Proposed continuous disposal of ash at the TUTUKA power station

SPECIALIST AVIFAUNAL IMPACT ASSESMENT

EIA SPECIALIST REPORT

14 July 2014

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EXECUTIVE SUMMARY

Eskom Holdings SOC (Ltd) is proposing to continue disposing of ash at the Tutuka Power Station ash disposal facilities. Lidwala Consulting Engineers were appointed by Eskom Holdings SOC Ltd to undertake an Environmental Impact Assessment and Waste Management Licencing for the proposed project and the Endangered Wildlife Trust (EWT) was subsequently appointed as an avifaunal specialist. In general, the study area has moderate to high sensitivity in terms of Avifauna. Of the 16 red listed species identified in the SABAP 1 data, only 10 species have again been recorded in the SABAP 2 data for the pentads examined, as well as one additional red listed species, the African Openbill. The most important species identified that may be impacted upon are Blue Korhaan, Blue Crane, Southern Bald Ibis, Greater Flamingo, Secretarybird, White Stork, Lesser Kestrel, Caspian Tern and Botha's Lark. The greatest impact of the proposed project is likely to be that of habitat destruction, while leachate from fly ash, into water systems used by avifauna is also of concern. Possible impacts of associated infrastructure (e.g. roads, power lines, conveyors, pollution control dams, pipelines and pump stations) were not fully assessed.; In terms of the possible collision impact with associated power lines (should these be required) the greatest concern is the presence of a number of Greater and Lesser Flamingos in the area. Sensitive areas have been mapped, within which the above mentioned collision mitigation must be implemented.

No fatal flaws have been identified in terms of avifauna and the proposed ash disposal facility can be built on any of the three alternatives A, B and C, provided that the various mitigation measures recommended in this report are implemented. However, from an avifaunal perspective, site alternatives C preferred for development while the extention of Altyernative A is considered "Not-Preferred". An "avifaunal walk through" by an avifaunal specialist, of the chosen site prior to construction/extension is recommended in order to identify potential breeding sites or nests of focal species.

DECLARATION OF INDEPENDANCE

Specialist Investigator

Andrew Pearson is employed by the Endangered Wildlife Trust's Wildlife and Energy Programme as a specialist investigator for conducting avifaunal specific specialist reports. Andrew has a Four Year BSc in Conservation Ecology, certificates in Environmental Law, as well as six years experience in the environmental management field. 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.

Declaration of Independence

All specialist investigators specified above declare that:

- We act as independent specialists for this project.
- We consider ourselves bound by the rules and ethics of the South African Council for Natural Scientific Professions.
- We do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2010.
- We will not be affected by the outcome of the environmental process, of which this report forms part of.
- We do not have any influence over the decisions made by the governing authorities.
- We do not object to or endorse the proposed developments, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.
- We undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Environmental Impact Assessment Regulations, 2010.
- Should we consider ourselves to be in conflict with any of the above declarations, we shall formally submit a Notice of Withdrawal to all relevant parties and formally register as an Interested and Affected Party.

Terms and Liabilities

- This report is based on a short term investigation using the available information and data related to the site to be affected. No long term investigation or monitoring was conducted.
- The Precautionary Principle has been applied throughout this investigation.
- The specialist investigator, and the Endangered Wildlife Trust, for whom he/she works, does not accept any responsibility for the conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from these assessments or requests made to them for the purposes of this assessment.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist investigator withholds the right to amend this report, recommendations and conclusions at any stage should additional information become available.
- Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- This report and all of the information contained herein remain the intellectual property of the Endangered Wildlife Trust.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.

Signed on the 14th June 2013 by Andrew Pearson in his capacity as specialist investigator for the Endangered Wildlife Trust's Wildlife and Energy Programme.

INTRODUCTION

Background and Project Description

Eskom Holdings SOC (Ltd) is proposing to continue disposing of ash at the Tutuka Power Station ash disposal facilities. Lidwala Consulting Engineers were appointed to undertake an Environmental Impact Assessment for the proposed project and the Endangered Wildlife Trust (EWT) was subsequently appointed as an avifaunal specialist. Two site visits were conducted, one during the scoping phase on the 25th July 2012, and the other during the EIA phase on the 25th and 26th March 2013.

Tutuka Power Station is a coal fired power generation facility which currently disposes of ash in a dry (20% moisture content) form by means of conveyors, spreader and a stacker system from the station terrace to the ash disposal site. According to Eskom's plans, the complete ash disposal site would eventually cover an area of 2 500 ha (Existing & Remaining ash disposal site & pollution control canals) and is located approximately 4.5 km east of the station terrace. Tutuka Power Station envisages the continuation of dry ash disposal over Eskom owned land, which was purchased before the commencement of environmental laws such as the Environment Conservation Act. In order to establish a new ash disposal site within close proximity to the power station and the current ash disposal site, a site selection exercise was undertaken in line with the Minimum Requirements for the Disposal of Waste by Landfill (both the 2nd Edition (1998) 1 and the Draft 3rd edition (2005) 2 were taken into account during the identification of the most feasible site alternatives, and design of the facility).

The Tutuka Power Station is situated approximately 25 km north-north-east of the town of Standerton in the Mpumalanga Province, and falls within the Lekwa Local Municipality, within the Gert Sibande District Municipality. Three site alternatives were identified within the greater study area (Figures 1 & 2). Each alternative site is briefly described below;

- Site alternative B
    - This site is located immediately north of the existing ash disposal facility and approximately 2 km north-east of the Tutuka Power Station. The total area identified is ~764.94 hectares in size. This site is comprised of parts of portions R, 2, 3, 4, 5 and 7 of the farm Dwars in die Weg 350 IS, portions R and 3 of the farm Racesbult 352 IS and portion 1 of the farm Spioenkop 375 IS.
- Site alternative C
    - This site is located south-west of the existing ash disposal facility and approximately 1.3 km north-east of the Tutuka Power Station. The total area

identified is ~534.41 hectares in size. This site is comprised of parts of portions 1 and 2 of the farm Spioenkop 375 IS and portions 3, 12 and 13 of the farm Pretoriusvley 374 IS.

- Site alternative A
  - This site is located immediately south and east of the existing ash disposal facility and approximately 3.5 km north-east of the Tutuka Power Station. The total area identified is 759 hectares in size. This site is comprised of parts of portions R, 1 and 2 of the farm Spioenkop 375 IS, portions 1, 4, 6 and 10 of the farm Mooimeisiesfontein 376 IS, portions 1, 2, 4, 5, 22 and 25 of the farm Rouxland 348 IS and portions 3 and 6 of Dars in de Weg 350 IS.
  - An extention of site alternative A was also considered and this is discussed in detail in the attached letter *Avifauna Specialist Study Verification and Input for the Continuous Disposal for Ash at the TUTUKA Power Station* dated 14 April 2014.
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The proposed continuous development is an ash disposal facility with the following specifications;

- Capacity of airspace of 353,1 million m^3 (Existing and remaining); and
- Ground footprint of 2 500 Ha (Existing & Remaining ash disposal facility & pollution control canals)
- Additional infrastructure
  - dirty and clean water channels flowing to settling and dirty water
  - expansion / upgrade of their existing emergency ashing area called TT02.

