Mobile: Sam - 072 437 1742
Mobile: Luke - 083 784 1997
Email: info@enviro-insight.co.za
Website: www.enviro-insight.co.za

Ecological Scoping Assessment for the Expansion of the Pollution Control Dams associated with the Continuous Disposal of Ash at the Majuba Power Station, Mpumalanga Province

November 2018

for

Advisian Worley Parsons

Marinda le Roux
MarindaLeRoux.Advisian@outlook.com
Cell: 0614174281

PREPARED BY

Enviro-Insight CC
Corné Niemandt *(Cand. Sci. Nat.)*
corne@enviro-insight.co.za

REVIEWED BY

Luke Verburgt (Pr. Sci. Nat.)
luke@enviro-insight.co.za

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1 INTRODUCTION

1.1 PROJECT DETAILS AND BACKGROUND

Enviro-Insight CC was commissioned by Advisian Worley Parsons to perform a Scoping and Environmental Impact Assessment (EIA) specialist report for the expansion of the Pollution Control Dams (PCD's) associated with the ash disposal facilities at the Majuba Power Station, Mpumalanga Province.

Majuba Power Station is Eskom's second largest power plant in South Africa. The ash generated by the facility is currently being disposed by means of "dry ashing" within Eskom owned land and on the premises of the Majuba Power Station. The current ash dump was initially designed for the planned life of operation of the Majuba Power Station. However, Eskom have recently decided to extend the planned operation of the Majuba Power Station until 2045. This process therefore requires the continuous disposal of ash on existing facilities and the extension of new ash disposal sites to accommodate increased ashing requirements of the power station for the next 27 years. Associated with this ash disposal facility extension is the necessity to increase the PCD's to accommodate the increased facility size.

This scoping report therefore seeks to detail any potential environmental impacts associated with the extension of three existing PCD's servicing the current ash disposal facility.

1.2 STUDY AREA

The study area is located approximately 16 km southwest (SW) of Amersfoort and approximately 40 km north northwest (NNW) of Volksrust in the Mpumalanga Province. The site can be accessed via the R35 from an unnamed road towards Perdekop or via an unnamed road between the R23 and the N11 (Figure 1-1). The Majuba Power Station falls within the Dr Pixley Ka Isaka Seme Local Municipality located in the Gert Sibande District Municipality.

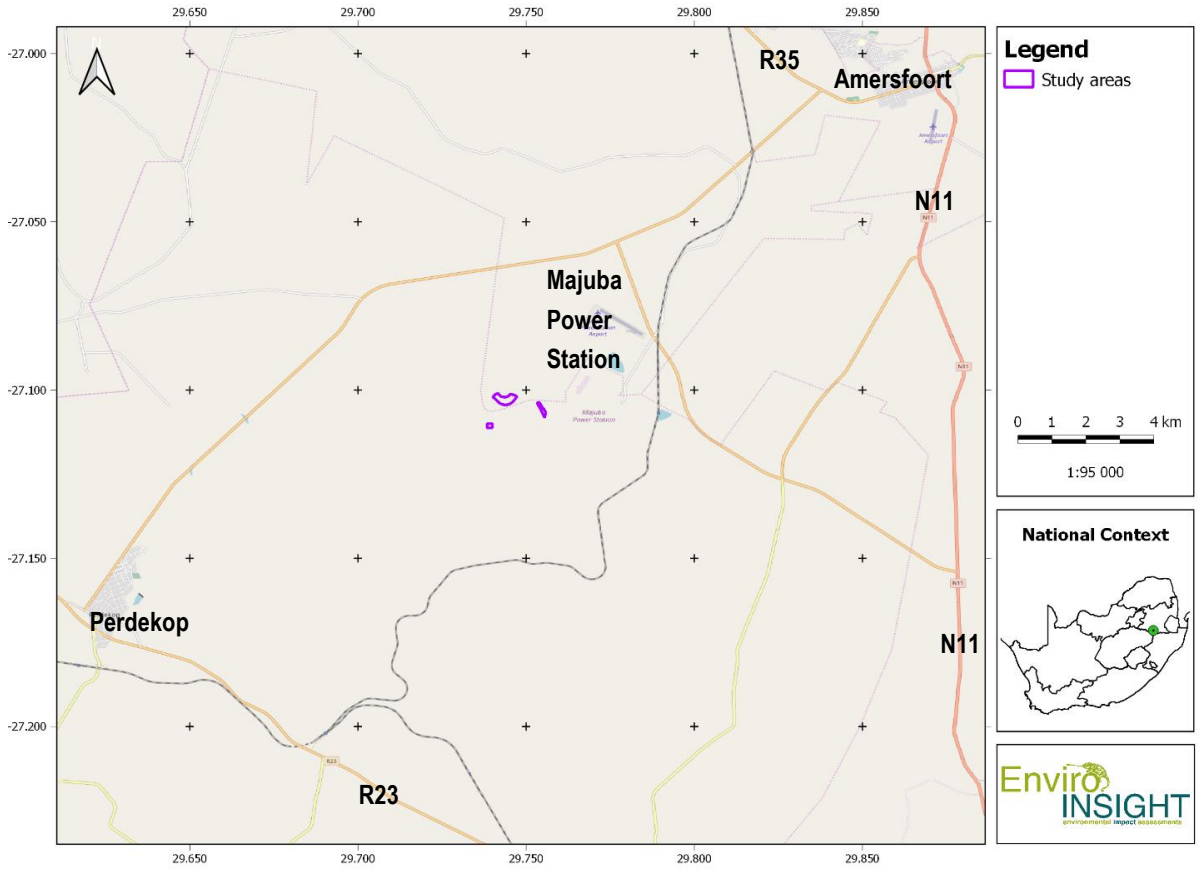

Figure 1-1: Locality of the study area for the proposed PCD expansions.

1.3 STUDY LIMITATIONS

- It is assumed that all third party information acquired is correct (e.g. GIS data and scope of work);
- A Site Development Plan (SDP) showing the exact location of the proposed infrastructure was provided prior to the site visit;
- The level of study did not warrant long-term trapping methods (i.e. small mammal trapping, herpetofauna trapping, camera trapping and night surveys) or a phytosociological delineation. The confidence in the assessment derived from the literature review and fieldwork data however is high due to the *status quo* of the study area, the location (disturbed area) and the size of the study area (relatively small);
- Due to the weather conditions on site during the survey, i.e. cold temperatures and high wind speeds, conditions were not optimal; and
- The site visit was conducted at the beginning of the wet season in November.

2 METHODS

2.1 DESKTOP SURVEY

2.1.1 Flora Assessment

A literature review was conducted as part of the desktop study to identify the potential habitats and flora species of conservation concern (SCC) present within the study area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA) (SANBI, 2017)[1], to access distribution records on southern African plants[2]. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree grid cell (QDGC) resolution; however, the BODATSA database provides distribution data as point coordinates. The literature study therefore, focussed on querying the database to generate species lists for the xMin, yMin 29.50°,-26.9° : xMax, yMax 30.20°,-27.34° extent (WGS84 datum) in order to increase the likelihood of obtaining a representative species list for the proposed study area.

The Red List of South African Plants website (SANBI, 2018)[3] was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Guide to grasses of Southern Africa (Van Oudtshoorn, 1999);
- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1998);
- Field guide to trees of southern Africa (Van Wyk & Van Wyk, 2013); and
- Problem plants and alien weeds of South Africa (Bromilow, 2010).

Additional information regarding ecosystems, vegetation types, and SCC included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006); and
- Red List of South African Plants (Raimondo *et al*., 2009; SANBI, 2018).

2.1.2 Fauna Assessment

The level of this study did not warrant intensive long term field sampling. Rather, conditions on site were evaluated during a rapid field assessment and placed into context within the regional vegetation type (Mucina & Rutherford, 2006), from which a series of conclusions and subsequent recommendations were derived to inform the development process.

Relevant databases, field guides and texts were consulted for the desktop and literature study included the following:

1 http://newposa.sanbi.org/
2 Data are obtained from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH)
3 http://redlist.sanbi.org/

- The online Virtual Museum (VM) facility of the Animal Demography Unit (ADU) of the University of Cape Town (http://vmus.adu.org.za) was queried for the presence of mammal (MammalMAP, 2018), reptile (ReptileMAP, 2018) and amphibian (FrogMAP, 2018) SCC within the QDGC in which the proposed development resides (2729BA and 2729BB);
- Information relating to avifauna species of conservation concern (SCC) was obtained from the Southern Africa Bird Atlas Project (SABAP 2), Hockey *et al.,* (2005) and Taylor *et al.,* (2015);
- Mammal SCC information was obtained from Child *et al.,* (2017);
- Reptile SCC information was obtained from Bates *et al.,* (2014); and
- Amphibian SCC information was obtained from Du Preez & Carruthers (2017).

Species nomenclature follows the aforementioned references throughout this document except for herpetofauna where nomenclature for reptiles follows ReptileMAP (2018) as new distribution data and taxonomic changes have already occurred since publication of Bates *et al.,* (2014). Similarly, the Frog Atlas of Southern Africa (FrogMAP, 2018) provides information on the geographic distributions of amphibians and keeps up-to-date with the latest taxonomic changes. The use of these online facilities is justified as it not only includes the latest verified publicly contributed data but also a complete record of the museum material in South Africa. The applicability of the information obtained from the literature sources was evaluated for the study area and the subsequent recommendations are to be used by the client in order to drive the development process in accordance with the relevant legislation.

2.1.3 GIS

Existing data layers were incorporated into a GIS to establish how the proposed the study area and associated activities interact with these important terrestrial entities. Emphasis was placed around the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006);
- Mpumalanga Biodiversity Sector Plan (MBSP, 2014[a])
- MBSP Terrestrial Assessment (MBSP, 2014[b]);
- Important Bird Areas (BirdLife South Africa, 2015); and
- National List of Threatened Ecosystems (SANBI, 2011).

All mapping was performed using open source GIS software (QGIS[4]).

2.2 FIELD SURVEY

A site visit was performed on 7 November 2018 by an ecologist where the faunal and floral aspects of the survey area were evaluated. The timing of the study represented the start of wet season conditions which is sub-optimal for plant identification and good foraging quality for fauna species.

4 http://qgis.osgeo.org/en/site/

During the field surveys, the habitats were evaluated on foot and a series of georeferenced photographs were taken of the habitat attributes. The field surveys focused on a classification of the observed fauna and flora, habitats as well as the actual and potential presence of species of conservation concern (either classified as Threatened by the IUCN (2018), protected by NEMBA (2014) or indeed other legislations applicable provincially or nationally). An analysis of the diversity and ecological integrity of the habitats present on site was also performed.

2.3 SPECIES OF CONSERVATION CONCERN

The Red List of threatened species generated by the IUCN (http://www.iucnredlist.org/) provided the global conservation status. However, regional conservation status assessments performed following the IUCN criteria were considered to be the most relevant and sourced for each group as follows:

- Plants: Red List of South African plants version 2018[5] and Raimondo *et al.* (2009);
- Reptiles: Bates *et al.* (2014);
- Amphibians: Du Preez & Carruthers (2017);
- Mammals: Child *et al.* (2016); and
- Avifauna: Taylor *et al.* (2015).

The conservation status categories defined by the IUCN, which are considered here to represent species of conservation concern, are the "threatened" categories defined as follows:

- **Critically Endangered (CR)** - Critically Endangered refers to species facing immediate threat of extinction in the wild.
- **Endangered (EN)** - Endangered species are those facing a very high risk of extinction in the wild within the foreseeable future.
- **Vulnerable (VU)** - Vulnerable species are those facing a high risk of extinction in the wild in the medium-term.

3 RESULTS

3.1 CLIMATE

The area around the Majuba Power Station normally receives approximately 584 mm of rain per year, with most of the rainfall occurring during the summer months (Sep - Feb). Weather conditions on the day of the site visit were not conducive for fauna observations in the surrounding area. Temperature measurements (obtained from Majuba power station weather stations every 10 minutes) were well below the average temperature recorded at midday (---) for the month of November (24 °C) (Figure 3-1).

5 http://redlist.sanbi.org/index.php

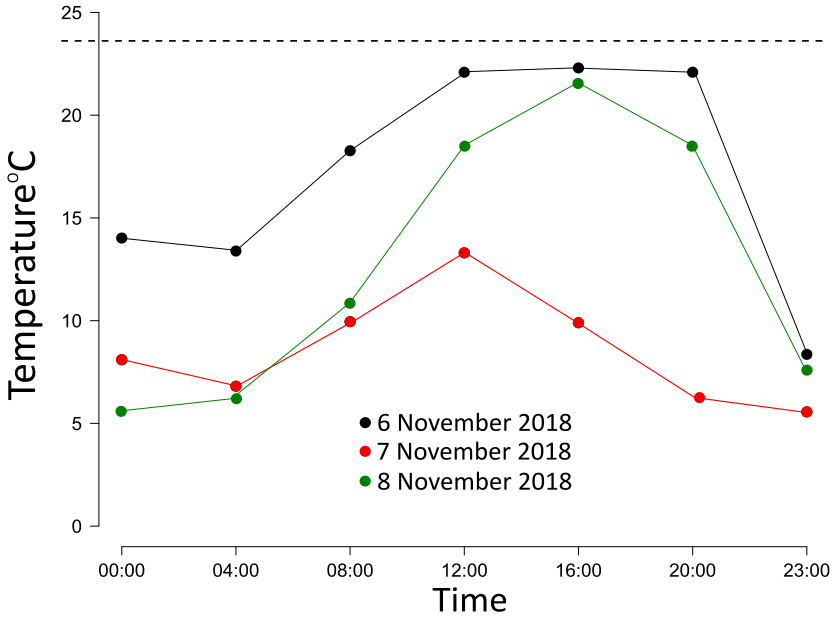

Figure 3-1: The mean temperature recorded at Majuba Power Station over the survey period.

The wind conditions were also not conducive for faunal surveys, especially so for avifauna, due to almost constant wind and occasional powerful gusts. Visibility was heavily affected due to ash being blown off the ash dump (Figure 3-2).

Figure 3-2: Strong winds at Majuba Power Station blowing ash off the ash dump into the surroundings.

3.2 REGIONAL VEGETATION

The study area falls entirely within the Amersfoort Highveld Clay Grassland vegetation unit (

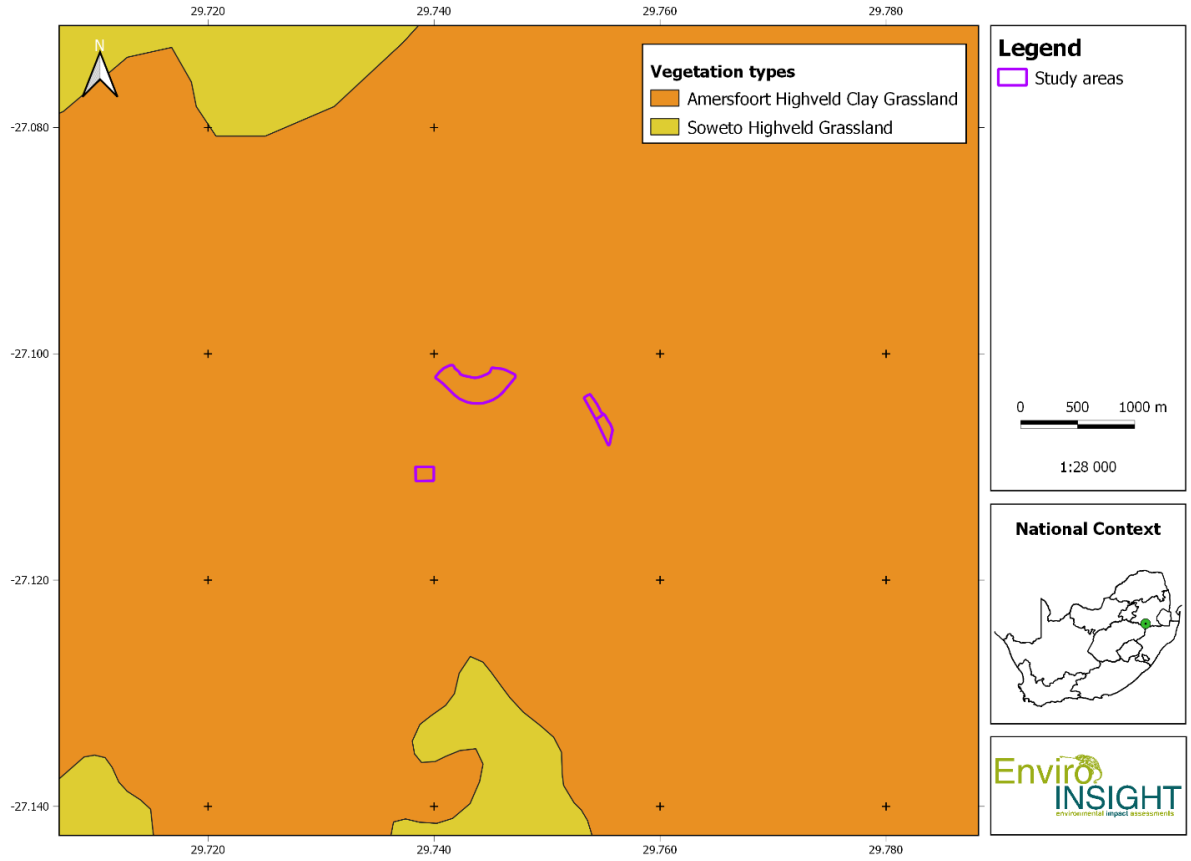

Figure 3-3) (Table 3-1). The vegetation is described as undulating grassland plains, with localised patches of dolerite outcrops in certain areas. The landscape is typically comprised of short closed grassland cover consisting mainly of *Themeda triandra*, which is often severely grazed to form a short lawn. This vegetation unit is considered Vulnerable with the conservation target set at 27 % of which none is currently protected. Approximately 25 % of the vegetation type is transformed of which 22 % is through cultivation, while exotic *Acacia* species (Silver and Black Wattle) and *Salix babylonica* invade drainage lines (Mucina & Rutherford, 2006). Overgrazing leads to the invasion of *Seriphium plumosum* (bankrupt bush).

Table 3-1: Attributes of the Amersfoort Highveld Clay Grassland regional vegetation unit

Name of vegetation type	Amersfoort Highveld Clay Grassland
Code as used in the Book - contains space	Gm 13
Conservation Target (percent of area) from NSBA	27 %

Protected (percent of area) from NSBA	0 %
Remaining (percent of area) from NSBA	75.5%
Description of conservation status from NSBA	Vulnerable
Description of the Protection Status from NSBA	Not protected
Area (km^2) of the full extent of the Vegetation Type	3896.55
Name of the Biome	Grassland Biome

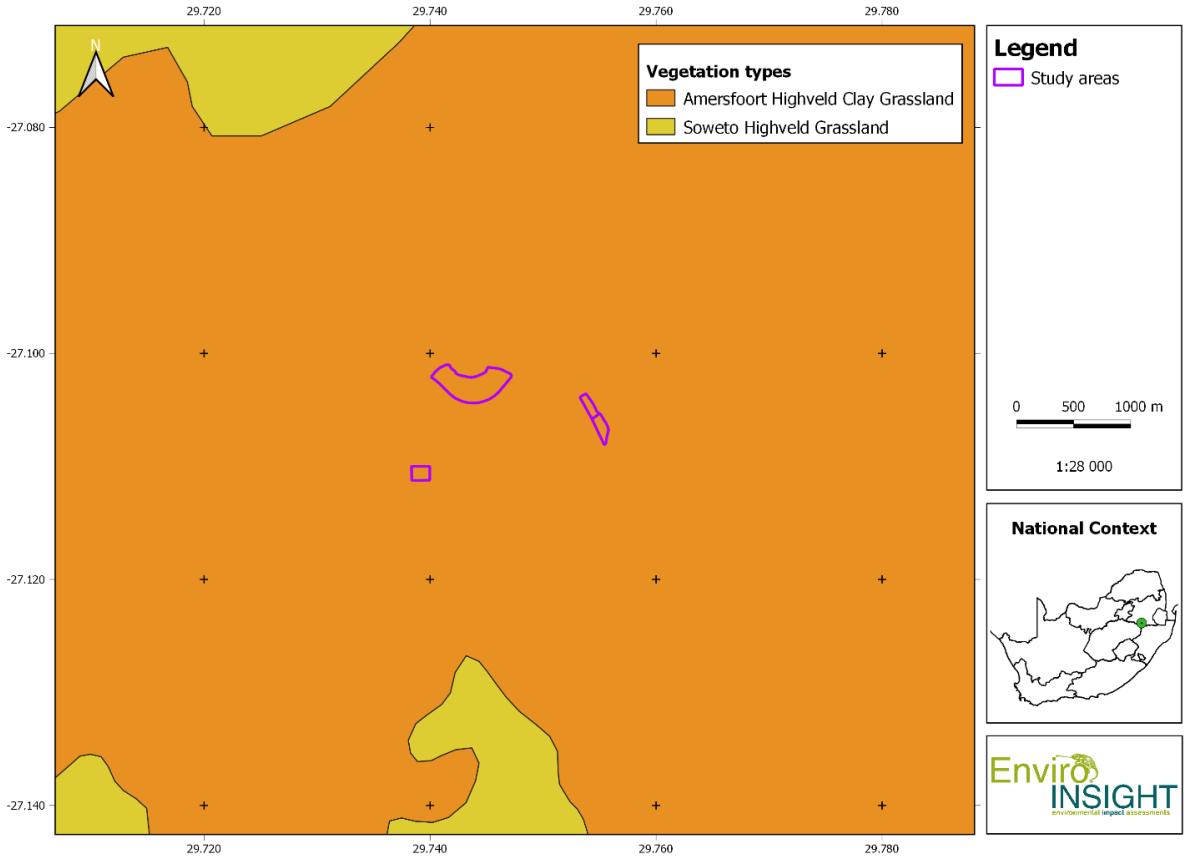

Figure 3-3: Regional vegetation types in relation to the study area.

3.3 MPUMALANGA BIODIVERSITY CONSERVATION PLAN

The Mpumalanga Terrestrial Biodiversity Management Plan (MBCP) maps the distribution of Mpumalanga's Provinces known biodiversity into six categories (Lötter & Ferrar, 2006). These are ranked according to ecological and biodiversity importance

and their contribution to meeting the quantitative targets set for each biodiversity feature. Classification of the six categories is as follows:

1. Protected areas – already protected and managed for conservation;
2. Irreplaceable areas – no other options available to meet targets – protection crucial;
3. Highly Significant areas – protection needed, very limited choice for meeting targets;
4. Important and Necessary areas – protection needed, greater choice in meeting targets;
5. Areas of Least Concern – Natural areas with most choices, including for development; and
6. Areas with No Natural Habitat Remaining – transformed areas that make no contribution to meeting targets.

According to the MBCP, the T (Figure 3-4).

