

**An avian biodiversity assessment for 11 proposed developments at the South African Police Services Operational and Tactical Academy, Thabazimbi, Limpopo.**

26-27 November 2012

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developments at the South African Police Services  
Operational and Tactical Academy, Thabazimbi,  
Limpopo.**

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26-27 November 2012

## DECLARATION OF INDEPENDENCE

I, Alan Charles Kemp RSA ID 4405075033081 declare that I:

- Am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to learn through the processes of constructive criticism and debate, I reserve the right to form and hold our own opinions. Therefore will not willingly submit to the interests of other parties, be they the client or the relevant competent authorities, nor change my statements to appease them;
- Abide by the Code of Ethics of the S.A. Council for Natural Scientific Profession;
- Act as an independent specialist consultant in the fields of ecology and zoology, particularly ornithology;
- Am contracted as a specialist consultant by EcoAgent CC for Interdesign Landscape Architects for "An avian biodiversity assessment for 11 proposed developments at the South African Police Services Operational and Tactical Academy, Thabazimbi, Limpopo", as described in this report;
- Do not have or will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Have or will not have any vested interest in the proposed activity proceeding;
- Have no and will not engage in conflicting interests in the undertaking of the activity;
- Undertake to disclose to the client and the competent authority any material information that has or may have the potential to influence the decision of the competent authority, as required in terms of the Environmental Impact Assessment Regulations 2006;
- Will provide the client and competent authority with access to all information at my disposal regarding this project, whether favourable or not; and
- Recognise that the contents of the final report, once I have received my remuneration in full, become the property of the client and may only be cited with their permission.



A. C. Kemp

## **EXECUTIVE SUMMARY**

### **Birds**

The main conservation objectives for birds on the SAPS Academy property at Thabazimbi are to retain as much as possible of the savanna habitats of woodland and bushveld, protect the sensitive drainage lines and associated riparian vegetation, and minimize the footprints and impacts of the small scattered developments across the property. Keeping the footprints of the developments as small as possible, during both construction and operation, making every effort to avoid removal of larger trees and associated ground cover, and controlling rainwater runoff to prevent erosion, especially along the network of roads interconnecting the developments, should be the principal environmental goals. The property has special potential, due to the quality of its broad-leaved woodlands, low human impact and high-than-expected local rainfall, to provide an important patch of conserved habitat for a wide variety of large and small animals and plants. This potential could best be realised if an all-inclusive environmental management plan was developed for the property to secure its ecological services in collaboration with neighbouring conservation areas.

## PROJECT BACKGROUND

The South African Police Services' (SAPS) Operational and Tactical Academy near Thabazimbi, Limpopo Province, is a property of about 9000 ha located on the farms Groenfontein 458 KQ, Buffelskloof 452 KQ and Buffelspoort 459 KQ, of which about 2400 hectares on Groenfontein has been secured with 3-m-high game fencing. The site is used as an advanced training institute for SAPS personnel and can house up to 10 concurrent training groups, with various training and accommodation sites located at relatively small, circumscribed localities within the property that are interconnected by a network of dirt roads. The greater portion of the property is managed as a game reserve, with large mammals reintroduced into the game-fenced portion, and a large dam built for water supplies is also an environmental feature.

It is proposed to upgrade some of the training facilities, denoted and spatially located as follows:

1. Existing A Training Camp (to be upgraded) 24° 32' 57"S; 27° 44' 37"E
2. New Residential Extension to Existing Housing 24° 33' 01"S; 27° 44' 58"E
3. New Groenfontein Residential Area 24° 33' 47"S; 27° 46' 24"E
4. Existing D Training Camp (to be upgraded) 24° 31' 20"S; 27° 43' 43"E
5. New Ammunition Safe by existing safe 24° 33' 10"S; 27° 43' 43"E
6. Existing B Training Camp (to be replaced *in situ*) 24° 34' 08"S; 27° 44' 24"E
7. New Shooting Range and Admin. Block 24° 34' 59"S; 27° 45' 36"E
8. New A Training Camp 24° 33' 48"S; 27° 45' 36"E
9. New Admin. Building & Landing strip extension 24° 33' 20"S; 27° 47' 00"E
- 10.1.1 Sewer line between existing A Training Camp and Sewage works - North
- 10.1.2 Sewer line between existing A Training Camp and Sewage works - South
- 10.2 Sewer lines between existing D and new A Training Camps, Landing strip and existing Sewage Works - East.
11. Existing farm roads interconnecting all training facilities.

This report assesses the avian biodiversity and habitats at and between each the 11 sites proposed for development or upgrades (hereafter 'the site(s)'). It combines a 19.5-

hour site visit on 26-27 November 2012, accompanied by the botanist and mammalogist that had made their previous assessments, and guided by Warrant Officer Hennie Kruger who resides on the property, with a subsequent desktop study to assess possible impacts of the developments and suggest possible mitigation options should they be approved.

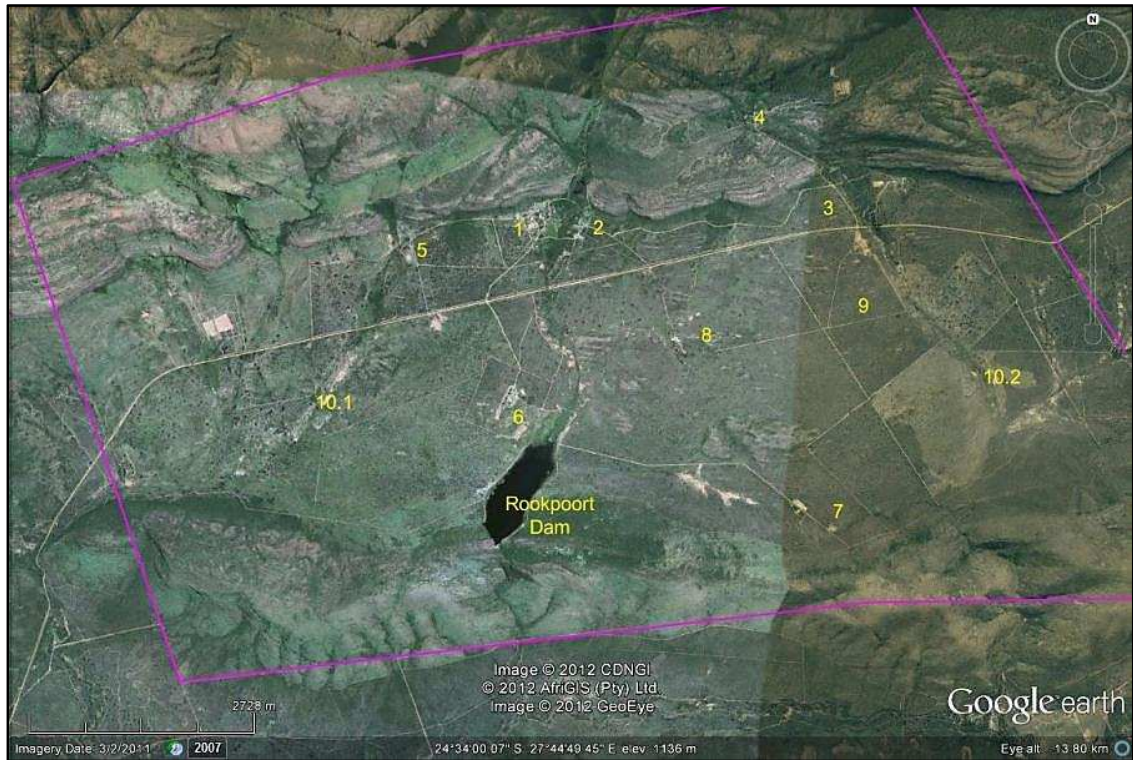


**Figure 1:** Satellite image of the greater Thabazimbi-Modimolle area, showing the approximate position of the SAPS property (purple lines), the main regional roads and towns, and some of the most important neighbouring conservation areas mentioned in the report (yellow text).



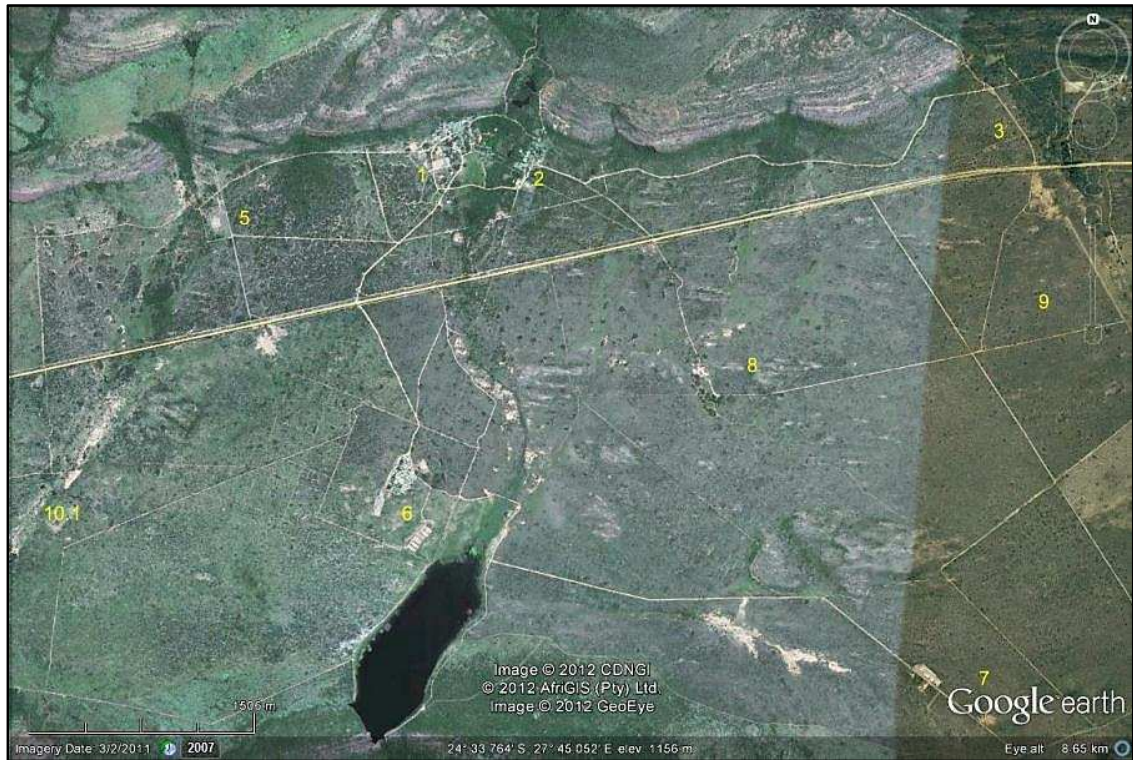


**Figure 2:** Satellite image of the Thabazimbi area, showing the approximate position of the SAPS property (purple lines), the mountainous topography and the most important neighbouring conservation area (yellow text).

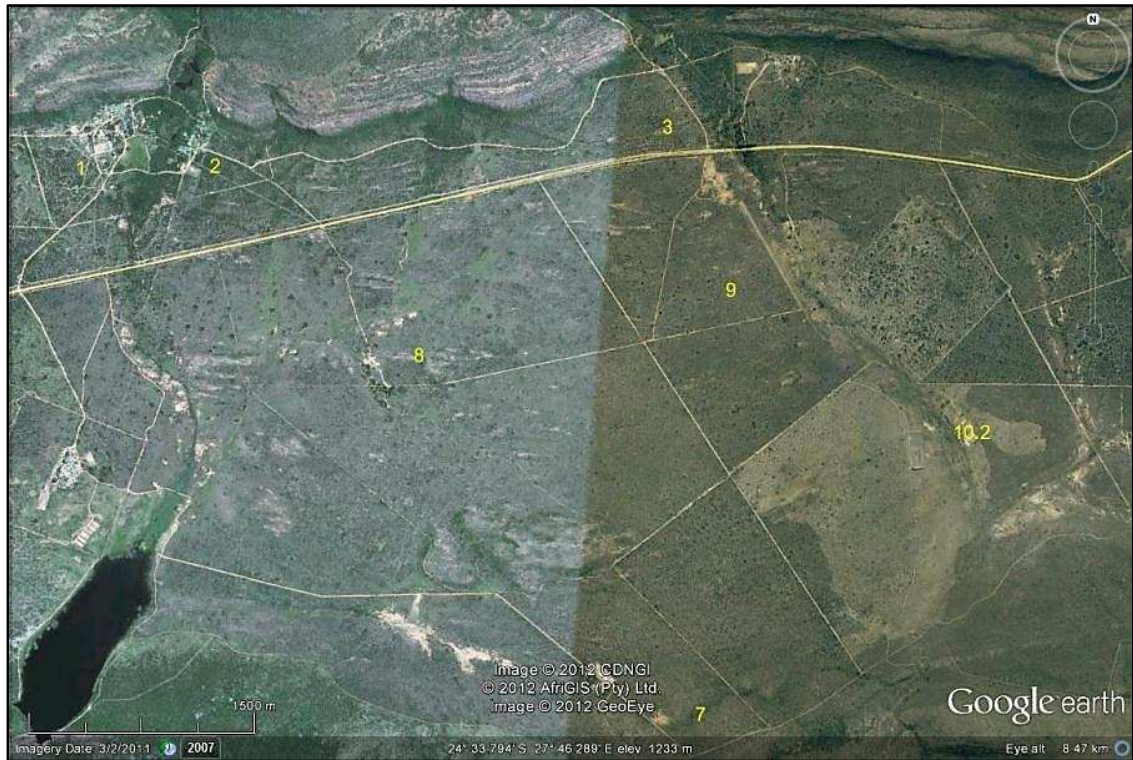


**Figure 3:** Satellite image of the SAPS property near Thabazimbi (purple lines), indicating the locations of the proposed developments and the Rookpoort Dam (yellow numbers and text, detailed above).