This avifaunal study used a set methodology as well as various data sets. The focal species for the study were determined, and then, by looking at the focal species which could occur in the area, as well as assessing the availability of bird micro habitats, the possible impacts of the development were then assessed. In general terms, the impacts that could be associated with a project of this nature include habitat destruction, disturbance of sensitive bird species, and the contamination of water sources used by birds. Associated infrastructure such as powerlines may also pose collision and electrocution risks to avifauna.

Terms of reference

The following standard EWT terms of reference were utilized for this study:

- Describe the current state of avifauna in the study area, outlining important characteristics which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction and operation.
- Identify Red Data species potentially affected by the proposed power lines and substation.
- Identify potential impacts (positive and negative, including cumulative impacts if relevant) of the proposed development on avifauna during construction and operation.
- Rate the significance of identified impacts according to a set of criteria (as supplied by Lidwala Consulting Engineers).
- Asses each site alternative, and supply a preference ranking in terms of avifauna to each alternative.
- Identify mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks.
- Identify and address any other aspects related to avifauna in the study area that should be incorporated into the reports.

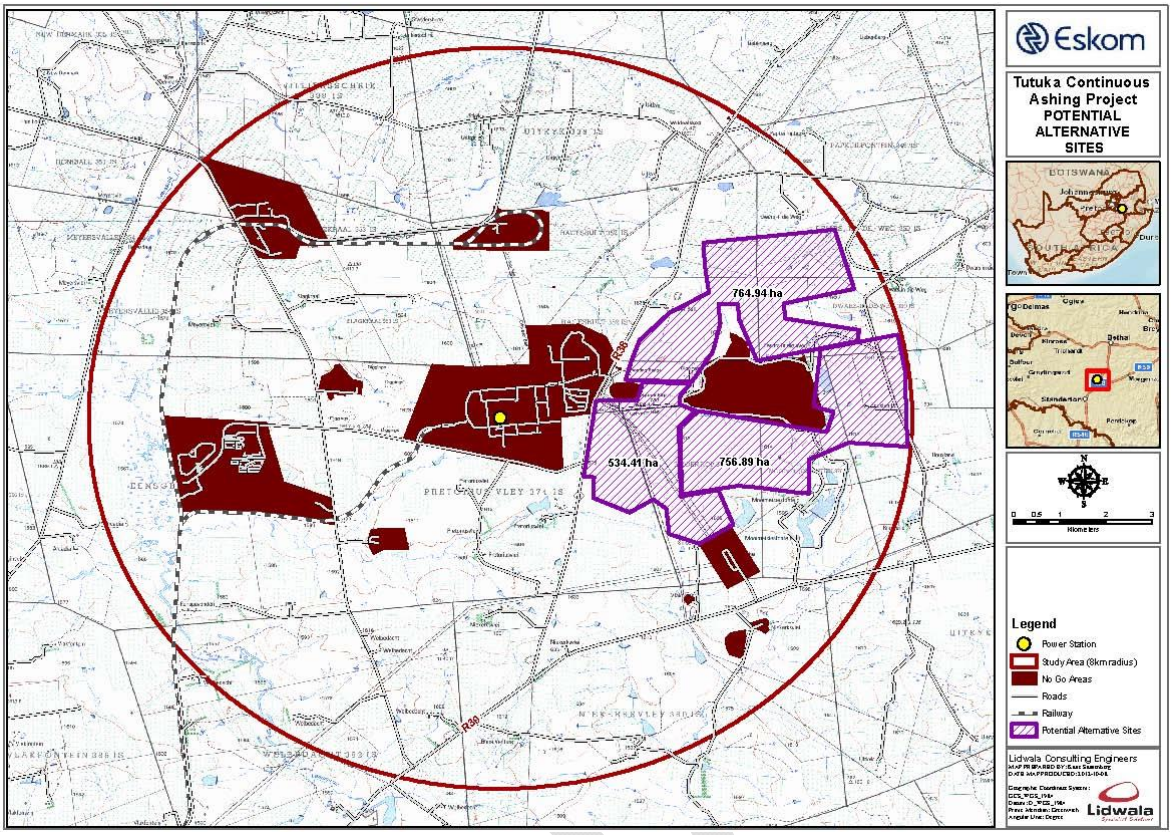

Figure 1: Topographical map showing the location of the ash disposal facility alternatives in relation to Tutuka Power Station and surrounding roads (SOURCE: Lidwala Consulting Engineers).

METHODS

Methodology

The methodology used to predict impacts in the current study was as follows:

- The various data sets discussed below under "sources of information" were collected and examined.
- The data was examined to determine the location and abundance of power line sensitive Red Data species as well as non-Red Data power line sensitive species in the study area.
- The study area was visited to obtain a first-hand perspective of the proposed route and birdlife, and to determine which bird micro-habitats are present and relevant to the study. This involved driving the study area, taking photographs, and walking certain accessible areas. The properties, on which

the proposed ash disposal facility is to be continued, were not accessible at this stage.

- 3 Observation Points (OP) were randomly chosen, all in the near vicinity of the proposed project. A 30 minute point count was conducted at each OP, recording all species seen or heard, as well as the numbers thereof.
- A desk top examination, using Google Earth imagery was done to assist in the identification of possible sensitive areas.
- The impacts of the proposed development on birds were predicted.
- Recommended mitigation measures for significant impacts were proposed.

Sources of information

The study made use of the following data sources:

- Bird distribution data of the Southern African Bird Atlas Project (SABAP – Harrison, Allan, Underhill, Herremans, Tree, Parker & Brown, 1997) obtained from the Avian Demography Unit of the University of Cape Town, in order to ascertain which species occur in the study area.
- The conservation status of all bird species occurring in the aforementioned degree squares was then determined with the use of The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland (Barnes, 2000).
- The Southern African Bird Atlas Project 2 data for certain pentads in the study area was examined.
- Data from the Co-ordinated Waterbird Count (CWAC) project was also consulted to determine whether any CWAC sites exist in the study area (Taylor, Navarro, Wren- Sargent, Harrison & Kieswetter, 1999). Updated CWAC data were obtained from the Animal Demography Unit, University of Cape Town.
- The Important Bird Areas of southern Africa (IBA) project data (Barnes 1998) was consulted to determine its relevance to this project.
- A classification of the vegetation types in the study area was obtained from Mucina and Rutherford (2006).
- Land Cover 2009 (CSIR) data was mapped, in order to assist in identifying the dominant forms of land use in the area.
- Information on the micro-habitat level was obtained through visiting the area and obtaining a firsthand perspective.
- Electronic 1:50 000 maps were obtained from the Surveyor General.
- Satellite Imagery of the area was studied using Google Earth ©2012.

Limitations & assumptions

This study made the assumption that the above sources of information are reliable. The following factors may potentially detract from the accuracy of the predicted results:

- The SABAP-1 data covers the period 1986-1997. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate. (For a full discussion of potential inaccuracies in ASAB data, see Harrison, Allan, Underhill, Herremans, Tree, Parker & Brown, 1997).
- During the site visits, due to time constraints and logistical reasons, it was not possible to access all site alternatives. Where an alternative was not accessed, it was viewed from a distance, the surrounding areas were accessed and the microhabitats present on the alternative were assessed from a desktop level.
- Predictions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour cannot be reduced to formulas that will hold true under all circumstances. However, power line impacts can be predicted with a fair amount of certainty, based on experience gained by the EWT through the investigation of hundreds of localities in southern Africa where birds have interacted with Eskom infrastructure since 1996.
- Google Earth Imagery may not always reflect the true situation on the ground, as some images may be outdated.

