REF: RKESKOMALTERNATIVES

Avifaunal assessment of the alternative powerline linkages between the Rietkloof WEF and the National Grid

Figure 1: *View east across the central Rietkloof WEF area towards Brandkop, the highest point. 132kV lines from several sub-stations will cross this terrain. The proposed Central Hub sub-station will be located on the horizon just left of centre.*

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March 2016

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1 INTRODUCTION

The proposed Rietkloof Wind Energy Facility (hereafter WEF) must have a 132 kV distribution line for connection to the national grid. African Insights was appointed to undertake the avifaunal impact assessment in order to determine the impacts associated with the proposed electrical infrastructure to inform the Basic Assessment process.

The powerline will cross properties in both the Witzenberg (Ceres) and Laingsburg Local Municipalities which fall within the Cape Winelands and Central Karoo District Municipalities respectively.

1.1 Project description

Various alternatives are being considered to 1) step up the voltage from 33 kV to 132 KV (on-site 33/132 kV sub-stations); 2) to distribute the 132 kV electricity to the national grid (overhead distribution line); and 3) various grid line options. The electrical distribution infrastructure related to this Basic Assessment process is:

- High voltage components of the 33/132kV onsite substation including transformers, isolators, cabling, light mast and other as required by Eskom. The onsite substation would have a footprint of up to 200m x 200m that would also house site offices, storage areas, ablution facilities and the maintenance building.
- 132kV above-ground distribution line to connect the onsite 33/132kV substation to the grid. The pylons for this line will have an average spacing of 250m to 300m.
- Connection to the national grid. There are three options being considered and the preferred option will be informed by environmental, technical considerations and Eskom's preference:
    - To the existing 400kV Komsberg substation with several electrical components to be defined by Eskom (e.g. additional feeder bay, transformer bay) on the existing substation property.
    - The Bon Espirange satellite 132kV substation. The Bon Espirange satellite substation will be established by Eskom and other IPPs as an alternative to connecting all wind farms west of Komsberg directly to the Eskom Komsberg Substation.
    - Construction of a central hub substation (up to 200m x 200m) to be shared by both Brandvalley and Rietkloof if both are awarded preferred bidders. If the central hub or switching station option is ultimately selected by Eskom, each project will build their own 33/132kV substation and connect to the central station. From there one 132kV line for both projects will lead to either the Komsberg or Bon Espirange substation.

All three grid connection options above have different sub-alternatives for line routings to connect to the seven potential onsite 33/132kV substations as indicated below and in Figure 2, Figure 3 and Figure 4.

- Substation alternative 1 to:
    - Brandvalley and Rietkloof shared central hub substation via one 132kV overhead distribution line from substation 1 (referred to as alternative RK SS1- central hub substation)
    - Eskom Komsberg substation via one 132kV overhead distribution line from substation 1 (referred to as alternative RK SS1- Komsberg)
    - Bon Espirange Substation via one 132kV overhead distribution line from substation 1 (referred to as alternative RK SS1- Bon Espirange)
- Substation alternative 2 to:
    - Brandvalley and Rietkloof shared central hub substation via one 132kV overhead distribution line from substation 2 (referred to as alternative RK SS2- central hub substation)
    - Eskom Komsberg substation via one 132kV overhead distribution line from substation 2 (referred to as alternative RK SS2- Komsberg)
    - Bon Espirange Substation via one 132kV overhead distribution line from substation 2 (referred to as alternative RK SS2- Bon Espirange)
- Substation alternative 3 to:
    - Brandvalley and Rietkloof shared central hub substation via one 132kV overhead distribution line from substation 3 (referred to as alternative RK SS3- central hub substation)
    - Eskom Komsberg substation via one 132kV overhead distribution line from substation 3 (referred to as alternative RK SS3- Komsberg)
    - Bon Espirange Substation via one 132kV overhead distribution line from substation 3 (referred to as alternative RK SS3- Bon Espirange)
- Substation alternative 4 to:
    - Brandvalley and Rietkloof shared central hub substation via one 132kV overhead distribution line from substation 4 (referred to as alternative RK SS4- central hub substation)
    - Eskom Komsberg substation via one 132kV overhead distribution line from substation 4 (referred to as alternative RK SS4- Komsberg)
    - Bon Espirange Substation via one 132kV overhead distribution line from substation 4 (referred to as alternative RK SS4- Bon Espirange)
- Substation alternative 5 to:

  - Brandvalley and Rietkloof shared central hub substation via one 132kV overhead distribution line from substation 5 (referred to as alternative RK SS5- central hub substation)
  - Eskom Komsberg substation via one 132kV overhead distribution line from substation 5 (referred to as alternative RK SS5-Komsberg)
  - Bon Espirange Substation via one 132kV overhead distribution line from substation 5 (referred to as alternative RK SS5- Bon Espirange)
- Substation alternative 6 to:
  - Brandvalley and Rietkloof shared central hub substation via one 132kV overhead distribution line from substation 6 (referred to as alternative RK SS6- central hub substation)
  - Eskom Komsberg substation 132kV overhead distribution line from substation 6 (referred to as alternative RK SS6-Komsberg)
  - Bon Espirange Substation via one 132kV overhead distribution line from substation 6 (referred to as alternative RK SS6- Bon Espirange)
- Substation alternative 7 to:
  - Brandvalley and Rietkloof shared central hub substation via one 132kV overhead distribution line from substation 7 (referred to as alternative RK SS7- central hub substation)
  - Eskom Komsberg substation via one 132kV overhead distribution line from substation 7 (referred to as alternative RK SS7-Komsberg)
  - Bon Espirange Substation via one 132kV overhead distribution line from substation 7 (referred to as alternative RK SS7- Bon Espirange)

Each of these distribution line alternatives will be buffered by 100m (200m in total) in order to allow for micro-sitting. Although numerous alternatives are considered, only one 33/132kV substation and one 132kV overhead power line will be built to connect to one grid connection option per project.

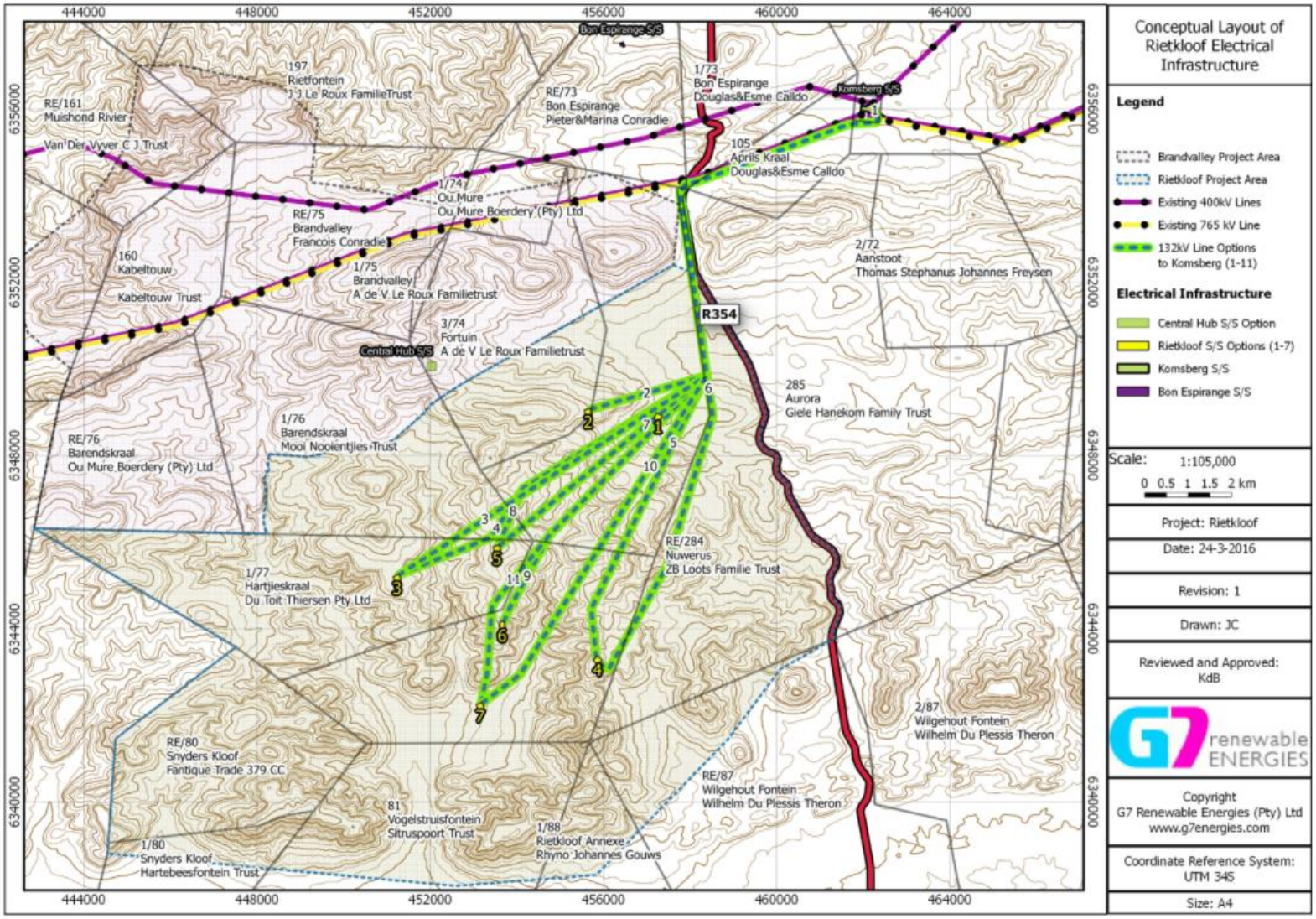

Figure 2: Conceptual layout of 132kV alternative line routes (including the 200m buffer) from the onsite substations to the Komsberg substation

