

WITBERG WIND FARM JUVENILE VERREAUX'S EAGLE MONITORING

FINAL REPORT



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The logo for Birds Unlimited Environmental Consultants. It features two stylized black birds in flight, one on the left and one on the right, with their wings spread. Between them is a green banner with white text. The banner contains the company name 'BIRDS UNLIMITED' at the top, 'Environmental Consultants' in a smaller font below it, and the names 'Dr Rob Simmons & Marlei Martins' and their contact details (phone numbers and email addresses) at the bottom.

Juvenile Verreaux's Eagle monitoring at the Witberg wind farm site

Background

The wind farm site at the Witberg, near Matjiesfontein, in the western Karoo was proposed by G7 Renewable Energies, and was originally planned with 70 turbines. Following the EIA and pre-construction monitoring of the possible bird impacts (Avisense 2010, Turpie et al. 2012) it was revealed that the area held three breeding pairs of Verreaux's Eagles *Aquila verreauxii* on the ridges, and a breeding Martial Eagle *Polemaetus bellicosus* pair below the ridge. Buffers of 1.5 km and 2.5 km around the Verreaux's and Martial Eagle nests respectively were suggested (following the recommendations of Avisense 2010) and reduced the number, and altered the placement of, the turbines. Birdlife South Africa, as an interested and affected party, objected to the Environmental Authorization and called for Collision-Risk modelling to quantitatively assess the impact to the Verreaux's Eagles there, considering it was too risky to have turbines so close to active nests. That was followed by collision-risk modelling of adult eagles by Shoney Renewables (Percival 2013), based on flight paths collected during the Turpie et al. report (2012).

Turbine numbers were reduced to 27 as a result of that report and further consultation, and some turbines moved to other locations. However, no juvenile eagles were present in the environment during these exercises, so it was recommended that further study be undertaken to determine flight paths and patterns of juvenile eagles to assess the risks to them.

The importance of the Verreaux's Eagle lies in its Vulnerable red data status (Taylor et al. 2015) and high collision-risk ranking at No. 2 (BAWESG 2014).

The present report on juvenile Verreaux's Eagles (*Aquila verreauxii*) satisfies the requirements of the Environmental Authorization by providing results from the monitoring of the juvenile eagles present within the wind farm proposed at the Witberg site. Specifically we were tasked by G7 Renewables/EDPR with recording the flight paths of juvenile Verreaux's eagles to determine the risk they are exposed to by the presently accepted layout of the 27 turbines (Figure 1).

We undertook four site visits from winter (July 2014) to summer (January 2015) to track the progress of all breeding eagles at the proposed Witberg wind energy facility (S33° 17 E20° 26). This final report collates our findings from all visits, and provides (i) maps for all flights undertaken by all juvenile and adult birds; (ii) a summary of all nests, including those interfered with; and (iii) recommends mitigation measures to avoid risks to this highly collision-prone species.



Protocol and Methods

Timing of site visits

- **Winter** – egg-laying – 3 full field days (27-30 June 2014) at the start of eagle breeding, to determine nest activity and collect adult flight data (22.5h observation);
- **Spring** – small young – 3 days (3-5 October 2014) spent observing the young on the nest and visiting other eagle sites to determine activity, or not (28.7h observation);
- **Summer** – 4 days observing first flights of fledged youngster (15-18 December 2015) from Bantam nest (46.0h observation);
- **Summer** – 5 days observing extended flights (21-26 January 2015) of the fledged youngster from Bantam nest (62.8h observation).

Our previous, extensive, knowledge of the site allowed us to quickly re-locate the three known Verreaux's Eagles nest sites and the two known Martial nests on pylons in the proposed wind energy facility (WEF). On these visits we wished to ascertain all flight paths around the active Verreaux's nest (Bantam Nest No. 1). The Martial Eagle nests were inactive and are not treated further here. We spent a total of 160 hours observing at the Verreaux's Eagle nests (the majority at the active Bantam Nest No.1) and recorded all flight activity of the pair at the nest. Laminated Google Earth images are taken into the field and flight paths (and heights) are recorded on them as we see the birds. Heights were estimated using the existing Sentec tower and graded into *Below* blade-swept area (0-20m and 20-40m), *Within* the blade-swept area (40-130m) or *Above* this high risk area (130+m).