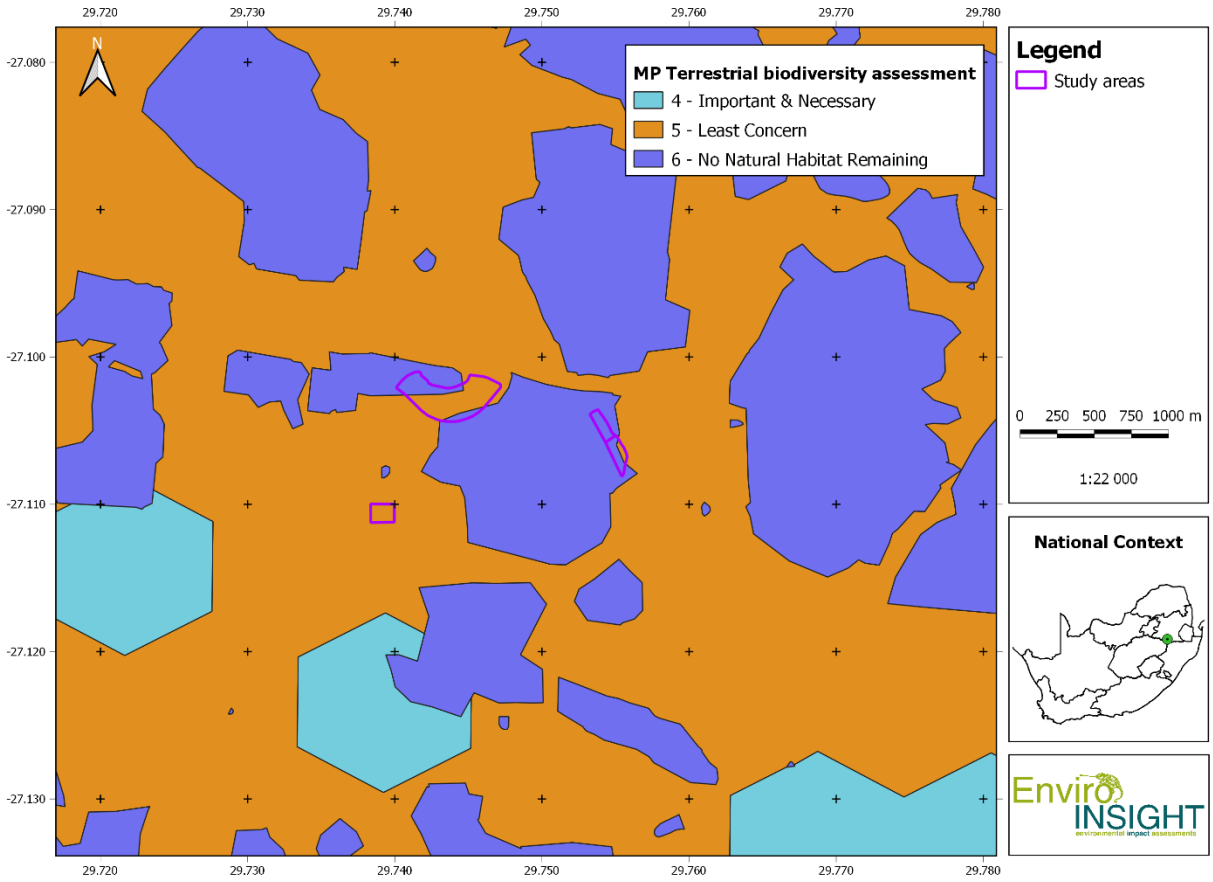

Figure 3-4: The study area in relation to the Mpumalanga Terrestrial Biodiversity Conservation Plan.

3.4 IMPORTANT BIRD AREAS

The study area falls within the Grassland Important Bird Area (SA125) covering an area of 1 084 550 ha in the Mpumalanga, Free State and KwaZulu-Natal Provinces (Figure 3-5). This large area is centred on the towns of Volksrust, Wakkerstroom and Memel. The IBA is partially protected in Mabola, KwaMandlangampisi and Pongola Bush, with the declaration of the Sneeuwberg Protected Environment currently in progress.

This area holds a significant proportion of the small population of the globally endangered White-winged Flufftail (*Sarothrura ayresi*) that has been recorded in South Africa. The species is known, or thought, to occur regularly at three wetlands in the IBA in seasons of suitable rainfall. Corn Crake (*Crex crex*) also occurs regularly at some of the wetlands. The various wetland systems hold large numbers of Little Bittern (*Ixobrychus minutus*), Baillon's Crake (*Porzana pusilla*), Red-chested Flufftail (*Sarothrura rufa*) and African Rail (*Rallus caerulescens*), as well as several breeding populations of African Marsh Harrier (*Circus ranivorus*), Grey Crowned Crane (*Balearica regulorum*) and African Grass Owl (*Tyto capensis*). Of the terrestrial birds, the core populations of most of South Africa's threatened and endemic grassland species are centred on the IBA. An estimated 85% of the global population of Rudd's Lark (*Heteromirafra ruddi*) is thought to occur within the IBA. Although this lark ranges throughout the site, it is highly localised in open, moderately to heavily grazed level grassland, without forb invasion. It prefers hill tops or plateaus and favours trampled areas. Botha's Lark (*Spizocorys fringillaris*) also occurs in the IBA and is highly localised in grassland on black clay or dolerite soils, where it favours short, dense, natural grassland on plateaus and upper hill slopes, avoiding rocky areas, taller grass in bottomlands, vleis, croplands and planted pastures. (Marnewick *et al.,* 2015)[6].

[6] http://www.birdlife.org.za/conservation/important-bird-areas/iba-directory/item/161-sa125-grasslands

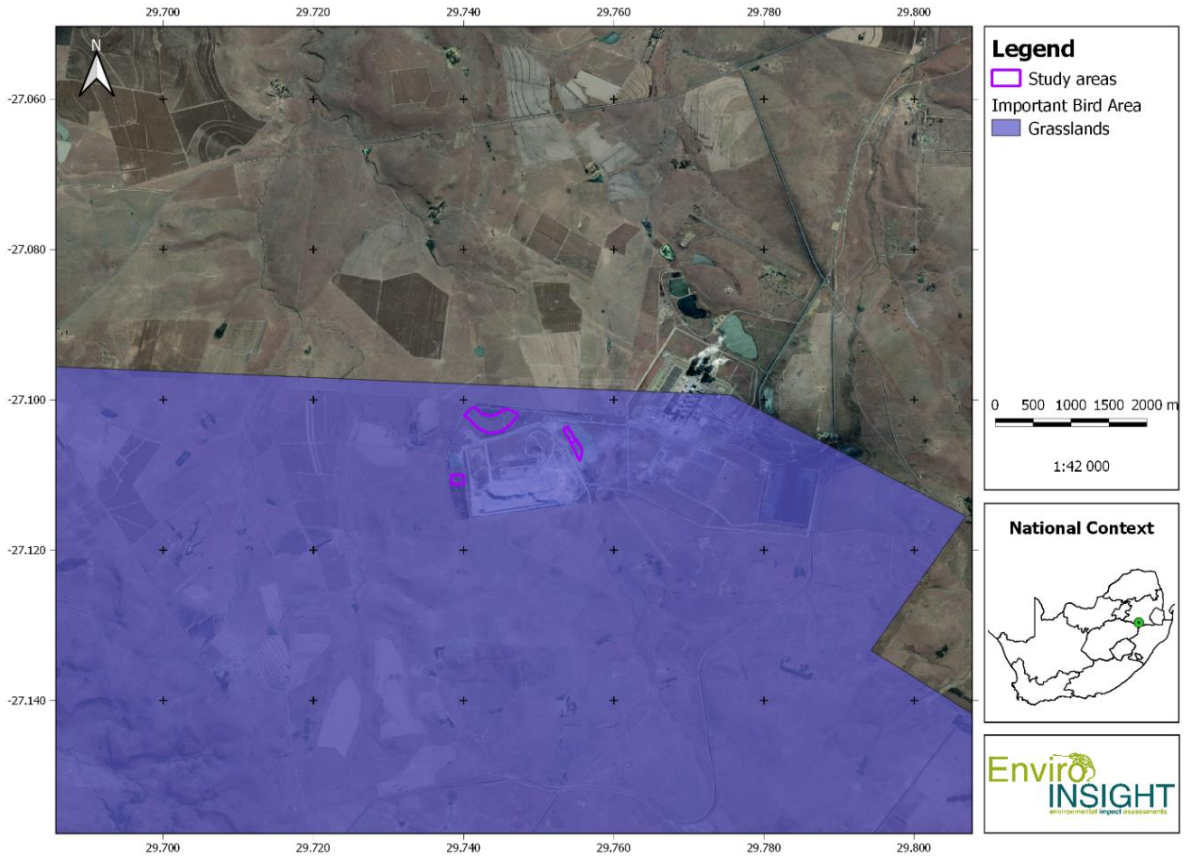

Figure 3-5: The study area in relation to Important Bird Areas.

3.5 OVERVIEW AND CURRENT IMPACTS

The current impacts of the study area include the existing ash disposal facilities and pollution control dams, and associated infrastructure such as internal roads and buildings. Limited natural vegetation remains as the study area has been negatively impacted on by the ash disposal facilities and pollution control dams. The surrounding areas are grazed and trampled by cattle but is still in semi-natural condition.

The specialist tracks as well as the location of the sample sites during the field survey are shown in Figure 3-6. The specialist coverage was considered to be complete and all areas of the study area were clearly visible and accessible.

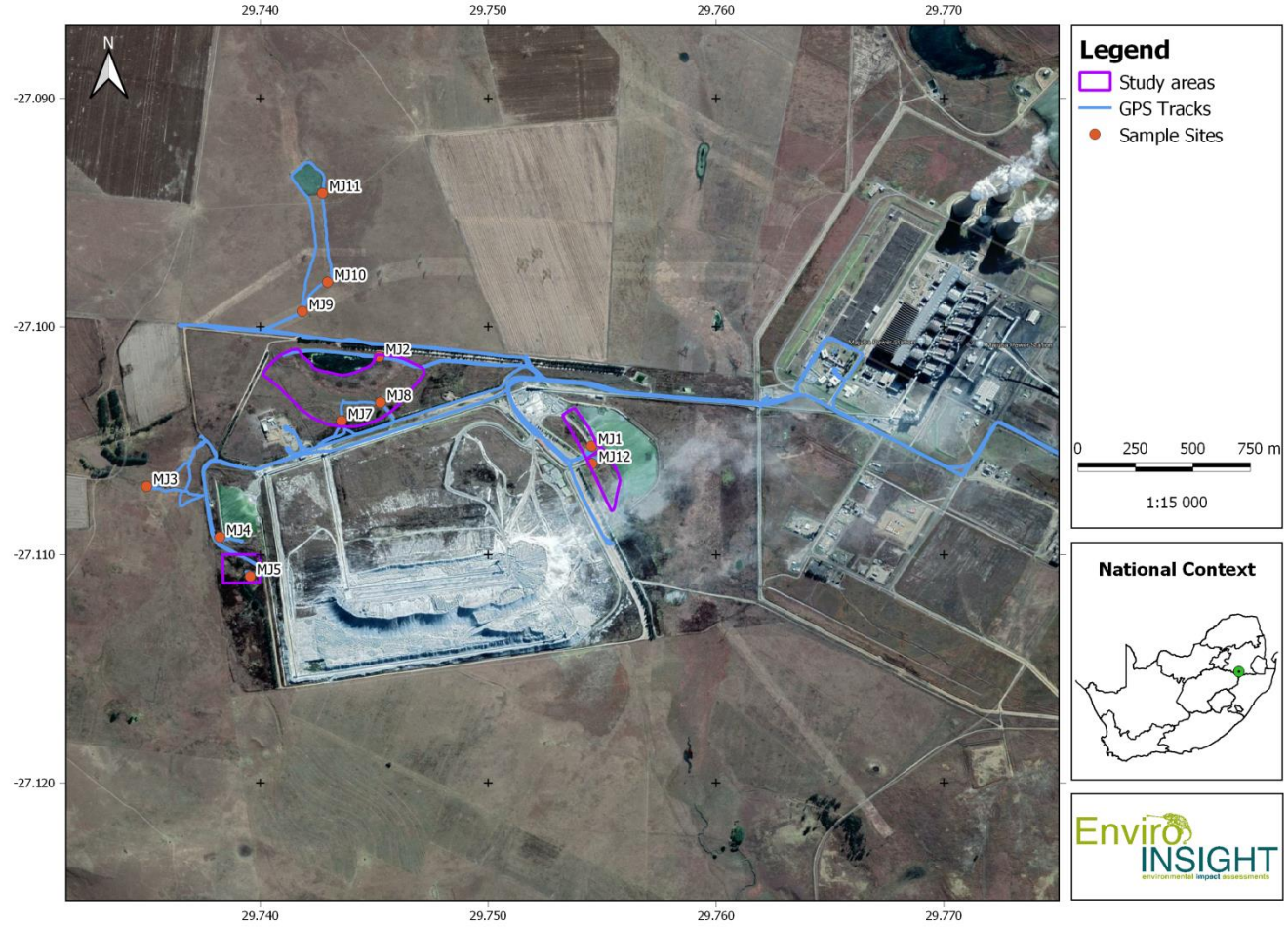

Figure 3-6: Specialist coverage (GPS tracks) and location of sample sites during the field survey.

3.6 HABITATS

3.6.1 Survey sites

Twelve survey sample sites surrounding the Majuba Power Station including the proposed extension areas were visited during the site visit. A short habitat description and visual representation of the 12 survey sites are presented in Table 3-2 below.

Table 3-2: A short habitat description and visual representation of the 12 survey sites surrounding the PCD extension areas. *PCD = Pollution Control Dam.

Survey sites	Habitat description	Photogtaphs

MJ1 -27.1052328° S 29.7545293° E	Existing PCD with surrounding ash. Small patch of reeds present.		
MJ2 -27.1013105° S 29.7452117° E	Existing with good reed beds and one rocky shore.		
MJ3 -27.1069981° S 29.7350124° E	Stream below PCD. No discernible flow, forming a series of small ponds. The area is heavily impacted by cattle (both trampling & faeces) and ash fallout (see 2nd photo).		
MJ4 -27.109223° S 29.7382175° E	Cement walled PCD adjacent to ash dump. Marginal reed beds on one side. Heavily choked with ash (see 2nd photo).		
MJ5 -27.1109452° S 29.7395529° E	Old ash dumps (from trucks) vegetated by both pioneer and exotic vegetation. Very low ecological value.		

MJ6 -27.1041327° S 29.7435633° E	Heavily disturbed grassland on edge of PCD.		
MJ7 -27.104132° S 29.74356° E	Seasonally inundated grassland on turf between PCD and dense disturbed grassland of MJ6.		
MJ8 -27.1033214° S 29.7452647° E	Excavated trench leading from ash dump to PCD. Densely reeded.		
MJ9 -27.099336 ° S 29.741842° E	Grassland drainage outside Eskom property. Grazed by cattle and trampled, but site is still in semi-natural condition.		
MJ10 -27.0980493° S 29.7429462° E	Dry drainage line leading down from PCD to clean farm dam.		

MJ11 -27.0941572° S 29.7427244° E	Damned drainage line frequented by cattle. No reeds or other marginal vegetation.		
MJ12 -27.106004° S 29.7545543° E	Transformed habitat adjacent to MJ1 (between PCD and ash dump).		

3.6.2 Main Habitats

Four main habitats were identified (Figure 3-7):

- Ash Dump and associated infrastructure, including Pollution Control Dam;
- Natural Drainage;
- Natural Grassland; and
- Transformed Habitat.

The Ash Dump and associated infrastructure, including Pollution Control Dams, has very limited natural vegetation remaining and therefore also has limited optimal habitat for fauna species. Nevertheless, the PCD's and the reeds surrounding them provide habitat for many waterbirds.

The Natural Drainage habitat has no obvious aquatic vegetation such as reeds or other marginal vegetation. One section of the drainage line leading northwards from PCD to the clean farm dam is dry. Cattle graze and trample within the drainage area, but it is still in a semi-natural condition.

The Natural Grassland habitat includes both natural and exotic plant species. Cattle graze within this habitat, and some sections are heavily impacted by both trampling and faeces from cattle, as well as ash fallout.

The Transformed habitat has virtually no ecological value due to old ash dumps which are vegetated by both pioneer and exotic plants.

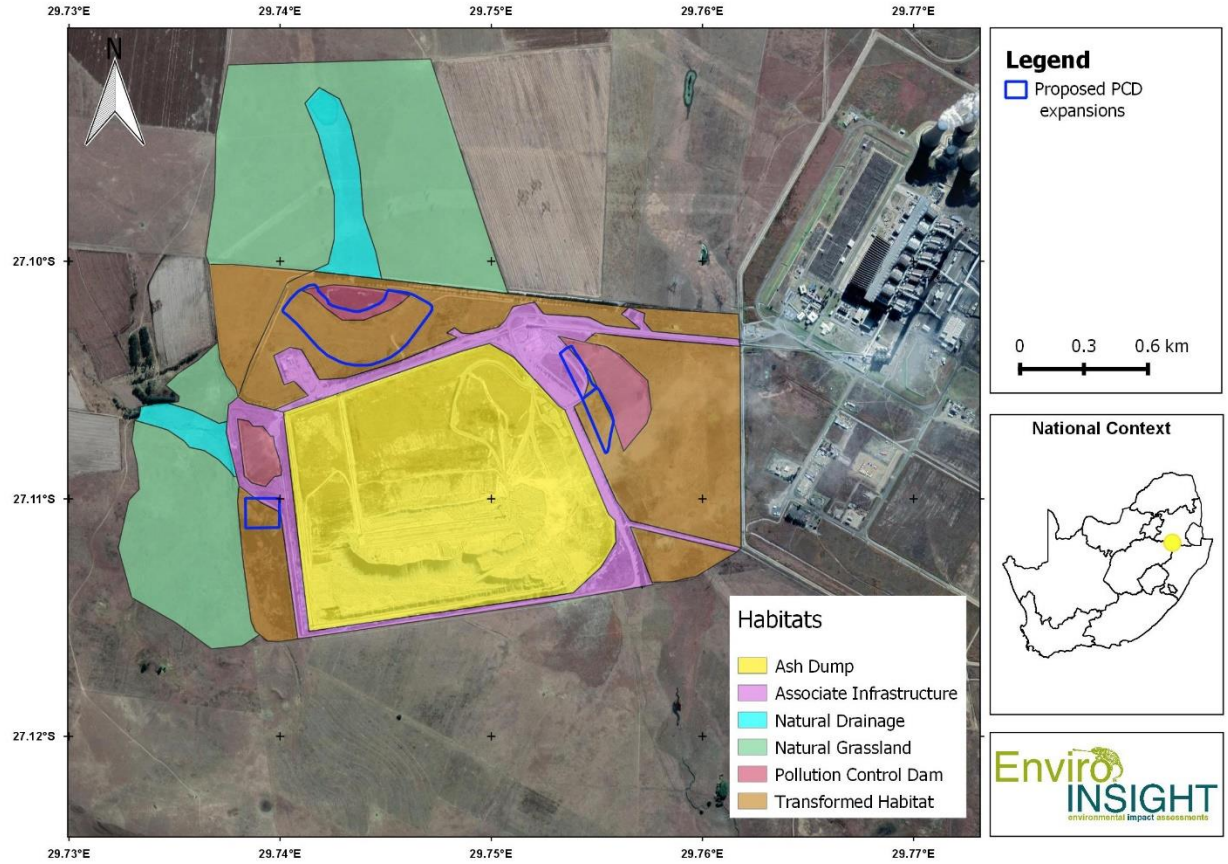

Figure 3-7: Habitat types identified within and surrounding the study area.

3.7 OBSERVED AND EXPECTED FAUNA

General

The study area resides on the 2729BA and the 2729BB quarter degree grid cells (QDGC). These QDGC's along with adjacent cells (2730AA, 2729BD, 2729BC, 2729AB, 2629DC, 2629DD) were considered to represent similar habitats and therefore the predicted species lists for mammals and herpetofauna were derived from observation records from these eight QDGC's.

All animal observations were recorded with photographic evidence where possible. For mammals and herpetofauna, this is provided in Table 3-3.

Mammals

The mammal species list derived from records collected for the QDGC's is presented in Appendix 2. Four species of conservation concern could be expected to occur within the study area and are discussed in section 3.9.

Herpetofauna

The herpetofauna species list derived from records collected for the eight QDGC's is presented in Appendix 4. Only one species of conservation concern could be expected to occur within the study area namely the Giant Girdled Lizard (*Smaug giganteus*; Vulnerable). This species is discussed in section 3.9.

Table 3-3: Observed fauna at the different survey sites.

Sites	Species	Photograph
RANDOM* -27.0994402° S 29.7419154° E	*Leptotyphlops scutifrons* (Peter's Thread Snake)	
MJ4 -27.1094642° S 29.7392172° E	*Canis mesomelas* (Black-backed Jackal) scat	
MJ4 -27.1094726° S 29.7392249° E	*Hystrix africaeaustralis* (Porcupine) scat	

RANDOM -27.1033491° S 29.752557° E	*Psammophylax rhombeatus* (Rhombic skaapsteker)		
MJ3 -27.1071325° S 29.7354653° E	*Cynictis penicillata* (Yellow mongoose burrow)		
MJ2 -27.1013108° S 29.7452123° E	*Aonyx capensis* (Cape Clawless Otter) scat		

MJ1 -27.1052876° S 29.7545062° E	*Canis mesomelas* (Black-backed Jackal) scat	

Avifauna

The study area is located in the 2705_2940 and 2705_2945 pentads. The avifauna species list derived from SABAP1 and SABAP2 records is presented in Appendix 3. Thirty-nine species were recorded during the survey, of which only a single species of conservation concern was observed namely the Blue Korhaan (*Eupodotis caerulescens*; Vulnerable). This species and other expected SCC are discussed in section 3.9. Photographic evidence of a selection of avifauna observed at the different survey sites are indicated in Figure 3-8 and Figure 3-9 below.

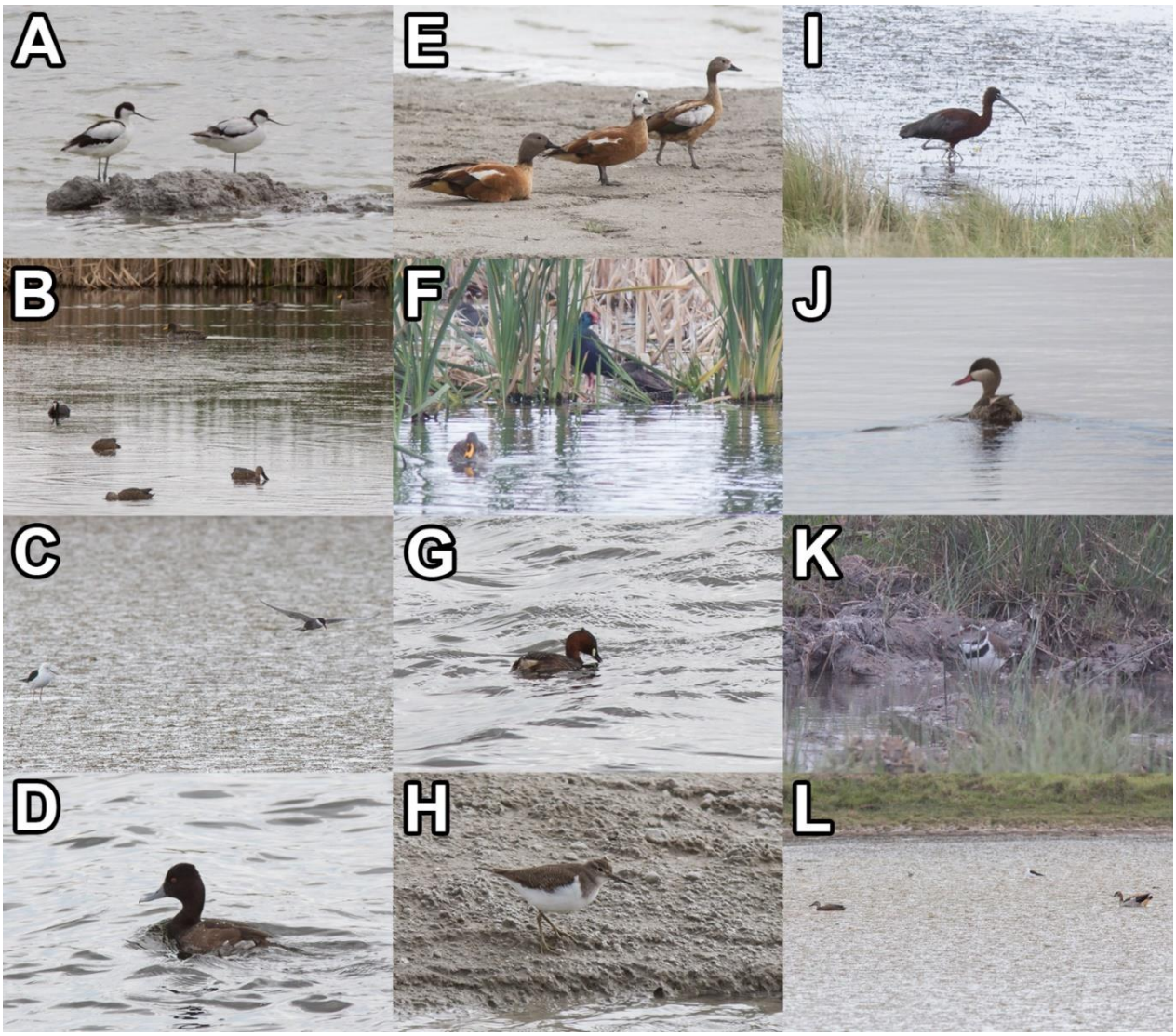

Figure 3-8: Photographic evidence of a selection of avifauna observed during the field survey[7].