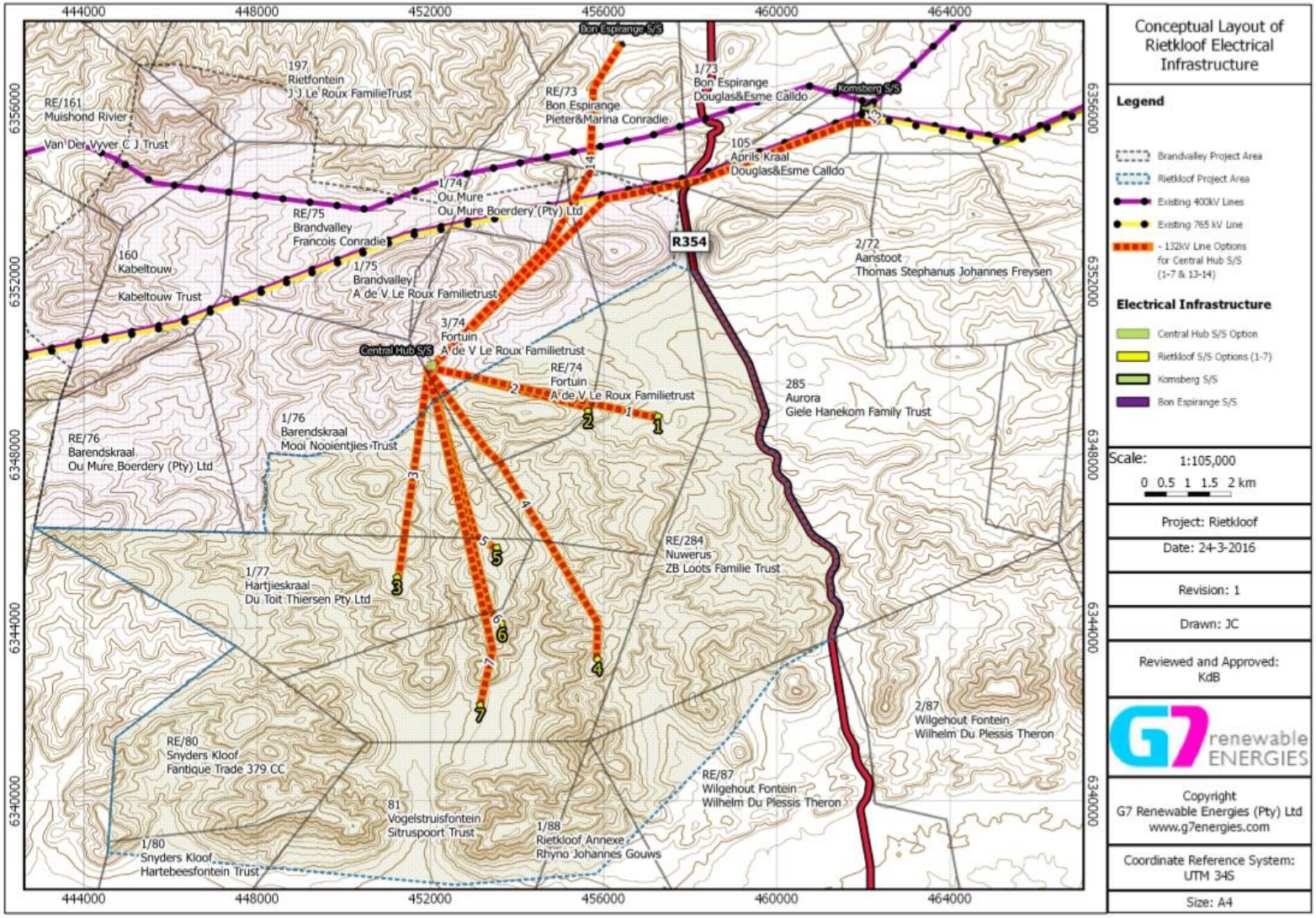

Figure 3: Conceptual layout of 132kV alternative line routes (including the 200m buffer) from the onsite substations to the Central hub substation and then to Komsberg or Bon Espirange

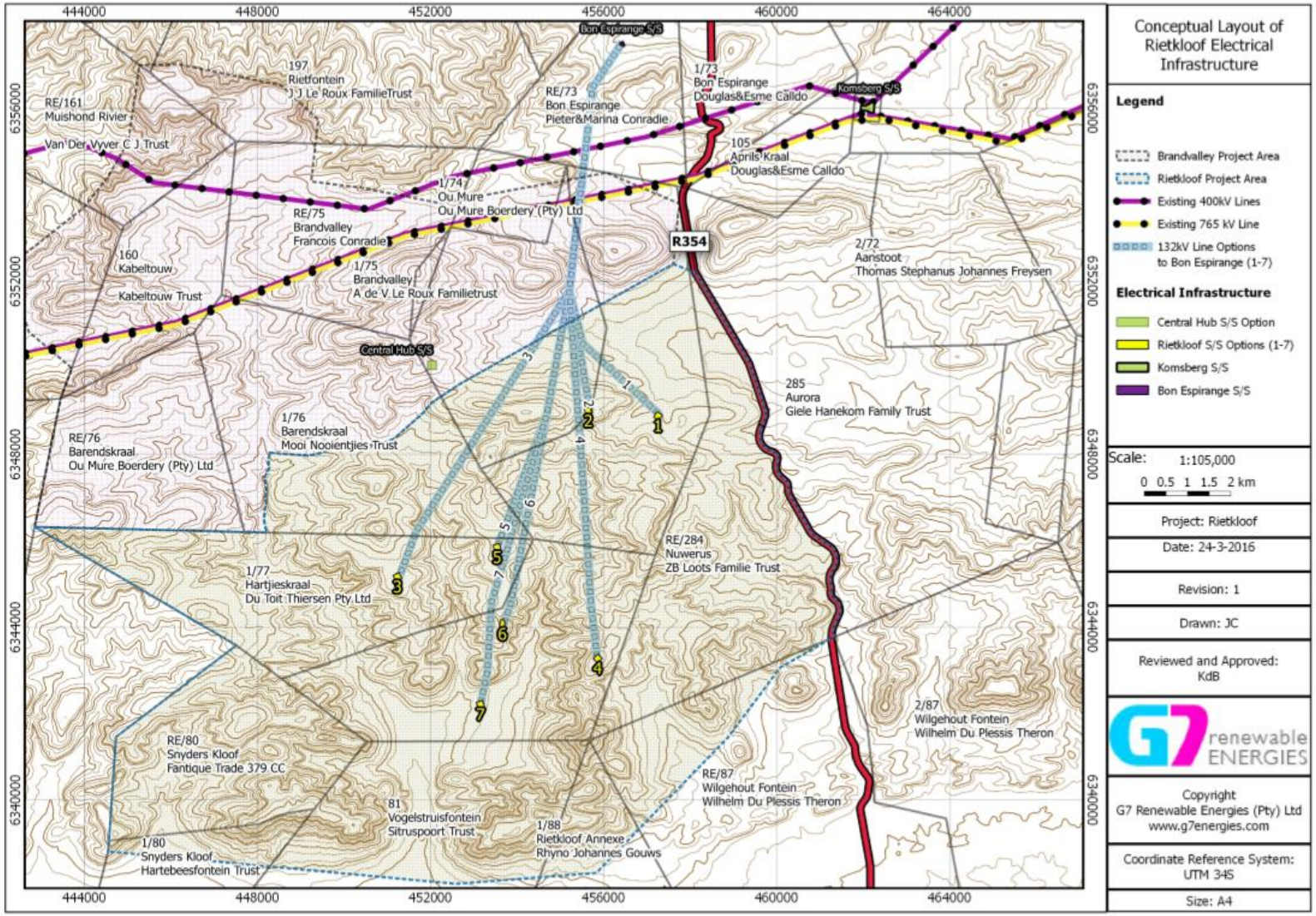

Figure 4: Conceptual layout of 132kV alternative line routes (including the 200m buffer) from the onsite substations to the Bon Espirange substation

2 TERMS OF REFERENCE

The terms of reference were to:

1) Prepare a basic assessment of the potential effects on the area's avifauna of each of the various proposed alternative electrical structures.
2) Describe the affected environment and determine the status quo.
3) Identify how avifaunal resources or communities will be affected by the proposed project.
4) Assess and evaluate the anticipated impacts using the provided methodology.
5) Discuss gaps in the baseline data with respect to avifauna and relevant habitats.
6) Map avifaunally sensitive areas in and around the proposed project area(s).
7) Make recommendations for relevant mitigation measures which will allow the reduction of negative impacts and the maximization of the benefits associated with any identified impacts.
8) Indicate, with motivation, the avifaunally most preferable of the alternative powerline corridors.

