Bird Impact Assessment Study

Proposed extension of the Ash Disposal Facilities at Camden Power Station

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EXECUTIVE SUMMARY

Eskom Generation plans to extend the ash disposal facility and associated infrastructure for the Camden Power Station. The new ash disposal site will need to cater for an estimated 12,86 million m^3 of ash up to 2023, plus five years contingency. It is estimated that the extension / new site will be in the order of 100 ha depending on the height of the facility. Additional structures *inter alia* ash water return dams and channels, roads and fences will increase the footprint by an estimated 20 ha.

It is envisaged that the construction of the proposed ash dump will result in the radical transformation of an area of approximately 125ha. The transformation will effectively displace the majority of avifauna currently utilizing the proposed development area, and, depending on where the development takes place, will result in the fragmentation of natural grassland habitat. The effect of this will be an overall reduction of species diversity and abundance in the study area. None of the priority avifauna species listed in the Mpumalanga Biobase Report was recorded by the on-site surveys, but their occurrence cannot be ruled out.

One of the objectives of this study is to arrive at a preferred alternative for the proposed development in terms of impacts on avifauna. In order to make an informed decision, the results of the on-site surveys were used as an indication of sensitivity. Birds were counted at all three alternative sites and the diversity and abundance of avifauna per habitat type (grassland vs agriculture) was compared for all three sites combined in order to establish which habitat type supported the greatest variety and abundance of avifauna. The quantity of each habitat type was then measured for each alternative, and the site that contained the lowest quantity of sensitive habitat was deemed to be the preferred alternative for the proposed development. From the analyses grassland emerged as the most sensitive habitat, as it supports the largest variety and density of birds. Quantification of the habitat types at the different sites indicated that alternatives 1 and 2 are closely matched, with alternative 3 emerging as the most suitable alternative from a bird impact perspective, as it contains the least amount of grassland and the most amount of transformed habitat. Ideally therefore, from a bird impact perspective, the development should be located in agricultural lands on alternative 3.

The cumulative impact of losing another 120 hectares of grassland bird habitat in the Mpumalanga Highveld should be regarded as a moderate to high impact within the overall context of existing pressure on natural grassland habitat in Mpumalanga. If, however, the development is located on existing agricultural lands, the cumulative impact would be low, as the agricultural operations have already transformed the natural habitat completely.

RECOMMENDED MITIGATION

- The primary recommendation is that the development is situated on site alternative 3 in agricultural land to minimise the impact on avifaunal diversity and abundance, which is linked directly to the availability of natural grassland in the study area.
- Should it for whatever reason not be possible to follow the recommendation above, Eskom should consider environmental enhancement projects such as the rehabilitation of degraded grasslands and wetlands within a specific area to a pristine state (or as close as possible to a pristine state). The specific area(s) should be identified in consultation with the avifaunal specialist prior to the commencement of construction.
- Irrespective of which alternative is used, the proposed recommendations of the Terrestrial Ecology Specialist Study for the Environmental Management Programme should be strictly applied to minimise the impact on the natural environment, specifically on the remaining natural grassland, as this is the most important bird habitat in the study area.
- Maximum use should be made of existing infrastructure (e.g. pipelines, access roads and fencing) to minimise the further fragmentation of natural grassland areas.

1 BACKGROUND

1.1 Scope

Zitholele Consulting have been appointed by Eskom Generation as independent environmental practitioners to undertake the Environmental Impact Assessment (EIA) for the extension of ash disposal facilities and associated infrastructure for the Camden Power Station. The new ash disposal site will need to cater for an estimated 12,86 million m³ of ash up to 2023, plus five years contingency. It is estimated that the extension / new site will be in the order of 100 ha depending on the height of the facility. Additional structures *inter alia* ash water return dams and channels, roads and fences will increase the footprint by an estimated 20 ha.

See Appendix 1 for a map showing the study area with the proposed alternative development areas.

Chris van Rooyen Consulting was appointed by Zitholele Consulting to conduct the investigations into the potential bird impacts that might occur as a result of the construction of the infrastructure.

1.2 Terms of reference

The terms of reference for this bird impact assessment report are as follows:

- a description of the existing environment, bird communities and micro habitats;
- a description of potential impacts;
- indication of confidence levels;
- selection of a preferred alternative;
- rating of impacts; and
- proposed mitigation measures.

