
| 116 | Spurwinged Goose | *Plectropterus gambensis* | | 0.1379 | |
| 118 | Secretarybird | *Sagittarius serpentarius* | NT | 0.0805 | |
| 127 | Black-shouldered Kite | *Elanus caeruleus* | | 0.7011 | Yes |
| 131 | Verreaux's Eagle | *Aquila verreauxii* | | 0.0115 | |
| 136 | Booted Eagle | *Aquila pennatus* | | 0.0115 | |
| 139 | Long-crested Eagle | *Lophaetus occipitalis* | | 0.0230 | |
| 140 | Martial Eagle | *Polemaetus bellicosus* | V | 0.0230 | |
| 141 | African Crowned Eagle | *Stephanoaetus coronatus* | NT | 0.0575 | |
| 148 | African Fish-Eagle | *Haliaeetus vocifer* | | 0.0805 | |
| 149 | Steppe Buzzard | *Buteo vulpinus* | | 0.1724 | Yes |
| 152 | Jackal Buzzard | *Buteo rufofuscus* | | 0.4943 | Yes |
| 155 | Rufous-chested Sparrowhawk | *Accipiter rufiventris* | | 0.0115 | |
| 158 | Black Sparrowhawk | *Accipiter melanoleucus* | | 0.0115 | |
| 160 | African Goshawk | *Accipiter tachiro* | | 0.0575 | |

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|---|---|---|---|---|---|
| 165 | African Marsh-Harrier | *Circus ranivorus* | V | 0.0575 | |
| 168 | Black Harrier | *Circus maurus* | NT | 0.0920 | |
| 169 | African Harrier-Hawk | *Polyboroides typus* | | 0.1839 | |
| 172 | Lanner Falcon | *Falco biarmicus* | NT | 0.0230 | |
| 173 | Eurasian Hobby | *Falco subbuteo* | | 0.0115 | |
| 181 | Rock Kestrel | *Falco rupicolus* | | 0.1954 | |
| 192 | Red-winged Francolin | *Scleroptila levaillantii* | | 0.1264 | |
| 198 | Red-necked Spurfowl | *Pternistis afer* | | 0.4368 | |
| 200 | Common Quail | *Coturnix coturnix* | | 0.0115 | Yes |
| 203 | Helmeted Guineafowl | *Numida meleagris* | | 0.2184 | Yes |
| 226 | Moorhen | *Gallinula chloropus* | | 0.0115 | |
| 228 | Red-knobbed Coot | *Fulica cristata* | | 0.4253 | |
| 229 | African Finfoot | *Podica senegalensis* | V | 0.0115 | |
| 231 | Denham's Bustard | *Neotis denhami* | V | 0.0460 | |
| 233 | White-bellied Korhaan | *Eupodotis senegalensis* | V | 0.0460 | |
| 249 | Three-banded Plover | *Charadrius tricollaris* | | 0.0230 | |
| 254 | Grey Plover | *Pluvialis squatarola* | | 0.0115 | |
| 255 | Crowned Lapwing | *Vanellus coronatus* | | 0.5057 | Yes |
| 257 | Black-winged Lapwing | *Vanellus melanopterus* | NT | 0.0690 | |
| 258 | Blacksmith Lapwing | *Vanellus armatus* | | 0.2644 | |
| 264 | Common Sandpiper | *Actitis hypoleucos* | | 0.0115 | |
| 266 | Wood Sandpiper | *Tringa glareola* | | 0.0230 | |
| 284 | Ruff | *Philomachus pugnax* | | 0.0115 | |
| 286 | African Snipe | *Gallinago nigripennis* | | 0.0115 | |
| 297 | Spotted Thick-knee | *Burhinus capensis* | | 0.3218 | |
| 312 | Kelp Gull | *Larus dominicanus* | | 0.0115 | |
| 348 | Rock Dove | *Columba livia* | | 0.0345 | |
| 349 | Speckled Pigeon | *Columba guinea* | | 0.2529 | |
| 350 | African Olive-Pigeon | *Columba arquatrix* | | 0.0920 | |
| 352 | Red-eyed Dove | *Streptopelia semitorquata* | | 0.3218 | Yes |
| 354 | Cape Turtle-Dove | *Streptopelia capicola* | | 0.7471 | Yes |