This assessment was informed by the following:

1) A desk-top review of existing literature to seek:
    a. Previous means of predicting bird mortality (and other impacts) of powerlines and associated infrastructure that affect birds in groups similar to those in the project area.
    b. Accounts of mortalities at powerlines
    c. Information on the status of bird groups most likely to be affected.
2) The 12-month bird monitoring campaign undertaken for the proposed Rietkloof WEF to identify bird species of special concern and assess the likely impacts of the construction and operational phases on the avifauna of the area.

3 AVIFAUNAL CONCERNS

The primary concerns from an avifaunal perspective are the potential impacts of:

1) **Disturbance** during construction of the sub-stations and powerlines
2) **Loss of habitat** as a result of grounded features – namely the sub-stations, pylon bases, and associated service tracks.
3) **Bird mortality through collision** with the overhead lines

For each impact there is a general impact on bird life with particular consideration of the impacts on species rated as of national conservation concern.

Disturbance and habitat destruction will only occur in the construction phase. Collision risk will occur throughout the operational phase. The decommissioning phase is not considered here since the regional situation is likely to have changed and will need reappraisal prior to that phase.

4 METHODOLOGY

4.1 Background field studies

A basic avifaunal appraisal of the Rietkloof WEF which involved monitoring, by four observers, of bird occurrence, and of the flight patterns of larger species, was conducted over 23 days spread across four seasons in 2015-2016 (Williams 2016a). During the same seasons, an additional 20 days of observations were made for the proposed Brandvalley WEF which is immediately north of the Rietkloof WEF (Williams 2016b). Previously, in 2013-2014, an avifaunal assessment, over similar seasons and timing, was made of the now authorized Roggeveld WEF which abuts the north-east of the Brandvalley WEF (Williams 2013). That report included the Bon Espirange farm where the Bon Espirange Substation will be constructed. Observations of bird occurrence were made east of the R354 road in 2014 during avifaunal assessment of a proposed WEF in that area as well as in 2014-2016 incidentally, whilst travelling between accommodation close to the Komsberg sub-station and the four WEFs. In February 2016 a field appraisal was made of the potential impacts on birds of the proposed Bon Espirange relay sub-station and the 132 kV powerline between that sub-station and the Komsberg transformer sub-station (Williams 2016c). Recording of birds across these several projects occurred in years that ranged from somewhat above (2013) to well below (2015-2016) the regional average rainfall. The experience of differing climatic conditions provided insight into how variation in conditions across the operational life of the proposed developments may affect the local avifauna. These surveys, made across a substantial period of time and involving differing seasons as well as climatic situations, are considered a better background for avifaunal appraisal of the proposed alternative 132 kV powerline routes than a dedicated single field survey would be, especially if commissioned in 2016 after the considerable period of drought conditions.

5 IMPACT ASSESSMENT

5.1 Disturbance

This is inevitable during the construction of the sub-stations, erection of the various 132 kV powerlines, as well as the tracks needed to install and service the powerlines. No time period is known at this stage but once development starts the duration of the construction phase is likely to be short, 12-18 months at maximum. There will be local displacement of mainly small scrub-dwelling birds during this phase. The disturbance will be temporary and its impact can be minimized if, once it begins, construction is kept to as short a period as feasible

and ideally is conducted outside the peak regional bird breeding season – August to October inclusive. This constraint need not apply to the powerline construction.

5.2 Habitat loss

The natural vegetation of the area, karooid bush, remains predominant across a wide region (Figure 1). The proposed footprint of the on-site sub-station is a square 200 x 200 m including a buffer halo such that habitat destruction will seldom exceed the proposed footprint area.

The footprint of each support structure for the 132 kV powerlines is small but there will be greater habitat damage and effective loss along the tracks created for the installation and maintenance of the powerlines.

The low woody bushes, the dominant vegetation of this region, are easily damaged by vehicles. They are slow growing and if damaged either do not regenerate or do so over very long periods, as exemplified by infrequently used farm tracks in the area. The footprints of the sub-stations, tracks and powerline support structures will thus result in effectively permanent (>20 years) loss of habitat for local birds. The loss of habitat will be definite and will have a negative, though extremely localized, impact with no probability of mitigation.

Elsewhere some bird species are known to be sensitive to human structures especially those that are visually intrusive and make a noise. Species sensitive to these issues may avoid otherwise unchanged habitat for some distance (variable between species) around the human structures. This results in a considerably greater habitat loss for these species than is represented by the actual footprint of the structures. The extent to which bird species in the Rietkloof WEF area are sensitive and may be displaced has not been studied so, in the absence of information, the precautionary principle must apply and until proved otherwise it must be considered that habitat loss will affect birds, especially larger-bodied birds, over a greater area than the immediate halo around the structures.

5.3 Collision risk

The habitat, over which the 132 kV powerlines will be developed, is one of low karooid scrub. The predominant bushes seldom grow above the knee height of an average human. Most of the food for birds is on this vegetation or the ground below. Consequently, the great majority of birds that use the area have no need to fly high off the ground and their risk of collision with powerlines is inconsequential. The main concern over collision mortality risk is with larger birds, which are known to be less agile in avoiding powerlines and, especially, the risk is greater for those that fly at night when lines are less detectable. Based on four years' experience monitoring birds in immediately adjoining areas three groups of birds are of particular concern in this region. These are:

1) bustards; 2) birds of prey; and 3) waterbirds.

5.3.1 **Bustards**

Two species of bustards occur in the area. These are Ludwig's Bustard (Endangered) and the Karoo Korhaan (Near-threatened). Neither species is common in the region as there have been fewer than ten sightings of each species across the four years of regional monitoring. With the single exception of a group of four Karoo Korhaans, no more than two individuals of either species have been seen together at any time during the years of monitoring. Thus, although Ludwig's Bustards are known to be prone to collision with overhead wires, the risk to this group from the proposed powerlines is extremely small and, unless an exceptional outbreak of suitable prey (e.g. locusts) occurs, the number involved is unlikely to ever be of a scale likely to cause conservation concern.

5.3.2 **Birds of prey**

Thirteen species of birds of prey have been recorded across the four years of regional observations and several of them are rated as of high conservation concern. Although considered at risk to powerline collisions, in fact locally several of the species use electricity support structures to their advantage by either roosting on pylons or perching on wires. Indeed, Martial Eagles (Endangered) probably would not occur in the region were it not for the off-ground roosting and breeding sites provided by pylons. The greatest risk envisaged for this bird group is collision where powerlines run along or especially across hillside slopes where several of the species do most of their foraging and so are visually focused downward to detect potential prey rather than looking forward and so may less readily detect fine obstructions like wires. For this reason, it is preferable that the powerlines are routed along rather than across terrain features i.e. along ridges or valleys rather than across them.

5.3.3 **Waterbirds**

In this semi-arid region waterbirds are largely restricted to farm dams. To ensure they also know the condition of alternative dams waterbirds must often move between dams. When they do so by daylight the risk of collision is low. However, many waterbirds often move at night. To do so they are predicted to follow valleys and cross ridges at low saddles.

The greatest risk to local waterbirds is considered to be when powerlines are located across (rather than along) valleys and when lines are located close to, particularly larger, dams. The risk of collision mortality is greatest where powerlines cross areas where topography funnels the bird's flight path. In the area under consideration there are two locations where there is an enhanced risk of collision mortality. These two locations are the:

1) Large dam on Fortuin farm, with associated irrigated fields; and

2) Col (or valley) across the ridge that otherwise separates the farms Ou Mure and Fortuin.

These areas are indicated in Figure 6.

6 CUMULATIVE AVIVAUNAL IMPACTS

This report was commissioned to review the alternative focal developments – of the substations and powerlines - and the likely impacts on birds in the immediately affected area. Impacts of the focal developments must also be considered in the wider context of other known regional developments. The Roggeveld wind farm has been authorised for development on properties immediately adjacent to the focal area. More WEFs, including the Rietkloof and Brandvalley projects, are being proposed in close proximity to the north, west east and south of the Roggeveld wind farm and the R 354 road as indicated in Figure 5.