1.3 Sources of information

The following information sources were consulted in order to conduct this study:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2) was obtained from the Animal Demography Unit website (http://sabap2.adu.org.za,), for the Quarter-Degree Grid Cell (QDGC) where the proposed development is located (2630CA).
- The conservation status of all species considered likely to occur in the area was determined as per the most recent iteration of the southern African Red Data list for birds (Barnes 2000), and the most recent and comprehensive summary of southern African bird biology (Hockey *et al.* 2005). QDGCs are grid cells that cover 15 minutes of latitude by 15 minutes of longitude (15. × 15.), which correspond to the area shown on a 1:50 000 map.
- Additional bird distribution data and a classification of the vegetation types in the QDGCs were obtained from Southern African Bird Atlas Project 1 (SABAP1) (Harrison *et al.* 1997).
- Information on the micro habitat level was obtained through visiting the area in January 2012 and obtaining a first-hand perspective. Transect counts were conducted to establish the densities and diversity of the avifauna at the different alternative sites. Three transects were identified and each transect was counted three times.
- The Mpumalanga Biobase Report (Emery *et al*. 2002) was consulted to establish which bird habitats are regarded as conservation priorities in the province.
- Data from the Co-ordinated Avifaunal Road count project (CAR) for the Mpumalanga precincts were obtained (Young, Harrison, Navarro, Anderson and Colahan, 2003). This data was of particular importance in order to establish what densities of large terrestrial birds could be expected to occur in the study area, and especially what the habitat preferences of those species are.

- Interviews were conducted with Ms Ursula Franke, Senior Field Officer: Highveld Crane Conservation Project of the Endangered Wildlife Trust, with regard to the occurrence of cranes and other Red Data species in the Ermelo district.

1.4 Assumptions & Limitations

This study made the assumption that the above sources of information are adequately reliable. However, there are factors that may potentially detract from the accuracy of the predicted results:

- Sources of error in the SABAP2 database, particularly limited coverage of some QDGCs. This means that the reporting rates of species may not be an accurate reflection of the true densities in QDGCs that has to date been sparsely covered during the data collecting. The 2630CA QDGC has not been well covered by SABAP2 with a total of only 15 checklists. Despite the relatively low sample sizes, it does provide a reasonably comprehensive set of data with regard to the species that are likely to occur.
- The SABAP2 information was supplemented with actual counts at the different site alternatives. The counts were conducted in January after good rains. These are the type of conditions which is most suitable for instantaneous sampling bouts on the Mpumalanga Highveld i.e. in the wet season when the highest species diversity and abundance is to be expected. However, it must be accepted that bird distribution patterns may fluctuate in response to climatic conditions, particularly rainfall, and that sampling over several seasons is required to get a representative picture of the species that occur at the site.

2 DESCRIPTION OF AFFECTED ENVIRONMENT

2.1 Vegetation

Table 1 below shows the vegetation composition of the relevant QDGC, namely 2630CA (Harrison *et al* 1997). It is generally accepted that vegetation structure, rather than the actual plant species, influences bird species distribution and abundance (in Harrison *et al.* 1997). Therefore, the vegetation description below does not focus on lists of plant species, but rather on factors which are relevant to bird distribution.

Table 2.1. Vegetation composition of 2630CA (Harrison *et al* 1997).

Biome	Vegetation type	2630CA
Grassland	Mixed grassland	100%

The proposed alignments fall within the grassland biome. The dominant plants in the grassland biome are grass species, with geophytes and herbs also well represented. Grasslands are maintained mainly by a combination of the following factors: relatively high summer rainfall; frequent fires; frost and grazing. These factors preclude the growth of trees and shrubs. This biome has been largely transformed in South Africa through various land uses such as afforestation, and in Mpumalanga and Gauteng, by crop cultivation and mining. **Sweet grassland** is generally found in the lower rainfall areas - vegetation is taller and sparser, and nutrients are retained in the leaves during winter. **Sour grassland** generally occurs in the higher rainfall areas on leached soils. Many grassland bird species show a preference for sour grassland over sweet or mixed grassland. **Mixed grassland** is a combination or a transition between the two grassland types above. In the study area itself, short, dense sour grassland is most prevalent, with the dominant grassland type in the study area being Eastern Highveld Grassland (Mucina & Rutherford 2006).

2.2 Bird micro-habitats

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of the broad vegetation type above, it is as important to examine the micro habitats available to birds. These are generally evident at a much smaller spatial scale than the vegetation types, and are determined by a host of factors, such as vegetation type, topography, land use and manmade infrastructure. The land use in the study area is a variety of mixed farming practices. Grazing is developed in parallel with crop farming.

The most important bird micro-habitats other than natural grassland that were identified during the field visit are the following (see Appendix 2 for a photographic record of recorded habitat):

- Dryland cultivation: The habitat in the study area has been transformed through dryland cultivation, mostly maize but also other crops. The region has summer rainfall and therefore intensive crop farming is practiced on a wide scale.
- Wetlands and dams: None of the three site alternatives for the proposed ash dump contains any significant wetlands or dams. This habitat is however present in the study area in the form of the existing ash dam (known as De Jagers Pan). This dam characterised by a relatively steep edges with little exposed shallow shoreline. In places, the edges are fringed by bulrush (*Typha capensis*) and reeds (*Phragmites australis*).