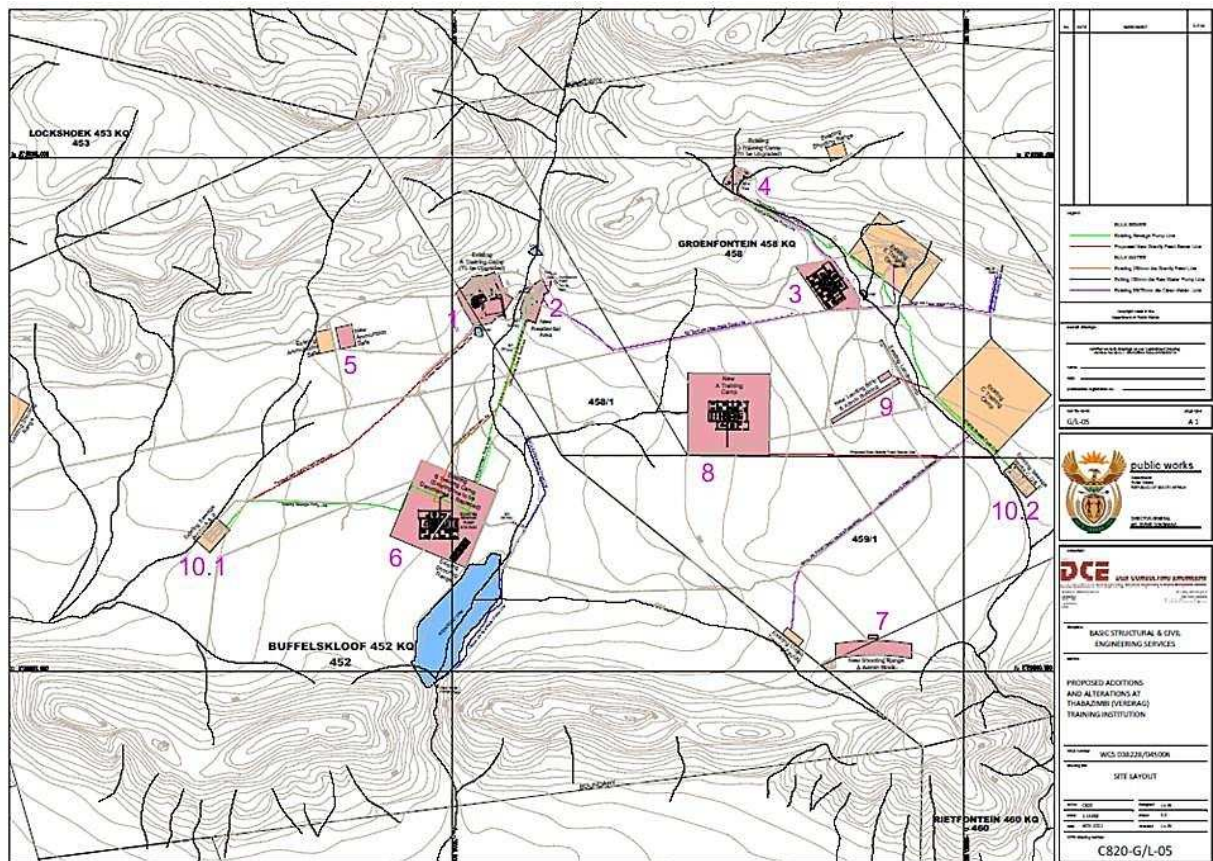


**Figure 4:** Enlarged satellite image of the western sector of the SAPS property near Thabazimbi, indicating the locations of the proposed developments (yellow numbers). Note the proximity of Sites 10.1, 5, 1 and 2 to major drainage lines, and the sheet erosion and other bare patches evident across the property.

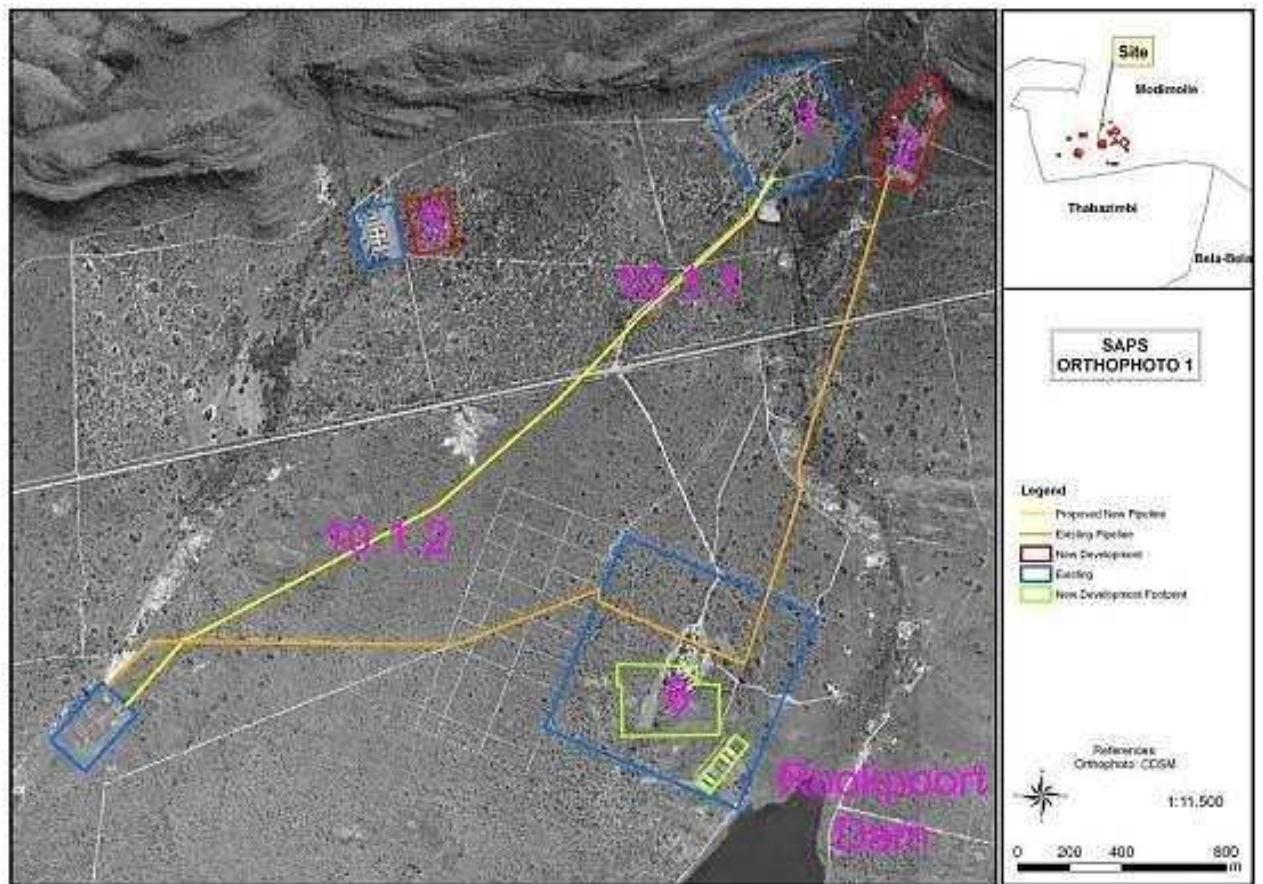


**Figure 5:** Enlarged satellite image of the eastern sector of the SAPS property near Thabazimbi, indicating the locations of the proposed developments (yellow numbers). Note the more degraded and transformed habitats to the east, and again the sheet erosion and other bare patches evident across the property

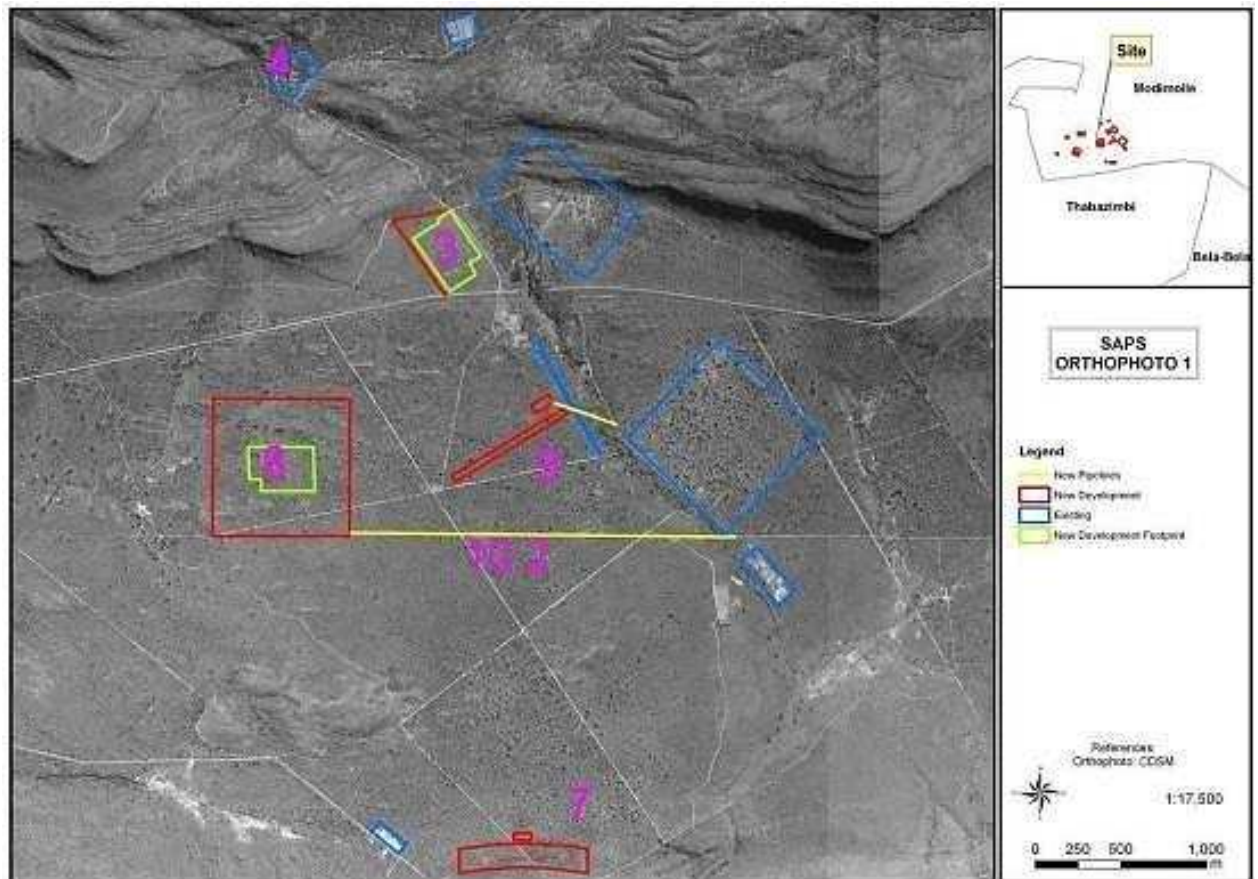




**Figure 6:** Topographical map showing the existing and some of the 11 proposed developments (purple numbers) on the SAPS property near Thabazimbi.



**Figure 7:** Orthophoto indicating the existing and proposed new developments (purple numbers) in the western sector of the SAPS property near Thabazimbi.



**Figure 8:** Orthophoto indicating the existing and proposed new developments (purple numbers) in the eastern sector of the SAPS property near Thabazimbi.



## 1. ASSIGNMENT – General Protocol

Eco-Agent CC Ecological Consultants were appointed by Interdesign Landscape Architects, on behalf of the Department of Public Works, to assess plant, mammal and avian biodiversity on the sites proposed for additions and alterations to the facilities of the Thabazimbi SAPS Operational and Tactical Academy. The species-richness of vegetation and mammals, and a habitat scan, had been conducted a year earlier. This assignment is in accordance with the 2010 EIA Regulations (No. R. 543-546, Department of Environmental Affairs and Tourism, 18 June 2010) emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

This assignment is interpreted as: Compile a study of the habitats and avifauna at the sites and their immediate surroundings, with emphasis on Red Data bird species that occur or may occur on the site. In order to compile this, the following had to be done:

### 1.1. Initial preparations:

- Obtain all relevant maps and information on the natural environment of the concerned area, including on threatened and/or Red Data habitats and bird species that may occur in the area.

### 1.2. Habitat survey:

- Examine the plant species (trees, shrubs, grasses and herbaceous species) and structures present to delimit those plant communities and ecosystems relevant to avian distributions and abundance.
- Identify potentially threatened, sensitive and/or Red Data habitats and vegetation.

### 1.3. Avifaunal assessment

- Obtain lists of the Red Data bird species that can be expected in the area.
- Assess the quantitative and qualitative condition of suitable habitats for the Red-listed bird species that may occur in the area.
- Assess the possibility of Red-listed avifauna being present on the study site.
- Compile a list of occurrences.

#### **1.4. General**

- Identify and describe natural areas of particular ecological sensitivity.
- Identify transformed areas in need of special treatment or management, e.g. bush encroachment, erosion, water pollution, degradation and/or reclamation.
- Recommend aspects that should be monitored before, during and/or after development.
- Provide information on Red Data bird species that may occur in the area.

## **2. RATIONALE**

It is widely recognised that natural resources are essential in providing the ecological processes and life support systems that maintain healthy and viable populations of plants and animals, including humans, on Earth. For sustainable development to take place, all possible impacts of any development on the environment must be considered before the relevant authorities can approve such a development. This has led to legislation protecting the natural environment in South Africa. In 1992, the landmark Convention of Biological Diversity was signed by more than 90 % of all members of the United Nations. In South Africa, the Environmental Conservation Act (Act 73 of 1989), the National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998) and the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004) ensure the protection of ecological processes, natural systems and natural beauty, as well as the preservation of biotic diversity within the natural environment. They also ensure the protection of the environment against disturbance, deterioration, defacement or destruction as a result of man-made structures, installations, processes, products or activities. In support of these Acts, a draft list of Threatened Ecosystems was published (Government Gazette 2009), as part of the National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004), and these Threatened Ecosystems are described by SANBI & DEAT (2009). International and national Red Data lists have also been produced for various threatened plant and animal taxa.

At a proposed development site, all components of the ecosystems (physical and abiotic environments, vegetation, animals) are interrelated and interdependent. A holistic approach is therefore imperative to include effectively within an integrated development

plan the development, utilisation and, where necessary, conservation of the given natural resources that will address all the needs of a modern human population (Bredenkamp & Brown 2001).

It is therefore necessary to make a thorough inventory of the biodiversity on the site, to evaluate the ecosystems, habitats and possibility of threatened species. This inventory should then serve as a scientific and ecological basis for planning, initiating, managing and, where necessary, terminating the development. Birds, being among the most visible and best studied group of animals, are an ideal group to provide 'indicator' species that might signal the health and importance of any terrestrial and/or aquatic habitats.

This development of various structures and servitudes at the SAPS Operational and Tactical Academy is obviously essential for the Academy to succeed in its assigned functions. If the development can proceed without any significant addition to the environmental impacts currently presented by the scattered and relatively confined facilities already present, then it offers important opportunities for the national and community benefits derived from a well-trained and efficient police force.

### **3. SCOPE AND OBJECTIVES OF THE STUDY**

- To assess qualitatively and quantitatively the significance of the habitat components and current general conservation status of the site,
- To comment on ecologically sensitive areas,
- To comment on connectivity with natural vegetation and habitats on adjacent sites,
- To recommend suitable buffer zones, if relevant,
- To provide a list of bird species that do or might occur on site and that may be affected by the development, and to identify species of conservation concern,
- To highlight potential impacts of the proposed developments on the bird species of the study site, and
- To provide management recommendations that might mitigate negative and enhance positive impacts, should the proposed development be approved.

## **4. STUDY AREA**

### **Regional setting**

The SAPS's Thabazimbi property is about 34 km ENE of the town of Thabazimbi and is approximately bisected by the D928 gravel road between Thabazimbi and Alma. Most of the property lies in the valley between the Sandrivier mountain range to the north and the Meletse range to the south, its boundaries extending more or less to the peaks on either side (Fig. 1). A prominent feature of the property is the large and deep Rookpoort Dam that has its catchment in the Sandrivier range, its wall in the gorge (poort) through the Meletse mountains, and its water providing bulk water to the on-site facilities (Figs. 1-7). The main river feeding the dam emerges from a deep valley in the Sandrivier range that passes between Sites 1 & 2, the Existing Training Camp A and its adjacent Residential Area, and Site 6, Training Camp B is on the west side of the dam.

The property is about 17 km SE of the Kransberg Cape Vulture colony, one of the three largest in southern Africa for this near-endemic species (Fig.1). The colony lies in the Marakele National Park, now linked ecologically to the equivalent large area of the Welgevonden Nature Reserve that lies northeast of the property. There is also the Ben Alberts Nature Reserve close to Thabazimbi and, in the 50-km surrounding areas, many private conservation areas that with collectively support large patches of natural bushveld vegetation. All these conserved areas and scattered water bodies have the potential to share bird populations with the SAPS property in various ways.

### **Physical Environment (mainly ex Mucina & Rutherford 2006)**

#### **Regional Climate**

The area experiences summer rainfall during November to April and long dry winters, but locally enjoys higher mean annual rainfall (~1000 vs. 650 mm) due to orographic effects from the surrounding mountains. Summers are hot and frost is infrequent during winter.