DESCRIPTION OF AFFECTED ENVIRONMENT

Study area vegetation and Land use

While this report is an avifaunal specialist report, vegetation and micro habitats are very important in determining avifaunal abundances and likelihood of occurrences. As such, vegetation types classified by Mucina & Rutherford (2006) were examined within an 8 km radius of Tutuka Power Station. It was found that the only vegetation type present within 8 km of the power station is that of "Soweto Highveld Grassland". Land use data (CSIR2009) was also considered for the study area, and it was found that the major land uses in the study area are "cultivated: temporary - commercial dryland" and "unimproved grassland". The land use (Figure 2) and microhabitats were considered to determine what species may occur and where they are likely to occur.

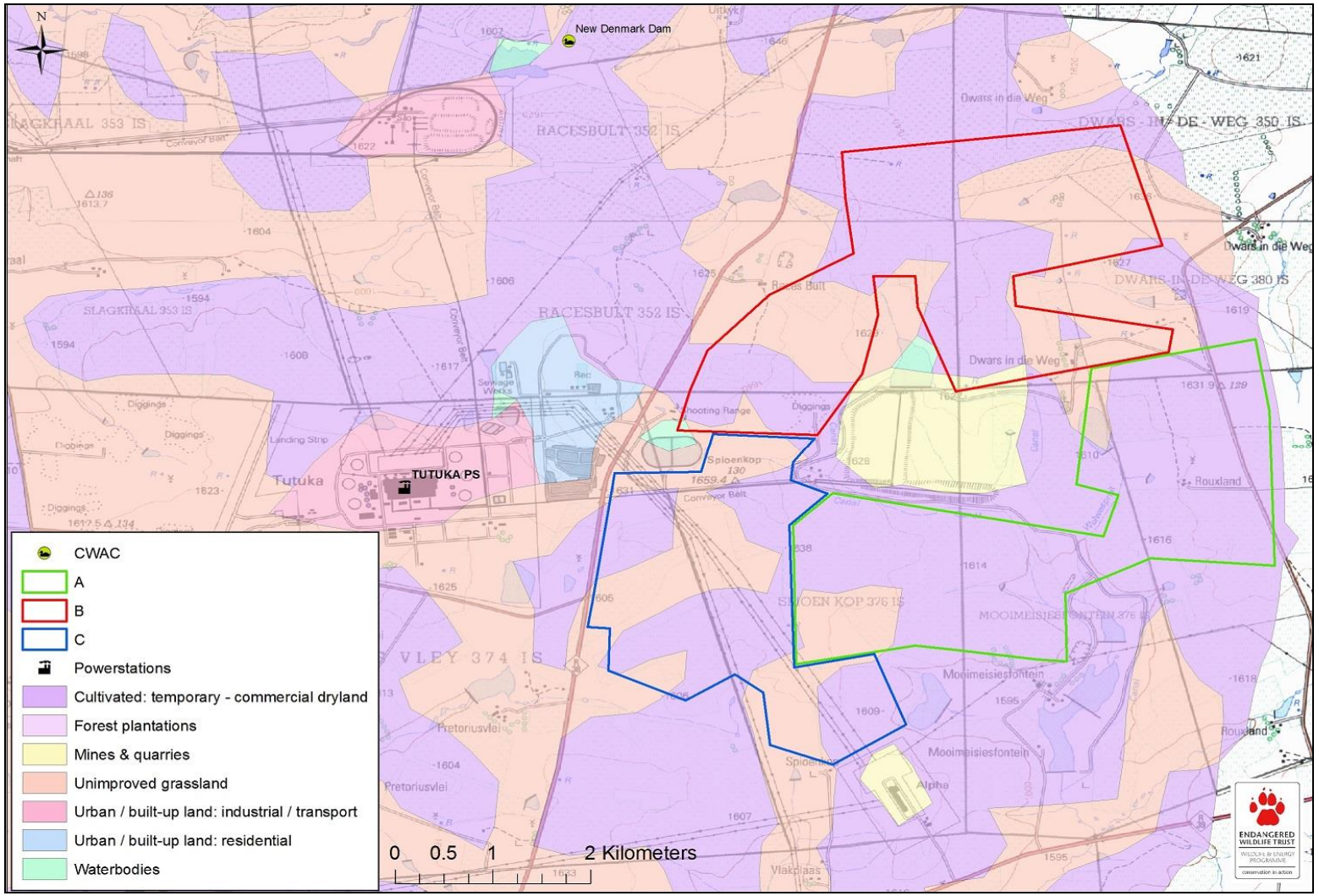

Figure 2: Land Cover (CSIR2009), across the three site alternatives, A, B and C, depicted by the green, red and blue polygons respectively. The location of the CWAC site is also shown.

Bird micro habitats

In addition to the description of vegetation, it is important to understand the habitats available to birds at a smaller spatial scale, i.e. micro habitats. Micro habitats are shaped by factors other than vegetation, such as topography, land use, food sources and man-made factors. Investigation of this study area revealed the following bird micro habitats.

Arable and/or cultivated lands

Arable or cultivated lands can represent significant feeding areas for many bird species in any landscape for the following reasons: through opening up the soil surface (Figure 3), land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. Relevant bird species that may be attracted to these areas include most importantly the Blue Crane, Southern Bald Ibis, Blue Korhaan and White Stork. Marsh Owls will also regularly forage over agricultural lands (Figure 4), especially in the late afternoon.

Figure 3: Agricultural lands observed in the study area.

Figure 4: One of four Marsh Owls observed in close vicinity to each other, foraging over agricultural lands in the study area.

Open Grasslands

The only vegetation type (Mucina & Rutherford, 2006) present is "Soweto Highveld Grassland", which falls within the greater Grasslands Biome. It was not surprising, therefore, that the most extensive bird microhabitat available in the study area is that of grasslands (see Figure 5). Grassland may attract the Blue Crane, Black-winged Pratincole, Southern Bald Ibis, Blue Korhaan, Secretarybird, and White Stork. Pristine patches of grassland, near to water, may provide breeding habitat for the African Grass Owl, although this species has not been recorded in the SABAP data for the study area. The grassland patches are also a favourite foraging area for game birds such as francolins and Helmeted Guineafowl, as well as being hunting habitat for raptors such as African Marsh Harrier, Lanner Falcon, Rock Kestrel (figure 7), Lesser Kestrel, Amur Falcon (figure 13) and Black-shouldered Kite. Important to this study is that Botha's Lark (Endangered) has been recorded in the quarter degree squares (SABAP1 data) examined, and is a relatively rare grassland species (figure 12).

Figure 5: Grassland observed in the broader study area.

Figure 6: Relatively undisturbed grassland observed in the broader study area.

Figure 7: A Rock Kestrel perches, while foraging over grassland in the study area.