| 355 | Laughing Dove | *Streptopelia senegalensis* | | 0.3678 | |
| 356 | Namaqua Dove | *Oena capensis* | | 0.0345 | |
| 358 | Emerald-spotted Wood-Dove | *Turtur chalcospilos* | | 0.4713 | |
| 359 | Tambourine Dove | *Turtur tympanistria* | | 0.0115 | |
| 360 | Lemon Dove | *Aplopelia larvata* | | 0.0115 | |
| 370 | Knysna Turaco | *Tauraco corythaix* | | 0.3218 | |
| 377 | Red-chested Cuckoo | *Cuculus solitarius* | | 0.0115 | |
| 378 | Black Cuckoo | *Cuculus clamosus* | | 0.1264 | |
| 382 | Jacobin Cuckoo | *Clamator jacobinus* | | 0.0115 | |
| 385 | Klaas's Cuckoo | *Chrysococcyx klaas* | | 0.0920 | |

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|---|---|---|---|---|---|
| 386 | Diderick Cuckoo | *Chrysococcyx caprius* | | 0.0575 | |
| 391 | Burchell's Coucal | *Centropus burchellii* | | 0.1724 | |
| 394 | African Wood-Owl | *Strix woodfordii* | | 0.0230 | |
| 395 | Marsh Owl | *Asio capensis* | | 0.0115 | |
| 401 | Spotted Eagle Owl | *Bubo africanus* | | 0.0345 | |
| 402 | Verreaux's Eagle-Owl | *Bubo lacteus* | | 0.0115 | |
| 405 | Fierynecked Nightjar | *Caprimulgus pectoralis* | | 0.3563 | |
| 412 | African Black Swift | *Apus barbatus* | | 0.0230 | |
| 415 | White-rumped Swift | *Apus caffer* | | 0.1034 | |
| 417 | Little Swift | *Apus affinis* | | 0.0115 | Yes |
| 418 | Alpine Swift | *Tachymarptis melba* | | 0.0230 | |
| 424 | Speckled Mousebird | *Colius striatus* | | 0.6322 | Yes |
| 426 | Red-faced Mousebird | *Urocolius indicus* | | 0.1724 | |
| 427 | Narina Trogon | *Apaloderma narina* | | 0.0345 | |
| 428 | Pied Kingfisher | *Ceryle rudis* | | 0.0575 | |
| 429 | Giant Kingfisher | *Megaceryle maximus* | | 0.0690 | |
| 430 | Half-collared Kingfisher | *Alcedo semitorquata* | NT | 0.0345 | |
| 431 | Malachite Kingfisher | *Alcedo cristata* | | 0.0460 | |
| 435 | Brown-hooded Kingfisher | *Halcyon albiventris* | | 0.5287 | |
| 446 | European Roller | *Coracias garrulus* | | 0.0575 | |
| 451 | African Hoopoe | *Upupa africana* | | 0.6552 | Yes |
| 452 | Green Wood-Hoopoe | *Phoeniculus purpureus* | | 0.4253 | |
| 455 | Trumpeter Hornbill | *Bycanistes bucinator* | | 0.0115 | |
| 460 | Crowned Hornbill | *Tockus alboterminatus* | | 0.4598 | |
| 464 | Black-collared Barbet | *Lybius torquatus* | | 0.3563 | Yes |
| 465 | Acacia Pied Barbet | *Tricholaema leucomelas* | | 0.0460 | |
| 469 | Red-fronted Tinkerbird | *Pogoniulus pusillus* | | 0.4598 | |
| 474 | Greater Honeyguide | *Indicator indicator* | | 0.0575 | |
| 476 | Lesser Honeyguide | *Indicator minor* | | 0.0230 | |
| 478 | Brown-backed Honeybird | *Prodotiscus regulus* | | 0.0115 | |
| 484 | Knysna Woodpecker | *Campethera notata* | NT | 0.0230 | |
| 486 | Cardinal Woodpecker | *Dendropicos fuscescens* | | 0.0460 | Yes |
| 488 | Olive Woodpecker | *Dendropicos griseocephalus* | | 0.0805 | |
| 489 | Red-throated Wryneck | *Jynx ruficollis* | | 0.0460 | |
| 494 | Rufous-naped Lark | *Mirafra africana* | | 0.1264 | |