#### **Geology and Soils**

The mountains on either side comprise sedimentary sandstones and conglomerates of the Waterberg Group (Kransberg Subgroup in the mountains and possibly Alma Formation further east) that form soils which are shallow, rocky or pebbly in the foothills

or deep and sandy in the valley, except where they have been eroded over underlying siltstones across the valley.

### **Topography and drainage**

The main valley of the property slopes to the southwest, with rain falling in the high Sandriver range to the north forming the main watercourses. This runoff drains down off the range as a series of waterfalls, streams, seepages and springs, many seasonal, crosses the property to the south, as watercourses en route to gorges cut through the lower Meletse range, while only in the west of the property do the watercourses drain down the valley to the west. The main drainage system passes through the Rookpoort, where it is dammed to form a large lake-like impoundment, while the smaller Kliprivier system to the east passes through the Buffelspoort: however, all main drainage lines also have one or more small dams across them.

### **Land Use**

Historically, the area was divided into farms and evidence of them is mainly from livestock grazing (camps, reservoirs and troughs, patches of degraded grass cover and/or bush encroachment) and small croplands (grassy blocks, with some *Stoebe* bankrotbos and *Terminalia* and *Dicrostachys* bush invasion), besides old farmhouses with some alien trees around them (*Eucalyptus*, *Pinus*, *Casuarina*). More recently, the use of the property as a training area has had only localised impact at the operational sites, with little effect on the woodland and ex-farming habitats, apart from the roads/tracks that are still in use or have been allowed to deteriorate. Only the large Rookpoort Dam is an obvious large recent addition.

### **Vegetation Types**

The main vegetation on the property is part of the Savanna Biome, that in the valley at the western edge of the Central Sandy Bushveld vegetation unit (SVcb of Mucina & Rutherford 2006), while on the mountains there is some Waterberg Mountain Bushveld (SVcb 17) on the slopes, and probably Waterberg-Magaliesberg Summit Sourveld (Gm 29) on the peaks of the Sandrivier mountains, although these areas were not visited during this survey since no development was proposed there. Structurally, the vegetation is mostly dense broad-leaved woodland, with relatively small trees and obvious bush and grass/forb layers; tallest and densest along the foothills and in the lower valley, and



lower and more open in the upper eastern parts of the valley, partly due to earlier farming with increases in fine-leaved woody plants. There were few obviously large emergent trees, other than a few in the higher gorges and lower valleys of the foothills.

## 5. METHODS

During a site visit, selected roads and tracks on the property were driven, with regular stops made to record avian diversity and habitat types by walking random transects. Coordinates were taken at localities of note, and attention was also paid to the biological condition and diversity within at least 500 meters on adjoining properties.

### 5.1. Bird Habitats

While bird distributions have been related to broad vegetation types, there is a general consensus internationally that vegetation structure, rather than floral composition, is the most critical parameter in most bird habitat preferences (Allan *et al.* in Harrison *et al.* 1997). The principal vegetation units identified for birds in South Africa, based primarily on similarity in vegetation structure rather than composition, are divided into four major groups **Karoo** (subdivided into Succulent, Nama and Grassy), **Grassland** (Sweet, Mixed, Sour and Alpine) **Kalahari** (South and Central), and **Woodland** (Arid, Moist and Mopane), plus the discrete and smaller areas of **Fynbos**, **Valley Bushveld**, **East Coast Littoral** and **Afromontane Forest** habitat (Allan *et al.* in Harrison *et al.* 1997).

Of course vegetation structure is determined by and offers a surrogate for a wide variety of abiotic factors (of which climate, in South Africa particularly rainfall and temperature, together with frost and fire frequency, are most important). The habitats occupied by flying birds differ from those of most terrestrial vertebrates in being three-dimensional, especially for aerial-feeding species and those regularly using the airspace above landscapes with low relief and/or short vegetation, but in the two horizontal dimensions birds depend most on vegetation structure and substrate texture and colour (except of a minority of species with particular food/nest requirements of substrate, foliage, flowers, fruit or seeds). Although plant species composition is the main criterion used to delimit most vegetation biomes and units described for South Africa, the most recent analyses also take into account and offer good synopses of such abiotic factors that underlie

these divisions as landscape structure and topography, geology and soil types, and climate, besides details of the flora and its conservation (Mucina & Rutherford 2006).

The principal habitats on site were identified and stratified into relatively homogeneous units on recent satellite (Google Earth) images of the area, including any particular natural features and/or indications of degraded or transformed habitats (croplands, mining, buildings). Within each homogeneous unit, a description was made, illustrated by images, of the principal features that might influence bird distribution (vegetation structure, composition, quality and extent; water-related moist patches, marshes and areas of open water; topographical and geological features such as steep slopes, cliffs, deep valleys or rocky outcrops; or man-made plantations or structures that might provide roost/nest sites).

The **biodiversity significance** of an area relates to its genetical species diversity, endemism (of species or ecological processes) and occurrence of threatened/legally-protected species or ecosystems. The following conservation priorities were used for each avian habitat type recognised on or nearby the site/property:

- High:** Ecologically sensitive and valuable land, with high species richness, sensitive ecosystems or Red Data species, that should be conserved and no development allowed.
- Medium-high:** Land where sections are disturbed but that is still ecologically sensitive to development/disturbance.
- Medium:** Land on which low-impact development with limited impact on the ecosystem could be considered, but where it is still recommended that certain portions of the natural habitat be maintained as open spaces.
- Medium-low:** Land on which small sections could be considered for conservation but where the area in general has little conservation value.
- Low:** Land that has little conservation value and that could be considered for developed with little to no impact on the habitats or avifauna.

Only **High or Low sensitivity** is indicated for the habitats, with no development allowed on areas of High sensitivity, applying the following criteria:

- High:** High and Medium-High conservation priority categories mentioned above are considered to have a High sensitivity and development should not be supported. These include sensitive ecosystems with low inherent resistance and/or resilience to disturbance factors, or highly dynamic systems important for maintenance of ecosystem integrity. Most such systems represent ecosystems with high connectivity to other important ecological systems or support high species diversity and provide suitable habitat for a number of threatened or rare species.
- Low:** Medium, Medium-Low and Low conservation priority categories mentioned above are considered to have a Low sensitivity and development may be supported. Portions of habitat with a Medium conservation priority should be conserved as open areas and/or buffers wherever possible. These are slightly modified systems that occur along disturbance gradients of low-medium intensity, with some degree of connectivity with other ecological systems or ecosystems with intermediate levels of species diversity that include potential ephemeral habitat for threatened species. Low sensitivity habitats are degraded, highly disturbed and/or transformed systems with little ecological function and low species diversity.

## **5.2. Bird Species**

On the site visit(s) I recorded the presence of bird species, or assessed the probability of their occurrence based on the habitat types recognized on and around the study site. This was done with due regard to the well-recorded general distributions of southern African birds at the quarter-degree grid cell (QDGC) scale (SABAP 1, Harrison *et al.* 1997) or the pentad (5' lat. x 5' long) scale (SABAP 2, on-going, Animal Demography Unit website [www.safring2.org](http://www.safring2.org)), coupled to my assessment and experience of the qualitative and quantitative nature of the habitats recognized on site. Due to the mobility of most birds, I also scanned at least 500 m of adjoining properties for important faunal habitats and avian species, and took note of the extent and proximity of other major areas of natural habitat and conservation potential within the normal flying distance of birds. I also extended my assessment of the extent, qualities, and limits of the various habitat types, both on site and on adjacent properties, by study of satellite images from

Google Earth. While the QDGC mapping of South African bird species provides the best current information of what birds to expect where, the roughly 26-23 km (west-east) x 27.3 km grid area usually far exceeds the area of most assessment sites and can only be expected to support regularly a subset of the QDGC species recorded, depending on the subset of possible QDGC habitats available on the site. Furthermore, the bird species listed for each QDGC are only those recorded during the atlas survey period and not necessarily as comprehensive as they may appear, with biases neglecting cryptic species and less accessible grids.

### **5.3. Field Survey**

Birds are a relatively visible and audible group of homoeothermic vertebrates, active throughout the day/night and year, and with habitat preferences that we can evaluate both by reference to the comprehensive literature available and by the subset of species detected during a field survey done at a particular season and time of day/night. Such information and personal experience also informs searches for particular species of conservation concern.

I identified bird species by visual sightings during random transect walks and drives across the site, attempting to visit and search samples of all recognised habitat types, with special attention to any unusual features within each habitat. No trapping or mist netting was conducted, since the terms of reference usually do not require such intensive work. The presence of some species was recognised by their calls or inferred from old nests, food remains, droppings and/or moulted feathers. Where possible, local people were questioned or supplied information about occurrence or absence of particular species.

### **5.4. Desktop Survey**

Three criteria were used to gauge the probability of occurrence of bird species on the study site: their known distribution range, their habitat preference(s) and the quality and extent of suitable habitat(s) on site. Initially, I derived and compared lists of bird species expected to occur on site from the QDGC records presented in atlases of southern African birds (e.g. Cyrus & Robson 1980; Tarboton *et al.* 1987; Earlé & Grobler 1987; Harrison *et al.* 1997). Based on an assessment of the habitats present on site, and on the most recent regional field guide(s) for the area (e.g. Sinclair *et al.* 2011; Marais & Peacock 2008; Peacock 2012), the list was then reduced to those species recorded on

site during this study, or expected subjectively to occur within those habitats as either resident species or regular visitors.

The **probability of occurrence** of a bird species on site was based primarily on its geographical distribution and the suitability of on-site habitats, taking into account that birds use their mobility to make intermittent use of habitats available when these are in a particular condition (e.g. during or after rain, flood, drought, burning, grazing, seeding, flowering) or season (e.g. regional, intra-African or inter-continental summer/winter migrants and nomads). Of course, during a site visit, species of all levels of probability might be recorded because this estimate is only a subjective statistic. I assessed the overall expectation of each species on site as:

- **High probability:** Applies to a species with a distributional range overlying the study site plus the presence of prime habitat on site. Another consideration for inclusion in this category is the tendency for the species to be 'common', i.e. to occur normally at a high population density.
- **Medium probability:** Applies to a species with a distributional range that peripherally overlaps the study site and/or the required habitat on site being sub-optimal. The extent of suitable habitat on site, related to its likelihood to sustain a viable breeding or non-breeding population, and its geographical isolation are also taken into consideration. Species categorized as 'medium' normally do not occur at high population densities, but cannot be deemed rare.
- **Low probability:** Means that the species' distributional range is peripheral to the study site and the habitats are sub-optimal. Furthermore, some bird species categorized as 'low' are generally deemed rare.

Due to the considerable aerial mobility of birds, one might expect a number of additional species as either infrequent nomads or rare vagrants, some of which may even be recorded by chance during the site visit. For these **Unlikely** species, I judged that the habitats available would offer no significant material support or conservation assistance to them, other than a temporary stopover, and that even if they did occur it would only be briefly and in insignificant numbers.



I made no objective assessment of the carrying capacity of the habitat for any species, since this varies through time, birds being capable of arriving or departing as conditions change, and our ability to detect them varying seasonally. Such an assessment would require a much longer time and greater expense. However, I did pay special attention to species considered as threatened internationally or nationally, so-called Red Data or Red-listed species (Birdlife International website [www.birdlife.org](http://www.birdlife.org); DEAT 2007; Barnes, 2000), and so for any threatened species expected to visit the area, even as unlikely, I elevated the category assigned to them accordingly, based on the Precautionary Principle.

## **6. RESULTS**

I made a 19.5-hour (14:30 - 10:00 hrs) site visit on 26-27 November 2012 as part of an EcoAgent team, comprising Prof G.J. Bredenkamp (botanist) and Dr I.L. Rautenbach (mammalogist) who had made their surveys here a year earlier and whose reports should be read in conjunction with this assessment. The visit was made in midsummer, after Palaearctic and intra-African migrant bird species had arrived. The weather during the visit was after good early summer and recent rains had fallen, under mild clear to partly cloudy conditions, and with only a slight breeze.

### **6.1. Regional Bird Habitats**

Details of the vegetation communities and flora on site are the subject of a separate specialist report.

The general habitat at the site as identified for bird distributions occurs within the Moist Woodland biome (Allan *et al.* in Harrison *et al.* 1997) and, more specifically, the proposed development sites along the valley in the Central Sandy Bushveld vegetation unit of the Central Bushveld within the Savanna Biome (SVcb of Mucina & Rutherford 2006). All but the relatively small areas at the existing and proposed development sites comprise mainly large- or small-tree to shrubby woodland at various densities, situated within extensive surrounding areas of the same or similar bushveld habitats (Figs. 1-8).

The aerial mobility of birds also demands attention to the principal habitats surrounding the study site and their conservation status, not just those along the immediate borders but also more distant habitats that might provide sources for species visiting the site and sinks for those breeding on site. In this context, the Marakele National Park and Welgevonden Game Reserve to the north are important sources, but the mosaic of other small private conservation areas throughout the Waterberg to the north and Springbok Flats to the south are also relevant to avian megapopulations throughout the general area.

## **6.2. On-site Bird Habitat Assessment**

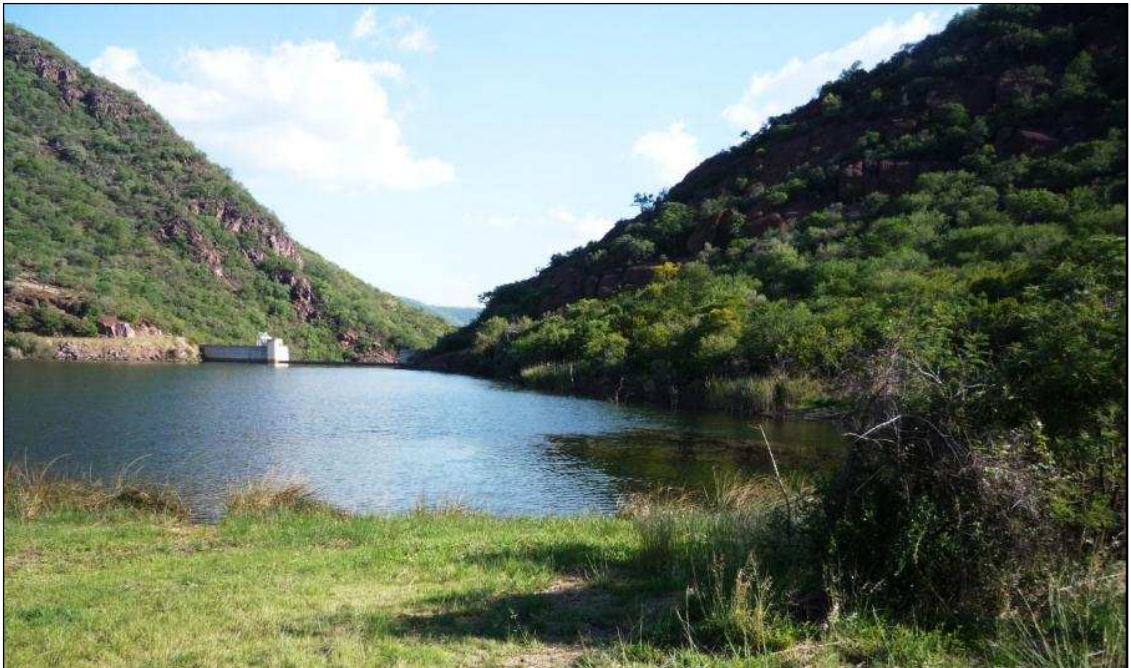
The principal habitat throughout the property is various forms of woodland and/or bushveld. The only obviously different habitat is the Rookpoort Dam, significant as an attractant to birds because of its relatively large size as a water body within the greater area. For the purposes of this assessment, the roads/tracks and associated bare areas, and the existing buildings, are also discussed separately because they are listed as part of the developments that require assessment.