3 ENVISAGED IMPACTS

3.1 Reduction in species diversity and abundance due to habitat transformation and fragmentation

It is envisaged that the construction of the proposed ash dump will result in the radical transformation of an area of approximately 125ha. The transformation will effectively displace the majority of avifauna currently utilizing the proposed development area, and, depending on where the development takes place, will result in the fragmentation of natural grassland habitat. The effect of this will be an overall reduction of species diversity and abundance in the study area.

5 AVIFAUNA IN THE STUDY AREA

None of the priority avifauna species listed in the Mpumalanga Biobase Report (Emery *et al*. 2002) was recorded by the on-site surveys, but their occurrence cannot be ruled out (see Table 5.1).

5.2 Grassland

The CAR data indicates that natural grassland remains the preferred habitat of large terrestrial birds in the Mpumalanga Highveld (Young *et al*. 2003), and the presence of typical grassland Red Data bird species in the SABAP2 dataset for 2630CA (Black-bellied Bustard *Lissotis melanogaster*, Blue Korhaan *Eupodotis caerulescens*, and Southern Bald Ibis *Geronticus calvus*) indicates that enough natural, unfragmented grassland still exists in the QDGC to support these species. However, the absence of other Red Data indicator species such as Blue Crane *Anthropoides paradiseus*, Grey Crowned Crane *Balearica regulorum,* Secretarybird *Sagittarius serpentarius,* Rudd's Lark *Heteromirafra ruddi* and Botha's Lark *Spizocorys fringillaris* in the same SABAP2 dataset bears evidence to the impact of habitat fragmentation (largely cultivation) that is also evident in the QDGC. None of the aforementioned species were recorded during on-site surveys, but overall, grassland supported a higher variety of species than agricultural lands (see see Tables 6.1 and 6.2 below).

5.1 Dryland cultivation

Data from the CAR project indicates that agricultural land in the Mpumalanga Highveld is used to a limited extent by large terrestrial birds, and that they prefer natural grassland. Although the preference is for grassland, fallow fields are used to a limited extent by Blue Cranes in summer whilst they might use recently ploughed fields in winter (Young *et al.* 2003). Other grassland Red Data species that may make limited use of agricultural areas on the Mpumalanga Highveld is the Grey Crowned Crane, Blue Korhaan, Southern Bald Ibis and Black-winged Lapwing *Vanellus melanopterus*. None of these species were recorded in cultivated fields during on site surveys. Overall, the cultivated areas in the study area have significantly fewer species than the remaining grassland (see Tables 6.1 and 6.2 below).

5.2 Wetlands and dams

As mentioned earlier, none of the three site alternatives contains any dams or significant wetlands. Alternative 2 contains a small drainage line, but not significant enough to justify a separate habitat classification from an avifaunal ultilisation perspective. The existing ash dam offers refuge to a number of waterbird species, mostly be deep water species that do not require shallow dam edges, or species that utilise the dense reeds and bulrushes on the dam edges (see Appendix 3 for a list of species potentially occurring at the existing ash dam). The construction of return water dams will create additional habitat for a limited suite of water associated species currently using the existing ash dam, but will not benefit any priority avifauna listed in the Mpumalanga Biobase Report that could potentially occur in the study area.

Table 5.1 below lists threatened species that could potentially occur at the three potential site alternatives.

Table 5.1: Threatened species potentially occurring at the three site alternatives, based on the existence of suitable habitat

Species	Conservation status (Barnes 2000)	Preferred habitat in Mpumalanga (Harrison *et al* 1997, Barnes 2000, Hockey *et al* 2005, personal observations)	Likelihood of occurrence
YELLOW-BILLED STORK *Mycteria ibis*	Near threatened	Always associated with water – dams, wetlands, rivers, marshes, even small pools.	Low. Could be a visitor to larger water bodies in the study area. Could be attracted to the new proposed ash dam, but existing ash dam not very suitable due to steep edges and water depth.
SECRETARYBIRD *Sagittarius serpentarius*	Near threatened	Prefers open grassland, densities low in maize growing areas.	Medium. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.
WHITE-BELLIED KORHAAN *Eupodotis senegalensis*	Vulnerable	Often in the interface between grassland and savanna. Avoids severely grazed and recently burnt sites.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.