We observed for 10h at the other two known Verreaux's Eagle nest sites to determine if they had become active (eggs laid, or not).

Bantam Nest No.1

This new alternate nest was found on 30 June 2014 in our first recce trip and was 1.03km west of the previously known nest No. 1 (Turpie et al. 2012). This nest successfully fledged a youngster in early December and all observations of juvenile birds refer to this nest.



Photo 1: The female Verreaux's Eagle returning to her alternate nest in June 2014 with eggs already present



Besterweg Nest No.2

None of the three alternative nests at this site were active in 2014/2015 (photo 2). The nest positions are shown in Figure 1.

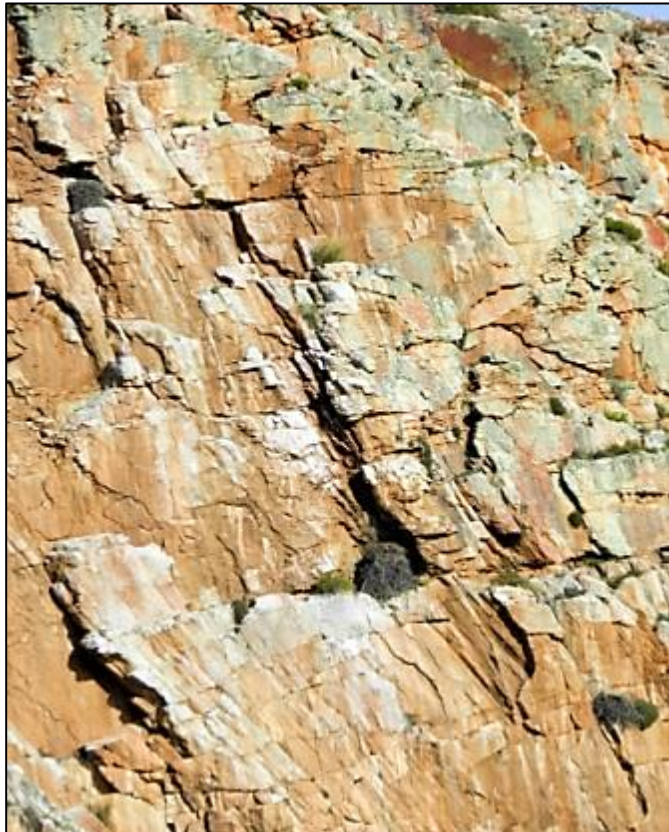


Photo 2: Three Verreaux's Eagle nests at Besterweg Nest No. 2 site. The middle nest had some signs of green lining in July 2014, but no birds were in attendance and no subsequent activity was observed when checked again in January 2015.

Elandsfontein Nest No.3

This nest area is 4 km west south west of the Sentec tower, and was active in November 2002 (pers. obs. and L Rodrigues photographed a juvenile bird there). In 2014-2015 we could find no nest structures on the cliff that previously held nests. We also rarely saw a pair of eagles that had been previously regularly seen, in this area. This was puzzling because Verreaux's Eagles are territorial year round and do not leave their nest area. More important their large cliff nests stay intact for decades (Steyn 1982). Therefore, we scoured the base of the cliff for signs of the nests.

Our search revealed that a nest had been pulled down, based on the number of hyrax skulls and sticks below the previous site. Nearby were carbon and smoke marks on the base of the rock suggesting a localised fire had been lit there in the last 12 months (but nowhere else).

This helps confirm the suspicions of L Rodrigues that an eagle nest (or nests) are being removed from the cliff site. We assume that this is by the Elandsfontein farmer or his labourers. This is an illegal activity and action should be enforced by Cape Nature and the developers (e.g. turbines will



not be erected on Elandsfontein until guarantees are secured that no eagle nests or adult birds will be interfered with).

As a threatened red data species (Taylor et al. 2015) it is illegal and unethical to interfere, in any way, with Verreaux's Eagles.