7

A. *Recurvirostra avosetta* (Pied Avocet)
B. *Anas smithii* (Cape Shoveler)
C. *Chlidonias hybrida* (Whiskered Tern)
D. *Netta erythrophthalma* (Southern Pochard)
E. *Tadorna cana* (South African Shelduck)
F. *Porphyrio madagascariensis* (African Swamphen)
G. *Tachybaptus ruficollis* (Little Grebe)
H. *Actitis hypoleucos* (Common Sandpiper)
I. *Plegadis falcinellus* (Glossy Ibis)
J. *Anas erythrorhyncha* (Red-Billed Teal)
K. *Charadrius tricollaris* (Three-Banded Plover)
L. *Alopochen aegyptica* (Egyptian Goose)

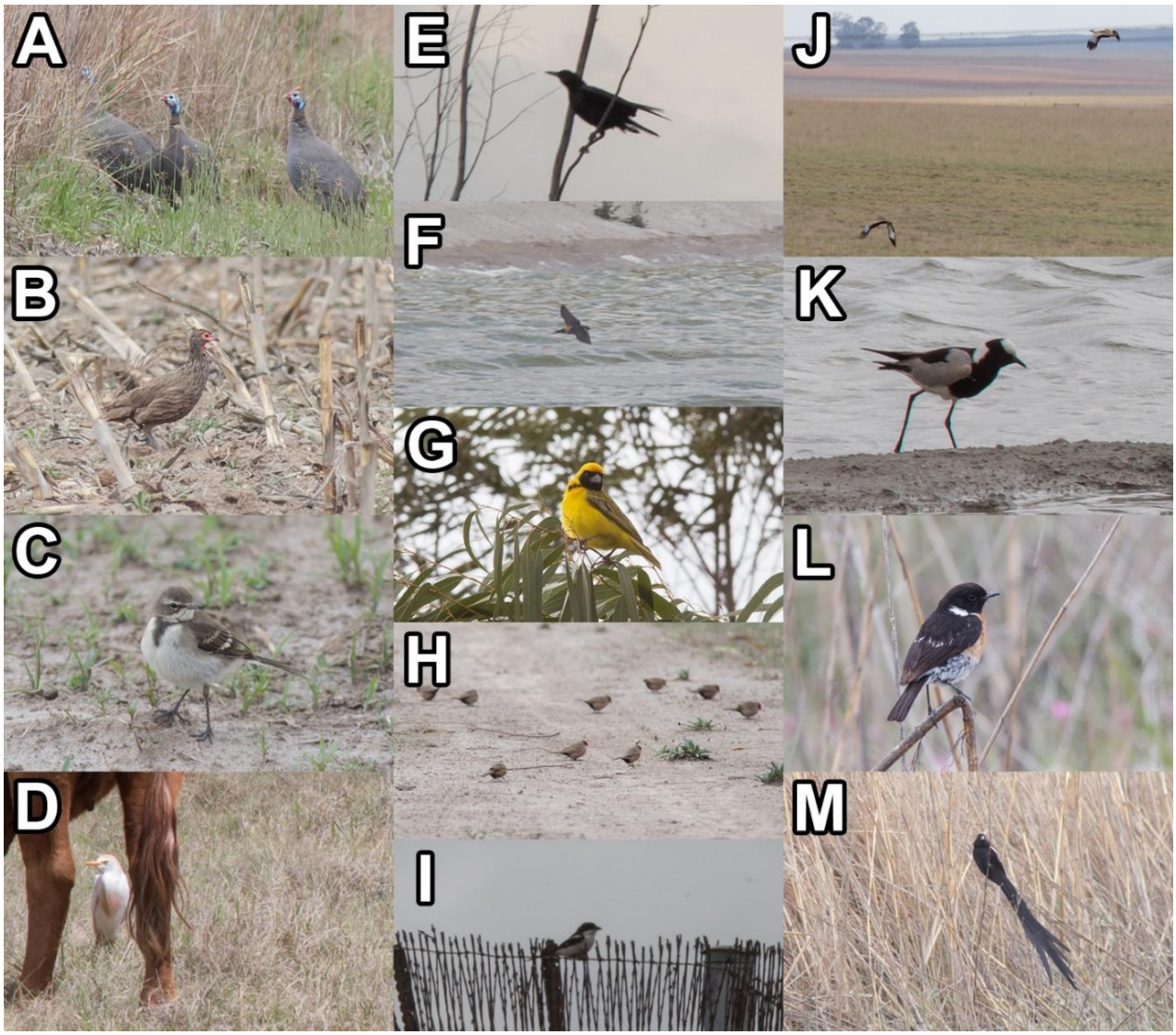

***Figure 3-9: Photographic evidence of a selection of avifauna observed during the field survey*[8].**

8

A. *Numida meleagris* (Helmeted Guineafowl)
B. *Pternistis swainsonii* (Swainson's Spurfowl)
C. *Motacilla capensis* (Cape Wagtail)
D. *Bubulcus ibis* (Western Cattle Egret)
E. *Lamprotornis bicolor* (Pied Starling)
F. *Cecropis semirufa* (Red-Breasted Swallow)
G. *Ploceus velatus* (Southern Masked Weaver)
H. *Estrilda astrild* (Common Waxbill)
I. *Lanius collaris* (Common Fiscal)
J. *Eupodotis caerulescens* (Blue Korhaan)
K. Vanellus armatus (Blacksmith Lapwing)
L. *Saxicola torquatus* (Africa Stonechat)
M. *Euplectes progne* (Long-Tailed Widowbird)

3.8 FLORAL SPECIES OF CONSERVATION CONCERN

No plants SCC were observed within the study area. All potential plant Species of Conservation Concern are indicated in Table 3-4. However, no suitable habitat for these plant species is present within the proposed PCD expansion areas.

Table 3-4: Potential plant Species of Conservation Concern.

Species	Conservation status	Habitat description	Present on site
Aloe kniphofioides	Vulnerable – species threatened by habitat loss through transformation and degradation, particularly from open cast coal mining in southern Mpumalanga. Populations declining from poor recruitment due to loss of pollinators and inappropriate fire management (species dependent on fire for flowering)	Occurs in high altitude montane grasslands (Flowering period: July – March)	No
Aspidoglossum demissum	Vulnerable – this species is known from only four localities all occurring within the Wakkerstroom district (Mpumalanga). Grasslands are susceptible to heavy grazing	Near edges of sheetrock on mountain summits, growing approximately 2000 m in Wakkerstroom Montane Grassland (Flowering period: November – December)	Unlikely
Aspidoglossum xanthosphaerum	Vulnerable – Habitat threatened by wetland drainage for crop cultivation and by trampling/grazing from livestock	Associated with marshy sites at around1800 m (Flowering period: September – December)	
Cyphia bolusii	Vulnerable – as a result of urban expansion, mining and alien plant invasion	Near rocky outcrops growing predominately on serpentine soils at altitudes 750 – 1700 m (Flowering period: September – March)	No
Gladiolus robertsoniae	Near threatened – predominately from agriculture, but recently through intensive coal mining. In addition, overgrazing and trampling by cattle particularly in the Amersfoort area. Populations in Gauteng have declined through urban expansion	Moist highveld grasslands, wedged in rock crevices, mostly dolerite outcrops. (Flowering period: October – February)	No
Kniphofia typhoides	Near threatened – reports suggest extensive declines in populations from habitat loss to coal mining, overgrazing by cattle and urban expansion. In Mpumalanga, habitat loss is	Associated with low lying wetlands and seasonally wet areas in *Themeda triandra* dominant grasslands on heavy black clay soils, tends to disappear from degraded	Unlikely

	primarily mediated through alien plant invasion	grasslands. (Flowering period: February – March)	
Nerine platypetala	Vulnerable – habitat loss through extensive harvesting and land degradation	Found predominately in perennial marshes (Flowering period: September – February)	No
Stenostelma umbelluliferum	Near threatened – the habitat is potentially threatened by urban expansion and industrial development has led to the establishment of highly fragmented populations. Loss of habitat through the the removal of topsoil associated with open-cast mining. Agriculture is also a threat because of the highly fertile soils in which this species occurs	Occurs in deep black turf, mainly near drainage lines on vertic soils with high clay content in grassland. Plants grow either in full sun or light shade. (Flowering period: September – March)	Unlikely

3.9 FAUNAL SPECIES OF CONSERVATION CONCERN

Seven faunal SCC were observed or could potentially occur within the study area with a high probability and are briefly discussed.

1. African Clawless Otter (*Aonyx capensis*; IUCN Near-Threatened) – Confirmed at two of the PCD's (scat). Unlikely to be negatively affected by proposed expansion of PCD's in the long-term: only temporary disturbance during construction anticipated.
2. Serval (*Leptailurus serval*; IUCN Near-Threatened) – Almost certainly occurs in the area and will forage around the PCD's but does not exclusively rely on them. Unlikely to be negatively affected by proposed expansion of PCD's in long-term: only temporary disturbance during construction anticipated.
3. Southern African Vlei Rat (*Otomys auratus*; IUCN Near-Threatened) – Almost certainly occurs in the areas surrounding the PCD's as well as the wetlands and drainage areas Unlikely to be negatively affected by proposed expansion of PCD's in long-term: only temporary disturbance during construction anticipated.
4. Giant Girdled Lizard (*Smaug giganteus*; IUCN Vulnerable) – Although found within the QDGC, no suitable habitats for this species in the areas earmarked for PCD expansion.
5. Blue Korhaan (*Eupodotis caerulescens*; IUCN Vulnerable) – Observed in the grasslands adjacent to the power station property. Wil not be directly affected by expansion of PCD's but structural failure and/or flooding of PCD's could result in significant habitat loss for this species.
6. Red-footed Falcon (*Falco vespertinus*; IUCN Near-Threatened) – Migratory species foraging in the area, will not be affected by expansion of PCD's.

3.10 HABITAT SENSITIVITY

Based on the habitat conditions and fauna and flora observations during the fieldwork, as well as the current impacts described above, each habitat type was evaluated in terms of its ecological sensitivity. This sensitivity is rated as either low, medium or high, where low sensitivity is considered ideal for development and high sensitivity areas are to be avoided by the development. Figure 3-10 shows the preliminary habitat sensitivity for the study area which indicates that the majority of the study area is regarded as low sensitivity as the areas are either disturbed or transformed. The Natural Drainage Areas are of medium-high ecological sensitivity, while the surrounding Natural Grasslands is considered to be of medium ecological sensitivity. Care should be taken to ensure that impacts to these habitats do not arise during the expansion of the PCD's.

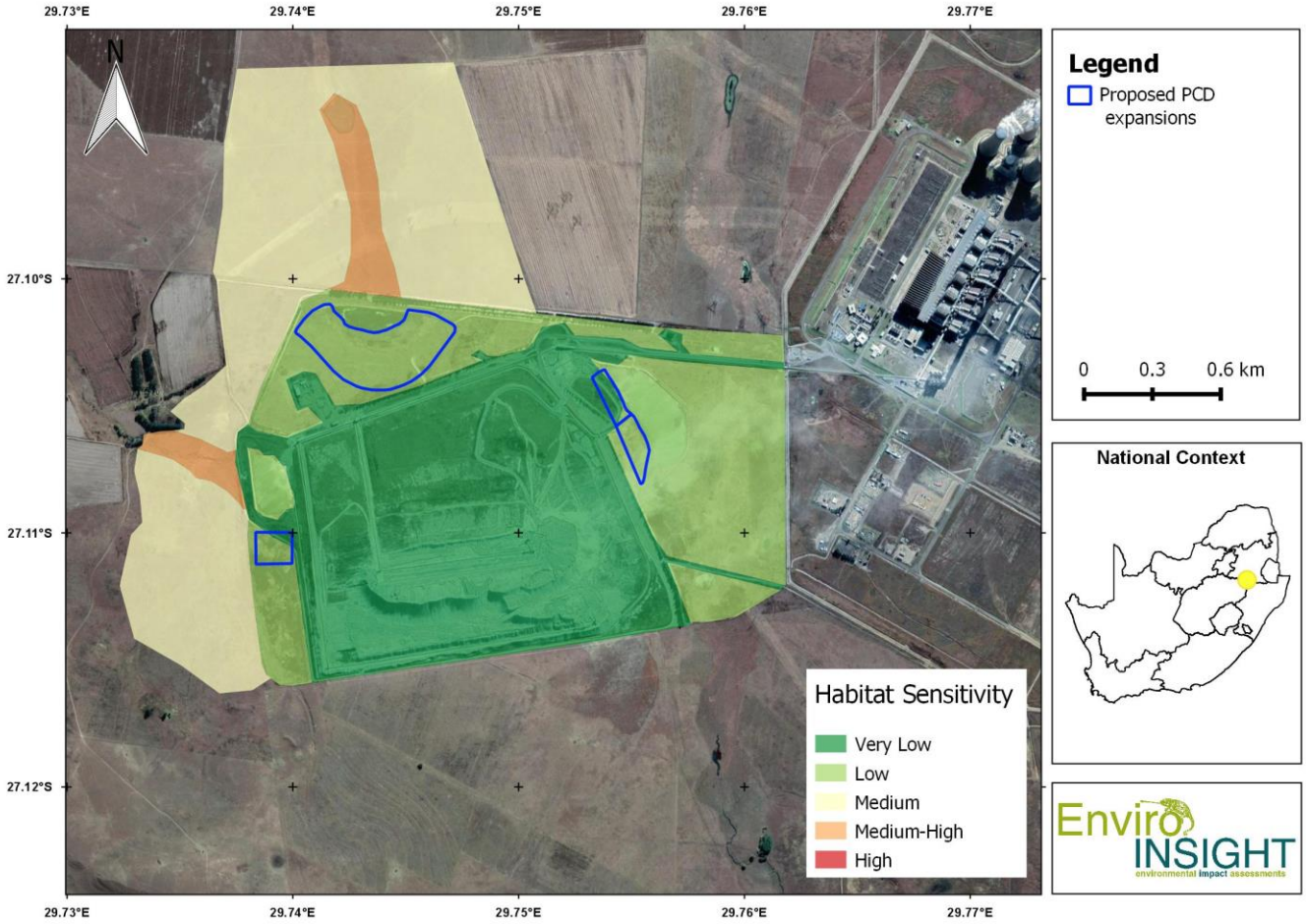

Figure 3-10: Preliminary habitat sensitivity of the study area.

4 CONCLUSION AND PROFESSIONAL OPINION

The vegetation and habitats of the proposed expansion areas for the PCD's are transformed or disturbed, with limited natural vegetation remaining, as per the MBCP "Least Concern" and "No Natural Habitat Remaining" areas. Almost no negative ecological impacts within these expansion areas are anticipated. However, the natural drainage areas and grassland surrounding the PCD's area considered to be sensitive habitats of importance and would need to be protected from impacts arising from the expansion of the PCD's such as flooding during construction etc. Mitigation measures to prevent these impacts are usually contained within standard operation procedures and best practice guidelines for construction and therefore no specialized mitigation measures are anticipated, although these will be addressed and described in the EIA report.

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6 APPENDIX

6.1 APPENDIX 1: FLORA SPECIES LIST

Plant species recorded on the BODATSA database in the xMin, yMin 29.50°,-26.9°: xMax, yMax 30.20°,-27.34° extent (WGS84 datum). Species of conservation concern have been marked in red.

Scientific name	IUCN Category[9]	Ecology
Alloteropsis semialata	LC	Indigenous
Tephrosia sp.		
Felicia muricata	LC	Indigenous
Stachys natalensis	LC	Indigenous
Crassula setulosa	NE	Indigenous; Endemic
Dactylis glomerata	NE	Not Indigenous; Naturalised
Dicoma anomala	LC	Indigenous
Selago sp.		
Chlorophytum fasciculatum		Indigenous
Cheilanthes quadripinnata	LC	Indigenous
Modiola caroliniana		Not Indigenous; Naturalised
Searsia dentata		Indigenous
Asplenium adiantum-nigrum	LC	Indigenous
Dyschoriste costata		Indigenous; Endemic
Cyperus congestus	LC	Indigenous
Dierama tyrium	LC	Indigenous; Endemic
Habenaria dregeana	LC	Indigenous
Indigofera hilaris	LC	Indigenous
Gazania krebsiana	LC	Indigenous
Helichrysum dregeanum	LC	Indigenous
Gladiolus crassifolius	LC	Indigenous
Eragrostis plana	LC	Indigenous
Eriosema cordatum	LC	Indigenous
Geranium robustum	LC	Indigenous; Endemic
Chaenostoma neglectum	LC	Indigenous
Indigofera torulosa	LC	Indigenous
Wahlenbergia virgata	LC	Indigenous
Asplenium varians	LC	Indigenous

[9] VU = Vulnerable; NT = Near Threatened; DD = Data Deficient; LC = Least Concern; NE = Not Evaluated;

Ipomoea crassipes	LC	Indigenous
Disperis tysonii	LC	Indigenous
Medicago laciniata	NE	Not Indigenous; Naturalised
Galium thunbergianum	LC	Indigenous
Hibiscus trionum		Not Indigenous; Naturalised
Imperata cylindrica	LC	Indigenous
Euryops transvaalensis	LC	Indigenous
Hyparrhenia anamesa	LC	Indigenous
Eragrostis cilianensis	LC	Indigenous
Lasiosiphon burchellii	LC	Indigenous; Endemic
Selago densiflora	LC	Indigenous
Xysmalobium pedifoetidum	LC	Indigenous
Fingerhuthia sesleriiformis	LC	Indigenous
Cirsium vulgare		Not Indigenous; Naturalised; Invasive
Fuirena pubescens	LC	Indigenous
Anredera cordifolia	NE	Not Indigenous; Naturalised; Invasive
Taraxacum hamatiforme		Not Indigenous; Naturalised
Alectra orobanchoides	LC	Indigenous
Centella asiatica	LC	Indigenous
Schistostephium crataegifolium	LC	Indigenous
Sporobolus centrifugus	LC	Indigenous
Hibiscus microcarpus	LC	Indigenous
Xysmalobium involucratum	LC	Indigenous
Cyperus usitatus	LC	Indigenous
Hypoxis iridifolia	LC	Indigenous
Monsonia attenuata	LC	Indigenous; Endemic
Verbascum thapsus		Not Indigenous; Cultivated; Naturalised; Invasive
Bulbostylis humilis	LC	Indigenous
Crassula lanceolata	LC	Indigenous
Cyperus fastigiatus	LC	Indigenous
Tritonia gladiolaris	LC	Indigenous; Endemic
Asplenium sp.		
Helichrysum splendidum	LC	Indigenous
Argyrolobium adscendens	LC	Indigenous
Kniphofia typhoides	NT	Indigenous; Endemic
Anthospermum rigidum	LC	Indigenous
Kniphofia albescens	LC	Indigenous; Endemic
Harpochloa falx	LC	Indigenous
Helichrysum melanacme	LC	Indigenous

Hermannia cristata	LC	Indigenous
Herniaria erckertii		Indigenous
Themeda triandra	LC	Indigenous
Brachiaria serrata	LC	Indigenous
Hesperantha coccinea	LC	Indigenous
Berula thunbergii	LC	Indigenous
Cheilanthes eckloniana	LC	Indigenous
Hermannia jacobeifolia	LC	Indigenous
Senecio hieracioides	LC	Indigenous
Arundinella nepalensis	LC	Indigenous
Limeum viscosum	NE	Indigenous
Aristida adscensionis	LC	Indigenous
Senecio erubescens	NE	Indigenous
Asparagus ramosissimus	LC	Indigenous
Sisymbrium turczaninowii	LC	Indigenous
Cyperus atriceps	LC	Indigenous
Cyperus rigidifolius	LC	Indigenous
Stenostelma umbelluliferum	NT	Indigenous; Endemic
Ipomoea purpurea		Not Indigenous; Naturalised; Invasive
Polygala amatymbica	LC	Indigenous
Riccia atropurpurea		Indigenous
Berkheya radula	LC	Indigenous
Physalis angulata		Not Indigenous; Naturalised; Invasive
Senecio laevigatus	LC	Indigenous; Endemic
Poa annua	NE	Not Indigenous; Naturalised
Nidorella resedifolia	LC	Indigenous
Tephrosia semiglabra	LC	Indigenous
Eragrostis micrantha	LC	Indigenous
Searsia discolor		Indigenous
Andropogon eucomus	LC	Indigenous
Kniphofia linearifolia	LC	Indigenous
Seriphium plumosum		Indigenous
Senecio isatideus	LC	Indigenous
Cynodon dactylon	LC	Indigenous
Lasiosiphon caffer	LC	Indigenous
Argyrolobium sp.		
Pachystigma thamnus	LC	Indigenous; Endemic
Jamesbrittenia silenoides	LC	Indigenous; Endemic
Lolium multiflorum	NE	Not Indigenous; Naturalised; Invasive

Manulea rhodantha	LC	Indigenous; Endemic
Tolpis capensis	LC	Indigenous
Euphorbia clavarioides	LC	Indigenous; Endemic
Cheilanthes involuta	LC	Indigenous
Trachyandra gerrardii	LC	Indigenous
Asclepias gibba	LC	Indigenous
Cephalaria pungens	LC	Indigenous
Cymbopogon dieterlenii	LC	Indigenous
Gymnosporia buxifolia	LC	Indigenous
Nerine platypetala	VU	Indigenous; Endemic
Albuca shawii		Indigenous
Cynodon hirsutus	LC	Indigenous; Endemic
Riccia okahandjana		Indigenous
Cynodon transvaalensis	LC	Indigenous
Xysmalobium undulatum		Indigenous
Helichrysum nudifolium	LC	Indigenous
Asclepias multicaulis	LC	Indigenous
Cyrtanthus breviflorus	LC	Indigenous
Brachystelma sp.		
Helichrysum mundtii	LC	Indigenous
Digitaria ternata	LC	Indigenous
Habenaria epipactidea	LC	Indigenous
Brachystelma foetidum	LC	Indigenous
Solanum campylacanthum		Indigenous
Eragrostis tef	NE	Not Indigenous; Naturalised
Rumex sagittatus	LC	Indigenous
Gladiolus sericeovillosus	LC	Indigenous; Endemic
Convolvulus sagittatus	LC	Indigenous
Solanum retroflexum	LC	Indigenous
Galium scabrelloides	LC	Indigenous
Colchicum striatum		Indigenous
Setaria sp.		
Haplocarpha nervosa	LC	Indigenous
Nidorella anomala	LC	Indigenous; Endemic
Watsonia pulchra	LC	Indigenous
Alternanthera pungens		Not Indigenous; Naturalised
Albuca setosa		Indigenous
Rhynchosia reptabunda	LC	Indigenous
Garuleum woodii	LC	Indigenous