| 495 | Eastern Clapper Lark | *Mirafra fasciolata* | | 0.0115 | |
| 507 | Red-capped Lark | *Calandrella cinerea* | | 0.0230 | |
| 512 | Large-billed Lark | *Galerida magnirostris* | | | Yes |
| 518 | Barn Swallow | *Hirundo rustica* | | 0.2644 | |
| 520 | White-throated Swallow | *Hirundo albigularis* | | 0.0115 | |
| 523 | Pearl-breasted Swallow | *Hirundo dimidiata* | | 0.0115 | |

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|---|---|---|---|---|---|
| 526 | Greater Striped Swallow | *Hirundo cucullata* | | 0.0575 | |
| 527 | Lesser Striped Swallow | *Hirundo abyssinica* | | 0.1609 | |
| 529 | Rock Martin | *Hirundo fuligula* | | 0.1724 | |
| 530 | Common House Martin | *Delichon urbica* | | 0.0115 | |
| 533 | Brown-throated Martin | *Riparia paludicola* | | 0.0115 | |
| 534 | Banded Martin | *Riparia cincta* | | 0.0115 | |
| 536 | Black Saw-wing | *Psalidoprocne holomelas* | | 0.1034 | |
| 538 | Black Cuckooshrike | *Campephaga flava* | | 0.0115 | |
| 540 | Grey Cuckooshrike | *Coracina caesia* | | 0.0230 | |
| 541 | Fork-tailed Drongo | *Dicrurus adsimilis* | | 0.7816 | Yes |
| 543 | Eurasian Golden Oriole | *Oriolus oriolus* | | 0.0345 | |
| 545 | Black-headed Oriole | *Oriolus larvatus* | | 0.5747 | |
| 547 | Cape Crow | *Corvus capensis* | | 0.4598 | |
| 548 | Pied Crow | *Corvus albus* | | 0.0575 | Yes |
| 550 | White-necked Raven | *Corvus albicollis* | | 0.3908 | Yes |
| 554 | Grey Tit | *Parus niger* | | 0.1609 | |
| 568 | Dark-capped Bulbul | *Pycnonotus tricolor* | | 0.7931 | Yes |
| 569 | Terrestrial Brownbul | *Phyllastrephus terrestris* | | 0.1264 | |
| 572 | Sombre Greenbul | *Andropadus importunus* | | 0.6207 | Yes |
| 577 | Olive Thrush | *Turdus olivaceus* | | 0.2414 | |
| 581 | Cape Rock-Thrush | *Monticola rupestris* | | 0.0920 | |
| 589 | Familiar Chat | *Cercomela familiaris* | | 0.0575 | |
| 593 | Mocking Cliff-Chat | *Thamnolaea cinnamomeiventris* | | 0.0230 | |
| 596 | African Stonechat | *Saxicola torquatus* | | 0.2874 | |
| 598 | Chorister Robin-Chat | *Cossypha dichroa* | | 0.0230 | |
| 601 | Cape Robin-Chat | *Cossypha caffra* | | 0.3103 | |
| 606 | White-starred Robin | *Pogonocichla stellata* | | 0.0115 | |
| 613 | White-browed Scrub-Robin | *Cercotrichas leucophrys* | | 0.0920 | |
| 614 | Karoo Scrub-Robin | *Cercotrichas coryphoeus* | | 0.0115 | |
| 621 | Chestnut-vented Tit-Babbler | *Parisoma subcaeruleum* | | 0.0115 | |
| 635 | Lesser Swamp-Warbler | *Acrocephalus gracilirostris* | | 0.0115 | |
| 638 | Little Rush-Warbler | *Bradypterus baboecala* | | 0.0115 | |
| 643 | Willow Warbler | *Phylloscopus trochilus* | | 0.0690 | |
| 644 | Yellow-throated Woodland-Warbler | *Seicercus ruficapillus* | | 0.0115 | |
| 645 | Bar-throated Apalis | *Apalis thoracica* | | 0.3793 | |
| 648 | Yellow-breasted Apalis | *Apalis flavida* | | 0.0460 | |
| 651 | Long-billed Crombec | *Sylvietta rufescens* | | 0.0115 | |
| 657 | Green-backed Camaroptera | *Camaroptera brachyura* | | 0.1034 | |