Dams

Various waterfowl, waders and numerous duck species, may frequent the man-made dams within the study area. More importantly, Blue Cranes use dams to roost in communally, and Flamingos may use these areas as stop over points while moving between larger water bodies. Various Storks may also frequent these water bodies. One particular Dam (New Denmark Dam) is a Co-ordinated Waterbird Count (CWAC) site, and both Lesser and Greater Flamingos were observed here during the scoping site visit. Greater Flamingos were observed at a dam just south east of site alternative A (26^0 47' 22.7"S; 29^0 25' 0.6"E) during the second site visit.

Figure 8: A typical man-made farm dam, as observed in the study area.

Figure 9: A medium sized dam where Greater Flamingos were observed during the second site visit (26^0 47’ 22.7”S; 29^0 25’ 0.6”E).

Wetlands and Rivers or drainage lines

In this area species such as Greater Flamingo, Lesser Flamingo, Yellow-billed Stork and Caspian Tern are attracted to water, and therefore may find flowing rivers or streams attractive. Non Red Data species may also occur in these areas for example herons. Rivers in their true form represent important habitat for many species, including Black Stork and a variety of other water birds, while the wooded riparian habitat along a river may provide habitat for various species such as the Hamerkop, African Darter, various cormorants, kingfishers, bee-eaters, robin-chats and numerous smaller species. According to GIS mapping using data from Mucina & Rutherford (2006), the only river in the study area is the Leeuspruit. 1 in 50 000 maps from the Surveyor General show the presence of the smaller Wolwespruit to the east of the existing ash disposal site. Numerous smaller drainage lines, some of which do not always carry water are also present in the broader area. Drainage lines, as well as all of the Rivers/"Spruite" discussed above, may serve as flight paths for several bird species.

Stands of Alien vegetation:

Patches of alien trees were observed throughout the study area, often associated with a farm stead, or along farm roads. These areas will mostly be important to physically smaller bird species. These also provide perching, roosting and nesting habitats for various raptor species and larger birds such as francolins, Guineafowl, Herons and Hadeda Ibises.

Figure 10: A stand of alien trees in the study area.

Relevant bird populations

The relevant bird populations that have been reported by the South African Bird Atlas Projects (1 and 2) can be found below in Tables 1 & 2. It is important to note that these species could have been recorded anywhere in the associated pentad or quarter degree square (QDGS), and not necessarily in the exact study area.

Table 1: Red Listed species recorded in the quarter degree squares (SABAP1) covering the study area (Harrison *et al* 1997)

Species	**Cons. status**	**Report rate (%)**	
QDGS		**2629CD**	**2629CB**
Number of cards submitted		*69*	*55*
Total Species		*175*	*175*
Botha's Lark	EN	-	2
African Marsh Harrier	VU	-	2
Lesser Kestrel	VU	22	16
Blue Crane	VU	12	7
Southern Bald Ibis	VU	4	-
White-bellied Korhaan	VU	-	4
Yellow-billed Stork	NT	1	-
Secretary Bird	NT	10	9
Greater Flamingo	NT	1	2
Lesser Flamingo	NT	1	-
Black-winged Pratincole	NT	-	4
Pallid Harrier	NT	-	2
Lanner Falcon	NT	6	4
Blue Korhaan	NT	30	20
Caspian Tern	NT	13	-
White Stork	Bonn	3	2

CR = Critically Endangered; EN = Endangered; V = Vulnerable; NT = Near-threatened; Bonn = Protected Internationally under the Bonn Convention on Migratory Species. Report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted.

Southern African Bird Atlas Project 2

SABAP 2 data was examined for selected pentads falling within the 8 km radius from Tutuka Power Station (Figure 11 below), and which had been counted more than twice. Table 2 below shows report rates, based on the number of cards submitted, for the Red Data species identified in the four pentads meeting the above criteria.

Interestingly, of the 16 red listed species identified in the SABAP 1 data, only 10 species have again been recorded in the SABAP 2 data for the pentads examined. This however, does not necessarily mean that these species do not occur here, or that they have moved from the area post SABAP1, but may merely be due to the low counting effort of the pentads or selective micro habitat counting by the SABAP2 field counters. White Stork, protected through the Bonn Convention, was recorded in both data sets. Botha's Lark was not recorded in the pentads examined, while an additional red listed species, the African Openbill, was recorded in the SABAP2 data only.

Table 2: Report rates from Southern African Bird Atlas Project 2 (SABAP2) as of 14/06/2013.

Species	**Cons. status**	**Pentad Report Rate (%)**				
Pentad		*2645_2915*	*2645_2920*	*2640_2915*	*2650_2915*	*2640_2925*
No Cards		*17*	*4*	*27*	*7*	*3*
Total Species		*130*	*102*	*136*	*98*	*71*
Botha's Lark	EN	-	-	-	-	-
African Marsh Harrier	VU	-	-	7.4	-	-
Lesser Kestrel	VU	-	-	-	-	-
Blue Crane	VU	-	-	-	-	-
Southern Bald Ibis	VU	11.8	-	-	28.6	33.3
White-bellied Korhaan	VU	-	-	-	-	-
Yellow-billed Stork	NT	-	-	-	-	-
African Openbill	NT	-	-	3.7	-	-
Secretary Bird	NT	11.8	-	-	-	-
Greater Flamingo	NT	41.2	50	7.4	14.3	33.3
Lesser Flamingo	NT	5.9	-	-	-	-
Lanner Falcon	NT	5.9	-	-	-	-
Blue Korhaan	NT	-	25	14.8	14.3	66.7
Caspian Tern	NT	-	-	-	28.6	-
Black-winged Pratincole	NT	23.5	-	7.4	14.3	-
Pallid Harrier	NT	11.8	-	3.7	-	-
White Stork	Bonn	5.9	-	3.7	-	-

CR = Critically Endangered; EN = Endangered; V = Vulnerable; NT = Near-threatened; Bonn = Protected Internationally under the Bonn Convention on Migratory Species. Species in bold were not recorded in the SABAP1 data set.

Table 3 below shows the micro habitats that each Red Data bird species typically frequents. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis in Table 3 represents each species' most preferred or normal habitats. These locations are where most of the birds of that species will spend most of their time – so logically that is where impacts on those species will be most significant. By looking at these preferred habitats, considering the

habitats available on each site alternative, analysing the reporting rates, as well as using personal experience, the author was able to predict the likelihood of occurrence of a particular species in the study area. Occurrence refers to a species making use of the site for purposes such as foraging, feeding, hunting, nesting and breeding, or regularly flying over as part of a flyway. The likelihood of occurrence is given on a scale of 1 to 10, where 1 is extremely unlikely, 3 is unlikely, 5 is possible, 7 is likely and 10 is highly likely.

Table 3: Preferred micro-habitat of red data species and their likelihood of occurrence on each site alternative.