BLACK-BELLIED BUSTARD *Lissotis melanogaster*	Near threatened	Tall dense grassland and grassy savanna, in both hilly and flat country, where rainfall > 600 mm.	Low. Could be encountered in any of the grassland areas in tall grassland. High level of grassland fragmentation reduces the chances of occurrence.
LANNER FALCON *Falco biarmicus*	Near threatened	Generally prefers open habitat, but exploits a wide range of habitats.	Medium. Could be encountered anywhere in the grassland and agricultural areas.
PEREGRINE FALCON *Falco peregrinus*	Near threatened	Generally associated with cliffs and tall buildings (e.g. grain reservoirs).	Low. Most likely to be recorded near suitable high buildings e.g. at Camden Power Station.
BLUE CRANE *Anthropoides paradiseus*	Vulnerable Mpumalanga Biobase Report priority species	Short grassland, often near wetlands.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence. No historical records in the study area (U. Franke 2012).
AFRICAN GRASS-OWL *Tyto capensis*	Vulnerable	Normally associated with pristine, well managed grasslands usually in close proximity of water, but also in alien vegetation structurally resembling tall grass.	Low. Could be encountered in any of the grassland areas, in grass taller than 75cm. High level of grassland fragmentation reduces the chances of occurrence.
GREY CROWNED CRANE *Balearica regulorum*	Vulnerable	Wetlands, adjoining grasslands and agricultural fields.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence. No historical records at any of the sites (U. Franke 2012).
SOUTHERN BALD IBIS *Geronticus calvus*	Vulnerable Mpumalanga Biobase Report priority species	Likely to be found on recently burnt ground and unburnt, short-grazed grassland, cultivated pastures, reaped maize fields and ploughed lands.	Medium. Could be encountered in grassland areas and freshly ploughed lands.
BLACK-WINGED PRATINCOLE *Glareola nordmanni*	Near threatened	Agricultural landscapes, ploughed lands and damp grassland.	Medium. Could be encountered in agricultural areas.
BLACK-WINGED LAPWING *Vanellus melanopterus*	Near threatened	Highland plateaux and slopes, fallow fields, meadows and pastures. Short grassland.	Medium. Could be encountered in the short grassland areas.
BLUE KORHAAN *Eupodotis caerulescens*	Near threatened Mpumalanga Biobase Report priority species	Flat and undulating terrain in grassland. Favours short vegetation, limited use of fallow fields.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.
RUDD'S LARK *Heteromirafra ruddi*	Critically endangered Mpumalanga Biobase Report priority species	High-rainfall (> 600 mm) grassland on hilltops, plateaux and ridges at 1 700-2 200 m. Favours sites with short, dense grass cover.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.

BOTHA'S LARK *Spizocorys fringillaris*	Endangered Mpumalanga Biobase Report priority species	Heavily-grazed upland grassland in sour grassveld.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.

6 IDENTIFYING A PREFERRED ALTERNATIVE

One of the objectives of this study is to arrive at a preferred alternative for the proposed development in terms of impacts on avifauna. In order to make an informed decision, the results of the on-site surveys were used as an indication of sensitivity. Birds were counted at all three alternative sites by driving slowly along a transect and stopping regularly to scan the surroundings for birds. The number of birds and habitat type for all species seen or heard were recorded. The diversity and abundance of avifauna per habitat type (grassland vs agriculture) was compared for all three sites combined in order to establish which habitat type supported the greatest variety and abundance of avifauna. The quantity of each habitat type was then measured for each alternative, and the site that contained the lowest quantity of sensitive habitat was deemed to be the preferred alternative for the proposed development. Tables 6.1 and 6.2 below list the results of the on site survey:

Table 6.1: Species diversity per habitat type for all three alternatives combined

Species composition	
All Species	45
Grassland	39
Agriculture	24

Table 6.2: Index of kilometric abundance (IKA=birds per kilometre) per habitat type for all three alternatives combined

IKA Index			
Habitat	Mean number of birds	Combined transect length (km)	IKA
Grassland	443.33	7.3	60.73
Agriculture	201.33	7.3	27.58
Combined site total:	644.67	7.3	88.31
Grassland			
Species	Mean number of birds	Combined transect length (km)	IKA
African Pipit	12.67	7.3	1.74
African Quailfinch	0.67	7.3	0.09
African Stonechat	4.00	7.3	0.55
Amur Falcon	6.00	7.3	0.82
Ant-eating chat	5.33	7.3	0.73
Banded Martin	8.67	7.3	1.19
Barn Swallow	47.00	7.3	6.44
Black-shouldered Kite	0.67	7.3	0.09