| 661 | Cape Grassbird | *Sphenoeacus afer* | | 0.0115 | |
| 664 | Zitting Cisticola | *Cisticola juncidis* | | 0.0230 | |
| 666 | Cloud Cisticola | *Cisticola textrix* | | 0.0115 | |

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|---|---|---|---|---|---|
| 667 | Wing-snapping Cisticola | *Cisticola ayresii* | | 0.0115 | |
| 669 | Grey-backed Cisticola | *Cisticola cinnamomeus* | | 0.0115 | |
| 677 | Levaillant's Cisticola | *Cisticola tinniens* | | 0.0230 | |
| 679 | Lazy Cisticola | *Cisticola aberrans* | | 0.0230 | |
| 681 | Neddicky | *Cisticola fulvicapilla* | | 0.6552 | Yes |
| 683 | Tawny-flanked Prinia | *Prinia subflava* | | 0.0230 | |
| 686 | Karoo Prinia | *Prinia maculosa* | | 0.0345 | |
| 690 | African Dusky Flycatcher | *Muscicapa adusta* | | 0.1034 | |
| 694 | Southern Black Flycatcher | *Melaenornis pammelaina* | | 0.1034 | |
| 698 | Fiscal Flycatcher | *Sigelus silens* | | 0.3218 | |
| 700 | Cape Batis | *Batis capensis* | | 0.1609 | |
| 701 | Chinspot Batis | *Batis molitor* | | 0.2644 | |
| 708 | Blue-mantled Crested-Flycatcher | *Trochocercus cyanomelas* | | 0.0115 | |
| 710 | African Paradise-Flycatcher | *.Terpsiphone viridis* | | 0.1149 | |
| 711 | African Pied Wagtail | *Motacilla aguimp* | | 0.0115 | |
| 712 | Mountain Wagtail | *Motacilla clara* | | 0.0460 | |
| 713 | Cape Wagtail | *Motacilla capensis* | | 0.5517 | Yes |
| 716 | African Pipit | *Anthus cinnamomeus* | | 0.0920 | |
| 717 | Long-billed Pipit | *Anthus similis* | | 0.0115 | |
| 727 | Cape Longclaw | *Macronyx capensis* | | 0.1954 | Yes |
| 732 | Common Fiscal | *Lanius collaris* | | 0.8161 | Yes |
| 736 | Southern Boubou | *Laniarius ferrugineus* | | 0.5632 | |
| 740 | Black-backed Puffback | *Dryoscopus cubla* | | 0.1379 | |
| 742 | Southern Tchagra | *Tchagra tchagra* | | 0.1034 | |
| 746 | Bokmakierie | *Telophorus zeylonus* | | 0.4828 | |
| 748 | Orange-breasted Bush-Shrike | *Telophorus sulfureopectus* | | 0.0115 | |
| 750 | Olive Bush-Shrike | *Telophorus olivaceus* | | 0.0460 | |
| 751 | Grey-headed Bush-Shrike | *Malaconotus blanchoti* | | 0.0345 | |
| 757 | Common Starling | *Sturnus vulgaris* | | 0.2414 | |
| 759 | Pied Starling | *Spreo bicolor* | | 0.0115 | |
| 764 | Cape Glossy Starling | *Lamprotornis nitens* | | 0.7126 | Yes |
| 768 | Black-bellied Starling | *Lamprotornis corruscus* | | 0.0115 | |
| 769 | Red-winged Starling | *Onychognathus morio* | | 0.5172 | Yes |
| 775 | Malachite Sunbird | *Nectarinia famosa* | | 0.1379 | |
| 783 | Southern Double-collared Sunbird | *Cinnyris chalybeus* | | 0.2184 | Yes |
| 785 | Greater Double-collared Sunbird | *Cinnyris afer* | | 0.2184 | |
| 789 | Grey Sunbird | *Cyanomitra veroxii* | | 0.0575 | |
| 792 | Amethyst Sunbird | *Chalcomitra amethystina* | | 0.4598 | |
| 793 | Collared Sunbird | *Hedydipna collaris* | | 0.0805 | |
| 796 | Cape White-Eye | *Zosterops virens* | | 0.2759 | |
| 801 | House Sparrow | *Passer domesticus* | | 0.0805 | |