From the perspective of flighted avian species, the relatively small extent and wide scatter of each of the individual developments, existing and proposed, are not considered relevant to interrupt the local movements and/or wider distributions of the bird species present. Basically, savanna bird species are either generalists, affected mainly by the overall tree and bush size and density, or they show a preferences for broad-leaved (e.g. *Combretum*, *Terminalia*, *Zizyphus*, *Ficus*) versus fine-leaved woody plants (e.g. *Acacia*, *Dicrostachys*, *Peltophorum*), the latter division generally correlated with less productive 'sourveld' on sandy soils versus more productive 'sweetveld' on clay soils. The tree types and sizes are obviously not discretely separate, but rather mixed in various combinations and densities. Most of the property supports broad-leaved savanna, interspersed with higher densities or patches of finer-leaved savannas at smaller scales, but none equivalent to the fine-leaved predominance of the Western Sandy Bushveld (SVcb 16) with its different subset of bird species that begins just west of the property. To discriminate some of the finer subjective savanna habitat

preferences, the sub-habitats of each savanna site was considered as one of the following:

1) Savanna woodland/bushveld

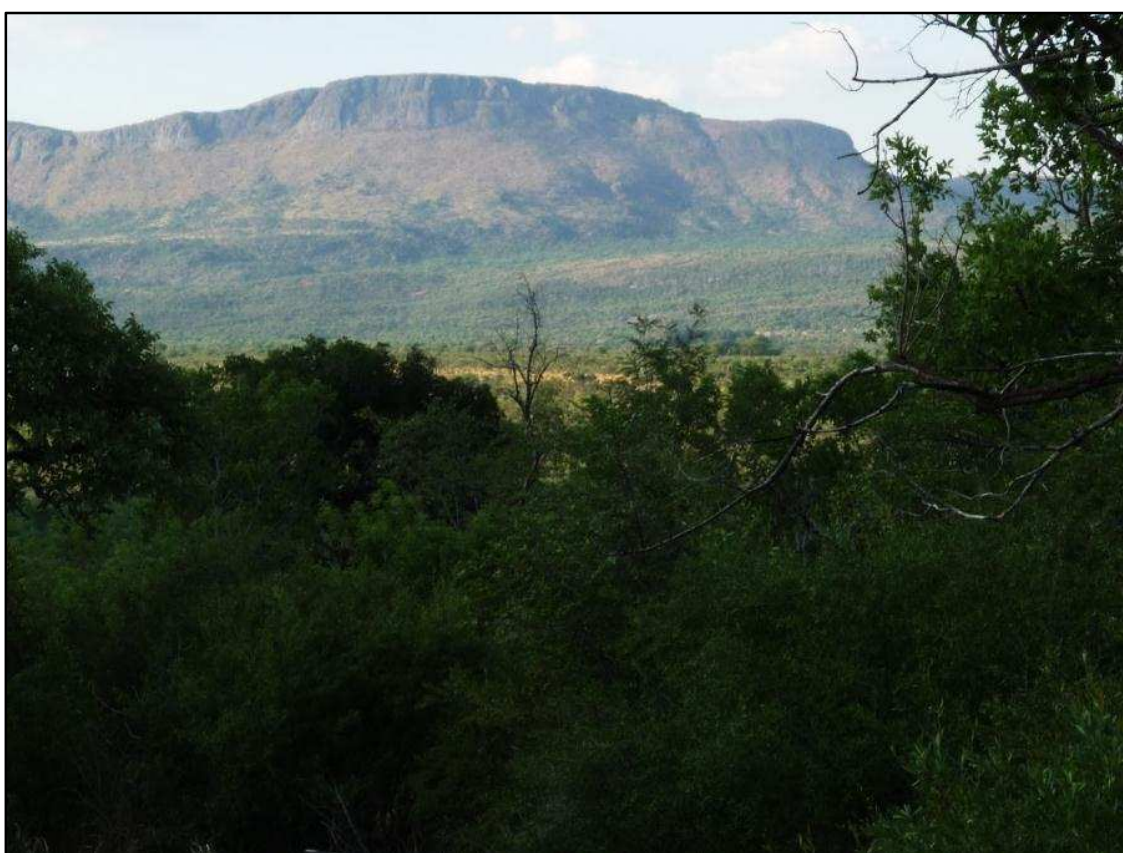
1a) Taller and denser woodland, Sites 1, 2, 4, 7. This habitat was found mostly along the base of the hills and especially along the banks of the drainage lines, including up into the valleys and gorges of the mountains. Some of the larger trees included *Acacia*, *Burkea*, *Celtis*, *Euphorbia*, *Faurea*, *Ficus*, *Lannea*, *Peltophorum* and *Zizyphus*. Ground cover is generally shaded and sparse, but taller and coarser on the more exposed rocky slopes. Several species that occur on the rocks and cliffs among the tall trees are actually more dependent on this substrate than on the wooded cover. Some open marshy patches with tall dense grasses and sedges occurred alongside the seasonal drainage lines and seeps, with open grassy areas under or between the trees retained on the development sites, but sometimes encroached by *Dicrostachys* shrubs (Photos 1-3).



**Photo 1:** View south over the Rookpoort Dam wall showing an example of tall dense woodland along the base of the Meletse range.



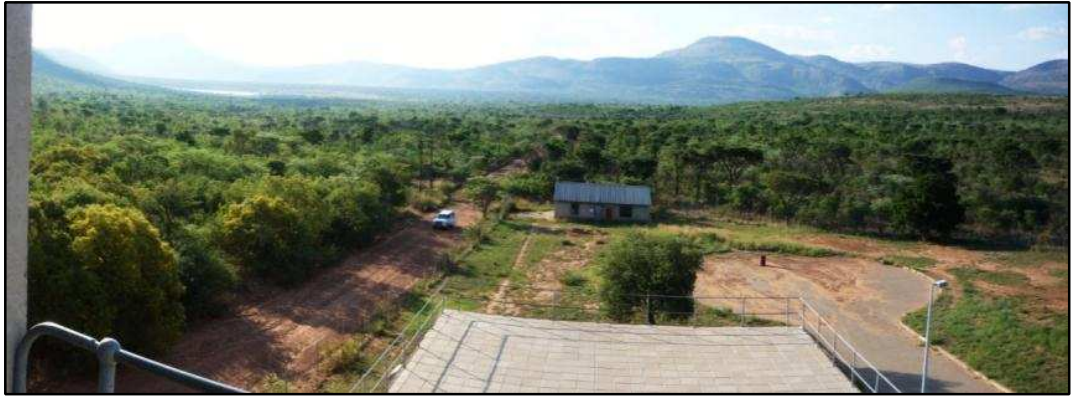
**Photo 2:** Panoramic view northeast from the Rookpoort Dam of the Sandrivier range and the tall dense woodland along its foothills, with the water tanks above Sites 1 & 2, the existing training camp A and its residential area, on the far left.



**Photo 3:** View north through the tall dense woodland at the foothill of the Meletse range above Site 7, the proposed new shooting range and admin block, with the Sandrivier range and its wooded foothills in the distance.

1b) Lower, denser woodland, Sites 5, 6, 10.1.1, 10.1.2. Smaller, more densely-packed trees with coarse grass cover wherever sunlight penetrates in less dense area, mainly on degraded patches in the western half of the valley. Obvious tree species include *Burkea*, *Combretum*, *Dombeya*, *Terminalia* and *Searsia*, with various

shrubs including *Grewia* and, especially in previously disturbed areas, *Terminalia sericea* and/or *Dicrostachys cinerea* encroachment. Most openings are formed by eroded sheet washes alongside drainage lines, except for old fields or gravel pits/rubbish dumps near the D926 gravel road (Photos 4-9).



**Photo 4:** View west from the top of the urban training facility across the low dense woodland of the valley floor, with the Rookpoort Dam and Site 6, training camp B, on the far left and the Sandrivier range on the far right.





**Photo 5:** View of the low woodland, here of medium density, at Site 5, the proposed new ammunition safe, from the road that will run between the safes. Note that this site will be cleared of all vegetation for safety reason.



**Photo 6:** View west towards the existing ammunition safe, just visible, at Site 5, showing denser low woodland than in Photo 5, which would also be cleared.

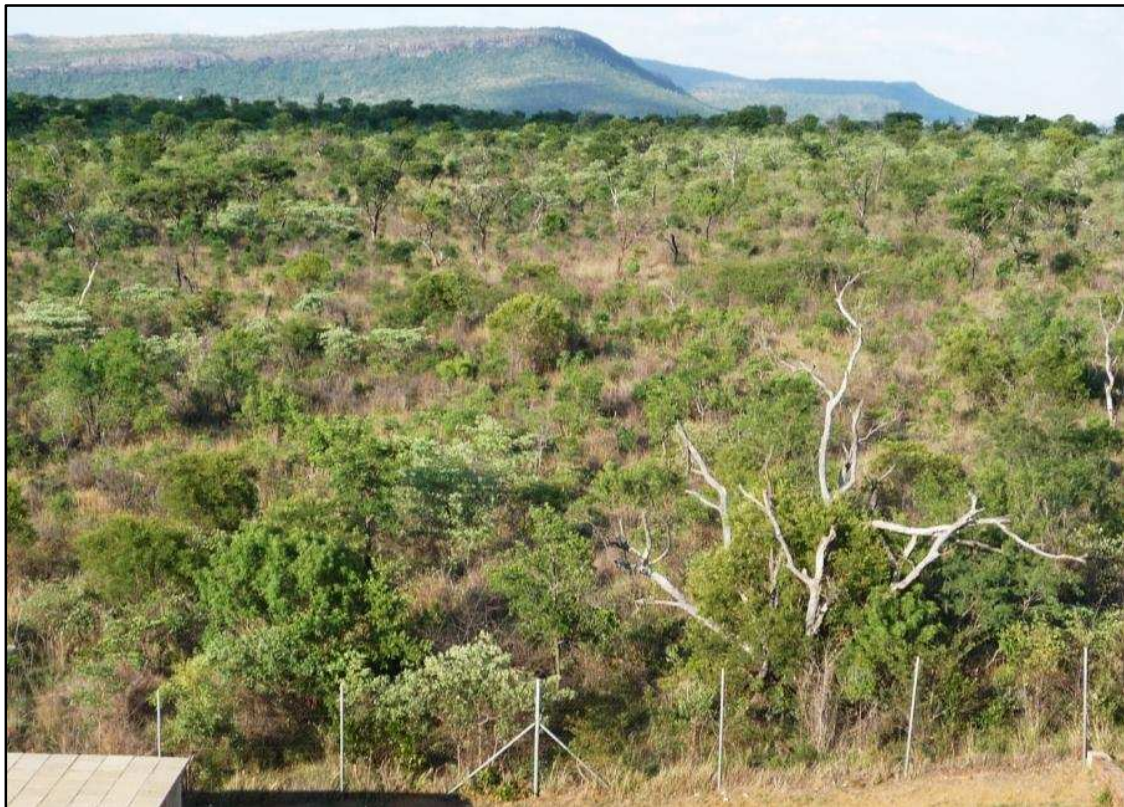


**Photo 7:** View northeast from the main access road to Site 1, the existing training camp A, showing the tall dense woodland on the foothills in the background and, on the left side of the road, the low dense woodland where a servitude would have to be cleared for the of the gravity-fed sewage lines 10.1.1 and 10.1.2 to their respective sewage works.



**Photo 8:** View southwest across the D928 Thabazimbi-Alma road from the main entrance to the Academy, showing the low dense woodland where the gravity-fed sewage servitudes 10.1.1 and 10.1.2 split to their respective works further south.





**Photo 9:** View northwest from the top of the urban training facility showing a medium-density section of the lower woodland that covers the western part of the SAPS property, with the Sandrivier range and its tall dense wooded foothills in the background.

1c) Low, shrubby bushveld, Sites 3, 8, 9, 10.2. Generally smaller trees with more open areas, some of this apparently due to shallower, more-gravelly soils (as revealed by bare areas at washes and/or erosion areas), but also due to past effects of unsuitable veld management and transformation on the farm Buffelspoort 459 KQ. Some stands of larger trees along watercourses, notably *Spirostachys*, but the rest mostly *Acacia*, *Dombeya*, *Euclea*, *Lannea*, *Mundulea* and *Searsia* species, with *Dichrostachys cinerea* shrubs encroaching in degraded areas and small *Terminalia sericea* trees in others. The shallower soils across the property, but especially in the south-eastern sector, seem especially prone to erosion, some of it as sheets on natural or on previously degraded areas, but most obvious as ditches along some of the unmaintained roads/tracks (Photos 10-11).



**Photo 10:** View north across the D928 Thabazimbi-Alma road showing the scrubby savanna left of the gate where Site 3, the Groenfontein residential area is proposed, and, in the left background, the small kloofs leading into the tall-wooded Site 4, an existing training camp, in the Sandrivier foothills.



**Photo 11:** View south down the existing runway, with its parking block in the foreground, showing some of the scrubby savanna to the right (west) where the proposed new runway and admin building will be placed.

2) Rookpoort Dam, and smaller dams/pools. This large dam, supported by some of the smaller permanent small dams/pools, is attractive to birds because of its large size, especially within an area of mainly small farms dams and few permanent natural water bodies due to the permeable sandy soils. It is fed by streams and springs from the Sandrivier range, most of which are seasonal, and the exit stream is also small, so associated riverine systems are minor attractants. Although well-stocked with fish, the dam is deep with rocky margins and few perching sites, the only shallow and muddy margins restricted to its upper reaches where the main reed beds, lily pads and associated wetland vegetation occur (Photos 12-13).





**Photo 12:** View northwest from the lower end of the Rookpoort Dam, showing the little-vegetated and rocky shoreline with reed beds only distantly visible at the top end. See Photo 1 for a view in the opposite direction towards the dam wall.



**Photo 13:** View west from the top end of the Rookpoort Dam, looking towards Site 7, the proposed new shooting range and admin building, in the dense woodland on the foothills of the Meletse range, with the reed beds at the top end of the Rookpoort Dam in the middle ground. Note the erosion on the degraded surfaces in the foreground and, in the left background, the buildings of the urban training facility.

3) Roads and bare degraded/eroded areas, Sites 11 and others. This is not really a separate or important avian habitat, but is one of the site-categories requested for assessment. Degraded bare and eroded areas are included with the roads as all are prone to the same problems of erosion and management requirements (Photos 14-18).