Black-throated Canary	1.00	7.3	0.14
Bokmakierie	0.33	7.3	0.05
Cape Canary	3.33	7.3	0.46
Cape Longclaw	16.00	7.3	2.19
Cape Sparrow	3.33	7.3	0.46
Cape Turtle-Dove	3.67	7.3	0.50
Cattle Egret	5.00	7.3	0.68
Cloud Cisticola	17.67	7.3	2.42
Common Fiscal	1.00	7.3	0.14
Common Quail	5.00	7.3	0.68
Common Waxbill	6.33	7.3	0.87
Diderick Cuckoo	3.33	7.3	0.46
Egyptian Goose	4.33	7.3	0.59
Fan-tailed widowbird	28.00	7.3	3.84
Greater Striped swallow	4.33	7.3	0.59
Levaillant's Cisticola	5.33	7.3	0.73
Long-tailed Widowbird	31.00	7.3	4.25
Pin-tailed Whydah	3.67	7.3	0.50
Red-billed Quelea	10.67	7.3	1.46
Red-collared Widowbird	8.00	7.3	1.10
South African Cliff-Swallow	18.33	7.3	2.51
Southern Masked-Weaver	15.67	7.3	2.15
Southern Red Bishop	77.33	7.3	10.59
Spur-winged Goose	2.00	7.3	0.27
Steppe Buzzard	0.33	7.3	0.05
Swainson's Spurfowl	4.33	7.3	0.59
Whiskered Tern	1.67	7.3	0.23
White-rumped Swift	5.33	7.3	0.73
White-throated Swallow	1.00	7.3	0.14
Yellow-crowned Bishop	35.00	7.3	4.79
Zitting Cisticola	36.00	7.3	4.93
Grand Total:	443.33	7.3	60.73
Agriculture			
Species	Mean number of birds	Combined transect length (km)	IKA
African Stonechat	4.00	7.3	0.55
Barn Swallow	2.33	7.3	0.32
Black-headed Heron	1.00	7.3	0.14
Black-throated Canary	0.33	7.3	0.05
Cape Canary	0.67	7.3	0.09
Cape Robin-chat	0.67	7.3	0.09
Cape Sparrow	3.00	7.3	0.41
Cape Turtle-Dove	8.67	7.3	1.19
Cattle Egret	1.00	7.3	0.14
Cloud Cisticola	1.00	7.3	0.14

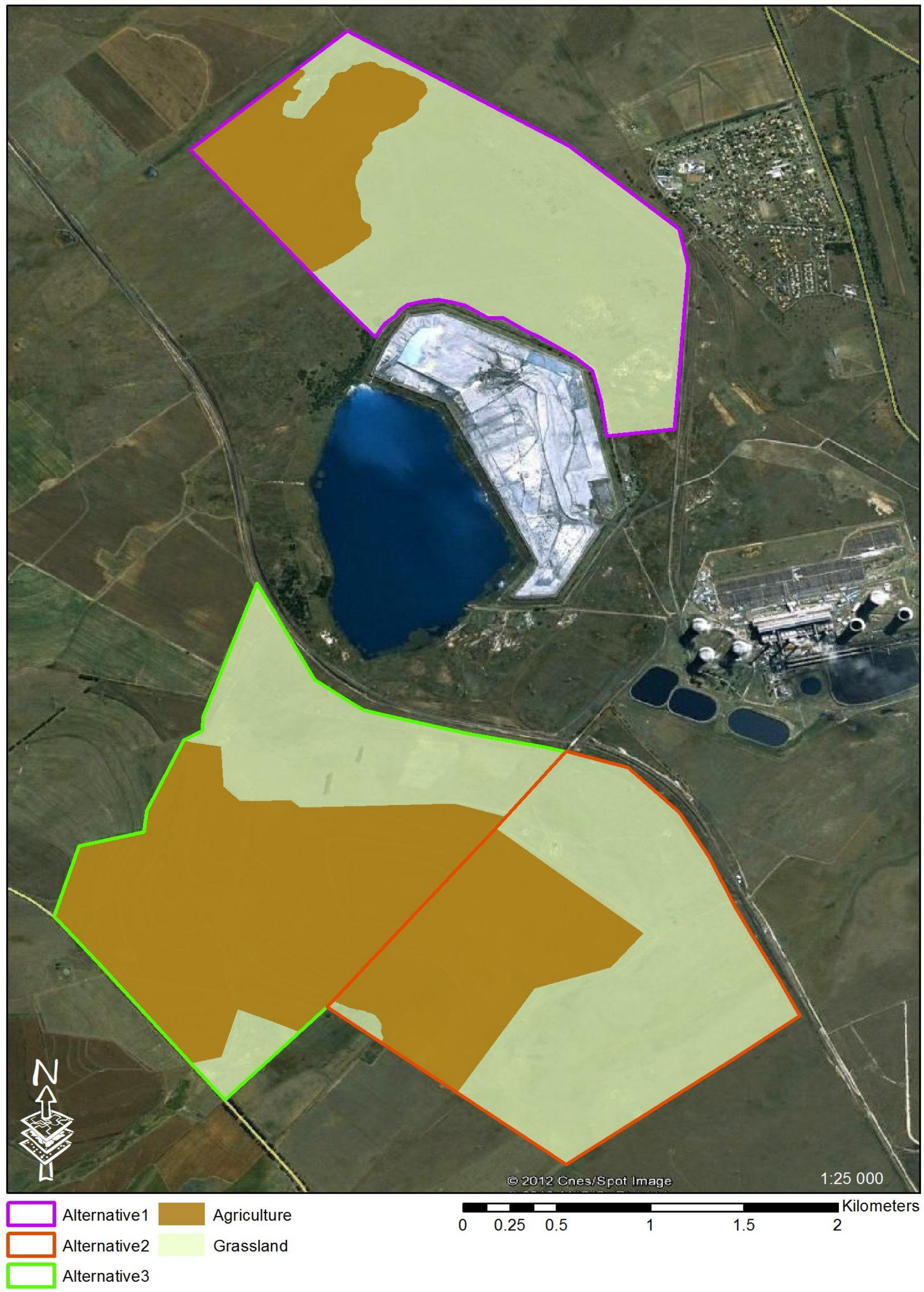
Common Fiscal	1.67	7.3	0.23
Egyptian Goose	7.00	7.3	0.96
Fan-tailed widowbird	0.67	7.3	0.09
Hadeda Ibis	1.00	7.3	0.14
Helmeted Guineafowl	13.33	7.3	1.83
Pin-tailed Whydah	5.00	7.3	0.68
Red-backed Shrike	0.33	7.3	0.05
Red-billed Quelea	3.00	7.3	0.41
Southern Masked-Weaver	15.00	7.3	2.05
Southern Red Bishop	25.33	7.3	3.47
Speckled Pigeon	84.00	7.3	11.51
Spur-winged Goose	12.67	7.3	1.74
Swainson's Spurfowl	7.33	7.3	1.00
Zitting Cisticola	2.33	7.3	0.32
Grand Total:	201.33	7.3	27.58