Photo 3: Elandsfontein nest cliff showing the area (circled) where an eagle nest was removed from the cliff.



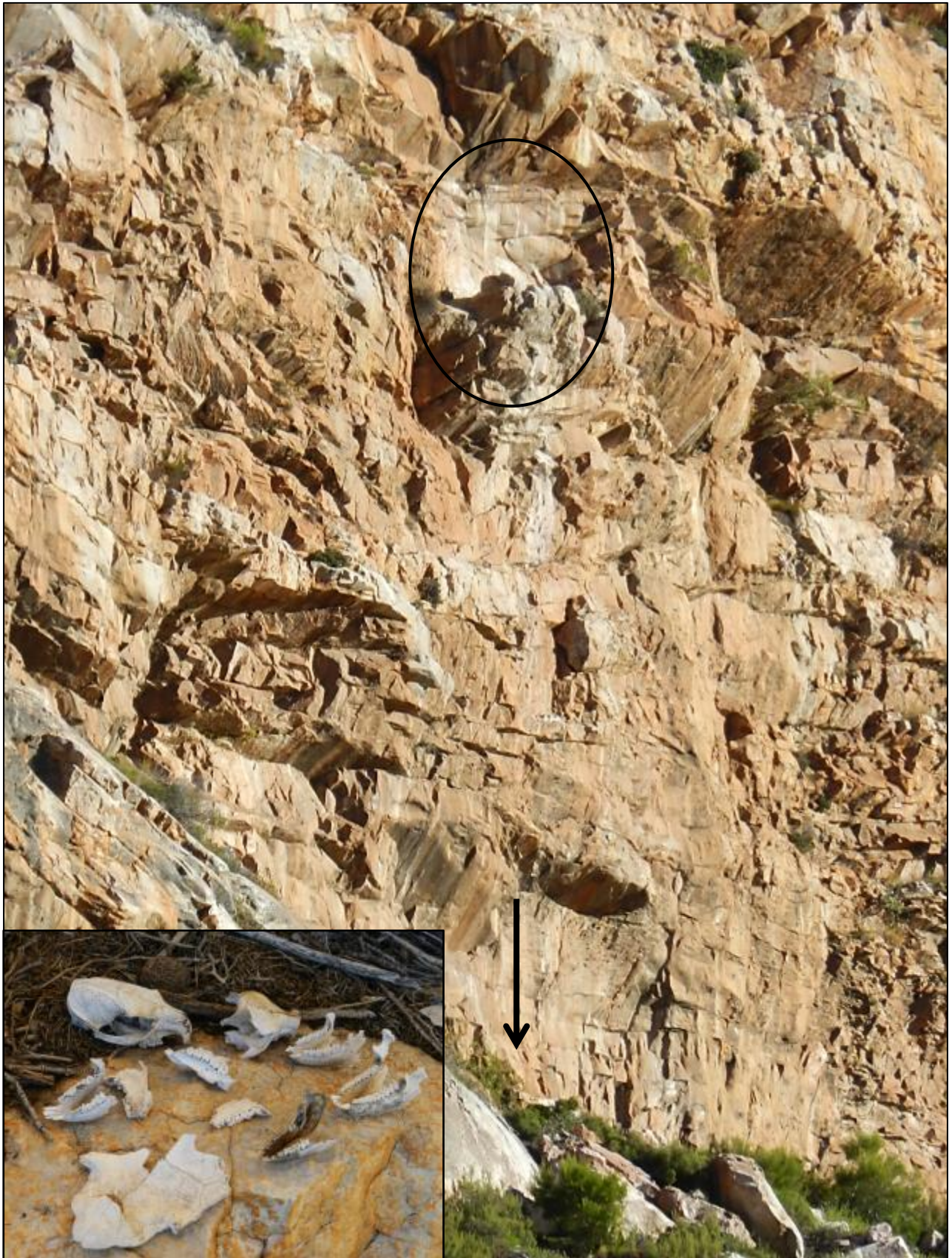


Photo 4: Nest site 3 – the **arrow** indicates where nest remains and 11 hyrax skulls (inset) and some tortoise shells were located indicating a Verreaux’s Eagle nest once occurred above this site. The **circle** indicates where “white-wash” (eagle faeces) is apparent on the rock face, and an appropriate ledge for a nest occurs. This indicates that an eagle nest has been removed from this site.