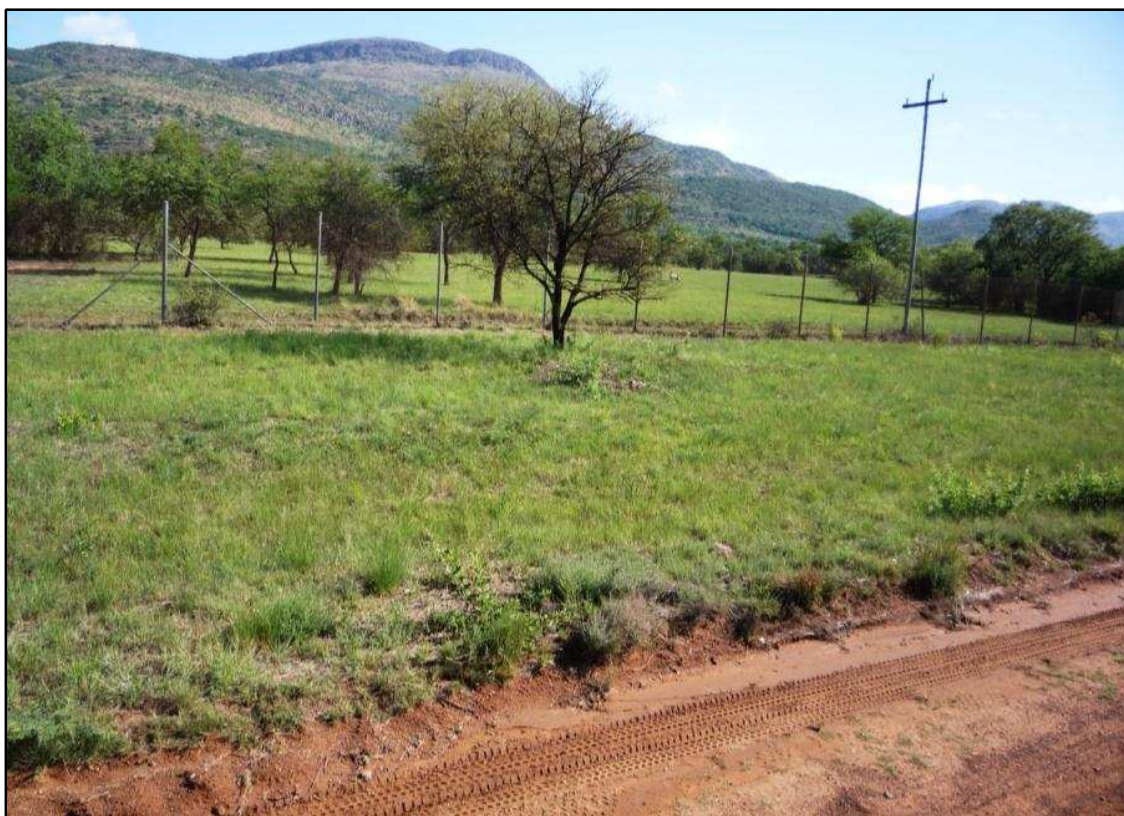


**Photo 14:** View south along the road leading to Site 7, just past the urban training facility, showing the eroded road from lack of drainage to reduce velocity of rainwater runoff, even though the road has been surfaced. See also Photo 13 for flatter erosion surfaces on degraded ground cover.





**Photo 15:** Gravel borrow pit near the urban training facility, showing the bare surface exposed to erosion, but the positive benefit of the water that has gathered as a temporary source for wild animals is also relevant, and may be enhanced by adding a clay lining during rehabilitation.



**Photo 16:** View northwest from the D928 Thabazimbi-Alma road showing the well-grassed remains of earlier cropland, now within the game fence, and the resulting lack of

erosion. An ungrassed borrow pit on the opposite (south) side of the road, now used as a dump site, offers a stark comparison in unmanaged transformation.



**Photo 17:** View south across a sparsely wooded and disturbed area at the turnoff to the runway from the D928 Thabazimbi-Alma road, showing the slow recovery of such disturbed and excavated habitats, not assisted by random dumping within the scattered scrapes across the area.





**Photo 18:** View north across the same disturbed area as in Photo 16, showing the less disturbed dense woodland and, further up (north) the small kloofs leading into the tall-wooded Site 4, an existing training camp, in the Sandrivier foothills.

4) Buildings and other manmade structures. These structures are used as nest sites by some commensal species (e.g. House Sparrow, Common Myna), but mostly by others that would otherwise nest on or under ledges on the surrounding cliffs and erosion dongas (e.g. smallows, swifts, chats) (Photo 19).

Otherwise, the broader habitats adjacent to the study sites are mainly extensions of those present on site, apparently even further than the 500-m buffer examined on satellite images. Just further east along the valley much of the bushveld has been cleared as grazing fields, with small dams obvious along the watercourses, while to the west *Acacia*-dominated savanna begins on the drier, flatter sandy terrain. The different neighbouring habitats support birds not expected regularly on the property habitats, but the latter extend for some distance north into the Waterberg and south of the Meletse hills. I generally did not assign aerial-feeding species, such as swifts, martins and swallows, to a specific habitat on site, except for those habitats that offered potential nesting habitats, since they feed wherever aerial wind-borne plankton is available.



**Photo 19:** View of part of the urban training facility, showing the open windows offering access to an empty building used as nest sites by various swifts, swallows and chats (with the location for Site 7, the proposed new shooting range and admin building, in the densely wooded foothills behind) .

**Table 1:** Ratings of recognised avian habitats on and around (site + 500 m buffer) the SAPS Operational and Tactical Academy, Thabazimbi, Limpopo (2427DA and 2427DB).

Avian Habitats	Conservation Priority					Sensitivity	
	High	Medium-high	Medium	Medium-low	Low	High	Low
1a) Taller, denser woodlands	X					X	
1b) Low, dense woodlands		X				X	
1c) Low, shrubby woodlands			X				X
2) Drainage lines and Rookpoort Dam		X				X	
3) Roads, bare degraded areas				X			X

### 6.3. Expected and Observed Bird Species Diversity

At least 281 bird species can be expected for the site, based on the 2427DA and 2427DB QDGCs (Sabap 1) or the pentads therein (Sabap 2) within which the site fell. Of these, I assessed that even more, 324 bird species, have a high, medium or low probability to occur on site, based on the diverse and rich habitats

available, excluding some from the lists that occur mainly on the more extensive secondary grasslands to the east and the drier Western Sandy Bushveld to the west. Of the 281 species reported I confirmed the presence of 107 species (38%), including 20 species not seen during the site visit but reported by WO H. Kruger, which offers a good sample in support of general species:habitat correlations (Table 2). The number would surely have been higher if we had spent more days/seasons in search of species, if the surveys had started earlier and extended later in the day/night, and if we had covered every sector in more detail. I scored 171 out of the 324 species (53%) as having a highly probability of occurrence, 81 species (25%) a medium probability and 72 species (22%) a low probability, and of these I confirmed (or had reported) the presence of 99, 5 and 3 (all reported) species, respectively. The total number of species expected would be much larger if other unlikely species that are only expected as rare vagrants to the area were not excluded from this analysis due to inadequate availability of their preferred habitat(s).

The four main different habitat types (plus the three variants of the savanna) that I distinguished either support or are expected to support somewhat different species of birds (Table 2). The majority (283, 87%) are expected only in a single habitat type, usually the savanna, with only 25 species (8%) in two main habitat types, a single species (<1%) in three habitats, but then 15 species (5%) in all four habitats only because they are aerial foragers that feed above every habitat. Based on a total of 651 assessments of predicted habitat preferences, by far the majority (510, 78%) favoured some form of savanna woodland and/or bushveld. Low shrubby bushveld (1c) was unexpectedly the richest savanna habitat, predicted to attract 195 (30%) for the expected species, low dense woodland (1b) was next most attractive (169 species, 26%), and tall dense foothill woodland (1a) was least attractive (146 species, 22%), although of course somewhat different species were attracted to each category. For the remaining non-savanna habitats, while 86 species (13%) were expected at the dam and other water bodies, only 21 species (3%) were expected to use the roads and other bare areas and 34 species (5%) the manmade structures. The 15 aerial-feeding species are included within the above analysis, not only for all the habitats they range across when feeding, but also if there are terrestrial habitats that some might use for breeding, such as the buildings. Overall, savanna supported by far the highest diversity, especially the low

shrubby bushveld whose mosaic of different heights and densities was expected to support various more open-habitat species, while the dam and water bodies came a distant second and the manmade structures and open areas had least significance.

**Table 2:** Bird species diversity **observed (reported)** or expected on and around the SAPS Operational and Tactical Academy, Thabazimbi, Limpopo (2427DA and 2427DB). Based on the national list and annotations of Birdlife South Africa (2011), sorted in the order of 'Roberts VII' (Hockey *et al.*, 2005), with probability of occurrence and habitat preferences assessed after a site visit on 26-27 November 2012 and comparison with lists from SABAP 1 & 2 ([www.sabap2.org](http://www.sabap2.org)).

Common English Name	Scientific Name	Status Codes (see below)			Probability of occurrence (see 5.4 above)			Preferred Habitats (see 6.2 above)
		RD	S	E	High	Medium	Low	
Coqui Francolin	<i>Peliperdix coqui</i>				H			1b,c
Crested Francolin	<i>Dendroperdix sephaena</i>				H			1b,c
Natal Spurfowl	<i>Pternistis natalensis</i>				H			1a
Swainson's Spurfowl	<i>Pternistis swainsonii</i>				H			1b,c
Common Quail	<i>Coturnix coturnix</i>		NBM				L	1c
Harlequin Quail	<i>Coturnix delegorguei</i>					M		1c
Helmeted Guinea fowl	<i>Numida meleagris</i>				H			1b,c
White-faced Duck	<i>Dendrocygna viduata</i>					M		2
Egyptian Goose	<i>Alopochen aegyptiaca</i>					M		2
Spur-winged Goose	<i>Plectropterus gambensis</i>						L	2
Comb Duck	<i>Sarkidiornis melanotos</i>						L	2
Cape Teal	<i>Anas capensis</i>						L	2
African Black Duck	<i>Anas sparsa</i>				H			2
Yellow-billed Duck	<i>Anas undulate</i>					M		2
Cape Shoveler	<i>Anas smithii</i>						L	2
Red-billed Teal	<i>Anas erythrorhyncha</i>					M		2
Southern Pochard	<i>Netta erythrophthalma</i>						L	2
Kurrichane Buttonquail	<i>Turnix sylvaticus</i>				H			1c
Greater Honeyguide	<i>Indicator indicator</i>				H			1a,b,c
Lesser Honeyguide	<i>Indicator minor</i>				H			1a,b,c
Brown-backed Honeybird	<i>Prodotiscus regulus</i>				H			1a,b,c
Red-throated Wryneck	<i>Jynx ruficollis</i>						L	1c
(Bennett's Woodpecker)	<i>Campethera bennettii</i>				H			1b,c
Golden-tailed Woodpecker	<i>Campethera abingoni</i>				H			1a,b

Cardinal Woodpecker	<i>Dendropicos fuscescens</i>				H		1a,b,c
Bearded Woodpecker	<i>Dendropicos namaquus</i>				H		1a,b
Yellow-fronted Tinkerbird	<i>Pogoniulus chrysoconus</i>				H		1a,b,c
Acacia Pied Barbet	<i>Tricholaema leucomelas</i>					M	1b,c
<b>Black-collared Barbet</b>	<b><i>Lybius torquatus</i></b>				H		<b>1a,b,c</b>
Crested Barbet	<i>Trachyphonus vaillantii</i>				H		1a,b,c
Red-billed Hornbill	<i>Tockus rufostris</i>					M	1c
<b>Southern Yellow-billed Hornbill</b>	<b><i>Tockus leucomelas</i></b>				H		<b>1b,c</b>
<b>African Grey Hornbill</b>	<b><i>Tockus nasutus</i></b>				H		<b>1a,b,c</b>
<b>(Southern Ground-Hornbill)</b>	<b><i>Bucconus leadbeateri</i></b>	Vul					L 1c
African Hoopoe	<i>Upupa africana</i>					M	1b,c
<b>Green Wood-hoopoe</b>	<b><i>Phoeniculus purpureus</i></b>				H		<b>1a,b,c</b>
<b>(Common Scimitarbill)</b>	<b><i>Rhinopomastus cyanomelas</i></b>				H		<b>1b,c</b>
European Roller	<i>Coracias garrulous</i>		NBM			M	1c
<b>Lilac-breasted Roller</b>	<b><i>Coracias caudatus</i></b>				H		<b>1c</b>
Purple Roller	<i>Coracias naevius</i>					M	1b,c
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	NT					L 2
Malachite Kingfisher	<i>Alcedo cristata</i>					M	2
African Pygmy-Kingfisher	<i>Ispidina picta</i>		BM			M	1b
Grey-headed Kingfisher	<i>Halcyon leucocephala</i>		BM			M	1b
<b>Woodland Kingfisher</b>	<b><i>Halcyon senegalensis</i></b>		BM		H		<b>1a,b</b>
<b>Brown-hooded Kingfisher</b>	<b><i>Halcyon albiventris</i></b>				H		<b>1a,b,c</b>
Striped Kingfisher	<i>Halcyon chelicuti</i>				H		1b,c
Giant Kingfisher	<i>Megaceryle maxima</i>						L 2
Pied Kingfisher	<i>Ceryle rudis</i>					M	2
White-fronted Bee-eater	<i>Merops bullockoides</i>					M	1b,c
Little Bee-eater	<i>Merops pusillus</i>				H		1b,c
Swallow-tailed Bee-eater	<i>Merops hirundineus</i>						L 1c
Carmine Bee-eater	<i>Merops nubicoides</i>		NBM				L 1b,c
<b>European Bee-eater</b>	<b><i>Merops apiaster</i></b>		B/NBM		H		<b>1a,b,c</b>
<b>(Speckled Mousebird)</b>	<b><i>Colius striatus</i></b>				H		<b>1a,b,c</b>
Red-faced Mousebird	<i>Urocolius indicus</i>				H		1b,c
Jacobin Cuckoo	<i>Clamator jacobinus</i>		BM		H		1a,b
Levaillant's Cuckoo	<i>Clamator levaillantii</i>		BM		H		1a,b
Great Spotted Cuckoo	<i>Clamator glandarius</i>		BM			M	1b,c
<b>Red-chested Cuckoo</b>	<b><i>Cuculus solitaries</i></b>		BM		H		<b>1a,b</b>
<b>Black Cuckoo</b>	<b><i>Cuculus clamosus</i></b>		BM		H		<b>1a,b,c</b>
Common Cuckoo	<i>Cuculus canorus</i>		NBM			M	1a,b
African Cuckoo	<i>Cuculus gularis</i>		BM				L 1b,c
Klaas's Cuckoo	<i>Chrysococcyx klaas</i>				H		1a,b,c
Diderick Cuckoo	<i>Chrysococcyx caprius</i>		BM		H		1a,b,c
<b>Burchell's Coucal</b>	<b><i>Centropus burchellii</i></b>				H		<b>1a,b,c; 2</b>