Species	**Cons. status**	**Preferred micro habitat**	**Likelihood of Occurrence**		
			Alt. A	**Alt. B**	**Alt. C**
Botha's Lark	EN	Grazed upland grassland	5	4	4
African Marsh Harrier	VU	Wetlands, grasslands	5	4	5
Lesser Kestrel	VU	Savanna, grassland, shrubland, arable land	8	7	7
Blue Crane	VU	Grassland, wetland, arable land, dams	7	7	7
Southern Bald Ibis	VU	Short Grassland, Hills and Ridges, Cliffs (breeding)	5	5	5
White-bellied Korhaan	VU	Tall grassland, Savanna	4	4	3
Yellow-billed Stork	NT	Rivers, Lakes, Estuaries	3	3	3
African Openbill	NT	Freshwater lakes and dams. Rivers	2	2	2
Secretary Bird	NT	Grassland, arable lands	6	6	5
Greater Flamingo	NT	Shallow lakes, Salt Pans, Estuaries	7	7	6
Lesser Flamingo	NT	Shallow lakes, Salt Pans, Estuaries	6	6	5
Lanner Falcon	NT	Open grassland, woodland	5	5	5
Blue Korhaan	NT	Open Grassland	8	7	7
Caspian Tern	NT	Bays, estuaries, lagoons and inland water bodies	6	6	6
Black-winged Pratincole	NT	Grassland, cultivated lands	6	6	5
Pallid Harrier	NT	Grassland and savanna	3	3	3
White Stork	Bonn	Grassland, arable lands, wetland, dams	6	6	6

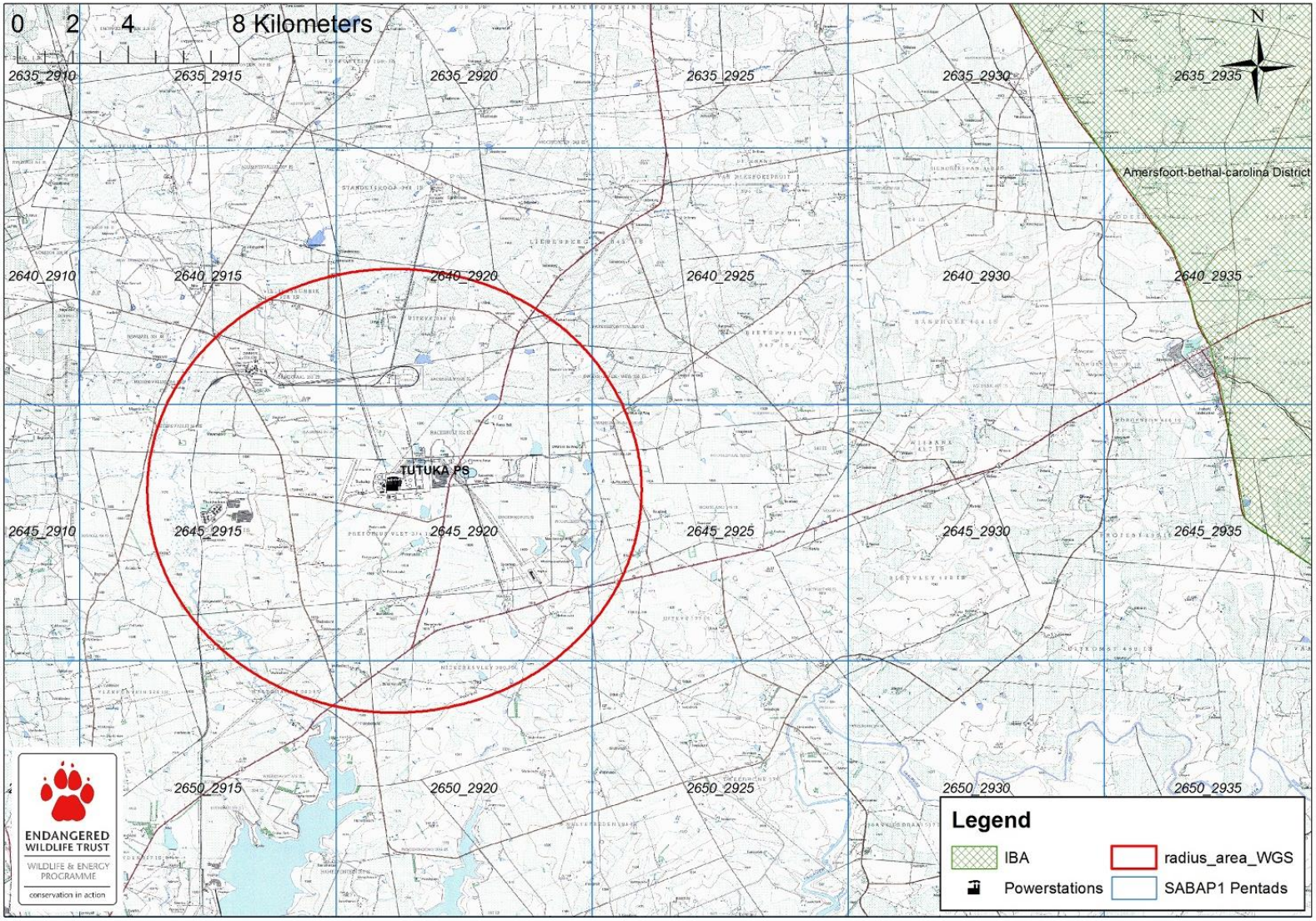

Figure 11: Map showing the location of the nearest IBA, as well as SABAP2 pentads in the study area.

Important Bird Areas (IBA's)

The sites where continuous ashing is proposed does not fall within any Important Bird Area (IBA). However, the *Amersfoort-bethal-carolina District (SA018)* IBA lies approximately 27 km to the east of Tutuka Power Station, and it is not unlikely that some bird species found in this IBA, may occur in the study area. This IBA is known to hold a large proportion (>10%) of the global population of the endangered Botha's Lark (Barnes 1998). This species (Figure 12) favours short dense, natural grassland found on plateaus and upper hill slopes. The Globally threatened Wattled Crane was listed as a vagrant to this IBA, while other key listed species recorded in this IBA include Southern Bald Ibis, Lesser Kestrel, Blue Crane, African Grass Owl, Lanner Falcon and Blackwinged Lapwing.

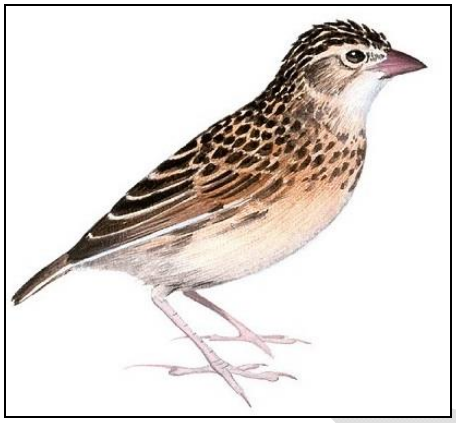

Figure 12: The Endangered Botha's Lark may occur in grasslands in the study area.

Coordinated Avifaunal Road-count (CAR) data

There are no routes within 50 km of the general study area.

Coordinated Waterbird count (CWAC) data

New Denmark Dam CWAC site is situated within the study area (Figure 2), and is a private dam in a coal mining area. CWAC data here records large numbers of Redknobbed Coot, Egyptian Goose, Yellow-billed Duck, Blacksmith Lapwing, Little Stint and African Darter. Greater Flamingo has been recorded here on numerous occasions between 2005 and 2009, while Caspian Tern has also been recorded at this site.