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|---|---|---|---|---|---|
| 803 | Cape Sparrow | *Passer melanurus* | | 0.0460 | |
| 804 | Southern Grey-headed Sparrow | *Passer diffusus* | | 0.1264 | |
| 805 | Yellow-throated Petronia | *Petronia superciliaris* | | 0.0345 | |
| 807 | Thick-billed Weaver | *Amblyospiza albifrons* | | 0.0115 | |
| 808 | Dark-backed Weaver | *Ploceus bicolor* | | 0.1149 | |
| 810 | Spectacled Weaver | *Ploceus ocularis* | | 0.0805 | |
| 811 | Village Weaver | *Ploceus cucullatus* | | 0.1724 | |
| 813 | Cape Weaver | *Ploceus capensis* | | 0.5402 | |
| 814 | Southern Masked Weaver | *Ploceus velatus* | | 0.0115 | |
| 817 | Yellow Weaver | *Ploceus subaureus* | | 0.0345 | |
| 824 | Southern Red Bishop | *Euplectes orix* | | 0.0575 | |
| 827 | Yellow Bishop | *Euplectes capensis* | | 0.0115 | |
| 828 | Fan-tailed Widowbird | *Euplectes axillaris* | | 0.0115 | |
| 831 | Red-collared Widowbird | *Euplectes ardens* | | 0.0115 | |
| 832 | Long-tailed Widowbird | *Euplectes progne* | | 0.0690 | |
| 840 | African Firefinch | *Lagonosticta rubricata* | | 0.0920 | |
| 846 | Common Waxbill | *Estrilda astrild* | | 0.0345 | |
| 850 | Swee Waxbill | *Coccopygia melanotis* | | 0.0115 | |
| 852 | African Quailfinch | *Ortygospiza atricollis* | | 0.0460 | |
| 860 | Pin-tailed Whydah | *Vidua macroura* | | 0.1494 | |
| 864 | Dusky Indigobird | *Vidua funerea* | | 0.0230 | |
| 869 | Yellow-fronted Canary | *Crithagra mozambicus* | | 0.3908 | |
| 872 | Cape Canary | *Serinus canicollis* | | 0.1264 | |
| 873 | Forest Canary | *Crithagra scotops* | | 0.0690 | |
| 877 | Brimstone Canary | *Crithagra sulphuratus* | | 0.1954 | |
| 878 | Yellow Canary | *Crithagra flaviventris* | | 0.0115 | |
| 881 | Streaky-headed Seedeater | *Crithagra gularis* | | 0.1954 | |
| 884 | Golden-breasted Bunting | *Emberiza flaviventris* | | 0.1379 | |
| 888 | Yellow-billed Kite | *Milvus migrans* | | 0.2299 | |

**APPENDIX 3 - Species recorded by the second Southern African Bird Atlas Project in the two relevant pentads 3315_2645 and 3315_2650.**

| | | | |
|---|---|---|---|
| 1 | 859 | Yellow-fronted Canary (Geeloogkanarie) | *Crithagra mozambicus* |
| 2 | 524 | White-necked Raven (Withalskraai) | *Corvus albicollis* |
| 3 | 588 | White-browed Scrub-Robin (Gestreepte Wipstert) | *Cercotrichas leucophrys* |
| 4 | 867 | Streaky-headed Seedeater (Streepkopkanarie) | *Crithagra gularis* |
| 5 | 390 | Speckled Mousebird (Gevlekte Muisvoel) | *Colius striatus* |
| 6 | 709 | Southern Boubou (Suidelike Waterfiskaal) | *Laniarius ferrugineus* |
| 7 | 551 | Sombre Greenbul (Gewone Willie) | *Andropadus importunus* |
| 8 | 745 | Red-winged Starling (Rooivlerkspreeu) | *Onychognathus morio* |
| 9 | 436 | Red-fronted Tinkerbird (Rooiblestinker) | *Pogoniulus pusillus* |
| 10 | 392 | Red-faced Mousebird (Rooiwangmuisvoel) | *Urocolius indicus* |
| 11 | 314 | Red-eyed Dove (Grootringduif) | *Streptopelia semitorquata* |