It is clear from the analyses above that grassland is the most sensitive habitat, as it supports a larger variety and bigger density of birds. Quantification of the habitat types at the different sites yielded the following results:

Table 6.3: Quantification of habitat types per site alternative

Site alternative	App. area (ha)	Agriculture (ha)	Grassland (ha)
Alt 1	256.08	64.83	191.25
Alt 2	277.17	96.16	181.02
Alt 3	298.45	193.83	104.62

Alternatives 1 and 2 are closely matched. Based on the analyses above, alternative 3 emerges as the most suitable alternative from a bird impact perspective, as it contains the least amount of grassland and the most amount of transformed habitat. Ideally therefore, from a bird impact perspective, the development should be located in agricultural lands on alternative 3 (see Figure 6.1 below).



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© 2012 Cnes/Spot Image
1:25 000
Alternative1
Alternative2
Alternative3
Agriculture
Grassland
0 0.25 0.5 1 1.5 2
Kilometers

7 IMPACT ANALYSIS

The significance (quantification) of potential avifaunal impacts identified during the specialist investigations at each alternative site was determined using a ranking scale, based on the following:

- Probability of occurrence (how likely is it that the impact may occur?)
- Duration of occurrence (how long may it last?)
- Magnitude (severity) of impact (will the impact be of high, moderate or low severity?), and
- Scale/extent of impact (will the impact affect the national, regional or local environment, or only that of the site?)

Each of these factors has been assessed for each potential impact using the following ranking scales:

Probability:
5 – Definite/don't know
4 – Highly probable
3 – Medium probability
2 – Low probability
1 – Improbable
0 – None

Duration:
5 – Permanent
4 - Long-term (ceases with the operational life)
3 - Medium-term (5-15 years)
2 - Short-term (0-5 years)
1 – Immediate

Magnitude:
10 - Very high/don't know
8 – High
6 – Moderate
4 – Low
2 – Minor

Scale:
5 – International
4 – National
3 – Regional
2 – Local (<5km)
1 – Site only
0 – None

The environmental significance of each potential impact was assessed using the following formula:

Significance Points (SP) = Probability x (Duration + Magnitude + Scale)

The maximum value is 100 Significance Points (SP).

Potential environmental impacts were rated as high, moderate or low significance on the following basis:

- More than 60 significance points indicates high environmental significance.

- Between 30 and 60 significance points indicates moderate environmental significance.
- Less than 30 significance points indicates low environmental significance.