(Meyer's Parrot)	<i>Poicephalus meyeri</i>					M	1a,b
African Palm-Swift	<i>Cypsiurus parvus</i>					M	Aerial
Alpine Swift	<i>Tachymarptis melba</i>		BM		H		Aerial
African Black Swift	<i>Apus barbatus</i>				H		Aerial
Little Swift	<i>Apus affinis</i>				H		Aerial, 4
Horus Swift	<i>Apus horus</i>						L Aerial, 4
White-rumped Swift	<i>Apus caffer</i>		BM		H		Aerial, 4
Grey Go-away-bird	<i>Corythaixoides concolor</i>				H		1b,c
Barn Owl	<i>Tyto alba</i>					M	1a,b,c; 4
African Scops-Owl	<i>Otus senegalensis</i>				H		1b,c
Southern White-faced Scops-Owl	<i>Ptilopsis granti</i>						L 1b,c
Cape Eagle-Owl	<i>Bubo capensis</i>						L 1a
(Spotted Eagle-Owl)	<i>Bubo africanus</i>				H		1a,b,c; 4
(Verreaux's Eagle-Owl)	<i>Bubo lacteus</i>				H		1a,b
Pearl-spotted Owlet	<i>Glauclidium perlatum</i>				H		1b,c
Fiery-necked Nightjar	<i>Caprimulgus pectoralis</i>				H		1b,c
Freckled Nightjar	<i>Caprimulgus tristigma</i>				H		1a
European Nightjar	<i>Caprimulgus europaeus</i>					M	1a,b
Rock Dove	<i>Columba livia</i>						L 4
Speckled Pigeon	<i>Columba guinea</i>				H		1a, 4
Laughing Dove	<i>Streptopelia senegalensis</i>				H		1a,b,c
Cape Turtle-Dove	<i>Streptopelia capicola</i>				H		1b,c
Red-eyed Dove	<i>Streptopelia semitorquata</i>				H		1a,b
Emerald-spotted Wood-Dove	<i>Turtur chalcospilos</i>				H		1a,b,c
Namaqua Dove	<i>Oena capensis</i>						L 1c; 3
African Green-Pigeon	<i>Treron calvus</i>				H		1a,b
Red-crested Korhaan	<i>Lophotis ruficrista</i>					M	1b,c
Blue Crane	<i>Anthropoides paradiseus</i>	Vul					L 1c
Red-chested Flufftail	<i>Sarothrura rufa</i>						L 2
African Rail	<i>Rallus caerulescens</i>					M	2
African Crane	<i>Crecopsis egregia</i>		BM				L 2
Corn Crane	<i>Crex crex</i>	Vul	NBM				L 1c; 2
Black Crane	<i>Amaurornis flavirostra</i>					M	2
Baillon's Crane	<i>Porzana pusilla</i>						L 2
African Purple Swampphen	<i>Porphyrio madagascariensis</i>						L 2
Common Moorhen	<i>Gallinula chloropus</i>					M	2
Lesser Moorhen	<i>Gallinula angulata</i>		BM				L 2
Red-knobbed coot	<i>Fulica cristata</i>						L 2
Double-banded Sandgrouse	<i>Pterocles bicinctus</i>				H		1b,c
African Snipe	<i>Gallinago nigripennis</i>						L 2
Marsh Sandpiper	<i>Tringa stagnatilis</i>		NBM			M	2
Common Greenshank	<i>Tringa nebularia</i>		NBM			M	2

Wood Sandpiper	<i>Tringa glareola</i>		NBM			M	2
Common Sandpiper	<i>Actitis hypoleucos</i>		NBM			M	2
Little Stint	<i>Calidris minuta</i>		NB			M	2
Ruff	<i>Philomachus pugnax</i>		NBM			M	2
Greater Painted-snipe	<i>Rostratula benghalensis</i>	NT					L 2
<b>African Jacana</b>	<i>Actophilornis africanus</i>				H		2
<b>(Spotted Thick-knee)</b>	<i>Burhinus capensis</i>				H		1a,b,c
Black-winged Stilt	<i>Himantopus himantopus</i>					M	2
Kittlitz's Plover	<i>Charadrius pecuarius</i>					M	2; 3
<b>(Three-banded Plover)</b>	<i>Charadrius tricollaris</i>				H		2; 3
<b>Blacksmith Lapwing</b>	<i>Vanellus amatus</i>				H		2; 3
<b>African Wattled Lapwing</b>	<i>Vanellus senegallus</i>				H		2
<b>Crowned Lapwing</b>	<i>Vanellus coronatus</i>				H		1c; 2; 3
Temminck's Courser	<i>Cursorius temminckii</i>				H		1c; 3
African Cuckoo Hawk	<i>Aviceda cuculoides</i>						L 1a,b
Black-shouldered Kite	<i>Elanus caeruleus</i>				H		1b,c
Black Kite	<i>Milvus migrans</i>		NBM			M	1a,b,c
Yellow-billed Kite	<i>Milvus aegyptius</i>		BM			M	1a,b,c
<b>(African Fish-Eagle)</b>	<i>Haliaeetus vocifer</i>				H		2
<b>Cape Vulture</b>	<i>Gyps coprotheres</i>	Vul			H		1b,c
Black-chested Snake-Eagle	<i>Circaetus pectoralis</i>				H		1c
<b>Brown Snake-Eagle</b>	<i>Circaetus cinereus</i>				H		1b,c
<b>(African Harrier-Hawk)</b>	<i>Polyboroides typus</i>				H		1a,b,c; 4
Lizard Buzzard	<i>Kaupifalco monogrammicus</i>				H		1b,c
Gabar Goshawk	<i>Melierax gabar</i>					M	1c
African Goshawk	<i>Accipiter tachiro</i>						L 1a
Shikra	<i>Accipiter badius</i>				H		1b,c
Little Sparrowhawk	<i>Accipiter minullus</i>					M	1a
<b>Black Sparrowhawk</b>	<i>Accipiter melanoleucus</i>				H		1a
Steppe Buzzard	<i>Buteo buteo</i>		NBM		H		1b,c
Jackal Buzzard	<i>Buteo rufofuscus</i>			(*)		M	1a,b,c
Verreaux's Eagle	<i>Aquila verreauxii</i>						L 1a
<b>(African Hawk-Eagle)</b>	<i>Aquila spilogaster</i>				H		1a,b,c
<b>Wahlberg's Eagle</b>	<i>Hieraaetus wahlbergi</i>		BM		H		1b,c
<b>(Martial Eagle)</b>	<i>Polemaetus bellicosus</i>	Vul				M	1a,b,c
<b>(Secretarybird)</b>	<i>Sagittarius serpentarius</i>	Vul					L 1c
Rock Kestrel	<i>Falco rupicolus</i>				H		1b,c; 4
Amur Falcon	<i>Falco amurensis</i>		NBM			M	1b,c
Lanner Falcon	<i>Falco biarmicus</i>	NT			H		1b,c
Peregrine Falcon	<i>Falco peregrinus</i>	NT					L 1a,b,c
Little Grebe	<i>Tachybaptus ruficollis</i>					M	2
<b>(African Darter)</b>	<i>Anhinga rufa</i>					M	2

Reed Cormorant	<i>Phalacrocorax africanus</i>					M	2
White-breasted Cormorant	<i>Phalacrocorax lucidus</i>					M	2
<b>Little Egret</b>	<b><i>Egretta gazetta</i></b>					<b>M</b>	<b>2</b>
Yellow-billed Egret	<i>Egretta intermedia</i>						L 2
Great Egret	<i>Egretta alba</i>						L 2
<b>(Grey Heron)</b>	<b><i>Ardea cinerea</i></b>					<b>M</b>	<b>2</b>
<b>(Black-headed Heron)</b>	<b><i>Ardea melanocephala</i></b>				H		<b>1c, 2</b>
Purple Heron	<i>Ardea purpurea</i>					M	2
<b>Cattle Egret</b>	<b><i>Bubulcus ibis</i></b>				H		<b>1c, 2</b>
Squacco Heron	<i>Ardeola ralloides</i>				H		2
<b>(Green-backed Heron)</b>	<b><i>Butorides striata</i></b>				H		<b>2</b>
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>					M	2
<b>Hamerkop</b>	<b><i>Scopus umbretta</i></b>				H		<b>2</b>
<b>Hadedda Ibis</b>	<b><i>Bostrychia hagedash</i></b>				H		<b>1a; 2</b>
African Sacred Ibis	<i>Threskiornis aethiopicus</i>						L 2
African Spoonbill	<i>Platalea alba</i>						L 2
Black Stork	<i>Ciconia nigra</i>	NT				M	2
Abdim's Stork	<i>Ciconia abdimii</i>		NBM				L 1c; 2
<b>(Woolly-necked Stork)</b>	<b><i>Ciconia episcopus</i></b>	NT					L 2
White Stork	<i>Ciconia ciconia</i>		NBM				L 1c; 2
Eurasian Golden Oriole	<i>Oriolus oriolus</i>		NBM				L 1a,b
<b>Black-headed Oriole</b>	<b><i>Oriolus larvatus</i></b>				H		<b>1a,b</b>
<b>Fork-tailed Drongo</b>	<b><i>Dicrurus adsimilis</i></b>				H		<b>1a,b,c</b>
<b>African Paradise-Flycatcher</b>	<b><i>Terpsiphone viridis</i></b>				H		<b>1a,b</b>
Brubru	<i>Nilous afer</i>				H		1a,b,c
<b>Black-backed Puffback</b>	<b><i>Dryoscopus cubla</i></b>				H		<b>1a,b,c</b>
<b>Black-crowned Tchagra</b>	<b><i>Tchagra senegalus</i></b>				H		<b>1a,b,c</b>
<b>Brown-crowned Tchagra</b>	<b><i>Tchagra australis</i></b>				H		<b>1a,b,c</b>
<b>Southern Boubou</b>	<b><i>Laniarius ferrugineus</i></b>				H		<b>1a,b,c</b>
Crimson-breasted Shrike	<i>Laniarius atrococcineus</i>						L 1c
<b>Orange-breasted Bush-Shrike</b>	<b><i>Chlorophoneus sulfureopectus</i></b>				H		<b>1a,b,c</b>
Grey-headed Bush-Shrike	<i>Malaconotus blanchoti</i>				H		1a,b,c
White-crested Helmet-Shrike	<i>Prionops plumatus</i>				H		1b,c
<b>Chinspot Batis</b>	<b><i>Batis molitor</i></b>				H		<b>1a,b,c</b>
Cape Crow	<i>Corvus capensis</i>						L 1c
Pied crow	<i>Corvus albus</i>					M	1a,b,c
Red-backed Shrike	<i>Lanius collurio</i>		NBM			M	1b,c
<b>Lesser Grey Shrike</b>	<b><i>Lanius minor</i></b>		NBM		H		<b>1b,c</b>
Common Fiscal	<i>Lanius collaris</i>					M	1c
Magpie Shrike	<i>Corvinella melanoleuca</i>						L 1c
Southern White-crowned Shrike	<i>Eurocephalus anguitemens</i>					M	1b
<b>Black Cuckooshrike</b>	<b><i>Campephaga flava</i></b>				H		<b>1a,b,c</b>



Grey Penduline-Tit	<i>Anthoscopus caroli</i>				H		1b,c
<b>Southern Black Tit</b>	<b><i>Parus niger</i></b>				H		<b>1a,b,c</b>
Ashy Tit	<i>Parus cinerascens</i>				H		1b,c
Brown-throated Martin	<i>Riparia paludicola</i>					L	Aerial
<b>Barn Swallow</b>	<b><i>Hirundo rustica</i></b>		NBM		H		<b>Aerial</b>
<b>White-throated Swallow</b>	<b><i>Hirundo albigularis</i></b>		BM		H		<b>Aerial, 4</b>
Pearl-breasted Swallow	<i>Hirundo dimidiata</i>					M	Aerial, 1b
<b>Greater Striped Swallow</b>	<b><i>Cecropis cucullata</i></b>		BM		H		<b>Aerial, 4</b>
Lesser Striped Swallow	<i>Cecropis abyssinica</i>		BM			M	Aerial, 4
Red-breasted Swallow	<i>Cecropis semirufa</i>				H		Aerial, 4
<b>(Rock Martin)</b>	<b><i>Hirundo fuligula</i></b>				H		<b>Aerial, 4</b>
Common House-Martin	<i>Delichon urbicum</i>		NBM			M	Aerial
<b>Dark-capped Bulbul</b>	<b><i>Pycnonotus tricolor</i></b>				H		<b>1a,b,c</b>
African Red-eyed Bulbul	<i>Pycnonotus nigricans</i>					L	1c
Yellow-bellied Greenbul	<i>Chlorocichla flaviventris</i>					M	1a,b
Fairy Flycatcher	<i>Stenostira scita</i>			(*)		M	1b,c
Cape Grassbird	<i>Sphenoeacus afer</i>			(*)		M	1a
<b>Long-billed crombec</b>	<b><i>Sylvietta rufescens</i></b>				H		<b>1a,b,c</b>
Yellow-bellied Eremomela	<i>Eremomela icteropygialis</i>				H		1b,c
Burnt-necked Eremomela	<i>Eremomela usticollis</i>					M	1c
Little Rush-Warbler	<i>Bradypterus baboecala</i>					M	2
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>		NBM			L	2
African Reed-Warbler	<i>Acrocephalus baeticatus</i>		BM			M	2
Marsh Warbler	<i>Acrocephalus palustris</i>		NBM			L	2
Great Reed-Warbler	<i>Acrocephalus arundinaceus</i>		NBM			M	2
Lesser Swamp-Warbler	<i>Acrocephalus gracilirostris</i>				H		2
Icterine Warbler	<i>Hippolais icterina</i>		NBM		H		1a,b,c
<b>Willow Warbler</b>	<b><i>Phylloscopus trochilus</i></b>		NBM		H		<b>1a,b,c</b>
<b>Arrow-marked Babbler</b>	<b><i>Turdoides jardineii</i></b>				H		<b>1a,b,c</b>
Chestnut-vented Tit-Babbler	<i>Sylvia subcaerulea</i>					M	1b,c
Garden Warbler	<i>Sylvia borin</i>		NBM		H		1a,b,c
<b>Cape White-eye</b>	<b><i>Zosterops capensis</i></b>			(*)	H		<b>1a,b,c</b>
Lazy Cisticola	<i>Cisticola aberrans</i>					M	1a
<b>Rattling Cisticola</b>	<b><i>Cisticola chiniana</i></b>				H		<b>1a,b,c</b>
Tinkling Cisticola	<i>Cisticola rufilatus</i>					M	1a,b
Wailing Cisticola	<i>Cisticola lais</i>					M	1a
Levaillant's Cisticola	<i>Cisticola tinniens</i>					L	2
<b>Neddicky</b>	<b><i>Cisticola fulvacapilla</i></b>				H		<b>1a,b,c</b>
Zitting Cisticola	<i>Cisticola juncidis</i>					M	1c
Desert Cisticola	<i>Cisticola aridulus</i>					M	1c
<b>Tawny-flanked Prinia</b>	<b><i>Prinia subflava</i></b>				H		<b>1a,b,c; 2</b>
Black-chested Prinia	<i>Prinia flavicans</i>					L	1c