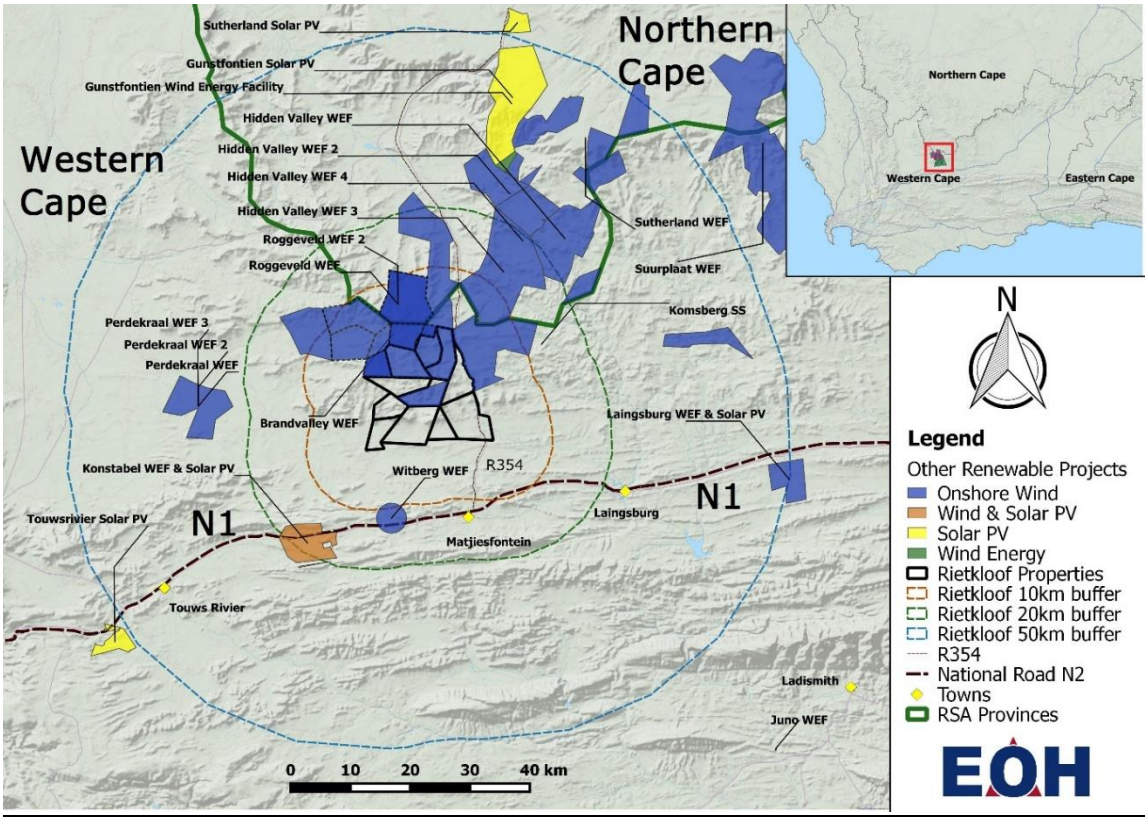

Figure 5: The proposed Rietkloof WEF project site in relation to other renewable energy projects (solar and wind) (map provided by CES).

In addition, two solar power plants are proposed and another is being contemplated in areas adjoining the wind farm localities. Together these developments cover a considerable area and form the most radical change to the regional environment since the establishment of farms with irrigated fields and dams.

All these developments are in areas of predominantly low scrub vegetation which covers a far wider area within South Africa. This vegetation, compared with wetter areas and richer vegetation types, offers few resources to birds so species diversity and, especially, the density and size of bird populations are low. The only local exceptions are small patches of natural riparian bush and farmlands with dams, trees and cultivated (often irrigated) fields.

Development of the windfarms requires widening of old farm roads and the construction of new roads to enable large vehicles to access to the hilltops where turbines, with their associated footprint areas will be located. These developments will result in considerable disturbance through the construction phase and the loss of considerable habitat. The solar power plants will also destroy habitat.

The potential impacts, on birds, of the various alternative powerline routes and substation locations have to be considered against this cumulative background.

To transfer electricity from the turbine strings to the national grid will, if all the proposed wind farms get authorisation, require a considerable number of 33kV overhead powerlines between turbine strings to one or more sub-stations and, after transformation, 132 kV lines from the sub-stations to the main Eskom 400 KV line. In places the 33 kV, and some 132kV, lines will cross valleys at right angles and also obstruct low points in ridges which are preferred flight paths of birds.

Many birds in the region birds prefer to fly along valleys rather than cross ridges. Lines across valleys will increase collision risk. This is especially the case for those larger birds which move by night e.g. waterbirds moving between dams in the valleys. Together the cumulative impact of these power lines, because they are less readily seen and are more often located across bird flight routes, impose a greater threat to birds than the turbines which are all located on hilltops which, in this region, support few birds. The cumulative impacts are acceptable provided the mitigation measures are implemented.

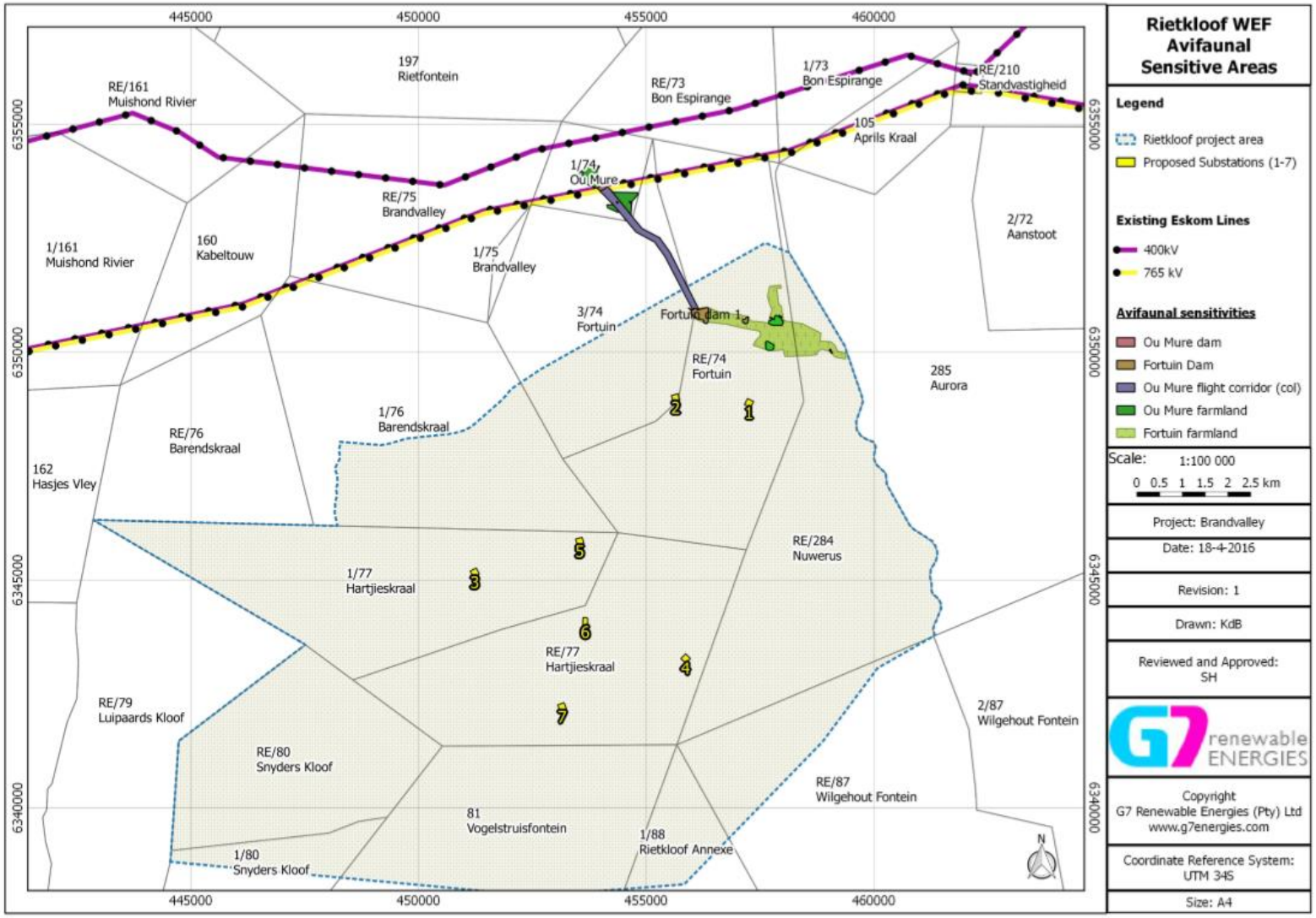

Figure 6: Sensitive areas identified for the Rietkloof WEF

7 COMPARISON OF THE ALTERNATIVE ROUTINGS

There are three localities of particular importance for birds in the overall Rietkloof area encompassed by the alternative powerline routes. No powerline routes come within 2 km of one of these localities - the only known currently active Verreaux's Eagle nest in the affected region. Both of the other two localities may be affected by one or another of the alternatives.