| 12 | 637 | Neddicky (Neddikkie) | *Cisticola fulvicapilla* |
| 13 | 751 | Malachite Sunbird (Jangroentjie) | *Nectarinia famosa* |
| 14 | 4133 | Knysna Turaco Turaco (Knysnaloerie) | *Tauraco corythaix* |
| 15 | 4139 | Karoo Prinia (Karoolangstertjie) | *Prinia maculosa* |
| 16 | 419 | Green Wood-Hoopoe (Rooibekkakelaar ) | *Phoeniculus purpureus* |
| 17 | 758 | Greater Double-collared Sunbird (Groot-rooibandsuikerbekkie) | *Cinnyris afer* |
| 18 | 517 | Fork-tailed Drongo (Mikstertbyvanger) | *Dicrurus adsimilis* |
| 19 | 665 | Fiscal Flycatcher(Fiskaalvlieivanger) | *Sigelus silens* |
| 20 | 89 | Egyptian Goose (Kolgans) | *Alopochen aegyptiacus* |
| 21 | 545 | Dark-capped Bulbul (Swartoogtiptol) | *Pycnonotus tricolor* |
| 22 | 427 | Crowned Hornbill (Gekroonde Neushoringvoel) | *Tockus alboterminatus* |
| 23 | 707 | Common Fiscal (Fiskaallaksman) | *Lanius collaris* |
| 24 | 1172 | Cape White-eye (Kaapse Glasogie) | *Zosterops virens* |
| 25 | 686 | Cape Wagtail (Gewone Kwikkie) | *Motacilla capensis* |
| 26 | 316 | Cape Turtle-Dove (Gewone Tortelduif) | *Streptopelia capicola* |
| 27 | 737 | Cape Glossy Starling (Kleinglansspreeu) | *Lamprotornis nitens* |
| 28 | 523 | Cape Crow (Swartkraai) | *Corvus capensis* |
| 29 | 402 | Brown-hooded Kingfisher (Bruinkopvisvanger) | *Halcyon albiventris* |
| 30 | 863 | Brimstone Canary (Dikbekkanarie) | *Crithagra sulphuratus* |
| 31 | 431 | Black-collared Barbet (Rooikophoutkapper) | *Lybius torquatus* |
| 32 | 712 | Black-backed Puffback (Sneeubal) | *Dryoscopus cubla* |
| 33 | 622 | Bar-throated Apalis (Bandkeelkleinjantjie) | *Apalis thoracica* |

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|---|---|---|---|
| 34 | 772 | Amethyst Sunbird (Swartsuikerbekkie) | *Chalcomitra amethystina* |
| 35 | 123 | Rock Kestrel (Kransvalk) | *Falco rupicolus* |
| 2 | 797 | Village Weaver (Bontrugwewer) | *Ploceus cucullatus* |
| 3 | 867 | Streaky-headed Seedeater (Streepkopkanarie) | *Crithagra gularis* |
| 6 | 527 | Southern Black Tit (Gewone Swartmees) | *Parus niger* |
| 8 | 506 | Rock Martin (Kransswael) | *Hirundo fuligula* |
| 15 | 152 | Jackal Buzzard (Rooiborsjakkalsvoel) | *Buteo rufofuscus* |
| 17 | 517 | Fork-tailed Drongo (Mikstertbyvanger) | *Dicrurus adsimilis* |
| 18 | 570 | Familiar Chat (Gewone Spekvreter) | *Cercomela familiaris* |
| 22 | 733 | Common Starling (Europese Spreeu) | *Sturnus vulgaris* |
| 24 | 673 | Chinspot Batis (Witliesbosbontrokkie) | *Batis molitor* |
| 28 | 749 | Cape Sugarbird (Kaapse Suikervoiel) | *Promerops cafer* |
| 31 | 863 | Brimstone Canary (Dikbekkanarie) | *Crithagra sulphuratus* |
| 32 | 722 | Bokmakierie (Bokmakierie) | *Telophorus zeylonus* |
| 33 | 521 | Black-headed Oriole (Swartkopwielewaal) | *Oriolus larvatus* |
| 35 | 712 | Black-backed Puffback (Sneeubal) | *Dryoscopus cubla* |
| 38 | 418 | African Hoopoe (Hoephoep) | *Upupa africana* |
| 39 | 130 | Black-shouldered Kite (Blouvalk) | *Elanus caeruleus* |