Dianthus mooiensis		Indigenous; Endemic
Juncus oxycarpus	LC	Indigenous
Selago cucullata	LC	Indigenous
Cordylostigma virgata		Indigenous
Pennisetum sphacelatum	LC	Indigenous
Dyschoriste setigera		Indigenous; Endemic
Anthoxanthum ecklonii	LC	Indigenous
Berkheya pinnatifida	LC	Indigenous; Endemic
Mimulus gracilis	LC	Indigenous
Cyperus uitenhagensis	LC	Indigenous
Hermannia geniculata	LC	Indigenous
Tragus racemosus	LC	Indigenous
Zaluzianskya microsiphon	LC	Indigenous
Ranunculus multifidus	LC	Indigenous
Tagetes minuta		Not Indigenous; Naturalised; Invasive
Pycnostachys reticulata	LC	Indigenous
Hyparrhenia hirta	LC	Indigenous
Euphorbia prostrata	NE	Not Indigenous; Naturalised
Withania somnifera	LC	Indigenous
Lobelia erinus	LC	Indigenous
Amaranthus hybridus		Not Indigenous; Naturalised
Solanum torreanum	LC	Indigenous
Erythrina zeyheri	LC	Indigenous
Mentha longifolia	LC	Indigenous
Senecio macrocephalus	LC	Indigenous
Riccia nigrella		Indigenous
Ajuga ophrydis	LC	Indigenous
Osteospermum moniliferum	LC	Indigenous
Aspidoglossum demissum	VU	Indigenous; Endemic
Scabiosa columbaria	LC	Indigenous
Cyperus obtusiflorus	LC	Indigenous
Digitaria eylesii	LC	Indigenous
Mentha aquatica	LC	Indigenous
Haplocarpha scaposa	LC	Indigenous
Trichoneura grandiglumis	LC	Indigenous
Oxalis corniculata		Not Indigenous; Naturalised; Invasive
Agrimonia procera	LC	Not Indigenous; Naturalised; Invasive
Aristida bipartita	LC	Indigenous
Commelina africana	LC	Indigenous

Solanum pseudocapsicum		Not Indigenous; Naturalised; Invasive
Berkheya echinacea	LC	Indigenous
Helichrysum callicomum	LC	Indigenous
Cyperus semitrifidus	LC	Indigenous
Vigna vexillata	LC	Indigenous
Scleria woodii	LC	Indigenous
Helichrysum sp.		
Brachystelma praelongum	LC	Indigenous
Gladiolus papilio	LC	Indigenous
Lessertia stricta	LC	Indigenous
Eleocharis dregeana	LC	Indigenous
Eragrostis curvula	LC	Indigenous
Empodium elongatum	LC	Indigenous
Helichrysum oreophilum	LC	Indigenous
Chloris virgata	LC	Indigenous
Gladiolus robertsoniae	NT	Indigenous; Endemic
Sebaea leiostyla	LC	Indigenous
Asplenium platyneuron	LC	Indigenous
Trifolium africanum	NE	Indigenous
Striga elegans	LC	Indigenous
Gladiolus dalenii	LC	Indigenous
Kohautia amatymbica	LC	Indigenous
Verbena brasiliensis		Not Indigenous; Naturalised; Invasive
Helichrysum ammitophilum	LC	Indigenous
Asclepias cultriformis	LC	Indigenous
Cyrtanthus tuckii	LC	Indigenous
Hibiscus aethiopicus	LC	Indigenous
Gazania krebsiana	LC	Indigenous
Gladiolus permeabilis	LC	Indigenous
Cucumis hirsutus	LC	Indigenous
Cheilanthes hirta	LC	Indigenous
Cycnium tubulosum	LC	Indigenous
Helichrysum nudifolium	LC	Indigenous
Commelina africana	LC	Indigenous
Diclis reptans	LC	Indigenous
Senecio coronatus	LC	Indigenous
Lactuca inermis	LC	Indigenous
Pennisetum villosum	NE	Not Indigenous; Naturalised; Invasive
Aspidoglossum dissimile	LC	Indigenous; Endemic

Oenothera rosea		Not Indigenous; Naturalised; Invasive
Brachiaria advena	NE	Not Indigenous; Naturalised
Eragrostis chloromelas	LC	Indigenous
Eragrostis patentissima	LC	Indigenous
Pachycarpus grandiflorus	LC	Indigenous
Dichilus strictus	LC	Indigenous
Typha capensis		Indigenous
Cyperus keniensis	LC	Indigenous
Helichrysum miconiifolium	LC	Indigenous
Melolobium calycinum	LC	Indigenous
Aspidoglossum ovalifolium	LC	Indigenous
Leucosidea sericea	LC	Indigenous
Rabdosiella calycina	LC	Indigenous
Hilliardiella aristata	LC	Indigenous
Rumex acetosella		Not Indigenous; Naturalised
Bulbostylis hispidula	LC	Indigenous
Schkuhria pinnata		Not Indigenous; Naturalised
Nemesia umbonata	LC	Indigenous
Aloe ecklonis	LC	Indigenous
Polygala gracilenta	LC	Indigenous
Agapanthus inapertus	LC	Indigenous
Aristida congesta	LC	Indigenous
Satyrium neglectum	LC	Indigenous
Pennisetum thunbergii	LC	Indigenous
Achyranthes aspera		Not Indigenous; Naturalised
Euclea crispa		Indigenous
Funaria sp.		
Carex glomerabilis	LC	Indigenous
Erucastrum austroafricanum	LC	Indigenous
Nesaea sagittifolia		Indigenous
Wahlenbergia undulata	LC	Indigenous
Berkheya robusta	LC	Indigenous
Helichrysum rugulosum	LC	Indigenous
Chenopodium schraderianum		Not Indigenous; Naturalised
Rosa rubiginosa		Not Indigenous; Naturalised; Invasive
Nolletia ciliaris	LC	Indigenous
Gazania sp.		
Pellaea calomelanos	LC	Indigenous
Helichrysum mixtum	NE	Indigenous

Senecio rhomboideus	LC	Indigenous
Xysmalobium stockenstromense	LC	Indigenous
Setaria nigrirostris	LC	Indigenous
Cucumis myriocarpus	LC	Indigenous
Andropogon schirensis	LC	Indigenous
Psammotropha myriantha	LC	Indigenous
Cordylogyne globosa	LC	Indigenous
Helichrysum cephaloideum	LC	Indigenous
Cyphia elata	NE	Indigenous
Asplenium aethiopicum	LC	Indigenous
Sonchus asper		Not Indigenous; Naturalised; Invasive
Polygonum aviculare		Not Indigenous; Naturalised
Cyperus denudatus	LC	Indigenous
Clutia affinis	LC	Indigenous
Jamesbrittenia stricta	LC	Indigenous
Rorippa nudiuscula	LC	Indigenous
Pelargonium minimum	LC	Indigenous
Eragrostis capensis	LC	Indigenous
Carex spartea		Indigenous
Pseudognaphalium luteoalbum	LC	Not Indigenous; Naturalised
Galium capense	NE	Indigenous
Zantedeschia albomaculata	LC	Indigenous
Limeum pauciflorum	LC	Indigenous; Endemic
Plectranthus grallatus	LC	Indigenous
Holcus lanatus	NE	Not Indigenous; Naturalised
Dipcadi viride		Indigenous
Rumex steudelii	LC	Indigenous
Disa versicolor	LC	Indigenous
Abildgaardia ovata	LC	Indigenous
Leobordea divaricata	LC	Indigenous
Setaria incrassata	LC	Indigenous
Eragrostis sclerantha	LC	Indigenous
Salvia repens	LC	Indigenous
Cineraria aspera	LC	Indigenous
Aristea montana	LC	Indigenous
Myrsine africana	LC	Indigenous
Senecio sp.		
Ledebouria ovatifolia		Indigenous; Endemic
Stachys nigricans	LC	Indigenous

Ledebouria revoluta	LC	Indigenous
Eriospermum flagelliforme	LC	Indigenous
Alchemilla kiwuensis		Indigenous
Cyperus difformis	LC	Indigenous
Delosperma sp.		
Diospyros austro-africana		Indigenous
Lobelia flaccida	LC	Indigenous
Bromus hordeaceus	NE	Not Indigenous; Naturalised
Cerastium capense		Indigenous
Acalypha caperonioides	DD	Indigenous
Polygala virgata	LC	Indigenous
Senecio parentalis	LC	Indigenous; Endemic
Silene burchellii		Indigenous
Senecio achilleifolius	LC	Indigenous
Campylopus introflexus		Indigenous
Gerbera piloselloides	LC	Indigenous
Helichrysum monticola	LC	Indigenous
Peltocalathos baurii	LC	Indigenous; Endemic
Bulbostylis scleropus	LC	Indigenous
Rumex brownii		Not Indigenous; Naturalised
Echinochloa colona	LC	Indigenous
Eleusine coracana	LC	Indigenous
Ipomoea oblongata	LC	Indigenous
Catalepis gracilis	LC	Indigenous
Agrostis lachnantha	LC	Indigenous
Conyza podocephala		Indigenous
Hermannia sp.		
Chaenostoma floribundum	LC	Indigenous
Diospyros lycioides		Indigenous
Searsia pyroides		Indigenous
Euphorbia inaequilatera	NE	Indigenous
Asparagus laricinus	LC	Indigenous
Falkia oblonga		Indigenous
Plantago myosuros		Not Indigenous; Naturalised
Bryum dichotomum		Indigenous
Cyperus esculentus	LC	Indigenous
Plantago virginica		Not Indigenous; Naturalised
Greyia sutherlandii	LC	Indigenous
Tephrosia purpurea	NE	Indigenous

Geigeria burkei	NE	Indigenous; Endemic
Athrixia gerrardii	LC	Indigenous; Endemic
Urochloa panicoides	LC	Indigenous
Listia heterophylla	LC	Indigenous
Salvia runcinata	LC	Indigenous
Senecio harveianus	LC	Indigenous
Pleopeltis macrocarpa	LC	Indigenous
Pycreus macranthus	LC	Indigenous
Euphorbia striata	LC	Indigenous; Endemic
Asparagus asparagoides	LC	Indigenous
Crassula lanceolata		Indigenous; Endemic
Oxalis obliquifolia	LC	Indigenous
Pogonarthria squarrosa	LC	Indigenous
Asclepias vicaria	LC	Indigenous; Endemic
Convolvulus natalensis	LC	Indigenous
Microchloa caffra	LC	Indigenous
Digitaria tricholaenoides	LC	Indigenous
Phragmites australis	LC	Indigenous
Eragrostis planiculmis	LC	Indigenous
Oxalis depressa	LC	Indigenous
Xysmalobium undulatum	LC	Indigenous
Clutia natalensis	LC	Indigenous
Aristida junciformis	LC	Indigenous
Melinis nerviglumis	LC	Indigenous
Pycreus unioloides	LC	Indigenous
Gnidia gymnostachya	LC	Indigenous
Cannabis sativa	NE	Not Indigenous; Naturalised
Schoenoplectus muriculatus	LC	Indigenous
Khadia alticola	LC	Indigenous; Endemic
Aloe kniphofioides	VU	Indigenous
Indigofera sp.		
Orthochilus foliosus		Indigenous
Hypochaeris radicata		Not Indigenous; Naturalised
Striga bilabiata	LC	Indigenous
Fuirena coerulescens	LC	Indigenous
Pterygodium nigrescens	LC	Indigenous
Polygala gerrardii	LC	Indigenous; Endemic
Brachypodium flexum	LC	Indigenous
Dipcadi marlothii		Indigenous

Rumex crispus		Not Indigenous; Naturalised; Invasive
Aspidoglossum xanthosphaerum	VU	Indigenous; Endemic
Brachiaria eruciformis	LC	Indigenous
Senecio crenatus	LC	Indigenous; Endemic
Avena sativa	NE	Not Indigenous; Naturalised
Plantago lanceolata	LC	Indigenous
Cyperus capensis	LC	Indigenous; Endemic
Amaranthus capensis	LC	Indigenous; Endemic
Pollichia campestris		Indigenous
Senecio ruwenzoriensis	LC	Indigenous
Orthochilus aculeatus		Indigenous
Chenopodium foliosum		Not Indigenous; Naturalised
Senecio othonniflorus	LC	Indigenous
Scirpoides burkei	LC	Indigenous
Trifolium sp.		
Leobordea eriantha	LC	Indigenous
Sporobolus africanus	LC	Indigenous
Hermannia lancifolia	LC	Indigenous; Endemic
Helictotrichon turgidulum	LC	Indigenous
Sorghum sp.		
Athrixia phylicoides	LC	Indigenous
Dierama insigne	LC	Indigenous
Leersia hexandra	LC	Indigenous
Gnidia nodiflora	LC	Indigenous
Cyphia elata	NE	Indigenous; Endemic
Eragrostis racemosa	LC	Indigenous
Polygala sp.		
Echium plantagineum		Not Indigenous; Naturalised; Invasive
Triumfetta obtusicornis	LC	Indigenous; Endemic
Rubus ludwigii	LC	Indigenous
Cyphia bolusii	VU	Indigenous
Nesaea sagittifolia		Indigenous
Dianthus basuticus		Indigenous
Trifolium africanum	NE	Indigenous
Sporobolus discosporus	LC	Indigenous
Lessertia affinis	LC	Indigenous; Endemic
Polygala uncinata	LC	Indigenous
Hermannia coccocarpa	LC	Indigenous
Cotula anthemoides	LC	Indigenous

Koeleria capensis	LC	Indigenous
Crassula alba		Indigenous
Hebenstretia rehmannii	LC	Indigenous; Endemic
Ranunculus dregei	LC	Indigenous
Rhodohypoxis baurii	LC	Indigenous
Polygala hottentotta	LC	Indigenous
Juncus exsertus	LC	Indigenous
Xenostegia tridentata		Indigenous
Crinum bulbispermum	LC	Indigenous
Gomphocarpus fruticosus	LC	Indigenous
Rhynchosia totta	LC	Indigenous
Cynoglossum austroafricanum	LC	Indigenous
Cyanotis speciosa	LC	Indigenous
Pachycarpus dealbatus	LC	Indigenous
Cyrtanthus tuckii	LC	Indigenous; Endemic
Eragrostis sp.		
Phytolacca heptandra	LC	Indigenous
Monopsis decipiens	LC	Indigenous
Argyrolobium nigrescens	LC	Indigenous
Schoenoplectus decipiens	LC	Indigenous
Kohautia caespitosa	LC	Indigenous
Senecio inaequidens	LC	Indigenous
Gnidia sp.		
Thesium resedoides	LC	Indigenous
Artemisia afra	LC	Indigenous
Hypericum lalandii	LC	Indigenous
Selago procera	LC	Indigenous
Nemesia fruticans	LC	Indigenous
Nemesia caerulea	LC	Indigenous
Mohria nudiuscula	LC	Indigenous
Senecio gregatus	LC	Indigenous
Kyllinga erecta	LC	Indigenous
Ledebouria cooperi		Indigenous
Lotononis sp.		
Portulaca oleracea		Not Indigenous; Naturalised
Kyllinga pulchella	LC	Indigenous
Jamesbrittenia aurantiaca	LC	Indigenous
Hermannia parviflora	LC	Indigenous
Cymbopogon pospischilii	NE	Indigenous

Agapanthus sp.		
Panicum schinzii	LC	Indigenous
Pygmaeothamnus chamaedendrum	LC	Indigenous; Endemic
Hermannia grandistipula	LC	Indigenous
Romulea camerooniana	LC	Indigenous
Cyperus rotundus	LC	Indigenous
Limosella longiflora	LC	Indigenous
Cyperus rupestris	LC	Indigenous
Dianthus basuticus		Indigenous
Cineraria lobata	LC	Indigenous
Zantedeschia rehmannii	LC	Indigenous
Monocymbium ceresiiforme	LC	Indigenous
Melianthus comosus	LC	Indigenous
Anthospermum rigidum	LC	Indigenous
Lolium perenne	NE	Not Indigenous; Naturalised
Moraea pallida	LC	Indigenous
Asclepias stellifera	LC	Indigenous
Berkheya setifera	LC	Indigenous
Albuca virens		Indigenous
Helichrysum psilolepis	LC	Indigenous
Sporobolus sp.		
Verbena rigida		Not Indigenous; Naturalised; Invasive
Crassula dependens		Indigenous; Endemic
Miraglossum pulchellum	LC	Indigenous
Erodium cicutarium		Not Indigenous; Naturalised
Berkheya sp.		
Hyparrhenia dregeana	LC	Indigenous
Chlorophytum haygarthii		Indigenous
Habenaria dives	LC	Indigenous
Echium vulgare		Not Indigenous; Naturalised; Invasive
Rhynchosia adenodes	LC	Indigenous
Denekia capensis	LC	Indigenous
Cynoglossum hispidum	LC	Indigenous
Helichrysum cooperi	LC	Indigenous
Sebaea sedoides	LC	Indigenous
Zinnia peruviana		Not Indigenous; Naturalised
Cyperus marginatus	LC	Indigenous
Asclepias meyeriana	LC	Indigenous
Trifolium africanum	LC	Indigenous

Colchicum melanthoides		Indigenous
Pentanisia prunelloides	LC	Indigenous
Cosmos bipinnatus		Not Indigenous; Naturalised
Geranium multisectum	LC	Indigenous; Endemic
Pelargonium luridum	LC	Indigenous
Geranium wakkerstroomianum	LC	Indigenous; Endemic
Bryum argenteum		Indigenous
Veronica anagallis-aquatica	LC	Indigenous
Diclis rotundifolia	LC	Indigenous
Ruschia sp.		
Eleusine multiflora	NE	Not Indigenous; Naturalised
Leonotis ocymifolia	LC	Indigenous

6.2 APPENDIX 2: MAMMAL SPECIES LIST

Mammals predicted to potentially occur within the study area. Species of conservation concern have been marked in red.

Family	Scientific name	Common name	Conservation status Child *et al.*, (2016)
Canidae	***Canis mesomelas***	**Black-backed Jackal**	**Least Concern**
Canidae	*Vulpes chama*	Cape Fox	Least Concern
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern
Felidae	*Caracal caracal*	Caracal	Least Concern
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable
Felidae	*Leptailurus serval*	Serval	Near Threatened
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern
Herpestidae	***Cynictis penicillata***	**Yellow Mongoose**	**Least Concern**
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern
Herpestidae	*Ichneumia albicauda*	White-tailed Mongoose	Least Concern
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern
Hystricidae	***Hystrix africaeaustralis***	**Cape Porcupine**	**Least Concern**
Leporidae	*Lepus saxatilis.*	Scrub Hare	Least Concern
Leporidae	*Pronolagus rupestris*	Smith's Red Rock Hare	Least Concern
Muridae	***Gerbilliscus brantsii***	**Highveld Gerbil**	**Least Concern**
Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern
Muridae	*Mus (Nannomys) minutoides*	Southern African Pygmy Mouse	Least Concern
Muridae	*Otomys auratus*	Southern African Vlei Rat	Near Threatened
Muridae	***Rhabdomys pumilio***	**Xeric Four-striped Grass Rat**	**Least Concern**
Mustelidae	***Aonyx capensis***	**African Clawless Otter**	**Near Threatened**
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern
Nesomyidae	*Dendromus mesomelas*	Brants's African Climbing Mouse	Least Concern
Pedetidae	*Pedetes capensis*	South African Spring Hare	Least Concern
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern
Vespertilionidae	*Neoromicia somalicus*	Somali Serotine	Least Concern

6.3 APPENDIX 3: AVIFAUNA SPECIES LIST

Avifauna predicted to potentially occur within the study area according to SABAP1 and SABAP2. Species observed during the fieldwork have been marked in bold. Species of conservation concern are indicated in red.

Scientific name	Common name	Conservation status Taylor *et al.* (2015)
Accipiter melanoleucus	Sparrowhawk, Black	Least concern
Acridotheres tristis	**Myna, Common**	**Least concern**
Acrocephalus arundinaceus	**Reed-warbler, Great**	**Least concern**
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Least concern
Actitis hypoleucos	**Sandpiper, Common**	**Least concern**
Afrotis afraoides	Korhaan, Northern Black	Least concern
Alcedo cristata	Kingfisher, Malachite	Least concern
Alopochen aegyptiacus	**Goose, Egyptian**	**Least concern**
Amadina erythrocephala	Finch, Red-headed	Least concern
Anas capensis	Teal, Cape	Least concern
Anas erythrorhyncha	**Teal, Red-billed**	**Least concern**
Anas smithii	**Shoveler, Cape**	**Least concern**
Anas sparsa	Duck, African Black	Least concern
Anas undulata	**Duck, Yellow-billed**	**Least concern**
Anastomus lamelligerus	Openbill, African	Least concern
Anhinga rufa	Darter, African	Least concern
Anthropoides paradiseus	Crane, Blue	Near threatened
Anthus cinnamomeus	Pipit, African	Least concern
Anthus leucophrys	Pipit, Plain-backed	Least concern
Anthus similis	Pipit, Long-billed	Least concern
Apus affinis	Swift, Little	Least concern
Apus barbatus	**Swift, African Black**	**Least concern**
Apus caffer	Swift, White-rumped	Least concern
Ardea cinerea	**Heron, Grey**	**Least concern**
Ardea goliath	Heron, Goliath	Least concern
Ardea melanocephala	Heron, Black-headed	Least concern
Asio capensis	Owl, Marsh	Least concern
Balearica regulorum	Crane, Grey Crowned	Endangered
Bostrychia hagedash	**Ibis, Hadeda**	**Least concern**
Bradypterus baboecala	Rush-warbler, Little	Least concern
Bubo africanus	Eagle-owl, Spotted	Least concern
Bubulcus ibis	Egret, Cattle	Least concern
Burhinus capensis	**Thick-knee, Spotted**	**Least concern**
Buteo rufofuscus	Buzzard, Jackal	Least concern
Buteo vulpinus	Buzzard, Steppe	Least concern
Calandrella cinerea	Lark, Red-capped	Least concern
Calidris minuta	**Stint, Little**	**Least concern**
Cercomela familiaris	Chat, Familiar	Least concern
Certhilauda semitorquata	Lark, Eastern Long-billed	Least concern
Cecropis semirufa	**Red-Breasted Swallow**	**Least concern**
Ceryle rudis	Kingfisher, Pied	Least concern
Charadrius pecuarius	Plover, Kittlitz's	Least concern
Charadrius tricollaris	Plover, Three-banded	Least concern
Chersomanes albofasciata	Lark, Spike-heeled	Least concern
Chlidonias hybrida	**Tern, Whiskered**	**Least concern**
Chrysococcyx caprius	Cuckoo, Diderick	Least concern
Ciconia ciconia	Stork, White	Least concern