These localities are 1) the dam on the farm Fortuin and 2) the col in the ridge between the Ou Mure and Fortuin farms as indicated in Figure 6.

In this region waterbodies are scarce. However, there is a likely waterbird flight route from waterbodies in the Tankwa Valley, up the Wilgebosch Valley via the Klipbanksfontein and Rietfontein dams, over the ridge above Leeustert, to the small dams in the Ou Mure farm and, via the col in the ridge between Ou Mure and Fortuin farms, to the Fortuin dam.

Ducks, geese, grebes, coot and some other waterbirds generally fly between waterbodies at night and so when the visibility of powerlines across their flight path is reduced. These birds often fly in flocks and, when moving locally as within this region, tend to fly low, at heights that will take them above any trees, and so at heights similar to those of overhead powerlines. These factors – night flight, in flocks and at potential collision height - renders waterbirds the group with the highest risk of colliding with powerlines.

The Fortuin dam is the largest body of water across the two adjoining WEFs. It retained water throughout the intense drought though its surface area was reduced to less than a third of the area flooded when the dam is full. It is located close to a series of irrigated croplands. The croplands provide foraging areas for many waterfowl and also some Korhaans. The waterfowl use the dam as a roost. The number of birds seasonally dependent upon the dam is considerable, >100 even when only a third full. This dam is the core facility for waterbirds in this sub-region of the Roggeveld.

Figure 7: The Fortuin dam in February 2016, its surface reduced to about two-fifths of its maximum area. Waterbirds roost on the dam after foraging in the adjacent irrigated fields so there is a wide flight path between the dam and the R354 road (seen in background) which marks the eastern limit of irrigated fields. The irrigated fields also, at least seasonally, support some Karoo Korhaans (Near threatened).

Two of the main routes associated with the proposed Rietkloof alternative powerline routes would cross the area between the Fortuin Dam and the Ou Mure dam namely: 1) the powerlines from the central hub substation to Komsberg and Bon Espirange and 2) powerlines from onsite substations to Bon Espirange. The col, or deep gap, in the ridge between the Ou Mure and Fortuin farms (Figure 8), is a flight path for birds, especially waterbirds, moving to or from the Fortuin area. As the col funnels bird movement any powerlines through or across the col or its' entry areas are likely to increase the risk of bird collision mortality.

The col has two patches of trees. In February 2016 one patch (Figure 8) supported a roost of European Bee-eaters. In 2015 the other patch supported a colony of Cape Weavers. This patch was deserted during the 2016 summer drought.

From the Fortuin corner to the northern border of the irrigated fields, lines in both alternatives would provide a potentially high collision mortality risk for birds moving between the irrigated fields and the dam, especially at night when lines would be less visible. The current layout of the powerlines from the onsite substations to Bon Espirange and the powerlines from the central hub substation to Komsberg or Bon Espirange are therefore not preferred. Therefore, an amended layout is proposed to avoid this sensitive col. The amended routes are described in Section 7.1 below.

Figure 8: The centre of the Ou Mure/ Fortuin col. In February 2016 the trees supported a roost of European Bee-eaters. The presumed flight path of waterbirds traversing the col would be between the trees and half way up the far side of the col. Day flights observed were in this height range. Night flights, when collision risk will be greater, are unlikely to be higher.

7.1 Amended layout

In order to avoid the sensitive areas identified, it is proposed to reroute the powerlines as follows:

a) Powerline routes from the onsite substations to Komsberg remains unchanged.
b) Powerlines routes from onsite substations to the central hub-substation remains unchanged, however to avoid the sensitive col, it is proposed to reroute the 132kV powerline options from the central hub substation to Komsberg and or to Bon Espirange to (see Figure 9):
    1. Be routed to the north of the col from where the powerlines will run parallel to the southern existing Eskom line, to the Bon Espirange or Komsberg sub-station. Where it crosses the Tankwa-Fortuin waterbird flight path there is already the Eskom obstruction,
    2. Cross the col at the highest point by placing the towers at the highest points on either side of the col to allow for a maximum clearance between the conductor and valley, or
    3. Be routed to the south of the flight corridor then turn north along the R354 towards Bon Espirange or Komsberg.
c) Powerline routes from onsite substations to the Bon Espirange substation to:
    1. Be routed to the north of the col from where the powerlines will run parallel to the northern existing Eskom line, to the Bon Espirange sub-station (see Figure 10)
    2. Cross the col at the highest point by placing the towers at the highest points on either side of the col to allow for a maximum clearance between the conductor and valley (see Figure 11), or

3. Be routed to the south of the flight corridor east to the Fortuin farm area then diagonally to the R354 and on to Bon Espirange (see Figure 12).

If the Central Hub option is chosen then, from an avifaunal perspective, the route north of the col is, by far the preferred route as it avoids both the col and the Fortuin area. The second choice is routes across the col as it will cross the col at a height considered to be above that at which most birds will fly when using this part of their flight-path. The routes to the south of the col are, avifaunally, the least preferred of the Hub routes as it the most likely to cause bird collision mortality where they cross between the irrigated fields and the Fortuin dam and flights between these two areas are considered more frequent (twice daily) than flights through the col.

If the Bon Espirange option is chosen then, from an avifaunal perspective, the route north of the col is, by far, the preferred route as it avoids both the col and the Fortuin area. The second choice is routes across the col as it will cross the col at a height considered to be above that at which most birds will fly when using this part of their flight-path. The routes to the south of the col is, avifaunally, the least preferred. Any of the powerline routes from the onsite substations to Komsberg (see Figure 2) or the powerline routes from onsite substations to the central hub-substation can proceed.

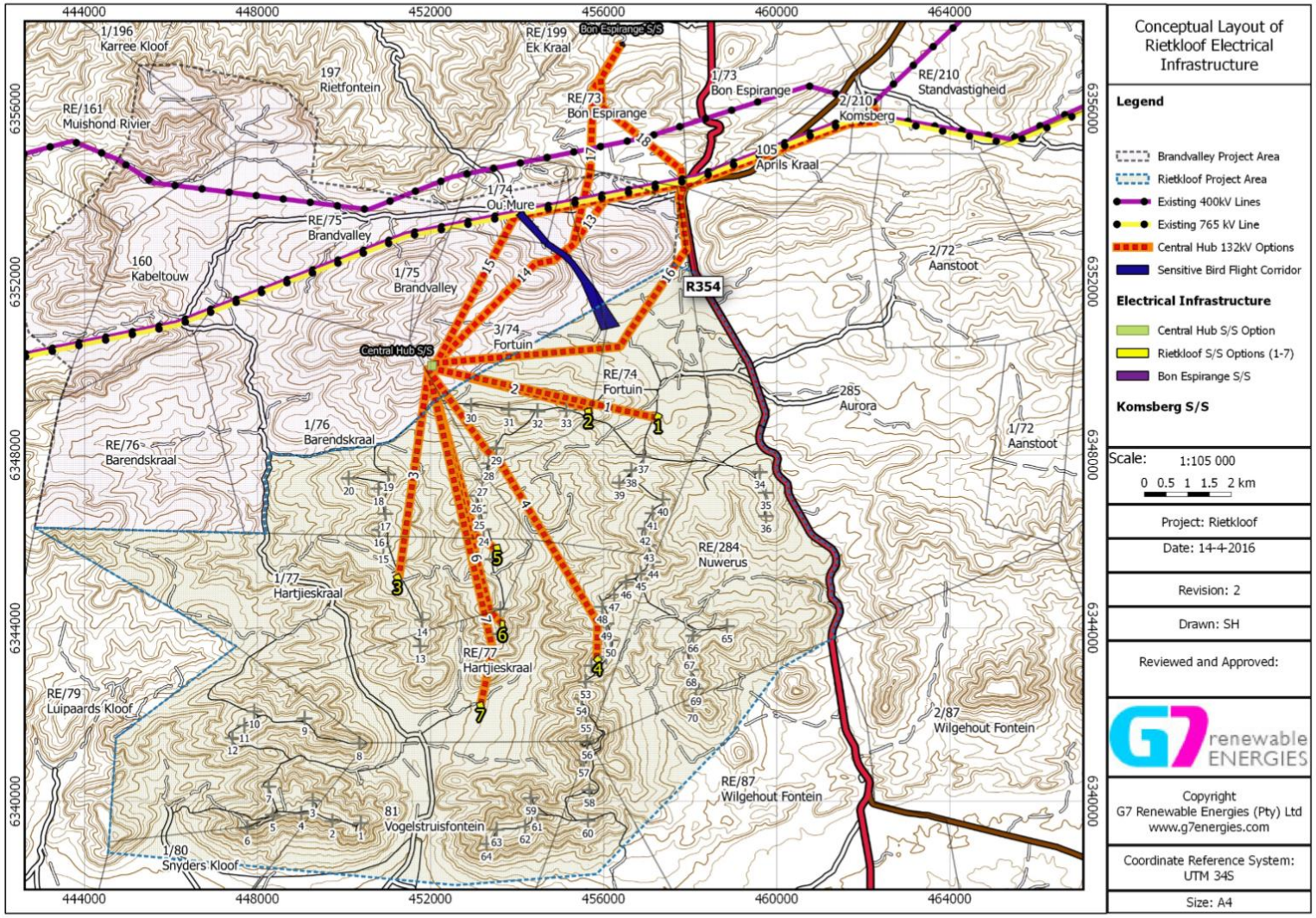

Figure 9: Three new proposed 132kV powerline routes from the central hub substation to the Bon Espirange and Komsberg