Table 7.1: Impact assessment table pre-mitigation

ALTERNATIVE 1					
Impact	**Probability**	**Duration**	**Magnitude**	**Scale**	**SP**
Reduction of species diversity and abundance in the study area due to habitat destruction and fragmentation.	4	5	8	2	60
ALTERNATIVE 2					
Impact	**Probability**	**Duration**	**Magnitude**	**Scale**	**SP**
Reduction of species diversity and abundance in the study area due to habitat destruction and fragmentation.	4	5	8	2	60
ALTERNATIVE 3					
Impact	**Probability**	**Duration**	**Magnitude**	**Scale**	**SP**
Reduction of species diversity and abundance in the study area due to habitat destruction and fragmentation.	4	5	6	2	52

Table 7.2: Impact assessment table post-mitigation

ALTERNATIVE 1					
Impact	**Probability**	**Duration**	**Magnitude**	**Scale**	**SP**
Reduction of species diversity and abundance in the study area due to habitat destruction and fragmentation.	4	5	6	2	52
ALTERNATIVE 2					
Impact	**Probability**	**Duration**	**Magnitude**	**Scale**	**SP**
Reduction of species diversity and abundance in the study area due to habitat destruction and fragmentation.	4	5	6	2	52
ALTERNATIVE 3					
Impact	**Probability**	**Duration**	**Magnitude**	**Scale**	**SP**
Reduction of species diversity and abundance in the study area due to habitat destruction and fragmentation.	3	5	4	2	33

The analysis of the impacts indicate that the pre-mitigation impacts would range from high to moderate, but with the application of appropriate mitigation, this can be reduced to moderate to low.

8 CUMULATIVE IMPACTS

The proposed development is situated in the grassland biome. The grassland biome in Mpumalanga is under severe threat from many sources, including crop cultivation, industrialisation, afforrestation and urbanisation (see for example Alan 1997). The birds least likely to show the effects of these transformations are the small species which are able to persist in small pockets of undisturbed habitat. Conversely, the species most likely to show disrupted patterns of distribution are large species with large home ranges. This is particularly evident in the disastrous decline of cranes in the Mpumalanga Highveld where numbers have crashed by more than 80% in the past four decades (Barnes 2000). It is conceivable that the perceived absence of larger species such as cranes, bustards and korhaans in the study area may be linked to existing irreversible impacts (roads, industrial development, fences, power lines and agriculture) which have resulted in fragmentation of the remaining grassland. However, there are relatively large tracts of grassland remaining in the study area, and it is not inconceivable that these species may still sporadically use the areas for foraging or even breeding. In this respect, the results of the instantaneous sampling conducted in January 2012, although very valuable to give an indication of what occurs on the site, cannot be regarded as conclusive. The cumulative impact of losing another 120 hectares of grassland bird habitat in the Mpumalanga Highveld should therefore be regarded as a **moderate to high impact** within the overall context of existing pressure on natural grassland habitat in Mpumalanga. If, however, the development is located on existing agricultural lands, the cumulative impact would be **low**, as the agricultural operations have already transformed the natural habitat completely.

9 RECOMMENDED MITIGATION

- The primary recommendation is that the development is situated on site alternative 3 in agricultural land to minimise the impact on avifaunal diversity and abundance, which is linked directly to the availability of natural grassland in the study area.
- Should it for whatever reason not be possible to follow the recommendation above, Eskom should consider environmental enhancement projects such as the rehabilitation of degraded grasslands and wetlands within a specific area to a pristine state (or as close as possible to a pristine state). The specific area(s) should be identified in consultation with the avifaunal specialist prior to the commencement of construction.
- Irrespective of which alternative is used, the proposed recommendations of the Terrestrial Ecology Specialist Study for the Environmental Management Programme should be strictly applied to minimise the impact on the natural environment, specifically on the remaining natural grassland, as this is the most important bird habitat in the study area.
- Maximum use should be made of existing infrastructure (e.g. pipelines, access roads and fencing) to minimise the further fragmentation of natural grassland areas.