Flight activity of the adults and juvenile at Bantam Nest No.1

All **juvenile** eagle flights recorded in 160h of observation were, as expected, centred around the Bantam nest itself. All other flights were directed to the east of the nest – along the rock face underneath the level of the nest itself – and thus away from the turbines. Significantly, there were no flights recorded by the juvenile near, or even towards, the nearest proposed turbine (No. 27). All recorded flights are shown in Figure 3.

Most flights of the **adult Verreaux's Eagles** were also centred around the nest or just above it. Their longer flights were directed either (i) in a north-north-easterly direction, away from the ridge, and at heights around 80-100 m, (ii) east along the lower ridge to and past the alternate nest (1 km east), presumably hunting, and (iii) north-west over the valley, also to hunt.

These were flights made despite the prevailing winds being predominantly from the south-east: this was unexpected because large eagles typically use the updraft created by the winds to forage, and thus use the slopes on the north-side of the nest. Because at least two of three prey items seen came in from the north-east this suggests that the adults' favoured foraging areas were away from the turbines and the nest No. 1 is at the western corner of the territory (Figure 2).

Passage Rates

The overall rate of passage (the number of times birds were seen in flight per hour of observation) declined steadily across seasons. In October 2014, passage rates were 1.36 eagles/hour, in December 2014, the rate was 0.98 eagles/hour and in January 2015 only 0.51 eagles/hour were recorded. This is despite the juvenile eagle taking more flights in January than earlier in the year. The reason for this is not known but the energy demands of young nestlings, including eaglets, often reaches a peak about two thirds of the way through the nestling period. This coincided with the October 2014 visit, and is also a time when the adult female no longer needs to brood the youngster, but stays in the vicinity of the nest to protect it.





Fig 1: The currently proposed (27) turbine layout (yellow pins) at the Witberg WEF site in relation to the active and inactive Verreault's Eagles' nests on site, January 2015.





Fig 2: Overview of all flight paths of all Verreaux's Eagles from visits in October and December 2014, and January 2015. The adult flights (orange & yellow), fledgling flights (red) and a sub-adult bird (maroon) are shown in relation to turbine layout (yellow pins). One flight to the south (yellow line) was by Pair 3 towards their inactive nest. The blue lines indicate an intruding Verreaux's Eagle that was escorted out of the territory by an adult bird. A Martial Eagle (white line) was briefly seen above turbine 17.





Figure 3: All flights of the **juvenile** Verreaux's Eagle from December 2014 and January 2015 at Nest No.1. The red lines represent the juvenile eagle and the maroon lines are those of a sub-adult (3-4 year old bird) escorted by one of the adults from the territory. Note that the juvenile bird spent no time near the turbines (yellow pins).



Eagle flying heights

By estimating the height at which all eagles flew every 15 seconds we can determine how frequently these birds flew in the danger zone i.e. the zone of the blade-swept area (40-130 m).



The results (Table 1) indicate that the proportion of time the **juvenile eagle** flew in the danger zone increased as it became more proficient. In October 2014 it spent no time at 30-140m, in December 2014 it spent 18% of its time in the danger zone, and in January 2015 it spent 43% of its time at this height. For all months it spent 31% of its flying time at the high-risk height.

Over the three site visits the **adult eagles** (often flying together) were recorded 554 times. For 29% of that period they flew within the high-risk height zone (Table 1). The next most often used category was the lowest height (1-20 m) and they spent 28% of the time at that height. Thus, while no flights took place over the proposed turbines, the juvenile and adult eagles could be at risk 31% and 29% of the time, respectively (Table 1).

Table 1: Recordings of the height at which the **juvenile** and adult Black (Verreaux's) eagles were flying in the Witberg study in October 2014, December 2014 and January 2015. Most data from Bantam Nest No.1.