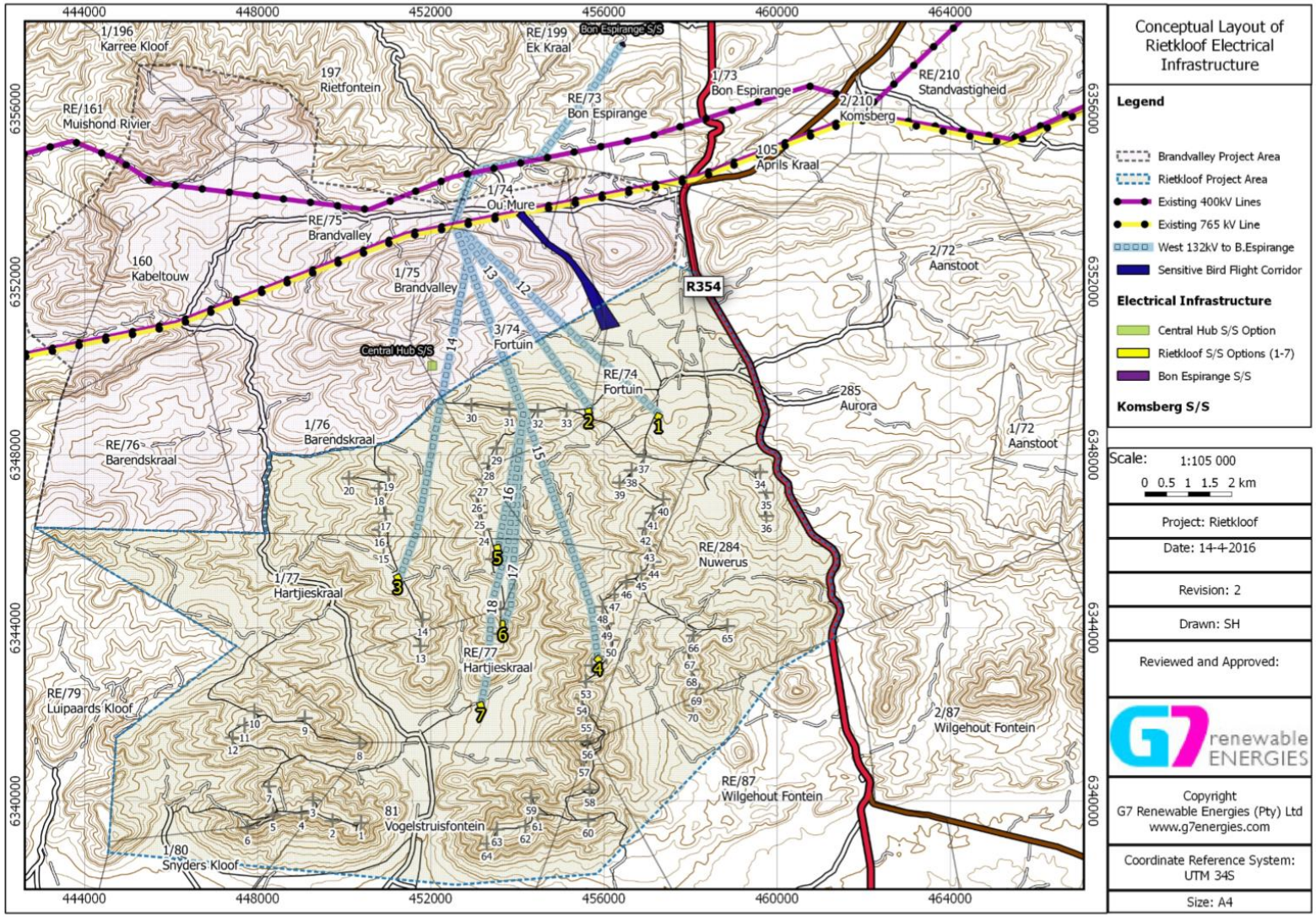

Figure 10: The new proposed 132kV powerline routes from the onsite substations north of the col to the Bon Espirange substation

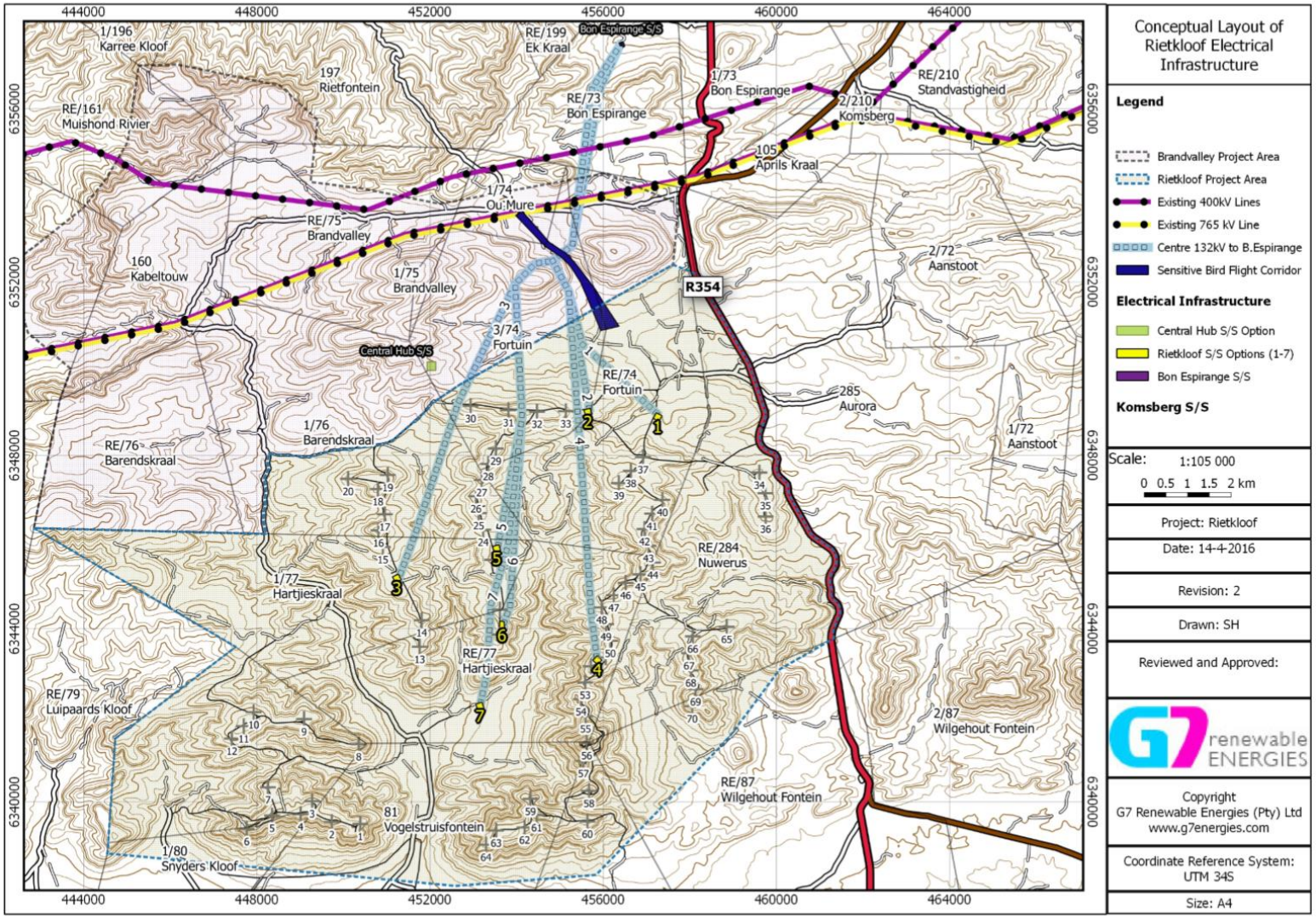

Figure 11: The new proposed 132kV powerline routes from the onsite substations cross the col to the Bon Espirange substation