9 REFERENCES

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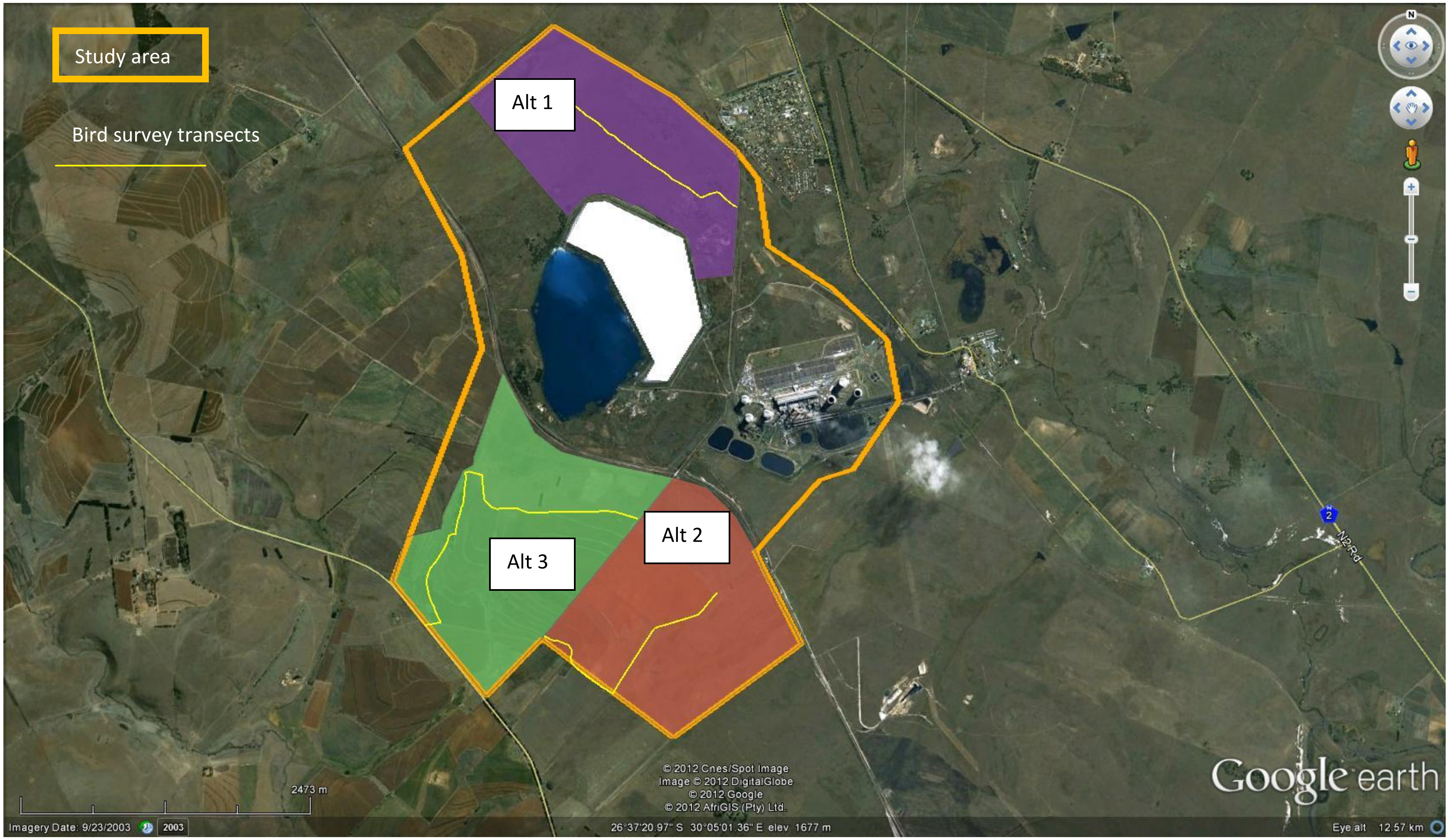
APPENDIX A: MAP OF STUDY AREA



APPENDIX B BIRD HABITAT

Figure 1: Cultivated fields

Figure 2: Grassland


Figure 3: Existing ash dam


Figure 4: Existing ash disposal facility

APPENDIX 3 POTENTIAL WATERBIRD SPECIES AT EXISTING ASH DAM

African Darter	*Anhinga rufa*
African Purple Swamphen	*Porphyrio madagascariensis*
African Rail	*Rallus caerulescens*
African Sacred Ibis	*Threskiornis aethiopicus*
African Spoonbill	*Platalea alba*
Cape Shoveler	*Anas smithii*
Cattle Egret	*Bubulcus ibis*
Common Moorhen	*Gallinula chloropus*
Egyptian Goose	*Alopochen aegyptiaca*
Grey Heron	*Ardea cinerea*
Hamerkop	*Scopus umbretta*
Little Egret	*Egretta garzetta*
Little Grebe	*Tachybaptus ruficollis*
Malachite Kingfisher	*Alcedo cristata*
Pied Kingfisher	*Ceryle rudis*
Purple Heron	*Ardea purpurea*
Red-billed Teal	*Anas erythrorhyncha*
Red-knobbed Coot	*Fulica cristata*
Reed Cormorant	*Phalacrocorax africanus*
Southern Pochard	*Netta erythrophthalma*
Spur-winged Goose	*Plectropterus gambensis*
Three-banded Plover	*Charadrius tricollaris*
Whiskered Tern	*Chlidonias hybrida*
White-breasted Cormorant	*Phalacrocorax lucidus*