Ciconia nigra	Stork, Black	Vulnerable
Circus macrourus	Harrier, Pallid	Near threatened
Cisticola ayresii	Cisticola, Wing-snapping	Least concern
Cisticola cinnamomeus	Cisticola, Pale-crowned	Least concern
Cisticola fulvicapilla	Neddicky, Neddicky	Least concern
Cisticola juncidis	Cisticola, Zitting	Least concern
Cisticola textrix	Cisticola, Cloud	Least concern
Cisticola tinniens	**Cisticola, Levaillant's**	**Least concern**
Colius striatus	Mousebird, Speckled	Least concern
Columba guinea	Pigeon, Speckled	Least concern
Columba livia	Dove, Rock	Least concern
Coracias garrulus	Roller, European	Near threatened
Corvus albus	**Crow, Pied**	**Least concern**
Corvus capensis	**Crow, Cape**	**Least concern**
Cossypha caffra	Robin-chat, Cape	Least concern
Coturnix coturnix	Quail, Common	Least concern
Crithagra atrogularis	Canary, Black-throated	Least concern
Crithagra flaviventris	Canary, Yellow	Least concern
Crithagra gularis	Seedeater, Streaky-headed	Least concern
Crithagra mozambicus	Canary, Yellow-fronted	Least concern
Delichon urbicum	House-martin, Common	Least concern
Dendrocygna viduata	Duck, White-faced	Least concern
Egretta alba	Egret, Great	Least concern
Egretta garzetta	Egret, Little	Least concern
Egretta intermedia	Egret, Yellow-billed	Least concern
Elanus caeruleus	**Kite, Black-shouldered**	**Least concern**
Emberiza capensis	Bunting, Cape	Least concern
Estrilda astrild	**Waxbill, Common**	**Least concern**
Euplectes afer	Bishop, Yellow-crowned	Least concern
Euplectes albonotatus	Widowbird, White-winged	Least concern
Euplectes ardens	Widowbird, Red-collared	Least concern
Euplectes axillaris	Widowbird, Fan-tailed	Least concern
Euplectes orix	Bishop, Southern Red	Least concern
Euplectes progne	**Widowbird, Long-tailed**	**Least concern**
Eupodotis caerulescens	Korhaan, Blue	Vulnerable
Falco amurensis	Falcon, Amur	Least concern
Falco biarmicus	Falcon, Lanner	Vulnerable
Falco naumanni	Kestrel, Lesser	Least concern
Falco rupicoloides	Kestrel, Greater	Least concern
Falco rupicolus	Kestrel, Rock	Least concern
Falco vespertinus	Falcon, Red-footed	Near threatened
Fulica cristata	**Coot, Red-knobbed**	**Least concern**
Gallinago nigripennis	Snipe, African	Least concern
Gallinula chloropus	**Moorhen, Common**	**Least concern**
Geocolaptes olivaceus	Woodpecker, Ground	
Geronticus calvus	Ibis, Southern Bald	Least concern
Glareola nordmanni	Pratincole, Black-winged	Least concern
Haliaeetus vocifer	Fish-eagle, African	Least concern
Himantopus himantopus	**Stilt, Black-winged**	**Least concern**
Hirundo albigularis	Swallow, White-throated	Least concern
Hirundo cucullata	Swallow, Greater Striped	Least concern
Hirundo fuligula	Martin, Rock	Least concern
Hirundo rustica	Swallow, Barn	Least concern
Hirundo spilodera	**Cliff-swallow, South African**	**Least concern**
Indicator indicator	Honeyguide, Greater	Least concern
Jynx ruficollis	Wryneck, Red-throated	Least concern

Lamprotornis nitens	Starling, Cape Glossy	Least concern
Lanius collaris	**Fiscal, Common (Southern)**	**Least concern**
Lybius torquatus	Barbet, Black-collared	Least concern
Macronyx capensis	Longclaw, Cape	Least concern
Megaceryle maximus	Kingfisher, Giant	Least concern
Mirafra africana	Lark, Rufous-naped	Least concern
Mirafra fasciolata	Lark, Eastern Clapper	Least concern
Motacilla capensis	**Wagtail, Cape**	**Least concern**
Muscicapa striata	Flycatcher, Spotted	Least concern
Mycteria ibis	Stork, Yellow-billed	Endangered
Myrmecocichla formicivora	Chat, Anteating	Least concern
Nectarinia famosa	Sunbird, Malachite	Least concern
Neotis denhami	Bustard, Denham's	Vulnerable
Netta erythrophthalma	**Pochard, Southern**	**Least concern**
Numida meleagris	**Guineafowl, Helmeted**	**Least concern**
Nycticorax nycticorax	Night-Heron, Black-crowned	Least concern
Oena capensis	Dove, Namaqua	Least concern
Oenanthe bifasciata	Chat, Buff-streaked	
Oenanthe monticola	Wheatear, Mountain	Least concern
Onychognathus morio	Starling, Red-winged	Least concern
Ortygospiza atricollis	Quailfinch, African	Least concern
Oxyura maccoa	Duck, Maccoa	Least concern
Passer diffusus	Sparrow, Southern Grey-headed	Least concern
Passer domesticus	**Sparrow, House**	**Least concern**
Passer melanurus	Sparrow, Cape	Least concern
Phalacrocorax africanus	Cormorant, Reed	Least concern
Phalacrocorax carbo	Cormorant, White-breasted	Least concern
Philomachus pugnax	Ruff, Ruff	Least concern
Phoenicopterus ruber	Flamingo, Greater	Near threatened
Phoeniculus purpureus	Wood-hoopoe, Green	Least concern
Phylloscopus trochilus	Warbler, Willow	Least concern
Platalea alba	Spoonbill, African	Least concern
Plectropterus gambensis	Goose, Spur-winged	Least concern
Plegadis falcinellus	**Ibis, Glossy**	**Least concern**
Plocepasser mahali	Sparrow-weaver, White-browed	Least concern
Ploceus capensis	Weaver, Cape	Least concern
Ploceus velatus	**Masked-weaver, Southern**	**Least concern**
Podiceps cristatus	Grebe, Great Crested	Least concern
Polemaetus bellicosus	Eagle, Martial	Endangered
Porphyrio madagascariensis	**Swamphen, African Purple**	**Least concern**
Prinia flavicans	Prinia, Black-chested	Least concern
Prinia hypoxantha	Prinia, Drakensberg	
Prinia subflava*	**Tawny-flanked Prinia**	
Pternistis swainsonii	Spurfowl, Swainson's	Least concern
Pycnonotus tricolor	Bulbul, Dark-capped	Least concern
Quelea quelea	**Quelea, Red-billed**	**Least concern**
Recurvirostra avosetta	Avocet, Pied	Least concern
Riparia cincta	Martin, Banded	Least concern
Riparia paludicola	Martin, Brown-throated	Least concern
Sagittarius serpentarius	Secretarybird, Secretarybird	Vulnerable
Saxicola torquatus	Stonechat, African	Least concern
Scleroptila africanus	Francolin, Grey-winged	
Scleroptila levaillantii	Francolin, Red-winged	Least concern
Scleroptila levaillantoides	Francolin, Orange River	Least concern
Scopus umbretta	Hamerkop, Hamerkop	Least concern

Serinus canicollis	Canary, Cape	Least concern
Spizocorys conirostris	Lark, Pink-billed	Least concern
Spizocorys fringillaris	Lark, Botha's	Endangered
Spreo bicolor	Starling, Pied	Least concern
Streptopelia capicola	Turtle-dove, Cape	Least concern
Streptopelia semitorquata	**Dove, Red-eyed**	**Least concern**
Streptopelia senegalensis	Dove, Laughing	Least concern
Struthio camelus	Ostrich, Common	Least concern
Tachybaptus ruficollis	**Grebe, Little**	**Least concern**
Tadorna cana	**Shelduck, South African**	**Least concern**
Telophorus zeylonus	Bokmakierie, Bokmakierie	Least concern
Thamnolaea cinnamomeiventris	Cliff-chat, Mocking	Least concern
Threskiornis aethiopicus	Ibis, African Sacred	Least concern
Trachyphonus vaillantii	Barbet, Crested	Least concern
Tringa glareola	Sandpiper, Wood	Least concern
Tringa nebularia	Greenshank, Common	Least concern
Upupa africana	Hoopoe, African	Least concern
Vanellus armatus	**Lapwing, Blacksmith**	**Least concern**
Vanellus coronatus	Lapwing, Crowned	Least concern
Vanellus melanopterus	Lapwing, Black-winged	
Vanellus senegallus	Lapwing, African Wattled	Least concern
Vidua macroura	Whydah, Pin-tailed	Least concern
Zosterops virens	**White-eye, Cape**	**Least concern**

6.4 APPENDIX 4: HERPETOFAUNA SPECIES LIST

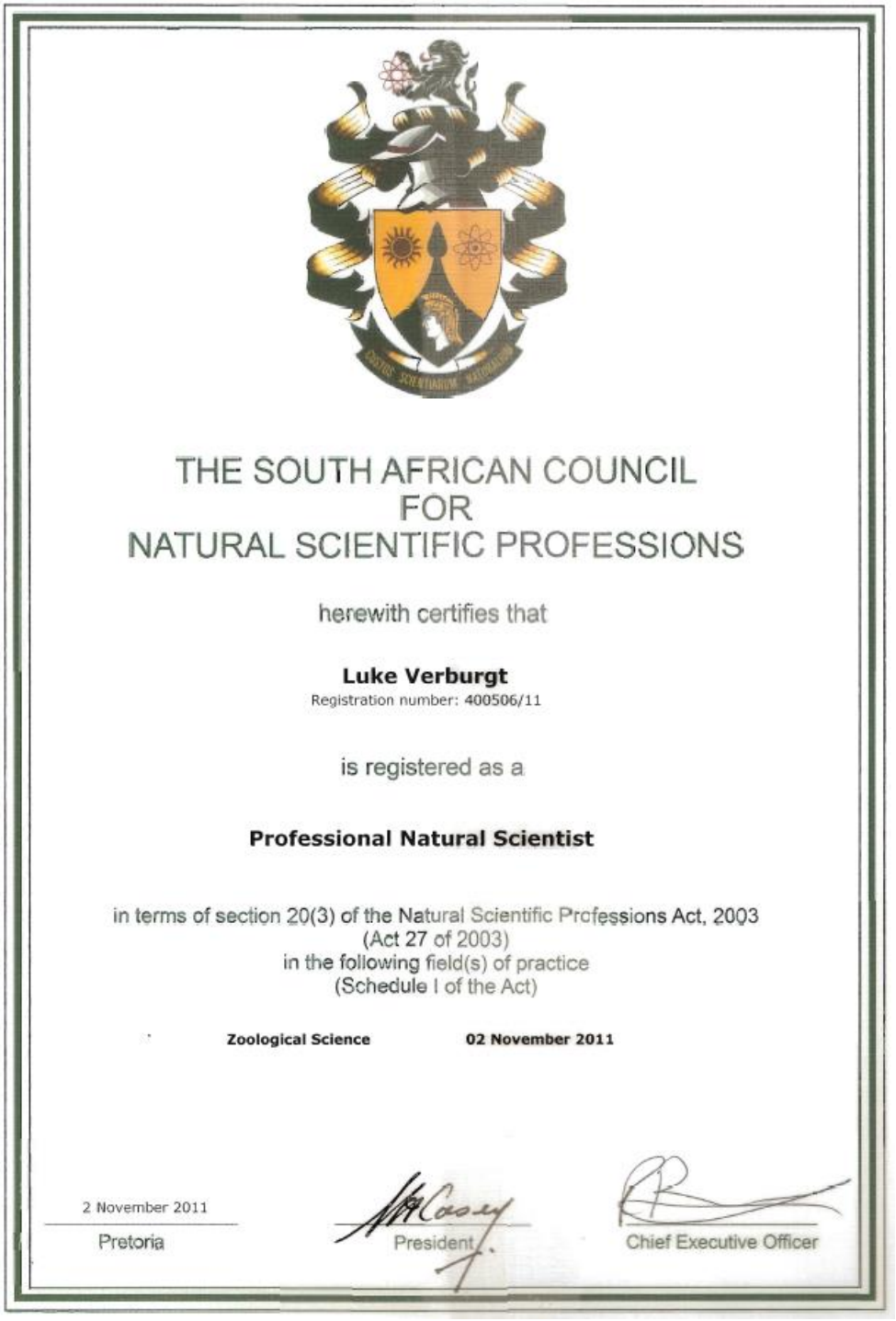
Herpetofauna predicted to potentially occur within the study area. Species observed during the fieldwork have been marked in bold. Species of conservation concern have been marked in red.

Group	Family	Scientific name	Common name	IUCN status
Reptiles	Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern
	Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern
	Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern
	Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern
	Cordylidae	*Pseudocordylus melanotus melanotus*	Common Crag Lizard	Least Concern
	Cordylidae	*Smaug giganteus*	Giant Girdled Lizard	Vulnerable
	Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern
	Gekkonidae	*Pachydactylus vansoni*	Van Son's Gecko	Least Concern
	Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern
	Lacertidae	*Nucras lalandii*	Delalande's Sandveld Lizard	Least Concern
	Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern
	Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	Least Concern
	Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern
	Lamprophiidae	*Duberria lutrix lutrix*	South African Slug-eater	Least Concern
	Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern
	Lamprophiidae	*Lamprophis guttatus*	Spotted House Snake	Least Concern
	Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern
	Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern
	Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	Least Concern
	Lamprophiidae	***Psammophylax rhombeatus***	**Spotted Grass Snake**	**Least Concern**
	Leptotyphlopidae	***Leptotyphlops scutifrons***	**Eastern Thread Snake**	
	Scincidae	*Acontias gracilicauda*	Thin-tailed Legless Skink	Least Concern
	Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern
	Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern
	Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern
Amphibians	Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern
	Hyperoliidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern
	Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
	Phrynobatrachidae	*Semnodactylus wealii*	Rattling Frog	Least Concern
	Pipidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern
	Ptychadenidae	*Xenopus laevis*	Common Platanna	Least Concern
	Pyxicephalidae	*Ptychadena porosissima*	Striped Grass Frog	Least Concern
	Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern
	Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern
	Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern

Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern

6.5 APPENDIX 5: SPECIALISTS PROOF OF QUALIFICATION AND CV

Specialist: Luke Verburgt



THE SOUTH AFRICAN COUNCIL
FOR
NATURAL SCIENTIFIC PROFESSIONS

herewith certifies that

Luke Verburgt
Registration number: 400506/11

is registered as a

Professional Natural Scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice
(Schedule I of the Act)

Zoological Science **02 November 2011**

2 November 2011
Pretoria

President

Chief Executive Officer

Disclaimer

I, Luke Verburgt, *Pr. Sci. Nat. (Zoology)* declare that the work presented above is my own and has not been influenced in any way by the client. At no point has the client asked me as a specialist to manipulate my results and the above methods have been carried out to the appropriate standards.

Luke Verburgt
Pr. Sci. Nat.

Freshwater Assessment for the Proposed Ash and Rehabilitation Dams at Majuba Power Station, Mpumalanga Province

for

Advisian

November 2018

by

Dr. James Dabrowski

Confluent Environmental

james@confluent.co.za

Declaration of Specialist Independence

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;
- I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity;
- This document and all information contained herein is and will remain the intellectual property of Confluent Environmental. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigators.
- All the particulars furnished by me in this document are true and correct.

Dr. James Dabrowski (Ph.D., Pr.Sci.Nat. Water Resources; SACNASP Reg. No: 114084)

27 November 2018

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

Majuba Power Station (Majuba) is a six (6) unit coal fired power plant that has an installed capacity of 4110MW of energy. The units are a mixture of three (3) dry cooled units each with installed capacity of 665MW and three (3) wet cooled units each producing 716MW.

Majuba Power Station needs to construct and extend the ash and rehabilitation dams for its ash disposal facility (ADF). These dams are used for the purposes of storm water management at the ADF area. The proposed construction of new dams and expansion of existing dams require various permits, amongst which are the environmental authorisation and the water use licence. The required environmental authorisation will assist in ensuring compliance to environmental legislation and protection to the environment. The overall objective of the larger project is therefore to:

1. Undertake an environmental impact assessment (EIA) process and produce an environmental impact assessment report (EIR) that will consider construction, operation and decommissioning impacts that will be submitted to the Competent Authority, with assessment of significant impacts, and refinement of alternatives to be put forward;
2. Provide adequate and relevant information to assist the authorities in their decision-making process; and
3. Develop an Environmental Management Programme (EMPr) for all the phases of the development (construction, operation, decommissioning) in close conjunction with Eskom project team.

1.2 SCOPE OF WORK

The impact of the development on freshwater resources (surface water and wetlands) has been identified as a specific specialist study that should be evaluated during the EIA process. This report has been compiled as part of the scoping phase of the project and addresses the following scopes of work:

- A desktop delineation of freshwater resources potentially affected by the development;
- A desktop assessment of relevant freshwater spatial biodiversity and conservation plans for the study area;
- A description of potential impacts of the development on freshwater resources; and
- Development of a plan of study for the EIA phase of the project, including the methods that will be used to characterise the Present Ecological State (PES) of freshwater resources and assess potential impacts to freshwater resources.

1.3 ASSUMPTION AND LIMITATIONS

- Results presented in this report are primarily derived from desktop resources and as such the information presented should be interpreted with caution as further field verification is required. A comprehensive field-based verification of the desktop assessment will be presented in the EIA report.
- Given the information presented forms part of the scoping phase, the contents of this report are considered adequate for the development of the plan of study and to inform decision-making related to the planned development.

1.4 KEY LEGISLATIVE REQUIREMENTS

1.4.1 National Environmental Management Act (NEMA, 1998)

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA EIA regulations, the applicant is required to appoint an environmental assessment practitioner (EAP) to undertake the EIA, as well as conduct the public participation process.

The objective of the Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the activities that have been identified. The purpose of these procedures is to provide the competent authority with adequate information to make decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorized, and that activities which are authorized are undertaken in such a manner that the environmental impacts are managed to acceptable levels.

In accordance with the provisions of Sections 24 (5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIA's in order to apply for, and be considered for, the issuing of an Environmental Authorisation (EA). These Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GN R. 983 and 985) and a more complete EIA process (activities listed in GN R. 984). In the case of this project there are activities triggered under GN R. 984 and as such a full EIA process is necessary.

A Scoping and EIA process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and EIA accordingly provides a mechanism for the comprehensive assessment of activities that are likely to have more significant environmental impacts.

1.4.2 National Water Act (NWA, 1998)

The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (NWA) (Act No. 36 of 1998) aims to protect water resources, through:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and
- A reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem, and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS.

For the purposes of this project, a wetland area is defined according to the NWA (Act No. 36 of 1998): "Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil".

Wetlands are generally characterised by one or more of the following attributes (DWAF, 2005):

- A high water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil;
- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils; and
- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

2 DESKTOP REVIEW

A variety of sources were consulted in order to gain a broad overview of the freshwater resources present in the study area as well as the associated PES of these resources. The approach to the desktop review included, *inter alia*, the following:

- A review of all layout or planning information relevant to the development (including the construction and operational phases);
- Consultation with the relevant authorities, as required, to determine the full scope of freshwater specialist work required by relevant permit/authorisation/licensing processes;
- Desktop identification of any watercourses that may be affected by the proposed development;

- Assessment of all watercourses from the perspective of provincial and regional systematic biodiversity plans;
- Examination of existing maps of the area including historical images;
- Review of existing databases for land use, climatic, water resource and aquatic ecosystem health data; and
- Compilation of sensitivity maps to inform concept footprints and layouts depicting affected and potentially affected watercourses.

2.1 AQUATIC ECOSYSTEMS

The area of interest falls entirely within quaternary catchment C11J in the Vaal Water Management Area. All watercourses draining the project area and its immediate vicinity ultimately flow into the Geelklipspruit River which flows in a north-westerly direction and joins the Vaal River (Figure 1). Surface water resources falling within the project area and potentially affected by the development are indicated in Figure 2 and include:

- Existing pollution control dams AD1, AD2 (both of which will be enlarged) and AD3 (which is not affected by the development);
- A non-perennial river originating from the vicinity of AD3, draining westwards outside of the boundary of the property;
- A non-perennial tributary located to the north of the property that falls outside of the property, draining in a northerly direction; and
- A series of wetland seeps located to the east of the ADF.

The existing pollution control dams (AD1-3) were all identified as wetlands by various desktop conservation planning resources (e.g. NFEPA). Based on the field visit these wetlands have all however been confirmed as man-made pollution control dams that receive stormwater from the ash dump (Figure 3). Reference to these dams as wetlands has therefore been corrected in subsequent maps.

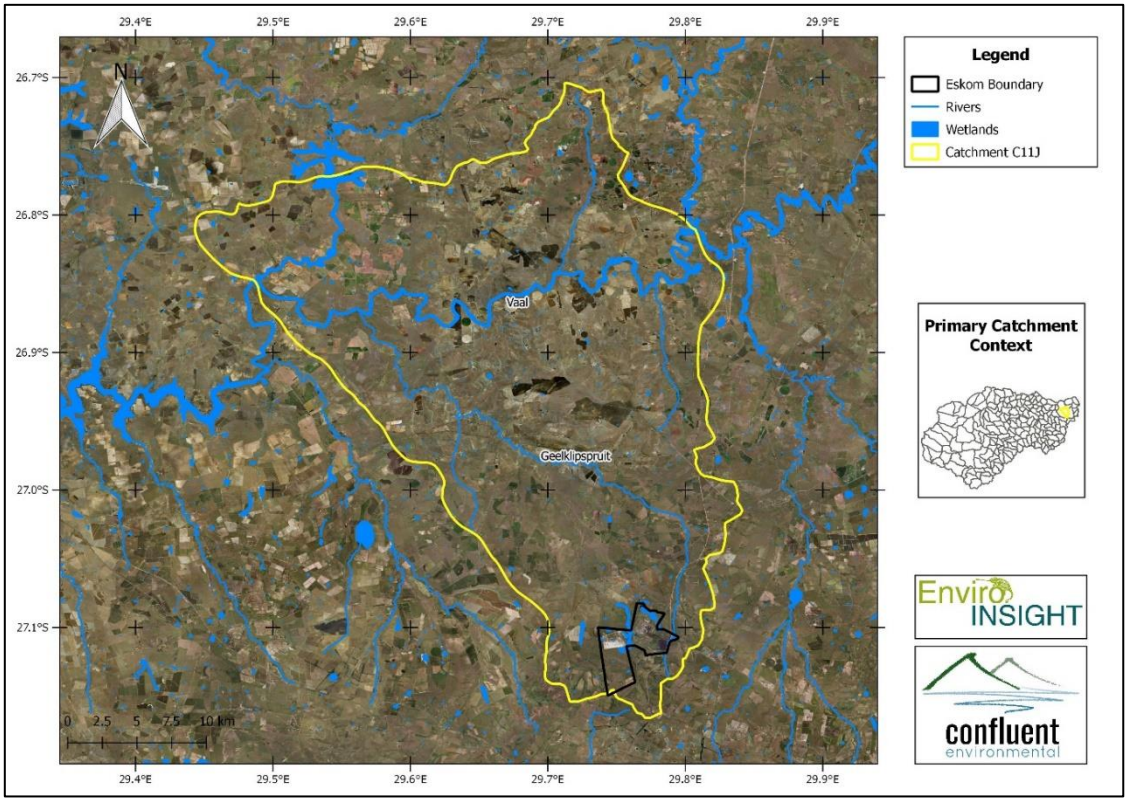

Figure 1: Location of Majuba power station property boundary within quaternary catchment C11J.