Personal observations

Table 4 below shows the sightings list of birds observed on site, during the two site visits. This list is merely for indicative purposes, and represents incidental observations (which could be positively identified). Data from this table needs to be used with caution, as observations over short periods, in two seasons, may not indicate all bird species potentially

present in the area. In particular, the target species for this study are threatened, rare species, so the likelihood of seeing one during the site visits was limited. This study has therefore attached far more weight to the secondary data sources such as the bird atlas projects (SABAP1 and SABAP2) which collected data over a far longer period, and more diverse conditions. It must be noted that many "non Red Data" bird species also occur in the study area and could be impacted on by the power line. Although this impact assessment focuses on Red Data species, the impact on non Red Data species is also assessed, albeit in less detail. Furthermore, much of the mitigation recommended for Red Data species will also protect non Red Data species in the study area.

Table 4: List of species observed by the author in the general study area during the two site visits.

No.	Common Name	No.	Common Name
1	Village Weaver	22	Black-headed Heron
2	African Stonechat	23	Laughing Dove
3	Redcollared Widowbird	24	Crowned Lapwing
4	Egyptian Goose	25	Rock Kestrel
5	Blacksmith Lapwing	26	Amur Falcon
6	Common Fiscal	27	Pin-tailed Whydah
7	Cape Sparrow	28	Zitting Cisticola
8	African Fish Eagle	29	Speckled Pigeon
9	Blackthroated Canary	30	Marsh Owl
10	Levaillant's Cisticola	31	Cape Longclaw
11	Grey Heron	32	Three-banded Plover
12	Reed Cormorant	33	Redbilled Teal
13	White-breasted Cormorant	34	Tawny-flanked Prinia
14	Redknobbed Coot	35	Swainson's Spurfowl
15	South African Shelduck	36	Cape Turtle Dove
16	Greater Flamingo	37	Red-eyed Dove
17	Lesser Flamingo	38	Cape Crow
18	Hadeda Ibis	39	Helmeted Guinaefowl
19	African Sacred Ibis	40	Long-tailed Widowbird
20	Black-winged Stilt	41	Red-capped Lark
21	Black-shouldered Kite	42	Greater Kestrel

Figure 13: The Amur Falcon (pictured here in cultivated lands) is a common Palearctic migrant present in the study area during summer.

Focal Species List

The focal species for this study, i.e. the most important species to be considered when determining site preferences and mitigations are as follows: **Blue Korhaan, Blue Crane, Southern Bald Ibis, Greater Flamingo, Secretary Bird, White Stork, Lesser Kestrel, Caspian Tern and Botha's Lark.** In some cases, these species serve as surrogates for other similar species (as mitigation will be effective for both), examples being White Stork for Yellow-billed Stork and Lesser Kestrel for Lanner Falcon. Assorted more common species will also be relevant to this study, but it is believed that the above focal species will to a large extent serve as surrogates for these in terms of impact assessment and management.

ASSESSMENT OF IMPACTS

Predicted Impacts of Ash Disposal Facilities

The greatest predicted impacts of ash disposal facilities on avifauna are the destruction of habitat and disturbance of birds during construction and operation. However, both of these impacts can be minimized and mitigated to some extent by avoiding more sensitive areas where possible. Similarly, the above mentioned construction and maintenance activities impact on birds through disturbance, particularly during bird breeding activities. Disturbance of birds is anticipated to be of lower significance than habitat destruction. Leachate from fly ash disposal facilities can contain heavy metals (Theism and Marley, 1979) which could result in contamination of surrounding water sources, used by water birds in the study area. Correct placing of the new disposal facility, away from wetlands, dams and water bodies, will help to mitigate this impact.

In addition to the continuous disposal of ash at the ash disposal facility, the project may also include the expansion of the relevant infrastructure associated with the ashing system, such as pipelines, storm water trenches, seepage water collection systems, pump stations, seepage dams, roads, etc. The impacts of such associated infrastructure on avifauna are predicted to be minimal, so long as the infrastructure is within the proposed ash disposal facility footprint. **Infrastructure outside of the proposed footprint has not been assessed by this study.** If any additional linear infrastructure, especially power lines, is to be constructed, the EWT will assess the impact thereof, once the routings have been made known. Below follows a brief description of impacts that may be associated with powerlines (**should these be required as part of the proposed project**):

General description of impacts of power lines on birds

Because of its size and prominence, electrical infrastructure constitutes an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are electrocution of birds (and other animals) and birds colliding with power lines (Ledger 1983; Verdoorn 1996; Kruger 1999; Van Rooyen 2000). Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, (Van Rooyen & Taylor 1999) and disturbance and habitat destruction during construction and maintenance activities.

Electrocutions

Electrocution of birds on overhead lines is an important cause of unnatural mortality of raptors and storks. It has attracted plenty of attention in Europe, USA and South Africa (APLIC 1994). Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Electrocution is possible on 132kV lines or lower, depending on the exact pole structure used.

Collisions

Collisions are the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001). Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The Red Data species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. These species have not evolved to cope with high adult mortality, with the results that consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the medium term or even in the long term. Many of the anthropogenic threats to these species are non-discriminatory as far as age is concerned (e.g. habitat destruction, disturbance and power lines) and therefore contribute to adult mortality, and it is not known what the cumulative effect of these impacts could be over the long term.

Habitat destruction

During the construction phase and maintenance of substations and power lines some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, and the clearing of servitudes, as well as clearing vegetation at the substation site. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat.

Disturbance

Similarly, the above mentioned construction and maintenance activities impact on bird through disturbance, particularly during bird breeding activities.

MITIGATION AND MANAGMENT MEASURES

Ash Disposal Facility

- *Construction Phase*

Impact	*Mitigation*
Habitat destruction	Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate properly for this as habitat destruction covering the entire ash dam footprint is inevitable. However, it is important to ensure that the construction **Environmental Management Plan** incorporates guidelines as to how best to minimize this impact, and ensure that only designated areas are impacted upon, as per the design.
Disturbance	Strict control should be maintained over all activities during construction. It is difficult to mitigate properly for this as some disturbance is inevitable. **During Construction, if any of the "Focal Species" identified in this report are observed to be roosting and/or breeding in the vicinity, the EWT is to be contacted for further instruction.**

- *Operational phase*

Impact	*Mitigation*
Leachate contamination of surrounding water sources	Ensuring that the construction Operational Management Plan incorporates guidelines as to how best to minimize this impact. Eskom must implement its existing Environmental procedures accordingly.

Transmission Lines (If Applicable)

- *Construction Phase*

Impact	*Mitigation*
Habitat destruction	Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate properly for this as some habitat destruction is inevitable. It is important to ensure that the construction **Environmental Management Plan i**ncorporates guidelines as to how best to minimize this impact.
Disturbance	Strict control should be maintained over all activities during construction. It is difficult to mitigate properly for this as some disturbance is inevitable. **During Construction, if any of the "Focal Species" identified in this report are observed to be roosting and/or breeding in the vicinity, the EWT is to be contacted for further instruction.**

- *Operational Phase*

Impact	*Mitigation*
Collision	Mark the relevant sections of line (i.e. those within the sensitivity zones, as depicted in figure 16 below) with appropriate marking devices. These sections of line, and the exact spans, will be finalised as part of the Environmental Management Programme (EMP) phase, once power-line routes are finalised and pylon positions are pegged.
Electrocution	All new pylon structures should make use of a "bird friendly" monopole structure, fitted with a bird perch, as per Eskom standard guidelines.
Nesting of birds on Tower structures and disturbance during routine maintenance.	No nests may be removed, without first consulting the EWT's Wildlife and Energy Program (WEP). During maintenance, if any of the "Focal Species" identified in this report are observed to be roosting and/or breeding in the vicinity, the EWT is to be contacted for further instruction**.**

New Pipe lines.