Bar-throated Apalis	<i>Apalis thoracica</i>				H		1a,b,c
<b>Grey-backed Camaroptera</b>	<b><i>Camaroptera brevicaudata</i></b>				H		<b>1a,b,c</b>
Barred Wren-Warbler	<i>Calamonastes fasciolatus</i>				H		1b,c
<b>Rufous-naped Lark</b>	<b><i>Mirafra africana</i></b>				H		<b>1c; 3</b>
Flappet Lark	<i>Mirafra rufocinnamomea</i>					M	1c
Sabota Lark	<i>Calendulauda sabota</i>				H		1b,c
Fawn-coloured Lark	<i>Calendulauda africanoides</i>						L 1b,c
Eastern Long-billed Lark	<i>Certhilauda semitorquata</i>			(*)			L 1a
Cape Rock-Thrush	<i>Monticola rupestris</i>			(*)	H		1a
<b>(Groundscraper Thrush)</b>	<b><i>Psophocichla litsitsirupa</i></b>				H		<b>1a,b,c</b>
<b>(Kurrichane Thrush)</b>	<b><i>Turdus libyanus</i></b>				H		<b>1a,b</b>
Pale flycatcher	<i>Bradornis pallidus</i>				H		1b
Marico flycatcher	<i>Bradornis mariquensis</i>					M	1c
Southern Black flycatcher	<i>Melaenornis pammelaina</i>				H		1a,b
Fiscal Flycatcher	<i>Sigelus silens</i>			(*)			L 1b,c
<b>Spotted flycatcher</b>	<b><i>Muscicapa striata</i></b>		NBM		H		<b>1a,b,c</b>
<b>African Dusky Flycatcher</b>	<b><i>Muscicapa adusta</i></b>				H		<b>1a</b>
Grey Tit-flycatcher	<i>Myioparus plumbeus</i>				H		1a,b,c
Cape Robin-Chat	<i>Cossypha caffra</i>				H		1a,b
<b>White-throated Robin-Chat</b>	<b><i>Cossypha humeralis</i></b>				H		<b>1a</b>
<b>White-browed Scrub-Robin</b>	<b><i>Erythropygia leucophrys</i></b>				H		<b>1a,b,c</b>
Kalahari Scrub-Robin	<i>Erythropygia paena</i>						L 1c
African Stonechat	<i>Saxicola torquatus</i>				H		2
Mountain Wheatear	<i>Oenanthe monticola</i>					M	1a; 4
Capped Wheatear	<i>Oenanthe pileata</i>						L 1c
<b>Familiar Chat</b>	<b><i>Cercomela familiaris</i></b>				H		<b>1a,b,c; 4</b>
Ant-eating Chat	<i>Myrmecocichla formicivora</i>						L 1c
<b>Mocking cliff-Chat</b>	<b><i>Thamnolaea cinnamomeiventris</i></b>				H		<b>1a; 4</b>
<b>Red-winged Starling</b>	<b><i>Onychognathus morio</i></b>				H		<b>1a,b; 4</b>
<b>Cape Glossy Starling</b>	<b><i>Lamprotornis nitens</i></b>				H		<b>1a,b,c</b>
Burchell's Starling	<i>Lamprotornis australis</i>				H		1b,c
<b>Violet-backed Starling</b>	<b><i>Cinnyricinclus leucogaster</i></b>				H		<b>1a,b,c</b>
Wattled Starling	<i>Creatophora cinerea</i>					M	1c
<b>Common Myna</b>	<b><i>Acridotheres tristis</i></b>		I		H		<b>4</b>
Red-billed Oxpecker	<i>Buphagus erythrorhynchus</i>	NT			H		1a,b,c
<b>Amethyst Sunbird</b>	<b><i>Chalcomitra amethystina</i></b>				H		<b>1a,b,c</b>
<b>Greater Double-collared Sunbird</b>	<b><i>Cinnyris afer</i></b>			*	H		<b>1a</b>
<b>White-bellied Sunbird</b>	<b><i>Cinnyris talatala</i></b>				H		<b>1a,b,c</b>
<b>Marico Sunbird</b>	<b><i>Cinnyris mariquensis</i></b>				H		<b>1a,b,c</b>
Red-billed Buffalo-Weaver	<i>Bubalomis niger</i>						L 1c
Scaly-feathered Finch	<i>Sporopipes squamifrons</i>						L 1c
White-browed Sparrow-Weaver	<i>Plocepasser mahali</i>						L 1c

Lesser Masked Weaver	<i>Ploceus intermedius</i>					M	1b,c
<b>Southern Masked-Weaver</b>	<b><i>Ploceus velatus</i></b>				H		<b>1a,b,c</b>
<b>Village Weaver</b>	<b><i>Ploceus cucullatus</i></b>				H		<b>1a,b</b>
Red-headed Weaver	<i>Anaplectes rubriceps</i>				H		1a,b,c; 4
Thick-billed Weaver	<i>Amblyospiza albifrons</i>						L 2
Red-billed Quelea	<i>Quelea quelea</i>				H		1a,b,c
Yellow-crowned Bishop	<i>Euplectes afer</i>				H		2
Southern Red Bishop	<i>Euplectes orix</i>				H		2
<b>White-winged Widowbird</b>	<b><i>Euplectes albonotatus</i></b>				H		<b>1a,b,c; 2</b>
Red-collared Widowbird	<i>Euplectes ardens</i>				H		1a; 2
African Quailfinch	<i>Ortygospiza fuscocrissa</i>						L 1c
Red-headed Finch	<i>Amadina erythrocephala</i>						L 1c
Cut-throat Finch	<i>Amadina fasciata</i>				H		1a,b,c
Sweet Waxbill	<i>Coccyzygia melanotis</i>			(*)		M	1a
Black-faced Waxbill	<i>Estrilda erythronotos</i>						L 1c
Common Waxbill	<i>Estrilda astrild</i>				H		1a,b,c
Violet-eared Waxbill	<i>Uraeginthus granatinus</i>					M	1c
<b>Blue Waxbill</b>	<b><i>Uraeginthus angolensis</i></b>				H		<b>1a,b,c</b>
Green-winged Pytilia	<i>Pytilia melba</i>				H		1a,b,c
Red-billed Firefinch	<i>Lagonosticta senegala</i>						L 1c
African Firefinch	<i>Lagonosticta rubricata</i>				H		1b,c
Jameson's Firefinch	<i>Lagonosticta rhodopareia</i>				H		1a
Bronze Mannikin	<i>Spermestes cucullata</i>				H		1a,b
Pin-tailed Whydah	<i>Vidua macroura</i>				H		1a,b,c
Long-tailed Paradise-Whydah	<i>Vidua paradisaea</i>				H		1a,b,c
Shaft-tailed Whydah	<i>Vidua regia</i>					M	1c
Village Indigobird	<i>Vidua chalybeata</i>						L 1c
Dusky Indigobird	<i>Vidua funerea</i>				H		1b,c
Purple Indigobird	<i>Vidua purpurascens</i>				H		1a
House Sparrow	<i>Passer domesticus</i>		I			M	4
Great Sparrow	<i>Passer motitensis</i>						L 1c
<b>Southern Grey-headed Sparrow</b>	<b><i>Passer diffusus</i></b>				H		<b>1a,b,c</b>
Yellow-throated Petronia	<i>Gymnoris supercilialis</i>				H		1a,b,c
African Pied Wagtail	<i>Motacilla aguimp</i>						L 2
<b>Cape Wagtail</b>	<b><i>Motacilla capensis</i></b>				H		<b>1a; 2</b>
Cape Longclaw	<i>Macronyx capensis</i>						L 1c
Striped Pipit	<i>Anthus lineiventris</i>				H		1a
African Pipit	<i>Anthus cinnamomeus</i>				H		1c; 3
Plain-backed Pipit	<i>Anthus leucophrys</i>						L 1c; 3
Buffy Pipit	<i>Anthus vaalensis</i>					M	1b,c; 3
Long-billed Pipit	<i>Anthus similis</i>						L 1a
<b>Bushveld Pipit</b>	<b><i>Anthus caffer</i></b>				H		<b>1a,b,c</b>

Yellow-fronted Canary	<i>Crithagra mozambica</i>				H		1a,b,c
Black-throated Canary	<i>Crithagra atrogularis</i>					M	1b,c
<b>Streaky-headed Seedeater</b>	<b><i>Crithagra gularis</i></b>				<b>H</b>		<b>1a,b,c</b>
Cinnamon-breasted Bunting	<i>Emberiza tahapisi</i>				H		1a; 3
Cape Bunting	<i>Emberiza capensis</i>					M	1a
Golden-breasted Bunting	<i>Emberiza flaviventris</i>				H		1a,b,c

Red Status	Status in south Africa (S)	Endemism in South Africa (E)
T = Threatened	BM = breeding migrant	Endemism in South Africa (E) (not southern Africa as in field guides)
NT = Near-Threatened	NBM = non-breeding migrant	
Vul = Vulnerable	V = vagrant	
E = Endangered	I = introduced	* = endemic
CE = Critically Endangered	R = rare	(*) = near endemic (i.e. ~70% or more of population in RSA)
RE = Regionally Extinct	PRB = probable rare breeder	B* = breeding endemic
§ = Refer to footnote	RB = rare breeder	B(*) = breeding near endemic
	RV = rare visitor	W* = winter endemic
Red Status is from <i>The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland, Barnes (2001)</i> .		

#### 6.4. Threatened and Red-Listed Bird Species

Thirteen species of international and/or national conservation concern (Birdlife International's IUCN Red Data species 2012; Barnes 2000), ranging from Near Threatened to Vulnerable, were considered as possible to occur on site, although none was recorded during the November 2012 assessment. Most of these threatened species fall into a few obvious categories by habitat preference (Table 3) and their likelihood of occurrence on the SAPS property (Table 4).

**Table 3:** List of threatened species that will possibly make use of the habitats on and around the SAPS Operational and Tactical Academy, Thabazimbi, Limpopo, showing their preferred habitat types. Note, one species may have more than one habitat preference for different purposes (e.g. feeding vs. nesting).

Threatened Status	Species	Preferred Habitat Type(s)		
		Savanna woodland and/or bushveld	Dams and other water bodies	Roads, bare areas and manmade structures
Near Threatened	Half-collared Kingfisher		X	
	Greater Painted-snipe		X	
	Lanner Falcon	X	X	
	Peregrine Falcon	X	X	
	Black Stork		X	
	Woolly-necked Stork		X	
	Red-billed Oxpecker	X		
Vulnerable	Southern Ground-hornbill	X		
	Blue Crane		X	
	Corn Crake	X		
	Cape Vulture	X	X	X
	Martial Eagle	X	X	X
	Secretarybird	X		
<b>TOTALS</b>	<b>13</b>	<b>8</b>	<b>9</b>	<b>2</b>

**Table 4:** The expected frequency of occurrence of threatened bird species on and around the SAPS Operational and Tactical Academy, Thabazimbi, Limpopo, based on the quantity and quality of habitats available.

Threatened Status	Species	Expected frequency of occurrence on site			
		Regular resident	Frequent visitor	Erratic visitor	Infrequent vagrant
Near Threatened	Half-collared Kingfisher			X	
	Greater Painted-snipe				X
	Lanner Falcon		X		
	Peregrine Falcon		X		
	Black Stork		X		
	Woolly-necked Stork				X



	Red-billed Oxpecker		X		
Vulnerable	Southern Ground-hornbill				X
	Blue Crane				X
	Corn Crane			X	
	Cape Vulture	X			
	Martial Eagle		X		
	Secretarybird			X	
<b>TOTALS</b>	<b>13</b>	<b>1</b>	<b>5</b>	<b>3</b>	<b>4</b>

These analyses indicate that by far the most important habitats to conserve for threatened species are the natural savanna woodlands and bushveld (for 8 species), and the various water bodies, in particular the Rookpoort Dam (for 9 species). Eight of the threatened bird species (**Lanner Falcon, Peregrine Falcon, Black Stork, Woolly-necked Stork, Southern Ground-hornbill, Blue Crane, Cape Vulture, Martial Eagle, Secretarybird**) are large and/or wide-ranging birds, expected naturally to have low densities and large home ranges, so that the SAPS property can form only part of their home ranges. However, conservation of a mosaic of suitable habitats across the region seems the only option to retain these low-density species, within an ever expanding counter-mosaic of habitats transformed and/or degraded by human activities. The other smaller threatened species (**Half-collared Kingfisher, Greater Painted-snipe, Red-billed Oxpecker, Corn Crane**) have more specialised, often patchy, habitat requirements that also need protection within the broader savanna biome. The recently Vulnerable **Southern Ground-hornbill**, despite being technically extirpated from the bushveld, is only included in the list because birds from a nearby reintroduction project at Macula did visit the SAPS property during their wanderings, suggesting that the property still has the potential to be included as a safe and suitable habitat.

Only one threatened species, the Vulnerable and near endemic **Cape Vulture**, is expected to be a regular resident on or above the property, mainly due to the proximity of one of its largest breeding colonies at Kransberg in the Marakele National Park. Birds will pass regularly over the area in search of carrion, some of which might come from game mammals that die on the property, and so this poison-free environment adds to the patches of such important safe habitat within the extensive foraging range of the colony.

Five species are expected to be frequent visitors. The Near Threatened **Lanner** and **Peregrine Falcons** are expected to nest on cliff ledges in the surrounding mountains and hunt for birds and other prey over the valleys and flats below. The Vulnerable **Martial Eagle** is also expected to nest in the general area, most likely in a large tree in a secluded kloof or high on the foothills, and then soar over a territory of at least 150 km<sup>2</sup> of flatter habitats below in search of its varied animal prey. The Near Threatened **Black Stork** builds its stick nest on high cliffs and then glides down to rivers, dams and pools below in search of its aquatic animal prey. The fifth species, the Near Threatened **Red-billed Oxpecker**, is expected to use the larger game mammals on the property as its typical symbiotic hosts, for food, and the extensive woodland available would also provide suitable natural nest holes in trees.

The remaining seven threatened species are only expected on the property as erratic visitors or infrequent vagrants. The Near Threatened **Half-collared Kingfisher** will occur along permanent clear-water streams with marginal plants for perches, most probably in the valleys of the mountains, but are expected as erratic visitors in summer to similar seasonal habitats, as on the SAPS property, during any local movements. The Vulnerable **Corn Crane** is included primarily because it is threatened in its Eurasian breeding range during the austral summer, but it is only expected on the property as an erratic visitor during the boreal summer, visiting the patches of dense, often moist, weeds and grasses that comprise its preferred habitat. The **Secretarybird**, recently raised to Vulnerable, is only expected as an erratic visitor to the property because of the limited extent of the open and lightly wooded savanna that it prefers, found mainly in the eastern sector of the property, although it is probably a resident breeder on the secondary grasslands higher up in and east of the valley.

The four infrequent vagrants are included based more on the Precautionary Principle than for any particular role expected from the habitats on the SAPS property in their conservation, as indicated for the **Southern Ground-hornbill** above. The Near Threatened **Greater Painted-snipe** is included since the grassy seasonal pools that it prefers may occur on site from time to time in summer, although the permeable sandy soils on the property mean that such sites are few, apart from at some old excavations. The Near Threatened **Woolly-necked Stork** is only included because one once visited

the Rookpoort Dam, but would otherwise have been expected only as an unlikely rare vagrant from the moister eastern habitats of the country. The Vulnerable **Blue Crane** is included because a few pairs are known to reside on grassland areas in the Waterberg, mainly to the north and east, and may visit the property in passing, maybe even roosting en route at the Rookpoort Dam, although the property does not really support its preferred grassland habitats.

## **7. ENVIRONMENTAL IMPACT ASSESSMENT**

By constraining developments to the smallest possible areas, minimising transformation of savanna and drainage lines, and optimising management of facilities and access routes, minimum environmental impact and maximum mitigation will be achieved.

### **7.1. The ecological importance of the study site**

The SAPS property supports mainly natural savanna woodland and bushveld, with only small patches of development for the necessary facilities and narrow servitudes for roads, communications, water and sewage. The extent of these patches individually is small, relative to the 9000 ha of the property and, additionally, the patches are widely and fairly evenly scattered throughout the natural habitats, which are also extensive on the surrounding properties. Such an extensive area of natural habitat forms an important conservation unit, especially for the low-density, often large bird species that are especially vulnerable to human encroachment. The Rookpoort Dame, a large water body in the area, is also an important attractant and/or staging habitat for water birds.

### **7.2 General impacts associated with the 11 proposed developments**

- **Loss and degradation of natural habitat** – Given the inherent mobility of birds, the individual size of each of the proposed developments is small and, within the relatively homogeneous and extensive natural habitats, of low conservation impact. This impact can be reduced even further if developments are constrained to the smallest possible footprint, and if as much as possible of the natural vegetation, especially the trees, is retained during construction and operation.
- **Loss of conservation-significant taxa and/or changes in community structure** – The small footprint of the proposed developments suggests low probabilities for negative conservation effects and no significant losses or reductions in species numbers. Populations of most of the savanna bird species resident on the property

should still be assured of their lifetime requirements, except for the larger, low-density, wide-ranging species where the property supplies only a small proportion of their requirements. To some extent, the developments may enhance locally the survival of some resident species, such as by the novel food scraps, water and irrigated garden habitats available, especially during the dry winters when food is limiting and/or the rest of the savanna is experiencing drought. The existing developments have and the proposed ones will alter community structure and in some cases marginally enhance the avian biodiversity of the site (attracting commensal species and those that favour more open woodland and bushveld, even treeless patches as at the runways). The Rookpoort Dam attracting water birds and the urban training buildings attracting cliff-nesting birds are the most obvious current examples. Possible negative effects, besides commensals excluding similar original species, might extend to novel selection pressures experienced by the prey animals on which these new arrivals feed.