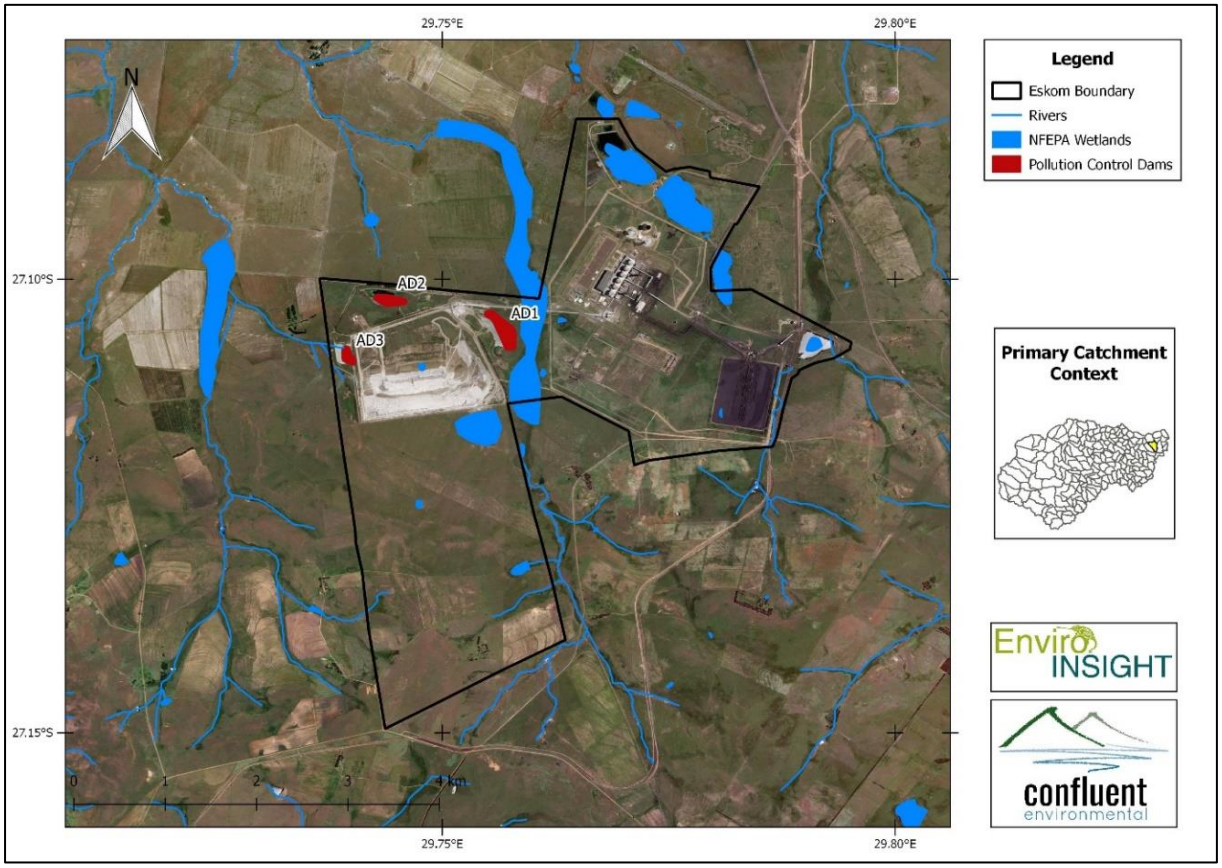

Figure 2: Freshwater resources potentially affected by the development

Figure 3: Photographs illustrating stormwater canals entering AD1 and AD2 (left and middle, respectively) and the dam wall at AD3 (right).

2.1.1 Desktop Present Ecological State

The Mpumalanga Highveld Wetland map (SANBI, 2012) provides geospatial information of the extent, distribution, condition and type of freshwater ecosystems in the Mpumalanga Highveld coal belt, in order to support informed and consistent decision-making by regulators in relation to the water-biodiversity-energy nexus. The majority of wetlands throughout the broader catchment area have been categorised as being in a near natural state (PES of A/B) (Figure 4). It must be stressed however that these assessments were performed at a low level of confidence and field verification of the PES is therefore essential. The non-perennial watercourse draining to the west of the ADF (originating from the vicinity of AD3) is classified as a seep wetland, also with a PES of A/B.

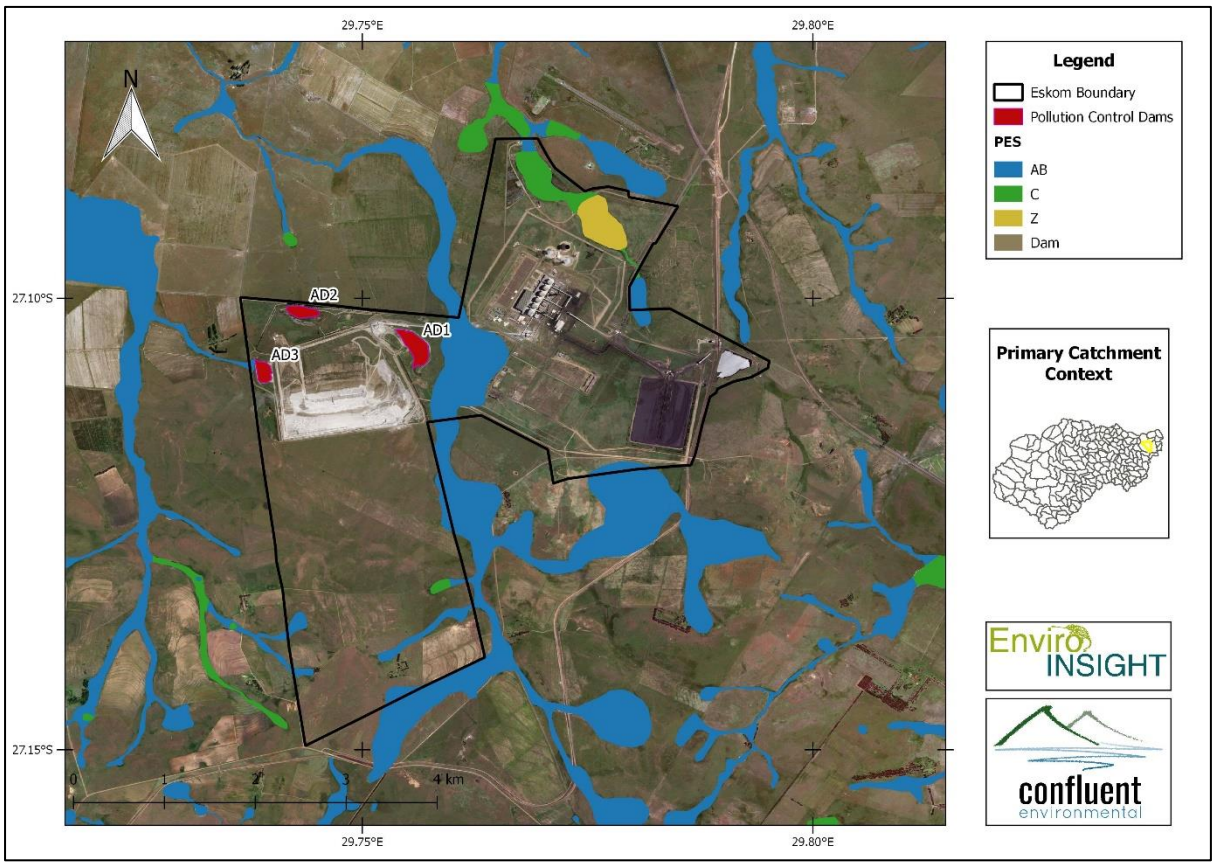

Figure 4: Present Ecological State (PES) of wetlands within and adjacent to the property boundary of the Majuba power station.

Potentially affected rivers are non-perennial in nature and have not been assessed at a desktop level for PES and EIS. The PES of the Geelklipspruit has however been assessed at a C (Moderately Modified). Modifications are largely due to moderate alterations in in-stream and riparian habitat and large modifications in water quality (DWS, 2014). The ecological importance of the Geelklipspruit is regarded as high mainly due to the high concentration of wetland and riparian habitats associated with the sub-quaternary river reach (DWS, 2014).

2.2 CONSERVATION AND BIODIVERSITY PLANS

2.2.1 NFEPA

The National Freshwater Ecosystem Priority Areas (NFEPA) database (Nel et al., 2011) forms part of a comprehensive approach to the sustainable and equitable development of South Africa's scarce water resources. This database provides guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act 36 of 1998). This directly applies to the National Water Act, which feeds into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives (Nel et al., 2011). The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) (Act 10 of 2004) biodiversity goals, informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel et al., 2011).

The study area forms part of the Geelklipspruit sub-quaternary catchment which has been classified as a river FEPA (Figure 5). River FEPAs have been prioritised for conserving freshwater ecosystems and associated biodiversity and should therefore be managed and maintained in a good ecological condition to protect water resources for human users. The recommended condition for all river FEPAs is an A or B ecological category (Nel et al., 2011). It is therefore important that the PES of non-perennial rivers draining the vicinity of the project area managed to achieve this management goal. None of the wetlands potentially affected by the development have been classified as wetland FEPAs.

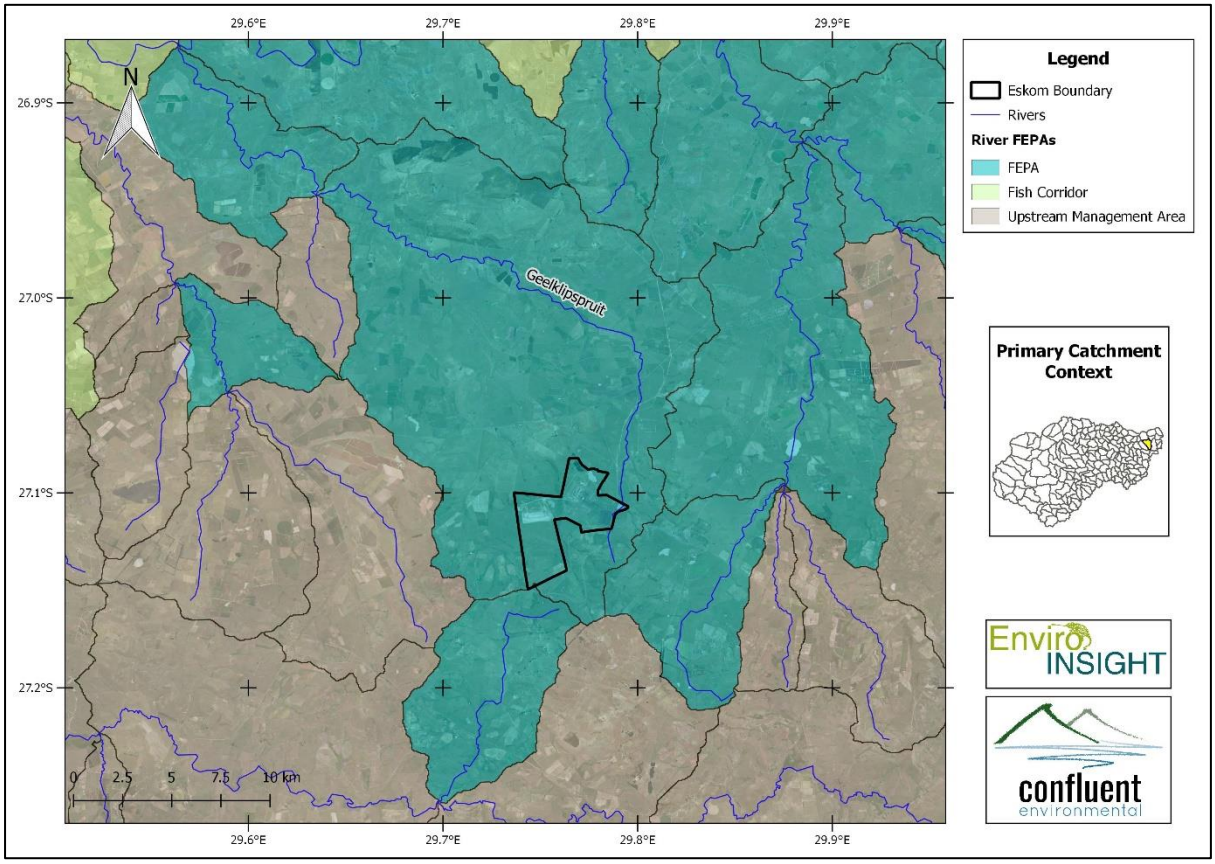

Figure 5: Freshwater Ecosystem Priority Area map for the study area.

2.2.2 Mpumalanga Freshwater Assessment

The Mpumalanga Biodiversity Sector Plan (MBSP) freshwater assessment (MTPA, CSIR and SANBI, 2011) serves as an important land-use decision support tool, and the foundation for the development of any Bioregional Plans within Mpumalanga. These maps have been developed using primarily using NFEPA products and are therefore closely related. Classification of the Biodiversity Classification categories in the study area are as follows:

- Critical Biodiversity Area (CBA): Together with protected areas, ensures that a viable representative sample of all ecosystem types and species can persist. The management objective for these areas is for them to remain in a largely natural condition.
- Ecological Support Area (ESA): Ensures the long-term ecological functioning of the landscape as a whole. Must retain ecological processes, which often requires at least semi-natural ecological condition.
- Other Natural Areas (ONA): Allows for range of other land uses, including intensive land uses. Determined by other spatial planning tools

Much of the land surface area within and adjacent to the project area is heavily modified, either through power generation (and associated activities) or through the transformation of land for dryland agriculture (Figure 6).

Natural areas surrounding these land use activities are regarded as ESAs. From a freshwater perspective, only the large seep wetland to the east of the ADF has been categorized as an ESA wetland. The non-perennial drainage lines located to the north and west of the ADF fall within ESAs. It is therefore important that the ecological function of all wetland and river habitats in these ESAs are not negatively compromised by the development.

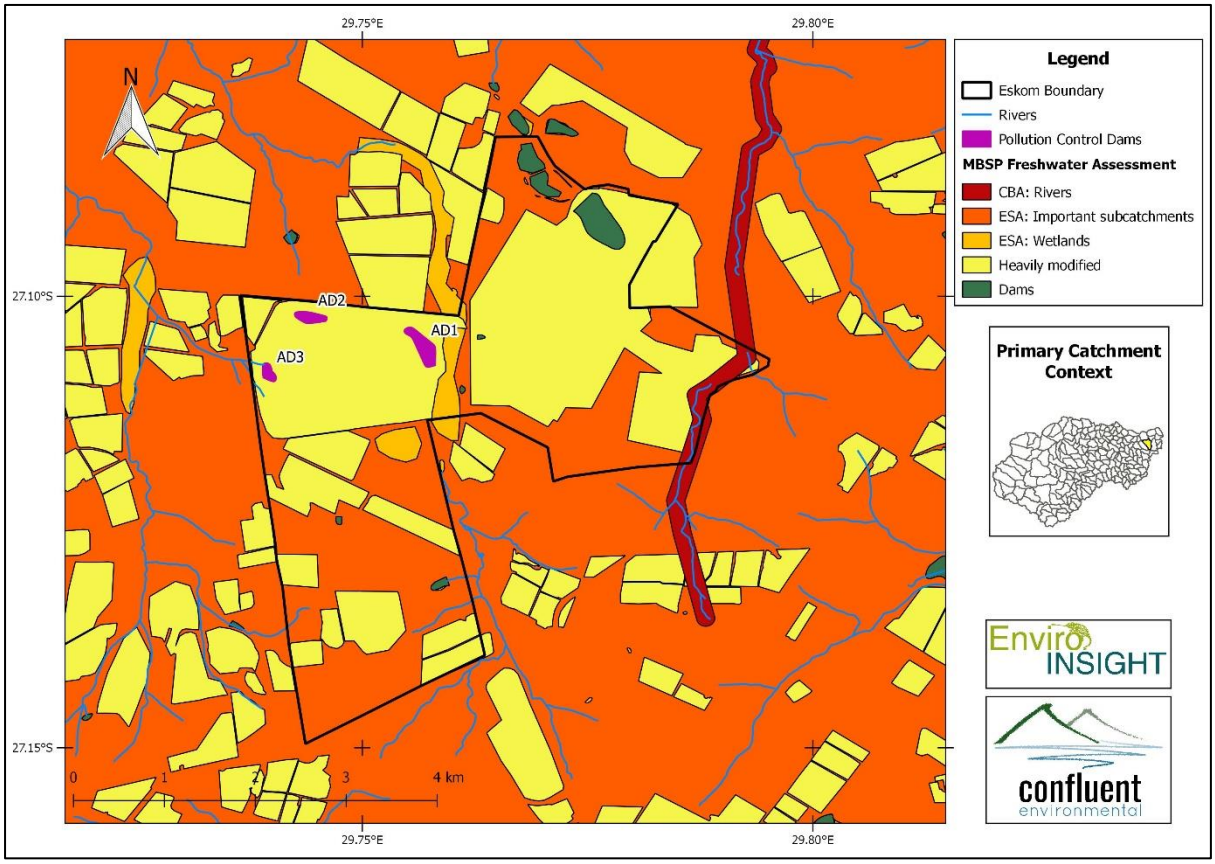

Figure 6: Mpumalanga Biodiversity Sector Plan for the study area.

3 DEVELOPMENT PLANS

An EIA process was undertaken for the continuous ADF, with associated pollution control dams (PCDs). There was however a change of scope during the detailed designs, which requires two new Rehabilitation Dams (RD) and extension of the two existing ash dams (AD), as per specifications shown in Table 1 below. The development will essentially expand the existing footprint of AD1 but create two new dams within this expanded footprint. This will result in a decrease in size of AD1 and the creation of the new rehabilitation dam (RD1). The footprint of AD2 will be increased while RD2 is a new dam. Figure 7 shows the proposed location of these ash and rehabilitation dams.

Table 1: Specifications for the expansion of existing dams (AD1 and AD2) and construction of new dams (RD1 and RD2)

PCD description	PCD current status	Current Dam wall height	New/increased dam height (Max height)*	Surface footprint change	Final footprint size	Final Volume/Storage Capacity
Ash Dam 1* (AD1)	Existing	Compartment wall = not existing	Compartment wall =7.6 m* (new)	Existing = -/+110 000m^2 Decrease by = **69 500 m^2**	40 500m^2	150 000m^3
Rehabilitation Dam 1*(RD1)	New	Dam wall = 5m	Dam wall = 2m (increase)	New size = **80 000 m^2**	80 000m^2	240 000 m^3
Ash Dam 2 (AD2)	Existing	3.1 m	1.7 m *	Existing = 95 000 m^2 Increase by = **65 000 m^2**	160 000m^2	390 000 m^3
Rehabilitation Dam 2 (RD2)	New	N/A	4.85 m *	New reduced size = **19 300 m^2**	19 300 m^2	65 000m^3

Figure 7: Map illustrating the footprint of a new rehabilitation dam (RD1) and expansions to existing dams (AD1, AD2 and RD2).

3.1 POTENTIAL IMPACTS

The planned activities involve the extension of existing pollution control dams (AD1 and AD2), which are man-made dams designed specifically to capture seepage and runoff originating from the ADF. As no natural water resources are associated with these dams (Figure 7), their planned expansion is unlikely to result in any negative impacts from and aquatic perspective.

The most significant potential impact relates to the construction of RD2, which is planned to be constructed in the upper reaches of a drainage line that is indicated to fall within the ESKOM property boundary (Figure 7). This drainage line feeds into the non-perennial tributary that drains to the west of the ESKOM property boundary. The site visit confirmed the presence of wetland habitat within the uppermost reach of the indicated drainage line, part of which falls within the footprint of the proposed RD2. It appears as if this habitat has been formed as a result of earth excavations which has resulted in the formation of an artificial wetland habitat, dominated by *Typha capensis* (Figure 8). The wetland habitat is isolated and there is no distinctive channel that connects this wetland to the larger drainage network draining to the west of the ADF.

The PES and functional importance of this wetland habitat and impacts associated with the construction of the RD2 dam will form the main focus of the EIA phase of this specialist assessment.

Figure 8: Wetland habitat which partly falls within the footprint of the proposed RD2

Potential construction phase impacts related to the construction of the rehabilitation dam (RD2) include the following:

- Loss of aquatic habitat that falls within the footprint of the dam;
- Deterioration of downstream aquatic habitat due to poor waste management, dumping of construction materials etc.;
- Transport of sediment further downstream as result of disturbance and erosion of soil during the construction process;

Operational phase impacts include the following:

- Deterioration of water quality in downstream water resources due to seepage or accidental discharge of high salinity water from the dam; and
- Reduced flows into the downstream watercourse due to loss of surface runoff proportional to the footprint of the dam.

These impacts will be addressed in more detail during the EIA report.

3.2 POSSIBLE ALTERNATIVES

Given the presence of wetland habitat within the footprint of the RD2 dam a possible alterative could be to shift the location of the new rehabilitation dam due south so as to avoid the loss of wetland habitat. The need for this alternative option will be evaluated against the significance of the impacts of the current development plan on potentially affected water resources which include the wetland habitat that falls within the footprint of RD2 and the downstream watercourse draining to the west of AD3 (Figure 7).

4 PLAN OF STUDY FOR THE EIA

The approach to this assessment will comprise of a combined desktop and field-based assessment of potentially affected watercourses. A site visit was conducted on the 7th of November 2018, with the objective of verifying, identifying and classifying aquatic resources and determining the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of potentially affected water resources. Based on this field assessment the impacts associated with the proposed development on aquatic ecosystem health (rivers and wetlands) will be assessed. This will be done according to the impact assessment methodology outlined in the Appendix to this report.

4.1 ASSESSMENT OF RIVER HABITATS

4.1.1 Present Ecological State

An important factor that influences the diversity and abundance of aquatic communities is the condition of the surrounding physico-chemical habitat. Habitat loss, alteration, or degradation generally results in a decline in species diversity. The PES of watercourses will be assessed using the Index of Habitat Integrity (IHI; Kleynhans, 1996). The IHI is regarded as the most appropriate method for assessing riverine habitats as it is not dependent on flow in the watercourse and therefore produces results that are directly comparable across perennial and non-perennial systems. The IHI was developed as a rapid assessment of the severity of impacts on criteria affecting habitat integrity within a river reach. Instream (water abstraction; flow modification; bed modification; channel modification; physico-chemical modification; inundation; alien macrophytes; rubbish dumping) and riparian (vegetation removal, invasive vegetation, bank erosion, channel modification, water abstraction, inundation, flow modification, physico-chemistry) criteria are assessed as part of the index. Each of the criteria are given a score

(from 0 to 25, corresponding to no and very high impact, respectively – Table 2) based on their degree of modification, along with a confidence rating based on the level of confidence in the score.

Weighting scores are used to assess the extent of modification for each criterion (x):

$$Weighted\ Score = \frac{IHI_x}{25} \times Weight_x$$

Where;

IHI = rating score for the criteria (Table 2);
25 = maximum possible score for a criterion; and
Weight = Weighting score for the criteria (Table 3).

The estimated impacts of all criteria calculated this way are summed, expressed as a percentage and subtracted from 100 to arrive at an assessment of habitat integrity for the instream and riparian components, respectively. An IHI class indicating the present ecological state of the river reach is then determined based on the resulting score (ranging from Natural to Critically Modified – Table 4).

Table 2: Descriptive classes for the assessment of habitat modifications (Kleynhans, 1996)

Impact Class	Description	Score
None	No discernible impact, or the modification is located in a way that has no impact on habitat quality, diversity, size and variability.	0
Small	The modification is limited to very few localities and the impact on habitat quality, diversity, size and variability are also very small.	1-5
Moderate	The modifications are present at a small number of localities and the impact on habitat quality, diversity, size and variability is limited.	6-10
Large	The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size and variability. Large areas are, however, not influenced.	11-15
Serious	The modification is frequently present and the habitat quality, diversity, size and variability in almost the whole of the defined area are affected. Only small areas are not affected.	16-20
Critical	The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally.	21-25

Table 3: Criteria and weights used for the assessment of instream and riparian zone habitat integrity

Instream Criteria	Weight	Riparian Zone Criteria	Weight
Water abstraction	14	Indigenous vegetation removal	13
Flow modification	13	Exotic vegetation encroachment	12
Bed modification	13	Bank erosion	14
Channel modification	13	Channel modification	12
Water quality	14	Water abstraction	13
Inundation	10	Inundation	11
Exotic macrophytes	9	Flow modification	12
Exotic fauna	8	Water quality	13
Solid waste disposal	6		
TOTAL	**100**		**100**

Table 4: Index of habitat integrity (IHI) categories and descriptions

Integrity Class	Description	IHI Score (%)
A	Unmodified, natural.	> 90
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 – 90
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 – 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 – 19

4.1.2 Ecological Importance and Sensitivity

The ecological importance of a river is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Ecological sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (resilience) (Resh et al. 1988; Milner 1994). The purpose of assessing importance and sensitivity of water resources is to be able to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Water resources with higher ecological importance may require managing such water resources in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term.