	Ht Categories	Number of Observation			% of all Observations			% Observations
		Oct	Dec	Jan	Oct	Dec	Jan	All months
Adults only								
	1 (1-20m)	67	48	41	36%	18.8%	37%	28%
	2 (20-40 m)	44	21	24	24%	8.2%	21%	16%
High risk	3 (40-130 m)	45	81	36	24%	31.8%	32%	29%
	4 (130-160 m)	17	56	11	9%	22.0%	10%	15%
	5 (>160m)	14	49	0	7%	19.2%	0%	11%
Totals		187	255	112				of 554 obs
Fledgling	1 (1-20m)	4	14	24	100%	35%	45%	43%
	2 (20-40 m)	0	19	4	0%	48%	8%	24%
High risk	3 (40-130 m)	0	7	23	0%	18%	43%	31%
	4 (130-160 m)	0	0	2	0%	0%	4%	2%
	5 (>160m)	0	0	0	0	0%	0%	0%
Totals		4	40	53				of 97 obs



Reasons for the lack of flights over the ridge line and proposed turbines

The result that almost no eagle flights took place over the ridge (and turbines) south of the Bantam Nest No.1 is unusual, given that Verreaux's Eagles are montane species and should use most parts of their territory. It seems that there are two likely explanations for this: (i) eagles hunt where their prey base (the Rock Hyrax *Procavia capensis*) is most vulnerable, along rocky ridges, and (ii) they use updrafts from steeper slopes to assist in their foraging and soaring (Gargett 1990, Davies and Ferguson 1994, Simmons 2005).

Our observation from many days spent walking and driving the ridge tops indicates that the areas where the turbines are to be situated do not support any hyrax, but only a few Klipspringer and a few game birds such as Grey-winged Francolin. The ridge tops are also topographically not conducive to slope-soaring because of their rounded nature and shallow slopes. Both reasons may explain the almost complete absence of birds from the areas around the proposed turbine sites.

Summary of findings

In four site visits (July 2014-January 2015) to the Witberg WEF site to determine the risk to Verreaux's Eagles of the proposed wind farm we found:

- The Verreaux's Eagle Nest No.1 (at Bantam) successfully fledged their nestling in December 2014;
- Neither of the other two nests (Besteweg Nest No.2 and Elandsfontein Nest No.3) were active, but a pair of Eagles was seen over the Elandsfontein nest;
- The Elandsfontein nest cliff had no nest structures and there was evidence that the nest had been taken down and possibly burnt. This is illegal.
- The adult pair of eagles at the active Bantam Nest No.1 spent all of their flight time around the nest or heading north-east and north-west to soar and forage; only one trip was recorded near the turbines (250m from turbine 27) in 160h of observation from Vantage Points above and below the nest;
- As the juvenile matured it became a more proficient flier and spent longer at greater heights. It spent 31% of its time within the danger zone (30-140m) but did not venture closer than 660m from any proposed turbines;
- The adults spent a similar amount of time (29% of 554 observations) within the high-risk zone of 40-130m. None of their flights took place closer than 250m from the nearest proposed turbines.



- These results and observations suggest that there is little risk from the turbines as presently laid out to either the adults or juvenile eagles at Bantam Nest No.1.

Recommendations

We recommend that the development of the wind farm at the Witberg site be allowed to proceed with the following provisos:

- (i) A binding agreement be reached with the Elandsfontein landowner that he, and his staff, do not interfere with, obstruct or remove nests from any eagle breeding site on his farm. Failure to do so would prevent the construction or further operation of the turbines on his property;
- (ii) During-construction monitoring of all eagle breeding sites be implemented to ensure that minimum interference occurs; this would require unrestricted access to all properties to monitor the eagles by registered specialists;
- (iii) Post-construction monitoring of the site proceeds as stipulated in previous authorizations by recognised specialists;
- (iv) As one of the first montane areas in South Africa to be developed for wind farms a longer-term monitoring programme should be implemented to determine the effects that wind turbines have on eagle breeding success and site occupancy. That should then be compared with eagle data being collected elsewhere in the Karoo.



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14 February 2015