- **Increased habitat fragmentation & loss of connectivity** – The assumption in this assessment is that, given the relatively small extent of the individual developments, there will be no significant fragmentation to or loss of connectivity between habitats. The only exception to this might be where a linear riparian habitat is disrupted by a development, although even here the presence of similar natural woodland around the disruption will minimise its impact.
- **Increased anthropogenic encroachment** – The proposed developments will extend the extent of anthropogenic encroachment into the natural habitats, but only as small patches linked by narrow servitudes, similar to earlier farming encroachments but without the negative presence and grazing pressures of alien livestock or the clearing of vegetation for crop- or grazing-land.

## **8. RECOMMENDED MITIGATION MEASURES**

The existing and proposed developments at Sites 1-11 have been described in more detail for the terrestrial-living plants and animals by the botanist and mammalogist of the EcoAgent team in an earlier report. For this bird report, only generic mitigation measures are offered since the mobility of birds does not constrain them to effects of small-scale features or changes. The mitigations can as well be applied to the existing developments as to the proposed developments, in a bid to move towards a common ecological management plan for the whole property.

1. Watercourses and associated water bodies. These are the most sensitive habitats on the property, primarily because they are linear and therefore have their ecological functioning easily disrupted and fragmented, such as by road and drain/bridge crossings, and secondarily because they are the routes and stores for runoff rainwater that is such a scarce national commodity. The main current and proposed disruption to watercourses occurs between Sites 1 & 2 (existing training camp A and its residential developments) and at Site 4 (existing training camp D and its upgrades). As delimited by the botanist, removal of existing and exclusion of proposed developments from the sensitive drainage lines is the ideal solution, with adequate buffer zones on both side to allow unhindered flooding and alluvial deposition. Elsewhere on the property, all road crossings or other breaches of watercourses should be inspected for signs that they constrict the watercourse and its riparian habitat, and/or cause unnatural erosion patterns.

2. Woodland and bushveld savanna. This habitat is less sensitive than the drainage ones mainly because of its dominant extent across the property, but it occurs with subtle local differences in tree height, density and diversity, plus in degradations induced by such past transformations as removal of large trees, partial clearing and/or bush encroachment. The primary mitigation in development of this habitat is to remove as few trees as possible during all developments, especially where tree heights and densities are highest, but consistent with the requirements for a successful development (such as complete clearance for Site 5, the new ammunition safe, or Site 7, the new shooting range). This applies whether the site is a single rectangular patch or a linear servitude, where all possible discretion in planning and placement should avoid live trees and their root systems. The suggestion by the botanist to move Site 7 further out into the valley and away from the larger trees along the foothills, if feasible, is therefore also supported from an avian perspective. The possibility of placing Site 5, the new ammunition safe, south rather than east of the existing safe, in much less dense woodland, should also be explored. Secondly, wherever possible, disturbance or at worst removal of the ground layer of vegetation should be avoided, so as to retain the role it plays in control of rainwater runoff, besides reducing negative effects on biodiversity. Some of earlier developments seem to have led to unnatural sheet erosion in their vicinity, notably in the vicinity west of Site 8 (new training camp A) and north of sewage works Site 10.1.1, and these effects should be addressed to restore more natural flow patterns followed by rehabilitation of the eroded washes.



3. Roads and other bare areas. The bare roads and excavation areas are habitats used by only a few bird species but, in their current form, they present some of the most obvious negative effects of habitat management on the property. Almost all the roads seem to have been placed as more or less straight lines along previous farm boundaries and/or fence lines, with no regard for such ecological planning principles as use of natural contours (being positioned on ridge tops rather than slopes, or curved across and not down contours) or control of runoff (lack of designs to reduce water velocity such barrier ridges or lateral drains to curtail and direct runoff). This has led to mild to severe ditch, donga or sheet erosion in various places, even where the road had been secondarily resurfaced, and also constriction or redirection of natural drainage lines. A property-wide road plan should address these issues, maybe with the help of a transport engineer. Construction of new roads is to be avoided, the new damage to woodland and bushveld out-weighing ecological advantages, so the plan should rather look at closing and rehabilitating any unnecessary roads, and then re-engineering and improving drainage control on the existing routes. Encouragement of grasses on the roads, or at least their verges, and on other such bare areas as borrow pits, should also be considered.

It is suggested that the following mitigation measures and recommendations also form part of any Environmental Management Plan:

### **Specific mitigation measures**

#### **M1: Loss of habitat**

- All areas designated as sensitive, i.e. outside the developed patches, should be incorporated into an open space system and/or declared and managed as a nature reserve.
- Development should be located on the areas of lowest sensitivity (in this instance old fields and encroached bushveld).
- Minimize area cleared for construction activities, including areas used by staff during construction, and cluster new developments as close as possible to existing ones.
- Locate building material at a secure site and prevent any spillage into sensitive areas.

- Retain natural corridors and all wetland features (with appropriate buffer zones) to promote movement of fauna.
- Rehabilitate all disturbed habitats as a continual process to prevent unnecessary loss of topsoil during construction and operation, restore the viability of the natural seed bank and replace all plants with locally indigenous species.
- Avoid sealing of surfaces under bridges or gabions to ensure free flow of water and movement of smaller animals.

## **M2: Disturbance**

- Limit construction activities to daytime and, where possible to the dry winter months when most birds and other small animals are not breeding.
- Minimize the use of earthmoving equipment that results in noise generation.
- Allocate construction staff an area away from sensitive habitat types and provide adequate ablution facilities to avoid use of natural (sensitive) areas as toilets.

## **M3: Soil disturbances & compaction**

- Degraded sites, such as erosion, should be rehabilitated using only indigenous plant species, especially using species from the naturally occurring vegetation of the area.
- All disturbed areas during construction and operation, including discard dumps, should be levelled to prevent runoff.

## **M4: Plundering of natural resources and killing of fauna**

- Harvesting of firewood or any plant material should be strictly prohibited. Staff shall only assist with the necessary removal of important plant species if requested to do so, under supervision.
- All staff should be advised (inducted) by means of environmental awareness training on the significance and conservation importance of the area.
- Intentional killing of any faunal species (including invertebrates) should be avoided by means of awareness programmes presented to the labour force. The labour force should be made aware of the conservation issues pertaining to the faunal and floral taxa occurring on the study site. Any person found deliberately harassing any animal should face disciplinary measures, possibly dismissal from the site.

**M5: Lighting and the attraction of invertebrates**

- Minimize outside lighting. Invertebrates flying at night are attracted to lights, often perish there and then are lost to the natural breeding and food chains.
- Outside lighting should be designed to minimize impacts on fauna. All outside lighting should be directed away from sensitive habitats. Fluorescent and mercury-vapour lighting should be avoided and sodium-vapour (yellow) lights should be used wherever possible so as not to impact on activities of nocturnal species.

**M6: Introduction of invasive species**

- Prevent introduction of alien plant and animal species. Indigenous species already present in the area should be used during any rehabilitation phases. Specialist advice should be sought on fish-stocking and pest (weed/rodent/insect) control.
- It is recommended that a monitoring programme be implemented to enforce continual eradication of alien and invasive species, especially on wetland and open-space systems.

**9. GENERAL CONCLUSIONS**

The main conservation objectives for birds on the SAPS Academy property at Thabazimbi are to retain as much as possible of the savanna habitats of woodland and bushveld, protect the sensitive drainage lines and associated riparian vegetation, and minimize the footprints and impacts of the small scattered developments across the property. Keeping the footprints of the developments as small as possible, during both construction and operation, making every effort to avoid removal of larger trees and associated ground cover, and controlling rainwater runoff to prevent erosion, especially along the network of roads interconnecting the developments, should be the principal environmental goals. The property has special potential, due to the quality of its broad-leaved woodlands, low human impact and high-than-expected local rainfall, to provide an important patch of conserved habitat in the region for a wide variety of large and small animals and plants. This potential could best be realised if an all-inclusive environmental management plan was developed for the property to secure its ecological services in collaboration with neighbouring conservation areas.

## 10. LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The primary data for this assessment came from the distribution and status information collected for southern African birds during the SABAP1 & 2 bird atlas projects, and is therefore only as accurate and reliable as the limitations and assumptions described for that exercise (Harrison *et al.* 1997; [www.sabap2.org](http://www.sabap2.org) 2012), augmented with information from earlier atlas studies of the old Transvaal (Tarboton *et al.* 1987). I also had access to suitable databases, information and identification resources, and did not consider that the present assignment warranted a more detailed (and expensive) survey, even though summer migrants were absent. My personal field experience includes work with birds in savannas and community surveys across a wide range of southern African habitats.

Environmental Impact Assessments (EIAs) attempt to provide an accurate but subjective study of the main environmental factors and possible mitigation measures that might apply to a given development proposal. EIAs are limited in scope, time and budget, even though every care is taken to ensure their accuracy. Even a more factual report, based on field sampling and observation over several years and seasons to account for fluctuating environmental conditions and migrations, may be insufficient, since one deals with dynamic natural systems, especially for birds that have such a mobile response to changing conditions. I offer this EIA in good faith, based on the information available to me at the time, but cannot accept responsibility for subsequent changes in knowledge or conditions.

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## **APPENDIX**

### **Abridged Curriculum Vitae: Alan Charles Kemp**

Born: 7 May 1944 in Gweru, Zimbabwe

Citizenship: South African, British

Marital status: Married, 1 daughter, 1 son

#### **Present work address:**

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#### **Qualifications:**

1965 B.Sc. Rhodes University, Zoology and Entomology majors

1966 B.Sc. Hons. Rhodes University, Zoology

1973 Ph.D. Rhodes University, Zoology of Pretoria

Thesis: (Ph.D.) The ecology, behaviour and systematics of *Tockus* hornbills (Aves: Bucerotidae), conducted mainly in the Kruger National Park

#### **Professional titles:**

- Pr.Sci.Nat. South African Council for Natural Scientific Professions Registration Number 400059/09, Zoological and Ecological Sciences.

#### **Professional career:**

- Field Research Assistant to Prof. Tom J. Cade, Section of Ecology and Systematics, Cornell University, in Kruger National Park, South Africa, Nov 1966 - Apr 1969.
- Department of Birds, Transvaal Museum, Pretoria, June 1969 – August 1999, Head of Department from 1971, rising to Senior Scientist and then Head Curator by 1974.
- Elected Manager, Transvaal Museum, September 1999 – July 2001, until voluntary



early retirement.

- Edward Grey Institute of Ornithology, Oxford, December 2001 – April 2002, drafting specialist bird texts for Gale Publishing, USA and Andromeda Press, Oxford, UK.
- Berg 'n Dal & Pretoria, April 2002 - February 2003, presenting paper and later editorial assistant for book from the Mammal Research Institute, University of Pretoria, *The Kruger Experience: ecology and management of savanna heterogeneity*.
- Bangkok, March – June 2003, drafting research papers for colleague at Mahidol University; touring Laos.
- Pretoria, August-December 2003, editorial assistant for book from the Mammal Research Institute, University of Pretoria, a revision of *The Mammals of Southern Africa*.
- Hala-Bala Wildlife Reserve, January – December 2004, a one-year rainforest study of hornbills, raptors and owls in southern Thailand for their National Center for Genetic Engineering and Biotechnology (BIOTEC).
- Pretoria, January 2005 – July 2007, organizing 4<sup>th</sup> International Hornbill Conference at Mabula Game Lodge and editing and publishing CD-ROM proceedings, and consulting on ground hornbills to Mabula, University of Cape Town and Endangered Wildlife Trust.
- Bangkok, India, Singapore, Sarawak, September 2006 – April 2007. assisted colleagues at Mahidol University, Bangkok, with compilation of research paper on molecular systematics of hornbills, and travelled to see other Asian habitats and meet with other colleagues.
- Singapore, March 2009, present opening address, paper and poster at 5<sup>th</sup> International Ornithological Conference

#### **Academic career:**

- Students:

- Supervise completed post graduate students: M.Sc. 14; Ph.D. 5.

- Author of:

- 104 scientific papers or notes in refereed journals
  - 48 papers at national and international congresses
  - 6 scientific (unpublished) reports on environment and natural resources

- 73 popular scientific papers.
  - 15 contributions in or as books
- Editorial Roles
    - Ostrich, African Journal of Ornithology (editor 1973-75).
    - Bird Conservation (International (editorial committee 1995-present)
- FRD evaluation category: C2 (Avian Biology and Systematics)
- **Associate positions:**
    - University of the Witwatersrand, Honourary lecturer, Department of Zoology (1988-2001)
    - Percy FitzPatrick Institute of African Ornithology, University of Cape Town, research associate (2001 – present).
    - Ditsong National Museum of Natural History (ex Transvaal Museum), Honourary curator (2004-present)
    - Wildlife Conservation Society, New York, wildlife conservation associate (1996-present).
- Membership:**
- American Ornithologist's Union, Corresponding Fellow (1986- present)
  - Birdlife South Africa (South African Ornithological Society), Ordinary Member (1969-present), President (1975-1993) of Northern Transvaal (Pretoria) Branch, Honourary Life Member of North Gauteng (Pretoria) Bird Club (2000 – present).
- Special committees:**
- International Ornithological Committee of 100, elected member (1989-present).
  - Raptor Research Foundation, Grants assessor, Leslie Brown Memorial Fund (1985-present).
- Merit awards and research grants:**
- 1969-86. Annual research grants from South African Council for Scientific and Industrial Research (CSIR).

- 1974. Chapman Fund Award, American Museum of Natural History, for field research in Borneo and India.
- 1986-98. Annual research award from South African Foundation for Research Development (FRD) as "C"-graded national scientist.
- 1989-95. Team member of FRD Special Programme in Conservation Biology.
- 1989-95. Team member of FRD Special Programme in Molecular Systematics.
- 1991-95. Various private sector sponsorships.
- 1992, 1994. FRD merit award to museum scientists.
- 2000. Special NRF Science Liaison award to attend 10<sup>th</sup> Pan-African Ornithological Congress, Kampala, Uganda.
- 2001. Special NRF Science Liaison award to attend 3rd International Hornbill Workshop, Phuket, Thailand.
- 2004. One year's support from Thailand's National Center for Genetic Engineering and Biotechnology (BIOTEC) for rainforest survey research.
- 2007-2008. Six month's funding to enable specialist assistance at Department of Microbiology, Mahidol University, Thailand.
- 2010. Gill Memorial Medal of Birdlife South Africa

### **Consultant**

- Sept-Oct 1994 – Kruger National Park, specialist consultant on ground hornbills to BBC Natural History Unit for filming of Wildlife on One programme, 10 weeks.
- Oct-Nov 1996. Kruger National Park, specialist consultant on various birds to David Attenborough for BBC series Life of Birds, 3 weeks.
- Sep-Oct 1998. Kruger National Park, specialist hornbill consultant to National Geographic magazine team, 4 weeks
- October 2001 – Mala Mala, specialist consulting on ground hornbills for National Geographic film unit, 1 week.
- 2004-present - >15 specialist birding and nature tours as a National South African Tourist Guide, registration number GP0770.  
     2005-present – >30 Biodiversity assessments for a Ramsar wetland proposal, Important Bird Area proposal, and general scoping, G20 and specialist avifaunal EIAs.

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