The ecological importance and sensitivity (EIS) of river habitats will be assessed by a method developed by Kleynhans (1999). In summary, several biological and aquatic habitat determinants are assigned a score ranging from 1 (low importance or sensitivity) to 4 (high importance or sensitivity). These determinants include the following:

- **Biodiversity support:**
  - Presence of Red Data species;
  - Presence of unique instream and riparian biota;
  - Use of the ecosystem for migration, breeding or feeding.
- **Importance in the larger landscape:**
  - Protection status of the watercourse;
  - Protection status of the vegetation type;
  - Regional context regarding ecological integrity;
  - Size and rarity of the watercourse types present;
  - Diversity of habitat types within the watercourse.
- **Sensitivity of the watercourse:**

- Sensitivity of watercourse to changes in flooding regime;
- Sensitivity of watercourse to changes in low flow regime, and
- Sensitivity to water quality changes.

The median value of the scores for all determinants is used to assign an EIS category according to Table 5.

Table 5: Ecological importance and sensitivity categories. Interpretation of median scores for biotic and habitat determinants.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

4.2 ASSESSMENT OF WETLAND HABITATS

4.2.1 Desktop Analysis

The wetland assessment involves a preliminary desktop analysis to identify the possible location of wetlands and important land use activities that may be potentially impacting the wetlands (as presented in this scoping report). The desktop analysis will be undertaken using recent aerial photography for the area (Chief Directorate: National Geo-spatial Information) and will be supplemented by the most recent and historical Google Earth imagery. In addition, historical orthophotos will also be interrogated to assess changes to identified wetlands over time.

4.2.2 Site Visit

The site visit will verify the locations of wetlands identified by the desktop analysis, identify wetland habitats that may not have been identified by the desktop analysis and describe existing onsite impacts. Wetlands occurring within the project area will be categorised into discrete hydrogeomorphic units (HGMs) based on their geomorphic characteristics, source of water and pattern of water flow through the wetland unit. HGMs will be classified

according to Ollis et al. (2013). The outer edge of wetlands potentially affected by the development will be delineated and mapped using a handheld GPS according to the following four indicators (DWAF, 2008):

- The presence of wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation such as grey horizons, mottling streaks, hard pans, organic matter depositions, iron and manganese concretion resulting from prolonged saturation (soil indicator);
- The presence of water loving plants (hydrophytes) (vegetation indicator);
- A high-water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil; and
- Topographical location of the wetland in relation to the surrounding landscape (terrain indicator).

4.2.3 Present Ecological State

Desktop and field data (e.g. description of current onsite impacts) will be used to populate the Level 1 WET-Health tool (Macfarlane et al., 2008) which will be used to derive the PES of the wetland HGM units. The magnitude of observed impacts on the hydrological, geomorphological and vegetation components of the wetland will be calculated and combined as per the tool to provide a measure of the overall condition of the wetland on a scale from 1-10. Resultant scores will then be used to assign the wetland into one of six PES categories as shown in Table 6 below.

Table 6: Wetland Present Ecological State categories and impact descriptions.

Ecological Category	Description	Impact Score
A	Unmodified, natural.	0 – 0.9
B	Largely natural with few modifications / in good health. A small change in natural habitats and biota may have taken place but the ecosystem functions are still predominantly unchanged.	1 – 1.9
C	Moderately modified / fair condition. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	2 – 3.9
D	Largely modified / poor condition. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	4 – 5.9
E	Seriously modified / very poor condition. The loss of natural habitat, biota and basic ecosystem functions is extensive.	6 – 7.9
F	Critically modified / totally transformed. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota.	8 - 10

4.2.4 Ecological Importance and Sensitivity

According to Rountree and Kotze (2013) the EIS for wetlands should be based on a combination of three suites of importance criteria, namely:

1. Ecological Importance and Sensitivity (EIS), incorporating the traditionally examined criteria used in EIS assessments of other water resources by DWS (Kleynhans, 1999) and thus enabling consistent assessment approaches across water resource types;

2. Hydro-functional importance, which considers water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide (Kotze et al., 2008); and
3. Importance in terms of basic human benefits – this suite of criteria considers the subsistence uses and cultural benefits of the wetland system (Kotze et al., 2008).

In summary, several determinants representative of each of the three importance criteria (Table 7) are assigned a score ranging from 0 (low importance or sensitivity) to 4 (high importance or sensitivity). The average score for each of the three criteria is calculated, with the highest average score being used to determine the overall EIS category of the wetland system according to Table 5.

Table 7: Determinants for three different importance criteria that are scored (from 0 to 4) in order to determine the overall EIS category for a wetland system.

Ecological Importance & Sensitivity	Hydro-Functional Importance	Direct Human Benefits
Presence of Red Data Species	Flood attenuation	Water for human use
Populations of Unique Species	Streamflow regulation	Harvestable resources
Migration Sites	Sediment trapping	Cultivated foods
Protections Status of Wetland	Phosphate assimilation	Cultural heritage
Protection Status of Vegetation Type	Nitrate assimilation	Tourism and recreation
Regional Context of Ecological Integrity	Toxicant assimilation	Education and research
Size and Rarity of Wetland Type Present	Erosion control	
Diversity of Habitat Types	Carbon storage	
Sensitivity to Changes in Floods		
Sensitivity to Changes in Low Flows		
Sensitivity to Changes in Water Quality		

5 CONCLUSION

Majuba Power Station needs to construct and extend the ash and rehabilitation dams for its ash disposal facility (ADF). These dams are used for the purposes of storm water management at the ADF area. The proposed construction of new dams and expansion of existing dams require various permits, amongst which are the environmental authorisation and the water use licence.

The planned activities involve the extension of existing pollution control dams (AD1 and AD2), which are man-made dams designed specifically to capture seepage and runoff originating from the ADF. The dams are not connected to a larger drainage network. Water from these dams is continuously recycled as part of the process requirements for the power station and is therefore not discharged into the receiving environment. The planned expansion of AD1 and AD2 is therefore unlikely to impact on any natural water resources.

The most significant potential impact relates to the construction of RD2, which is planned to be constructed in the upper reaches of an existing drainage line that falls within the ESKOM property boundary (Figure 7). This drainage

line feeds into the non-perennial tributary that drains to the west of the ESKOM property boundary. This drainage line and associated freshwater habitats will form the main focus of the EIA phase of this specialist assessment.

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7 APPENDICES

Appendix 1: Significance Rating Methodology

Individual impacts for the construction and operational phase were identified and rated according to criteria which include their intensity, duration and extent. The ratings were then used to calculate the consequence of the impact which can be either negative or positive as follows:

Consequence = *type x (intensity + duration + extent)*

where type is either negative (i.e. -1) or positive (i.e. 1). The significance of the impact was then calculated by applying the probability of occurrence to the consequence as follows:

Significance = *consequence x probability*

The criteria and their associated ratings are shown in Table 8.

Table 8: Categorical descriptions for impacts and their associated ratings

Rating	Intensity	Duration	Extent	Probability
1	Negligible	Immediate	Very limited	Highly unlikely
2	Very low	Brief	Limited	Rare
3	Low	Short term	Local	Unlikely
4	Moderate	Medium term	Municipal area	Probably
5	High	Long term	Regional	Likely
6	Very high	Ongoing	National	Almost certain
7	Extremely high	Permanent	International	Certain

Categories assigned to the calculated significance ratings are presented in Table 9.

Table 9: Value ranges for significance ratings, where (-) indicates a negative impact and (+) indicates a positive impact

Significance Rating	Range	
Major (-)	-147	-109
Moderate (-)	-108	-73
Minor (-)	-72	-36
Negligible (-)	-35	-1
Neutral	0	0
Negligible (+)	1	35
Minor (+)	36	72
Moderate (+)	73	108
Major (+)	109	147

Each impact was considered from the perspective of whether losses or gains would be irreversible or result in the irreplaceable loss of biodiversity of ecosystem services. The level of confidence was also determined and rated as low, medium or high (Table 10).

Table 10: Definition of reversibility, irreplaceability and confidence ratings.

Rating	Reversibility	Irreplaceability	Confidence
Low	Permanent modification, no recovery possible.	No irreparable damage and the resource isn't scarce.	Judgement based on intuition.
Medium	Recovery possible with significant intervention.	Irreparable damage but is represented elsewhere.	Based on common sense and general knowledge
High	Recovery likely.	Irreparable damage and is not represented elsewhere.	Substantial data supports the assessment

HERITAGE SCOPING REPORT

Establishment of 2 Rehabilitation Dams & Extension of 2 Existing Ash Dams for Majuba Power Station Ash Disposal Facility, Mpumalanga Province

Client:
Advisian

Client information:
Marinda le Roux
E – Mail: MarindaLeRoux.Advisian@outlook.com

HCAC - Heritage Consultants

Private Bag X 1049
Suite 34
Modimolle
0510

Tel: 082 373 8491
Fax: 086 691 6461
E-Mail: jaco.heritage@gmail.com

Report Author:

Mr. J. van der Walt

Project Reference:

2181201

Report date:

December 2018

DOCUMENT PROGRESS
Heritage Scoping Report

Document status

Document Version	**v1.0**		
Report Purpose	**Draft for review Advisian**		
Report Ref. No.	**2181201**		
	Name	**Signature**	**Date**
Document Compilation	**Mr. J. van der Walt**		**Dec 2018**

Distribution List

Date	Report Reference number	Document Distribution	Number of Copies
2018/12/03	2181201	Advisian	Electronic copy

Amendments on document

Date	Report Reference Number	Description of Amendment

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EXECUTIVE SUMMARY

Site name and location: The Establishment of 2 Rehabilitation Dams & Extension of 2 Existing Ash Dams for Majuba Power Station Ash Disposal Facility is located Portion 1, 2 and 6 of the farm Witkoppies 81 HS, Mpumalanga Province.

1: 50 000 Topographic Map: 2729BB

EIA Consultant: Advisian

Developer: Eskom Holdings (SOC) Limited

Heritage Consultant: Heritage Contracts and Archaeological Consulting CC (HCAC).

Contact person: Jaco van der Walt Tel: +27 82 373 8491 E –mail jaco.heritage@gmail.com.

Date of Report: 3 December 2018

Findings of the Assessment:

The scope of work comprises a heritage scoping report for the Majuba Ash and Rehabilitation Dams. This report was conducted based on a desktop study of available data regarding cultural heritage resources of the area followed by a field study.

This scoping study revealed that very few known heritage sites occur in the larger region and no standing structures older than 60 years occur in the study area (Section 34 of the NHRA). The study area was assessed in terms of the archaeological component of Section 35 of the NHRA and no surface indicators of archaeological (Stone or Iron Age) material was identified in the study area. The study area is of high paleontological sensitivity and according to the SAHRIS palaeontological sensitivity map must be subjected to a desktop palaeontological assessment. In terms of Section 36 of the NHRA it should be noted that no known graves are on record for the study area but graves can be expected anywhere on the landscape.

The impact of the proposed project on heritage resources is considered low and no fatal flaws were identified. It is expected that impacts on heritage resources by the proposed project can be mitigated to an acceptable level and that the project is viable from a heritage point of view.

Contents

Figures

ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BIA: Basic Impact Assessment
CRM: Cultural Resource Management
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Plan
ESA: Early Stone Age
GPS: Global Positioning System
HIA: Heritage Impact Assessment
LIA: Late Iron Age
LSA: Late Stone Age
MEC: Member of the Executive Council
MIA: Middle Iron Age
MPRDA: Mineral and Petroleum Resources Development Act
MSA: Middle Stone Age
NEMA: National Environmental Management Act
PRHA: Provincial Heritage Resource Agency
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological site (remains of human activity over 100 years old)

Early Stone Age (2 million to 300 000 years ago)

Middle Stone Age (300 000 to 30 000 years ago)

Late Stone Age (30 000 years ago until recent)

Historic (approximately AD 1840 to 1950)

Historic building (over 60 years old)

Lithics: Stone Age artefacts

1. INTRODUCTION

Heritage Contracts and Archaeological Consulting (HCAC) was contracted by Advisian to conduct a Heritage Scoping report for the establishment of 2 Rehabilitation Dams and Extension of 2 Existing Ash Dams for Majuba Power Station Ash Disposal Facility. The heritage scoping report forms part of the EIA for the proposed project. The proposed project is located on the farm Witkoppies 81 HS, to the south west of Amersfoort, Mpumalanga Province (Figure 1 -3).

The aim of the scoping report is to identify possible heritage resources within the project area and to assess their importance within a Local, Provincial and National context. The study furthermore aims to assess the impact of the proposed project on non - renewable heritage resources and to submit appropriate recommendations with regards to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve and develop them within the framework provided by Heritage legislation.

The report outlines the approach and methodology utilised for the Scoping phase of the project. The report includes information collected from various sources and consultations. Possible impacts are identified and mitigation measures are proposed in the following report.

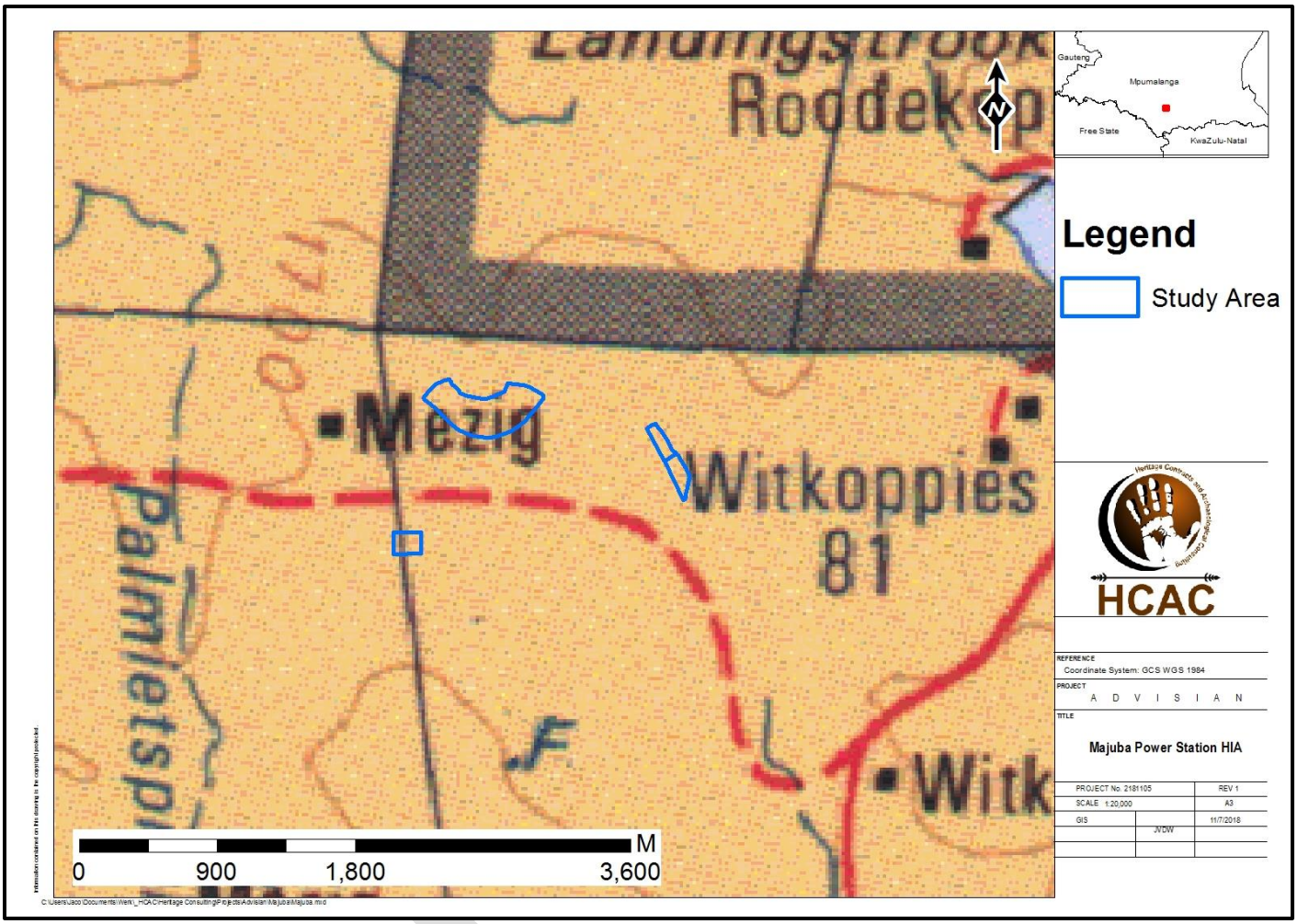

Figure 1. Regional locality map of the study area.

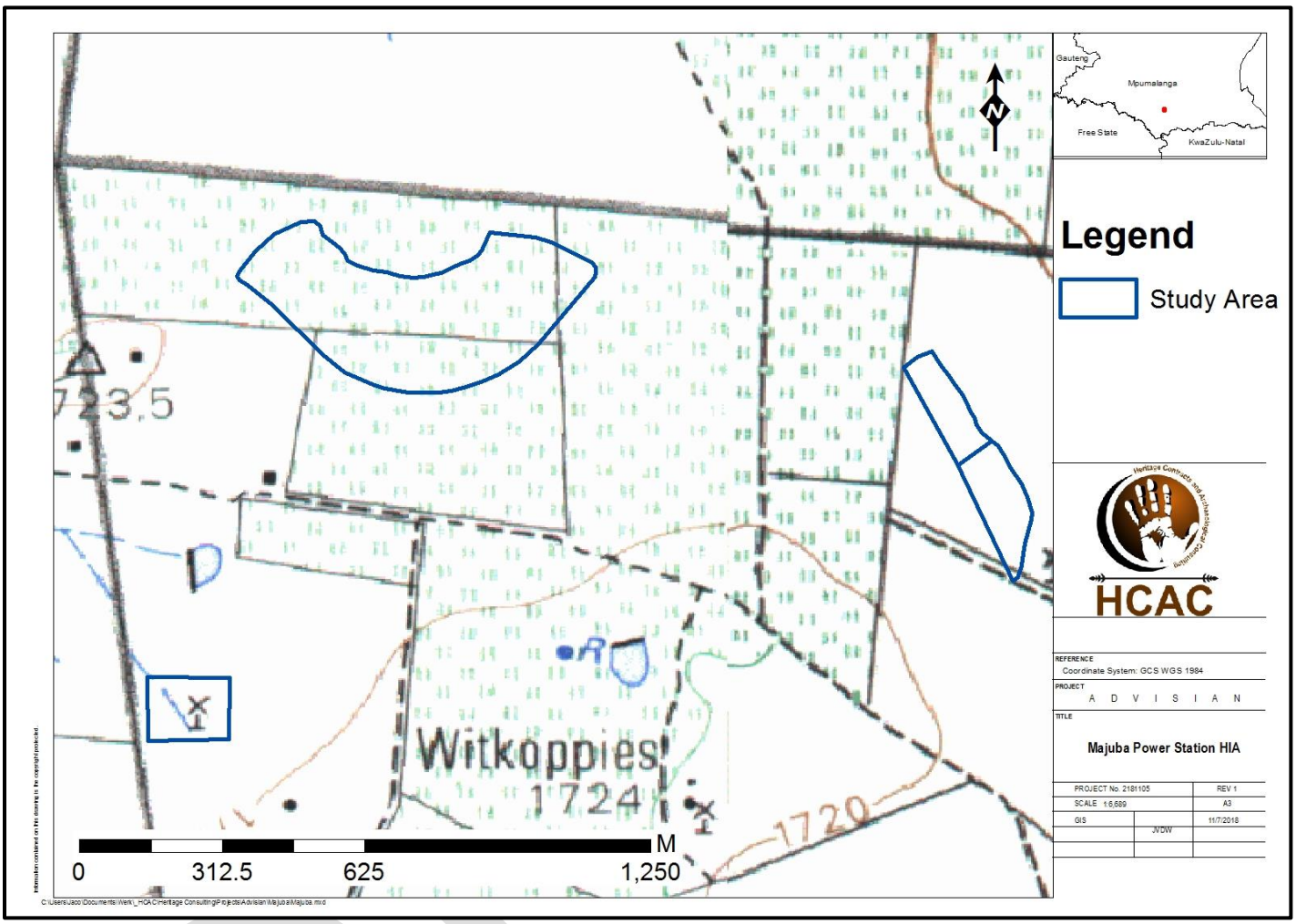

Figure 2: Location Map of the proposed Majuba Solar PV Project.

Figure 3. Google Earth Image indicating the study area.

1.2 Terms of Reference

The main aim of this scoping report is to determine if any known heritage resources occur within the study area and to predict the occurrence of any possible heritage significant sites that might present a fatal flaw to the proposed project. The objectives of the scoping report were to:

- Conduct a desktop study:
    - Review available literature, previous heritage studies and other relevant information sources to obtain a thorough understanding of the archaeological and cultural heritage conditions of the area;
    - Gather data and compile a background history of the area;
    - Identify known and recorded archaeological and cultural sites;
    - Determine whether the area is renowned for any cultural and heritage resources, such as Stone Age sites, Iron Age sites, informal graveyards or historical homesteads.
- Report

The reporting of the scoping component is based on the results and findings of the desk-top study and site visit, wherein potential issues associated with the proposed project will be identified, and those issues requiring further investigation through the IA Phase highlighted. Reporting will aim to identify the anticipated impacts, as well as cumulative impacts, of the operational units of the proposed project activity on the identified heritage resources for all 3 development stages of the project, i.e. construction, operation and decommissioning. Reporting will also consider alternatives should any significant sites be impacted on by the proposed project. This is done to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve and develop them within the framework provided by Heritage Legislation.

1.3 Nature of the development

An EIA process was previously undertaken for the continuous ash disposal facility and an Environmental Authorisation (reference number 14/12/16/3/3/3/53) received from Department of Environmental Affairs. A change in the scope of work during the detailed engineering design for the ADF, requires 2 new Rehabilitation Dams and extension of the 2 existing ash dams. The RD and AD dams will be utilised for storm water management within the ADF area.

1.4 The receiving environment

The topography of the area is relatively flat with no rocky outcrops that could have been focal points for human activity in antiquity. The proposed impact areas are largely disturbed from a heritage point of view and is characterised by existing dams (Figure 4, 5 & 6). The study area falls within the Mesic Highveld Grassland Bioregion as described by Mucina et al (2006) with the vegetation described as Amersfoort Highveld Clay Grassland and peripheral sections of the original vegetation type is found in the study area (Figure 7). Land use in the general area is characterized by mining and agriculture.

Figure 4. General site conditions

Figure 5. General site conditions

Figure 6. General site conditions

Figure 7. General site conditions

2. APPROACH AND METHODOLOGY

The assessment is to be undertaken in two phases, a desktop study as part of the Scoping phase and a Heritage Impact Assessment as part of the Environmental Impact Assessment phase. This report concerns the scoping phase. The aim of the scoping phase is to cover archaeological and cultural heritage data available to compile a background history of the study area. In order to identify possible heritage issues or fatal flaws that should be avoided during development.

This was accomplished by means of the following phases (the results are represented in section 4 of this report):

2.1 Literature search

A literature search was conducted utilising data from published articles on the archaeology and history of the area. The aim of this is to extract data and information on the area in question, looking at archaeological sites, historical sites and graves of the area.

2.2 Information collection

The SAHRA report mapping project (Version 1.0) and SAHRIS was consulted to further collect data from CRM practitioners who undertook work in the area to provide the most comprehensive account of the history of the area where possible.

2.3 Public consultation

A full public consultation process will be facilitated by Advisian.

2.4 Google Earth and mapping survey

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where archaeological sites might be located.

2.5 Genealogical Society of South Africa

The database of the genealogical society was consulted to collect data on any known graves in the area.

2.6 Site visit

The study area was subjected to a field survey over a period of one day.