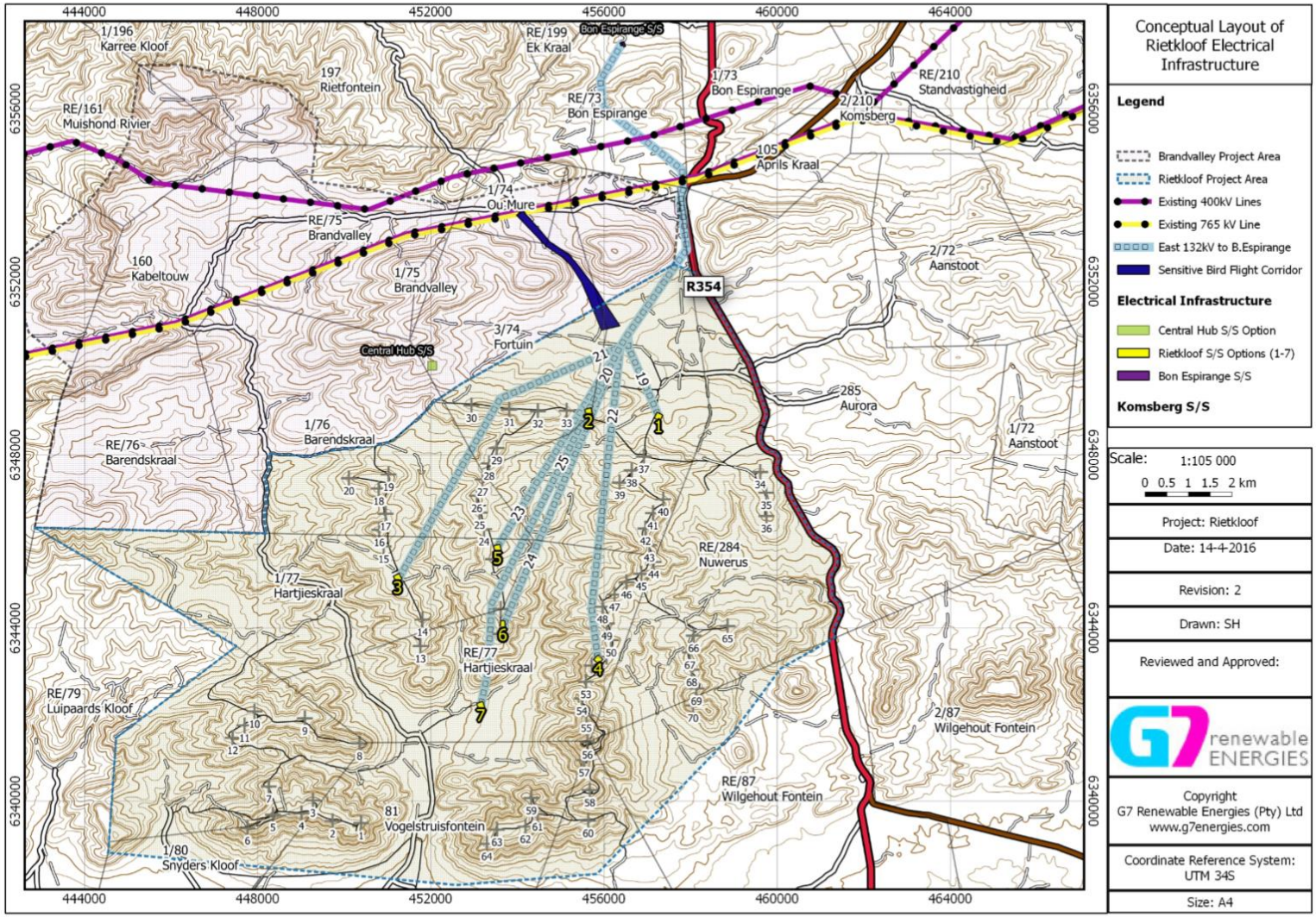

Figure 12: The new proposed 132kV powerline routes from the onsite substations south of the col to the Bon Espirange substation

8 POTENTIAL MITIGATION MEASURES

From an avifaunal perspective mitigation measures were considered for application to any of the proposed alternatives:

1) Reroute the powerlines as discussed in section 7.1
2) Reduce the loss of bird habitat by minimal clearance of vegetation from the entire service tract and where possible using a single track to install and service the local powerlines.
3) Where possible avoid, or minimize, construction of sub-stations during the period August to October inclusive – the main breeding season for local birds.
4) Wherever feasible, route powerlines along, rather than across, terrain features (ridges and valley bottoms).
5) Placing of diverters at 5 m intervals on each span of all lines crossing saddles. It is accepted that these are likely to deteriorate across the operational life of the lines. The main aim is to alert bird to the lines in the immediate post-construction years when the lines will be a novel risk which locally resident birds will, over years, learn to compensate for.
6) Place diverters at 2m intervals on any powerlines that cross the sensitive col between Ou Mure and Fortuin.
7) Placing cables at ground level (buried or in pipes) would be preferable to overhead lines but is, in view of the perceived low level of bird collision risk, environmentally and financially unjustified for this project.

9 ASSESSMENT OF IMPACTS

Disturbance and habitat loss will occur in the construction phase of the various new onsite sub-stations and the powerlines with their attendant service tracks. Habitat loss will be permanent. Bird collision risk will occur throughout the operational phase.

DISTURBANCE **associated will all the 132 kV distribution lines and on-site substation alternatives**		
	Without mitigation	**With mitigation**
Extent	Localised (1)	Localised (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Slight (1)	Slight (1)
Probability	Definite (4)	Definite (4)
Significance	Low (7)	Low (7)
Status (positive/negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?		Yes

Mitigation		Avoidance of construction of sub-stations during the main breeding season for local birds which is the period August to October inclusive, as far as possible.
Cumulative impacts:	Minor	Acceptable
Residual impacts:	Short-term	Short-term

HABITAT LOSS **associated will all the 132 kV distribution lines and on-site substation alternatives**		
	Without mitigation	**With mitigation**
Extent	Localised (1)	Localised (1)
Duration	Long-term (3)	Long-term (3)
Severity	Slight (1)	Slight (1)
Probability	Definite (4)	Definite (4)
Significance	Moderate (9)	Moderate (9)
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?		Yes
Mitigation		Clear only areas where absolutely necessary Minimize the number of service tracks
Cumulative impacts:	Minimal	Acceptable
Residual impacts:	Permanent alteration	Permanent alteration

BIRD COLLISION MORTALITY RISK **ASSOCIATED WITH ALL THE 132kV DISTRIBUTION LINE ALTERNATIVES**		
	Without mitigation	**With mitigation**
Extent	Localised (1)	Localised l (1)
Duration	Long-term (3)	Long-term (3)
Magnitude	Moderate (2)	Moderate (2)
Probability	Definite (4)	Definite (4)
Significance	Moderate (10)	Moderate (10)
Status (positive/negative)	Negative	Negative
Reversibility	Minimal	
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?		Yes
Mitigation: Mitigation measures		No powerline routes 1) near Fortuin dam and 2) through, or across, the

		col between Ou Mure and Fortuin farms, or for these localities unless powerlines are elevated.
Residual impacts:	So long as infrastructure lasts	So long as infrastructure lasts

10 ENVIRONMENTAL IMPACT STATEMENT

Provided the final routing takes full cognisance of the avifaunal preferences (bearing in mind the preferences of other specialists and the technical requirements), and the suggested mitigation measures are followed, the disturbance and habitat loss resulting from the proposed development are, though of negative impact, minor and inconsequential in regional terms even allowing for cumulative impact.

The risk of bird deaths as a result of collision with infrastructure, though negative, is extremely low for the greater part of the local avifauna and, though somewhat higher, is also considered low – and at an acceptable level – for the three groups of birds of anticipated greater risk. Again the contribution to the likely cumulative threat is minor and acceptable.

None of the identified impacts can be considered positive. However, from an avifaunal perspective there is no reason to oppose this development.

If the Central Hub option is chosen then, from an avifaunal perspective, the amended routes north of the col are, by far the preferred route as it avoids both the col and the Fortuin area. The second choice is amended routes across the col as it will cross the col at a height considered to be above that at which most birds will fly when using this part of their flight-path. The routes to the south of the col are, avifaunally, the least preferred. Any of the powerlines from the onsite substations to the central hub can proceed.

If the Bon Espirange option is chosen then, from an avifaunal perspective, the routes north of the col are, by far the preferred route. The second choice are the routes across the col followed by the routes to the south of the col which is, avifaunally, the least preferred.

Any of the powerline routes from the onsite substations to Komsberg as indicated in Figure 2 can proceed.

All substation locations are acceptable.

11 REFERENCES

BirdLife South Africa. Checklist of birds in South Africa 2016 [has latest national and global conservation status for each species]. Johannesburg: BirdLife South Africa.