- *Construction phase:*

Impact	*Mitigation*
Habitat destruction	Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate properly for this as some habitat destruction is inevitable. It is important to ensure that the construction **Environmental Management Plan i**ncorporates guidelines as to how best to minimize this impact.
Disturbance	Strict control should be maintained over all activities during construction. It is difficult to mitigate properly for this as some disturbance is inevitable. **During Construction, if any of the "Focal Species" identified in this report are observed to be roosting and/or breeding in the vicinity, the EWT is to be contacted for further instruction.**

IMPACT RATING

All of the predicted impacts above have been rated for significance, as per a standard set of criteria (supplied by Lidwala Consulting Engineers (SA) (Pty) Ltd, and shown below in Appendix A). The ratings were done both for the construction (Appendix B) and Operational (Appendix C) phases of the project. Cumulative impacts were considered, but were not deemed applicable to the avifaunal study.

SENSITIVITY ANALYSIS

In general the study area is moderate to highly sensitive in terms of avifauna, based on the occurrence of a number of listed species in the study area, as well as the various micro-habitats available to avifauna. The sensitive zones are mapped and described below.

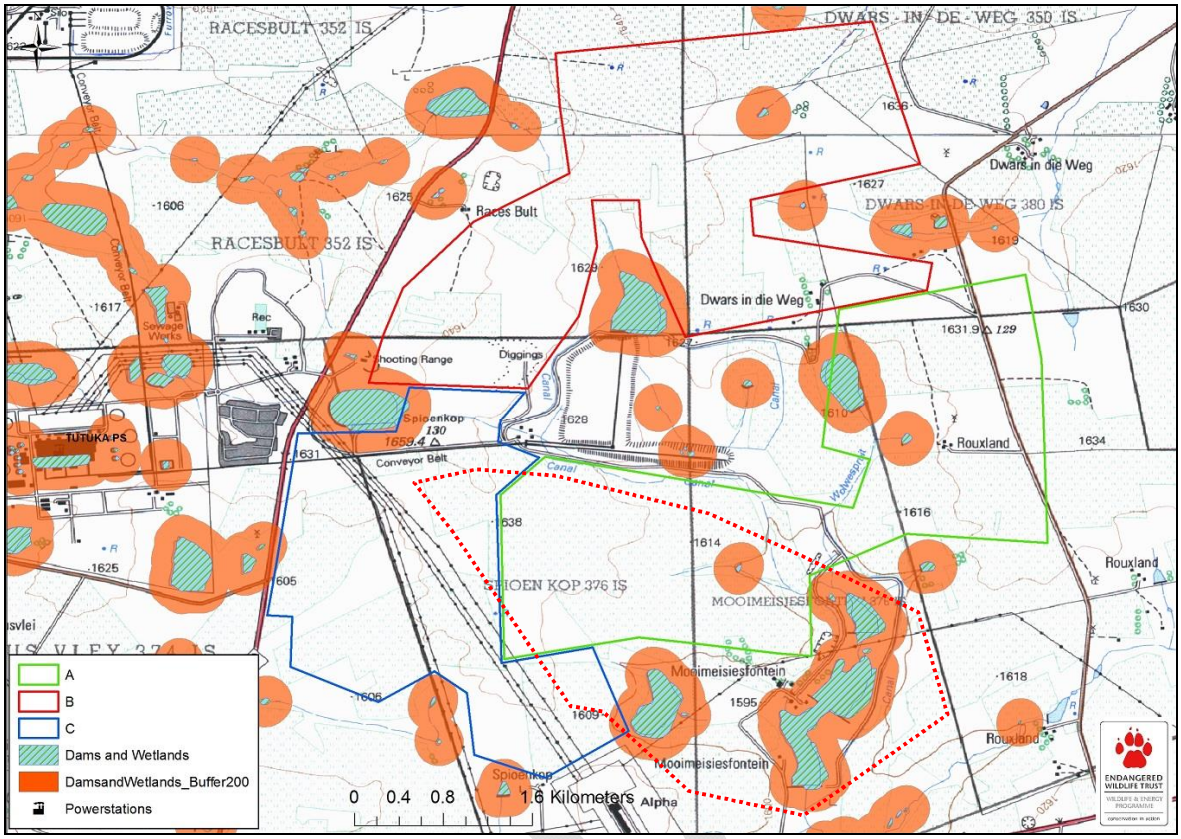

Figure 14: Avifaunal sensitivity map of the study area.

The above map (Figure 14) shows a landscape feature, dams and wetlands, which have been buffered by 200m. The importance of this micro-habitat to avifauna has been discussed in earlier sections of this report. **All of these buffered zones are regarded as *Medium-High Sensitivity areas* and if possible should be avoided for construction activities.** The dotted red polygon also shows a general area, which in the specialists opinion, appears sensitive following the field investigations. There are relatively open grassland areas here as well as dams where good numbers of birdlife were seen. This zone is designated as ***Medium Sensitivity.*** **The remaining areas outside of the wetland buffers and outside of the red polygon are designated as *Low – Medium sensitivity*.**

SITE PREFERENCE RATING

All three sites are acceptable from an avifaunal perspective, and no fatal flaws have been identified in terms of avifauna. (See the attached letter with regards to Alternative A extension). Due to its smaller size, as well as its proximity to existing disturbance (e.g. power lines, substation, power station and main road) Alternative C is preferred. Site A was found to have extensive open grassland areas, and was in close proximity to dams, while site B has more attractive avifaunal microhabitats than alternative C, and is also larger.

Table 5: Criteria for Site Preference Ratings

Site preference Rating	**Criteria**
Preferred (4)	Closest to existing ash dump. Relatively small footprint. No wetlands impacted upon. Consists predominantly of disturbed grasslands or agriculture. Focal species unlikely to occur.
Acceptable (3)	Close to existing ash dump. Relatively small footprint. Least wetlands impacted upon. Grasslands partially disturbed, some natural areas exist or agriculture. Possibility that some focal species may occur
Not Preferred (2)	Far from existing ash dump. Larger footprint. Wetlands impacted upon. Large proportion of site appears natural. Likely that focal species will utilise the site extensively.
No-Go (1)	Predominantly undisturbed natural grassland. Presence of focal species breeding or roosting on site and/or utilising the site extensively.