3. LEGISLATION

For this project the National Heritage Resources Act, 1999 (Act No. 25 of 1999) is of importance and the following sites and features are protected:

a. Archaeological artefacts, structures and sites older than 100 years
b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography
c. Objects of decorative and visual arts
d. Military objects, structures and sites older than 75 years
e. Historical objects, structures and sites older than 60 years
f. Proclaimed heritage sites
g. Grave yards and graves older than 60 years
h. Meteorites and fossils
i. Objects, structures and sites or scientific or technological value.

The national estate that includes the following:

a. Places, buildings, structures and equipment of cultural significance
b. Places to which oral traditions are attached or which are associated with living heritage
c. Historical settlements and townscapes
d. Landscapes and features of cultural significance
e. Geological sites of scientific or cultural importance
f. Archaeological and palaeontological importance
g. Graves and burial grounds
h. Sites of significance relating to the history of slavery
i. Movable objects (e.g. archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.)

Section 34 (1) of the act deals with structures which is older than 60 years. Section 35(4) of this act deals with archaeology, palaeontology and meteorites. Section 36(3) of the National Heritage Resources Act, deals with human remains older than 60 years. Unidentified/unknown graves are also handled as older than 60 until proven otherwise.

3.1 Heritage Site Significance and Mitigation Measures

The presence and distribution of heritage resources define a Heritage Landscape. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface.

This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. National and Provincial Monuments are recognised for conservation purposes. The following interrelated criteria were used to establish site significance:

- The unique nature of a site;
- The integrity of the archaeological/cultural heritage deposit;
- The wider historic, archaeological and geographic context of the site;
- The location of the site in relation to other similar sites or features;
- The depth of the archaeological deposit (when it can be determined or is known);
- The preservation condition of the site;
- Potential to answer present research questions.

The criteria above will be used to place identified sites with in SAHRA's (2006) system of grading of places and objects which form part of the national estate. This system is approved by ASAPA for the SADC region. The recommendations for each site should be read in conjunction with section 10 of this report.

FIELD RATING	***GRADE***	***SIGNIFICANCE***	***RECOMMENDED MITIGATION***
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

4. REGIONAL OVERVIEW

4.1 General Information

4.1.1. Literature search

Several previous heritage studies were conducted in the immediate vicinity of the study area (SAHRA report mapping project V1.0 and SAHRIS). Studies consulted for this scoping study include Van Schalkwyk (2013), Becker (2008) and Seliane (2013) as well as Van der Walt (2014). Becker recorded graves close to the Majuba Power Station and Seliane and van Schalkwyk also recorded graves as well as structures that could be older than 60 years and therefore protected by legislation. Van der Walt (2014) recorded no sites of significance.

4.1 2. Public consultation

A public participation process is facilitated by Advisian as per the EIA process.

4.1.3. Google Earth and mapping survey

Google Earth and 1:50 000 maps of the area was utilised to identify possible places where archaeological sites might be located.

4.1.4. Genealogical Society of South Africa

No grave sites are indicated within the study area.

4.2. Palaeontology

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 8. Palaeontological sensitivity map of the study area.

4.3 Archaeological and Historical Information Available on the Study Area"

The following section will endeavour to give an account of the history of the greater area of the proposed development and also a brief overview of the history of the district in which it is located. The report has been divided into several sections that will focus on the following aspects:

- General history of human settlement in the area
- The history of black and white interaction in the farm area

The Stone Age is divided in Early; Middle and Late Stone Age and refers to the earliest people of South Africa who mainly relied on stone for their tools.

Very few Early Stone Age sites are on record for Mpumalanga and no sites dating to this period are expected for the study area. An example in Mpumalanga is Maleoskop on the farm Rietkloof where ESA tools have been found. This is one of only a handful of such sites in Mpumalanga.

The MSA has not been extensively studied in Mpumalanga but evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district. This cave was excavated twice in the 1960s by Louw and later by Eloff. The MSA layers show that the cave was repeatedly visited over a long period. Lower layers have been dated to over 40 000 BP (Before Present) while the top layers date to approximately 27 000 BP (Esterhuizen & Smith in Delius, 2007). MSA material is found widely across South Africa and some MSA manifestations can be expected in the study area.

The Later phases of the Stone Age began at around 20 000 years BP. This period was marked by numerous technological innovations and social transformations within these early hunter-gatherer societies. These people may be regarded as the first modern inhabitants of Mpumalanga, known as the San or Bushmen. They were a nomadic people who lived together in small family groups and relied on hunting and gathering of food for survival. Evidence of their existence is to be found in numerous rock shelters throughout the Eastern Mpumalanga where some of their rock paintings are still visible. A number of these shelters have been documented throughout the Province (Bornman, 1995; Schoonraad in Barnard, 1975; Delius, 2007). These include areas such as Witbank, Ermelo, Barberton, Nelspruit, White River, Lydenburg and Ohrigstad.

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD
- The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. No Sites dating to the Early or Middle Iron Age have been recorded or is expected for the study area. The same goes for the Later Iron Age period where the study area is situated outside the southern periphery of distribution of Late Iron Age settlements in Mpumalanga. This phase of the Iron Age (AD 1600-1800's) is represented by various tribes including Ndebele, Swazi, BaKoni, Pedi marked by extensive stonewalled settlements found throughout the Mpumalanga escarpment

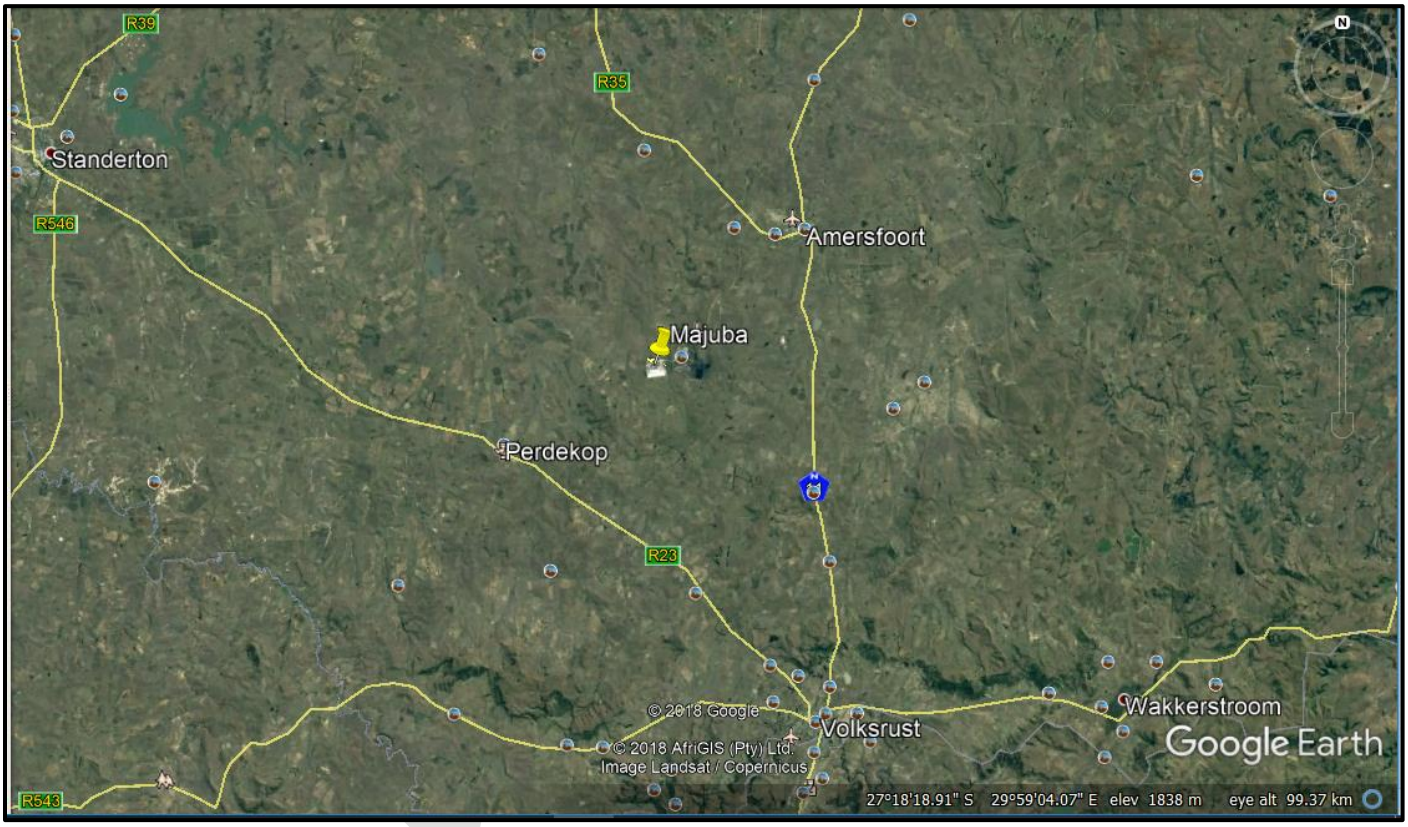

Figure 9 The study area in relation to Standerton, Amersfoort, Wakkerstroom and Volksrust.

When writing about the Mpumalanga Province, it is perhaps best to briefly glance back to prehistoric times, when coals formed in vast swamps from rotting forests between 200 and 300 million years ago. Massive seams of vast coal fields have been discovered and extracted in the southern areas in the province. The areas surrounding the towns of Witbank, Middelburg, Bethal, Hendrina, Ermelo and Carolina had long provided South Africa with an abundant source of cheap energy. This discovery has also had unfortunate effects on these areas, since the toxic by-products of burning coal in such quantities had severely polluted the ground and atmosphere in this area. (*Delius* 2007: 36-37)

Iron Age sites have been identified to the north of the area, around Bethal (Bergh 1999: 6-7). These sites date to the Late Iron Age. It is also known that the early trade routes did not run through this area (Bergh 1999: 9).

No major black tribes seem to have settled very close to the area where the study area is located today by the start of the nineteenth century, but the Phuthing Tribe was prominent in the area to the north thereof. (Bergh 1999: 10)

In a few decades, the sociographic nature of the then Transvaal province would change forever. The Difaqane (Sotho), or Mfekane ("the crushing" in Nguni) was a time of bloody upheavals in Natal and on the Highveld, which occurred around the early 1820's until the late 1830's. (Bergh 1999: 109-115) It came about in response to heightened competition for land and trade, and caused population groups like gun-carrying Griquas and Shaka's Zulus to attack other tribes. (Bergh 1999: 14; 116-119) Mzilikazi and his raiders had moved from the Northern Nguni area to the area north of the Vaal River by 1821. It has been recorded that the Ndebeles first attacked the Phuthing tribe, which in turn migrated to the south of the Vaal River and joined groups of Southern Sotho speakers. The Phuthing and Southern Sotho tribes moved westward and northward and started raiding Tswana communities in the surrounding area. The Phuthing were commanded first by Chief Tshane, and later Ratsebe. As the Phuthing under Ratsebe moved eastwards along the Vaal River, they collided with Mzilikazi's Ndebele once more. The Phuthing and other raiding groups were finally taken captive in 1823 by Mzilikazi's men. (Bergh 1999: 110-111) It is unlikely that these events would have had a great influence on the area where the farms under investigation are located today, but it is still important to understand the social dynamics of the larger area.

During the time of the Difaqane, a northwards migration of white settlers from the Cape was also taking place. Some travellers, missionaries and adventurers had gone on expeditions to the northern areas in South Africa – some as early as in the 1720's.

By the late 1820's, a mass-movement of Dutch speaking people in the Cape Colony started advancing into the northern areas. This was due to feelings of mounting dissatisfaction caused by economical and other circumstances in the Cape. This movement later became known as the Great Trek.

This migration resulted in a massive increase in the extent of that proportion of modern South Africa dominated by people of European descent. (Ross 2002: 39) As can be expected, the movement of whites into the northern provinces would have a significant impact on the black people who populated the land. By 1860, the population of whites in the central Transvaal was already very dense and the administrative machinery of their leaders was firmly in place. Many of the policies that would later be entrenched as legislation during the period of apartheid had already been developed. (Bergh 1999: 170)

During the second Anglo Boer War the Town of Standerton played a role when a British Garrison was besieged in the town for three months.

Much can be said about the systematic oppression of black people in South Africa. In 1904 about a half of the black population in the Transvaal was living on private land, owned by whites or companies. According to the Squatters' Law of 1895, no more than five families of "natives" could live on any farm or divided portion of a farm, without special permission of the Government in the Transvaal. (Massie 1905: 97)

Black and white relations were however at times also interdependent in nature. After the Great Trek, when white farmers had settled at various areas in the northern provinces, wealthier farmers were often willing to lodge needy white families on their property in exchange for odd jobs and commando service. This bywoner often arrived with a family and a few cows. He would till the soil and pay a minimal rent to the farmer from the crops he grew. The farmer did not consider him a laborer, but mostly kept black workers for hard labour on the farm. After the Anglo-Boer War, many families were left destitute. Post war years of severe droughts and locust plagues did not ameliorate this state of affairs. All of these factors

resulted in what became known as the ‘poor white problem’. On the advent of commercial farming in South Africa, white landowners soon found bywoners to be a financial burden, and many were evicted from farms. In many cases, wealthier landlords found it far more profitable to rent their land to blacks than to bywoners. This enabled them to create reservoirs of black labour (for which mine recruiting agencies were prepared to pay handsome commissions), while it was also possible to draw more rent from their black tenants. This practice was outlawed by the 1913 Natives Land Act, which forbade more than five black families from living on white farms as peasant squatters. (Readers Digest 1992: 329-332)

The discovery of diamonds and gold in the northern provinces had very important consequences for South Africa. After the discovery of these resources, the British, who at the time had colonized the Cape and Natal, had intensions of expanding their territory into the northern Boer republics. This eventually led to the Anglo-Boer War, which took place between 1899 and 1902 in South Africa, and which was one of the most turbulent times in South Africa’s history. Even before the outbreak of war in October 1899 British politicians, including Sir Alfred Milner and Mr. Chamberlain, had declared that should Britain's differences with the Z.A.R. result in violence, it would mean the end of republican independence. This decision was not immediately publicized, and republican leaders based their assessment of British intentions on the more moderate public utterances of British leaders. Consequently, in March 1900, they asked Lord Salisbury to agree to peace on the basis of the status quo ante bellum. Salisbury's reply was; however, a clear statement of British war aims. (Du Preez 1977)

During the British march into the Transvaal between February and September 1900, several troops passed by the area where Witbank is situated today. The battalions of Lieutenant Generals J. French, R. Pole-Carew and F. Roberts all travelled close by the Witbank area and through Middelburg. A railway line ran along this route at the time. (Bergh 1999: 51)

During the Anglo-Boer War, two railway stations were located in the vicinity of the Witbank area, and close to each a black concentration camp had been established. At Middelburg, about 20 kilometres to the east of Witbank, one white and one black concentration camp was also set up. During the Anglo Boer War, the highveld areas saw much action consisting of various skirmishes between Boer and Brit.

5. PROBABILITY OF OCCURRENCE OF SITES

Based on the above information, it is possible to determine the probability of finding archaeological and cultural heritage sites within the study area to a certain degree. For the purposes of this section of the report the following terms are used – low, medium and high probability. Low indicates that no known occurrences of sites have been found previously in the general study area, medium probability indicates some known occurrences in the general study area are documented and can therefore be expected in the study area and a high probability indicates that occurrences have been documented close to or in the study area and that the environment of the study area has a high degree of probability having sites.

» Palaeontological landscape

Fossil remains*. Medium probability.*

» Archaeological And Cultural Heritage Landscape

NOTE: *Archaeology is the study of human material and remains (by definition) and is not restricted in any formal way as being below the ground surface*.

*Archaeologica*l remains dating to the following periods can be expected within the study area:

» Stone Age finds

ESA: *Low-Medium Probability*
MSA*: Low-Medium Probability*
LSA: Low-Medium Probability
LSA –Herder: Low Probability

» Iron Age finds

EIA: *Low Probability*
MIA*: Low Probability*
LIA: Low -Medium Probability

» Historical finds

Historical period: *Low-Medium Probability*
Historical dumps: *Low-Medium Probability*
Structural remains: *Low-Medium Probability*
Cultural Landscape*: low probability*

» Living Heritage
For example, rainmaking sites: *Low Probability*

» Burial/Cemeteries

Burials over 100 years: *Low-Medium Probability*
Burials younger than 60 years*: Medium Probability*

Subsurface excavations including ground levelling, landscaping, and foundation preparation can expose any number of these.

6. ASSUMPTIONS AND LIMITATIONS

The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the subsurface nature of archaeological artefacts, the possibility exists that some features or artefacts may not have been discovered/recorded during the survey and the possible occurrence of unmarked graves and other cultural material cannot be excluded. Similarly, the depth of the deposit of heritage sites cannot be accurately determined due its subsurface nature. This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this report.

7. FINDINGS

The heritage scoping study revealed that the following heritage sites, features and objects that can be expected within the study area.

7.1. Palaeontological

The area is of high paleontological sensitivity and SAHRA will most likely require further studies prior to development.

7.2. Archaeology

7.2.1 Archaeological finds

Almost no archaeological sites are on record close to the study area and no major landscape features like rocky outcrops or hills occur in the study area that would have been focal points in antiquity. Furthermore the study area lacks raw material suitable for the manufacture of stone artefacts or for the construction of late Iron Age Stone walled settlements.

7.2.2 Nature of Impact

The construction phase of the project could (although unlikely) impact on surface and subsurface archaeological sites.

7.2.3 Extent of impact

The project could have a low to medium impact on a local scale.

7.3. Historical period

7.3.1 Historical finds: I

Historical finds include middens, structural remains and cultural landscape. No homesteads/structures are visible on Google earth in the study area. No structures older than 60 years were noted during the site visit.

7.3.2 Nature of Impact
No direct impacts are expected on the historical landscape.

7.3.3 Extent of impact
The construction phase of the project could have a low impact on a local scale.

7.4. Burials and Cemeteries

7.4.1 Burials and Cemeteries
Graves and informal cemeteries can be expected anywhere on the landscape but no graves were recorded in the study are during the field visit. Studies in the larger geographical area recorded informal cemeteries.

7.4.2 Nature of Impact
Although unlikely the construction and operation of the proposed project could directly impact on marked and unmarked graves.

7.4.3 Extent of impact
The project could have a low to medium impact on a local scale.

8. POTENTIAL SIGNIFICANCE OF HERITAGE RESOURCES
Based on the current information obtained for the area at a desktop level collaborated by a site visit it is anticipated that any heritage resources that occur within the proposed development area will have a Generally Protected B (GP.B) field rating and all sites should be mitigatable and no red flags are identified.

9. CONCLUSIONS AND RECOMMENDATIONS
This scoping study revealed that very few known heritage sites occur in the larger region with a similar lack of heritage sites in the study area. It should also be noted that the study area has been extensively disturbed and this could have impacted on surface indicators of heritage sites. The following conclusions are applicable to heritage resources:

» Archaeological sites

No sites of significance are on record for the study areas.

» Historical finds and Cultural landscape

No structures occur in the study areas.

» Burials and cemeteries

Graves and informal cemeteries can be expected anywhere on the landscape but no graves were recorded in the study are during the field visit. It is generally recommended that these sites are preserved with in a development. These sites can however be relocated if avoidance is not possible, but this option must be seen as a last resort and is not advisable. The lack of any grave sites in the impact areas must be confirmed the public consultation process.

10 LIST OF PREPARERS

Jaco van der Walt (Archaeologist and project manager)

Liesl Bester (Archival Specialist)

11. STATEMENT OF COMPETENCY

The author of the report is a member of the Association of Southern African Professional Archaeologists and is also accredited in the following fields of the Cultural Resource Management (CRM) Section, member number 159: Iron Age Archaeology, Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation. Jaco is also an accredited CRM Archaeologist with SAHRA and AMAFA.

Jaco has been involved in research and contract work in South Africa, Botswana, Mozambique, Zimbabwe, Tanzania and the DRC and conducted well over 300 AIAs since he started his career in CRM in 2000. This involved several mining operations, Eskom transmission and distribution projects and infrastructure developments. The results of several of these projects were presented at international and local conferences.

12. STATEMENT OF INDEPENDENCE

I, Jaco van der Walt as duly authorised representative of Heritage Contracts and Archaeological Consulting CC, hereby confirm my independence as a specialist and declare that neither I nor the Heritage Contracts and Archaeological Consulting CC have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which the client was appointed as Environmental Assessment practitioner, other than fair remuneration for work performed on this project.

SIGNATURE: _____

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1 Groundwater

1.1 Climate

The Majuba Power Station area is characterised by moderate summer rainfall with an average rainfall of 658 mm per annum. Mean temperatures reach a maximum during December/January of 37.6 and a minimum in June/July of -1.6.

The winds in the region are usually north-westerly and reach their maximum speed in the afternoon. During thunderstorms, strong and gusty south-westerly winds are common but short in duration. Local thunderstorms and showers are responsible for majority of the summer precipitation.

1.2 Regional Geology

Majuba Power Station lies on the north-eastern rim of the Great Karoo Basin which comprises predominantly sediments of the Karoo Supergroup. The Karoo dolerite have intruded these sediments along planes of weakness and form a large part of the Karoo rocks in the area.

The Karoo sediments that underlie the site belong to the Volksrust Formation (Ecca Group). The sediments consist of light to dark bluish grey micaceous mudrocks and shales with subordinate and intercalated siltstone/sandstone. Over much of the Karoo basin, the sedimentary rocks are horizontally bedded or have very gentle dips. Sandstones comprise a large portion of the Karoo sediments and are generally closely intercalated with the mudrocks and siltstones. The intruding dolerites dykes and still comprised dark-coloured, crystalline, igneous basaltic rocks weathering as prominent ridges or hills.

1.3 Groundwater

The Majuba Power Station lies within the C11J quaternary catchment. Within this catchment two aquifer systems are present underlying the site. These aquifers comprise an upper and lower / deeper system. Groundwater is predominantly topographically controlled. However, the geological structures, such as dolerite dykes, also have a very important influence on the flow directions and flow velocities of the groundwater.

The underlying geology determines the geohydrological conditions as groundwater in the area predominantly is contained in fractures, faults, joints and dykes or contacts between the sediments and the dolerite.

The upper aquifer is associated with the weathered zone. Water is often found within a few metres of the surface. Rainfall infiltrates into the weathered material and is constrained by a lower impermeable shale layer or dolerite. Groundwater movement above this this shale or dolerite is lateral in the general direction of the surface slope. At surface, this water appears as either base flow in nearby streams or as springs/seepage. Below the weathered zone, within the consolidated formations, the deeper aquifer is found occurs in fractures, joints and structural openings in the rock. Dolerite and sandstone show better development of these structures, therefore these formations show higher water-yielding properties. Yields from boreholes vary from 0.01 l/sec to 16 l/sec in the deeper aquifer from sandstone or dolerite.

1.4 Groundwater Levels and Flow

On average the water levels within Majuba Power Station area at a depth of 3.06 mbgl with a minimum depth of 0.31 mbgl between ash disposal facility and Witbankspruit and maximum depth of 11.75mbgl is observed between the ash disposal facility and Palmietspruit.

1.5 Ground Water Quality

Two types of groundwater have been observed to occur in the Majuba Power Station area. These two types are:

Calcium-bicarbonate ($Ca\text{-}HCO_3$) water which originates as runoff (Ash moisture, dust suppression, etc.) and enters the groundwater system through Ash Dump area. This is typical of shallow, fresh groundwater's, implicating that it is freshly recharged water; and

Sodium-bicarbonate ($Na\text{-}HCO_3$) waters – this type of groundwater occurs in the deeper aquifer within the fracture rock aquifer in the groundwater found in sandstone and dolerite.

Groundwater monitoring has been occurring on the site since 2010. No change in the physical or chemical quality has been observed for the site currently.