Williams, A.J. 2013. Avifaunal specialist report for the environmental impact assessment phase 1 of the G7 Roggeveld wind energy facility, Western Cape Province. Unpublished report by African Insights.

Williams, A.J. 2016a. Avifaunal specialist report for the environmental impact assessment of the proposed Rietkloof wind energy facility, Western Cape Province. Unpublished report by African Insights.

Williams, A.J. 2016b. Avifaunal specialist report for the environmental impact assessment of the proposed Brandvalley wind energy facility, Western Cape Province. Unpublished report by African Insights.

Williams, A.J. 2016c. Avifaunal assessment for the proposed Bon Espirange substation and powerline linking it to the existing Eskom Komsberg substation. Unpublished report by African Insights.

12 DECLARATION OF CONSULTANT'S INDEPENDENCE AND QUALIFICATIONS

Dr. Anthony (Tony) Williams is an independent consultant. He has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work.

Dr. Williams has been a professional ornithologist for 45 years, including 9 years as a researcher at the FitzPatrick Institute of African Ornithology, 19 years as specialist scientist in Cape Nature (Conservation), five years at the (then) Avian Demography Unit, and 11 years as a consultant. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information.

13 CONSULTANT'S CURRICULUM VITAE

Dr A.J. (Tony) Williams

SA ID: 420902 5541 080

QUALIFICATIONS

B.Sc. *Cum laude,* in Geography, University of Sheffield, UK 1964

Postgraduate Certificate in Museum Studies, University of Leicester, UK 1968

M.Sc. Zoology, University of Sheffield, UK 1972

Ph.D. Zoology, University of Cape Town, South Africa 1980

EMPLOYMENT

2008-present: **Consultant. Co-director: African Insights. Director: Dr Williams Bird Surveys**

2001-2007	Seconded, as ornithological researcher, by Cape Nature to **Avian Demography Unit, University of Cape Town.**
1994-2007	Senior Professional Officer (Ornithology) at **Western Cape Nature Conservatio**n (later renamed as **Cape Nature**). Provision of expert avifaunal advice.
1988-1994	Senior Ornithologist **Cape Provincial Nature Conservation**: Responsible for Walvis Bay and guano islands 1988-1994;
1982-1988:	Ornithologist for **Department of Conservation and Tourism SW Africa/ Namibia**
1973-1982:	Research officer at **Percy Fitzpatrick Institute of African Ornithology, University of Cape Town**: dealing with sub-Antarctic Marion and Gough Islands (23 published scientific papers) and coastal birds in the southwestern Cape (6 papers)
1969-1972	**Norway** – research assistant at University of Tromso
1967-1968	**UK** Museum Studies course at Leicester University
1967	**UK** Field Research for MSc.
1965-1966	**Canada** - Assistant Planner in Vancouver, British Columbia
1964-1965	**UK** Peak District National Park - Assistant planner
Pre-1964	**UK** Education. and study at University of Sheffield
Overall:	43 years as a professional ornithologist; 25 years as a conservation ornithologist; and 20 years involvement in consultancy.

CONSULTATIONS

Fields of expertise:

Specialist avifaunal assessments/ surveys;

Development of tourism concepts;

Provision of nature interpretational material/signage

TERRESTRIAL DEVELOPMENTS:

Energy projects:

***Eskom*:** Appraisal of new power lines at Kimberley and at Misverstand (Swartland); and three lines related to wind energy facilities in the Roggeveld (border between Northern and Western Cape Provinces). Review of the potential impacts of electricity infrastructure on birds in the entire West Coast District Municipality.

***Wind Energy Facilities (WEF*)**: Work on 10 WEFs. Scoping for a WEF, with associated radar survey and full moon observations of bird movements, near Vredenburg; Scoping for Denham WEF near Struis Bay; Avifaunal EIA section for Zen WEF near Gouda (2013-2014); Seasonal pre-construction avifaunal field monitoring for 5

WEFs in the Roggeveld region between Matjiesfontein and Sutherland (2013-16); Socio-economic plans related to Witteberg WEF near Laingsburg, and for proposed WEFs near Klawer and in the Richtersveld.

Solar Power Plants (SPP) Avifaunal EIAs for 9 PV solar arrays: near Langebaan (2014); near Touws River (2015); near Vanderkloof Dam in the Free State (2015-2016); and 6 proposed SPPs near Vryburg in the North West Province (2015-2016).

Nuclear Power Plants

Specialist peer-reviewer for faunal reports prepared for 3 proposed nuclear plants (2009)

URBAN PROJECTS:

Residential developments: Strandfontein (2008), Paarl golf estate (1999), Atlantic Hills (Cape Town) (2012)

Landfills: Avifaunal appraisals in terms of habitat loss, bird use, and problems in developed landfills for proposed new regional landfills for Eden (2011) and Winelands (2013) District Municipalities

Roads: Impacts of new roads on birds, including pollution and disturbance: R 300 Strandfontein (2004) & Military Road (2008) proposals; R27 Elands Bay to Lamberts Bay phases 1 (2000) and 2 (2004). Prepared global review of road impacts on reptiles

WETLAND RELATED DEVELOPMENTS:

Century City, Cape Town – Reports on: the control of building heights (2007); Canoeist disturbance of birds (2008); Impacts on birds of rotenone poisoning of fish (2009). Also, 20 years as ornithologist on the environmental advisory committee for the Intaka Island Nature reserve within Century City.

Paardevlei, Somerset West: - Pre-draining appraisal (2004), Impacts on birds of rotenone poisoning of fish (2005), wetland development plan and bird monitoring ongoing 2013-2016

Flamink Vlei, Berg River: 2006-2011 impacts on birdlife of this major – 900 residential units – development; reports on potentials for avi-tourism (2007) and for establishing a guano enterprise (2007)

Paarl: 10 years in advisory role for the Bird Sanctuary/ WWTW; Advice to the Paarl Golf Estate;

Miscellaneous: Assessment of impacts on birds of developments at Uilenkraal (2 separate residential development proposals eastern (2002) western (2005)); Thesen Island, Knysna (1996); De Plaat – on Berg River (2005-2011); Atlantic Hills, Richwoood (2012): – How to reduce waterbird use of wetlands to avoid collision mortalities.

MARINE/ COASTAL DEVELOPMENTS:

Offshore: Marine oil, gas and diamond EIAs (1998-2004). Assessment of proposed salmon farm in Saldanha Bay (2012)

Onshore: Avifaunal advisor for Saldanha Port development (2014-2016); Site selection for the proposed West Coast District Municipality desalination plant (2012); Report on the potential for further guano platforms along the Namibian coast (1989). Effects of off-road vehicles on beach birds (published scientific paper)

Coastal residential developments*:* in the Uilenkraal valley, near Gansbaai (1999), Laaiplek (2005), Doring Bay (2008), Strandfontein (near Olifants River)(2008),

TOURISM/ ECO-EDUCATION DEVELOPMENTS:

Concept developer, fund raiser, and partial project manager of numerous tourism developments most connected with the development of local communities

Rietvlei wetland eco-centre: Developed concept, motivated funding, taken to full Scoping level.

West Coast Investment Initiative: 1997-1999. Prepared tourism development proposals for Verloren Vlei and Pakhuis Pass (Cederberg). Concept development, fund motivator, and project manager for Lamberts Bay Bird Island tourism phases 1 (completed 1998) and 2 (completed 2001).

Cape Nature: Project manager for the Whale Hiking Route at De Hoop Nature Reserve (2002). Rocher Pan – provision of interpretation material (2009).

Coastcare: 2005> Developed proposals for Coastcare funding of tourism facilities at Kleinbaai (near Gansbay), Bettys Bay, and Lamberts Bay. All were short-listed, field inspected, and endorsed by the authorities. However, the foreign donor withdrew funding at national level. The Bettys Bay development at Stoney Point has been developed under different funding and I provided the interpretation material (2012-2014).

Flandos & associates: Matzikama Eco-park in Vredendal taken from concept to completion (2002-2004). Proposed developments at Doring Bay (2007), Graafwater, Citrusdal, and near Darling are still being considered.

Miscellaneous: Boschberg eco-residential/ ecotourism development (Somerset East) for Blue Crane Route (2010); Paardevlei (Heartlands); Flamenco Eco-centre, De Plaat; provision of interpretation material for Lamberts Bay Bird Island tourism phase 3 (2012-2015).

SCIENTIFIC ACHIEVEMENT:

110 peer-reviewed papers in the international scientific literature.

SANCCOB (South African National Council for Conservation of Oiled Birds). Member of the executive committee 1994-2000, chairperson 1998-2000. High level involvement during the *Apollo Sea* spill in 1994; research into subsequent survivability and reproduction of de-oiled penguins 1994-1999; and advisor to the top level daily response committee for the *Treasure* spill of 2000.