Table 6: Final Site Ranking Matrix

Study	**Alt A**	**Alt B**	**Alt C**
Avifaunal	3	3	4

CONCLUSION

No fatal flaws have been identified in terms of avifauna and the proposed ash disposal facility can be built on any of the alternatives A, B or C, provided that the various mitigation measures recommended in this report are implemented. However, from an avifaunal perspective, site alternative C is preferred for development. The Alternative A Extension is considered "Not-Preferred" as detailed in the attached letter. The greatest impact of the proposed project is likely to be that of habitat destruction, while leachate from fly ash, into water systems used by avifauna is also of concern. Possible impacts of associated infrastructure (e.g. roads, power lines, pollution control dams, conveyors, pipelines and pump stations) will be fully assessed upon identification of the chosen alternative site. However, collisions are expected to be the largest impact of associated power lines (should they form part of the scope of the development and assuming that "bird-friendly" pylon structures are used which prevent the impact of electrocution), and some line marking may be a suitable mitigation method for this. Sensitive areas have been mapped, within which the abovementioned collision mitigation may need to be implemented. Furthermore the following conclusions and recommendations are made:

- Habitat destruction and disturbance are impacts that are associated with all activities of the proposed project; however they are not expected to be highly significant, and should be mitigated for as per this report and the use of the Construction EMP.
- Should any of the focal species be found to be nesting, breeding or roosting on the site, during any future phase, the EWT should be contacted for further instruction.
- An "avifaunal walk through" by an avifaunal specialist, of the chosen site prior to construction/extension is recommended in order to identify potential breeding sites or nests of focal species.

This report is to be read in conjunction with the attached letter *Avifauna Specialist Study Verification and Input for the Continuous Disposal for Ash at the TUTUKA Power Station* dated 14 April 2014.

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Tutuka Power Station is located approximately 25 km north-north-east (NNE) of Standerton in the Mpumalanga Province. The power station falls within the Lekwa Local Municipality which falls within the Gert Sibande District Municipality.

Appendix A:

The Significance Rating Scales – for an EIA
Example 3

Issues are assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected;
- The physical **extent**, wherein it is indicated whether:
  - 1 - the impact will be limited to the site;
  - 2 - the impact will be limited to the local area;
  - 3 - the impact will be limited to the region;
  - 4 - the impact will be national; or
  - 5 - the impact will be international;
- The **duration**, wherein it is indicated whether the lifetime of the impact will be:
  - 1 - of a very short duration (0ï 1 years);
  - 2 - of a short duration (2-5 years);
  - 3 - medium-term (5ï 15 years);
  - 4 - long term (> 15 years); or
  - 5 - permanent;
- The **magnitude of impact on ecological processes**, quantified on a scale from 0-10, where a score is assigned:
  - 0 - small and will have no effect on the environment;
  - 2 - minor and will not result in an impact on processes;
  - 4 - low and will cause a slight impact on processes;
  - 6 - moderate and will result in processes continuing but in a modified way;
  - 8 - high (processes are altered to the extent that they temporarily cease); or
  - 10 - very high and results in complete destruction of patterns and permanent cessation of processes;
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:
  - 1 - very improbable (probably will not happen;
  - 2 - improbable (some possibility, but low likelihood);
  - 3 - probable (distinct possibility);
  - 4 - highly probable (most likely); or
  - 5 - definite (impact will occur regardless of any prevention measures);
- the **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- the **status**, which is described as either positive, negative or neutral;
- the degree to which the impact can be reversed;

- the degree to which the impact may cause irreplaceable loss of resources; and
- the *degree* to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M)*P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- **31-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area

Appendix B: Assessment of Impacts during the Construction phase.

Construction Phase									
Ash Disposal Facility - Alternative A									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Disturbance	**Nature of impact:**	Noise and movement, from staff and machinery, may disturb avifauna, and nests may be disturbed.							
	without	2	4	6	4	**48**	**Medium**		Medium
	with	2	4	4	3	**30**	**Low**		Medium
	degree to which impact can be reversed:	Partially reversible							
	degree of impact on irreplaceable resources:	Low							
Habitat Destruction	**Nature of impact:**	Permanent removal of habitat that is used, or may be used, by avifauna.							
	without	1	5	6	5	**60**	**Medium**		Medium
	with	1	5	6	5	**60**	**Medium**		Medium
	degree to which impact can be reversed:	Irreversible							
	degree of impact on irreplaceable resources:	Medium							
Ash Disposal Facility - Alternative B									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Disturbance	**Nature of impact:**	Noise and movement, from staff and machinery, may disturb avifauna, and nests may be disturbed.							
	without	2	4	6	4	**48**	**Medium**		Medium
	with	2	4	4	3	**30**	**Low**		Medium

	degree to which impact can be reversed:	Partially reversible							
	degree of impact on irreplaceable resources:	Low							
Habitat Destruction	**Nature of impact:**	Permanent removal of habitat that is used, or may be used, by avifauna.							
	without	1	5	6	5	**60**	**Medium**		Medium
	with	1	5	6	5	**60**	**Medium**		Medium
	degree to which impact can be reversed:	Irreversible							
	degree of impact on irreplaceable resources:	Medium							

Ash Disposal Facility - Alternative C

Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Disturbance	**Nature of impact:**	Noise and movement, from staff and machinery, may disturb avifauna, and nests may be disturbed.							
	without	2	4	4	4	**40**	**Medium**		Medium
	with	2	4	4	3	**30**	**Low**		Medium
	degree to which impact can be reversed:	Partially reversible							
	degree of impact on irreplaceable resources:	Low							
Habitat Destruction	**Nature of impact:**	Permanent removal of habitat that is used, or may be used, by avifauna.							
	without	1	5	4	5	**50**	**Medium**		Medium
	with	1	5	4	5	**50**	**Medium**		Medium

	degree to which impact can be reversed:	Irreversible							
	degree of impact on irreplaceable resources:	Medium							
Ash Disposal Facility - No-Go									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
N/A	**Nature of impact:**								
	without								
	with								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								

Appendix C: Assessment of Impacts during Operational Phase

Operational Phase									
Ash Disposal Facility - Alternative A									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Contamination of surrounding water.	**Nature of impact:**	Leachate containing heavy metals, could result in contamination of water sources, used by water birds.							
	without	2	4	6	3	**36**	**Medium**		Low
	with	2	4	4	2	**20**	**Low**		Low
	degree to which impact can be reversed:	Reversible							
	degree of impact on irreplaceable resources:	Low							
Ash Disposal Facility - Alternative B									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
Contamination of surrounding water.	**Nature of impact:**	Leachate containing heavy metals, could result in contamination of water sources, used by water birds.							
	without	2	4	6	3	**36**	**Medium**		Low
	with	2	4	4	2	**20**	**Low**		Low
	degree to which impact can be reversed:	Reversible							
	degree of impact on irreplaceable resources:	Low							
Ash Disposal Facility - Alternative C									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**

Contamination of surrounding water.	**Nature of impact:**	Leachate containing heavy metals, could result in contamination of water sources, used by water birds.							
	without	2	4	4	3	**30**	**Low**		Low
	with	2	4	4	2	**20**	**Low**		Low
	degree to which impact can be reversed:	Reversible							
	degree of impact on irreplaceable resources:	Low							
Ash Disposal Facility - No-Go									
Potential Impact	**Mitigation**	**Extent (E)**	**Duration (D)**	**Magnitude (M)**	**Probability (P)**	**Significance (S=(E+D+M)*P)**		**Status (+ve or -ve)**	**Confidence**
N/A	**Nature of impact:**								
	without								
	with								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								