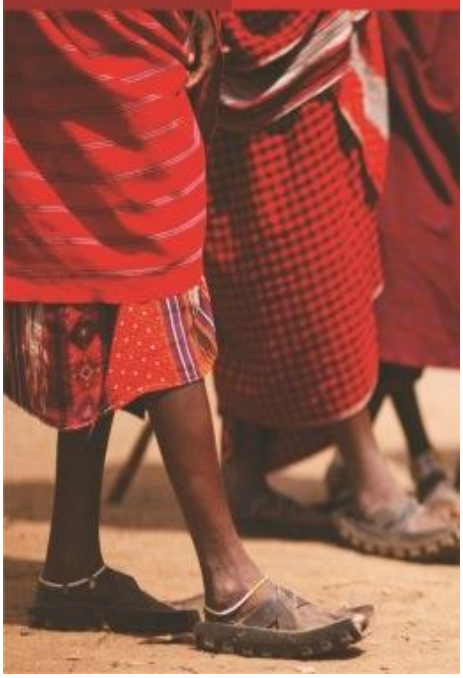

DIGBY WELLS
ENVIRONMENTAL

Weltevreden Environmental Authorisation

Flora & Fauna Assessment

Project Number:

NOR1982

Prepared for:

Northern Coal (Pty) Ltd

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Flora & Fauna Assessment**
Project Name:	**Weltevreden Environmental Authorisation**
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EXECUTIVE SUMMARY

Digby Wells was commissioned by Northern Coal South Africa (Pty) Ltd (Northern Coal) to conduct an update survey for the existing wet and dry season assessment studies that were completed in March 2010 on the farms Weltevreden 381 JT and Zoekop 426 JS.

The aims of this survey were to corroborate the existing information from the basic ecological assessment of the local fauna and flora in the study areas that was undertaken in 2010 and update it accordingly. The objectives are to establish the significance of the impacts of the construction and operation of the proposed opencast mine and associated infrastructure on the fauna and flora. Recommendations have also been made for mitigation actions that may either enhance potential benefits or minimize harmful effects.

Weltevreden 381 JT and Zoekop 426 JS form part of the Northern Coal proposed project area, which is located in Mpumalanga Province, South Africa. The study area falls within the Highlands Local Municipality. According to the Mpumalanga Conservation Plan, done by Mpumalanga Tourism and Parks Agency, this area is listed as a Least Concern with minimal Natural Habitat Remaining (Grassland).

The dry season is typically not ideal for a biodiversity survey as most vegetation is dormant and many animal species are not as active or not even present compared with the wet season. Eighty three plant species have been recorded for the site.

Furthermore, the area also supported many alien invasive plant species, particularly *Cirsium vulgare*, *Bidens pilosa*, *Acacia mearnsii, Eucalyptus camuldulensis* and *Solanum sisymbrifolium*. An eradication and control program should be included with rehabilitation efforts to ensure that the area becomes free of these alien invasive species which will, if uncontrolled, further alter the landscape and convert the grasslands to disturbed savanna. Four plant Species of Special Concern (SSC) were recorded, namely: *Aloe ecklonis* (Grass Aloe); *Boophone disticha* (Tumbleweed); *Eucomis autumnalis* (Pineapple Flower) and *Gladiolus crassifolius.*

Ten mammals were recorded for the site, none of which were Species of Special Concern (SSC). Fifty two birds were recorded on site. No frogs or reptiles (except one lizard) were observed during the dry season field surveys; however, this could be attributed to temperatures that were below zero. These species tend to hibernate during cold spells. Only 3 frog species were recorded during the wet season survey. The various animal species that were observed in the area are adaptable species. By increasing the natural flora diversity during rehabilitation, a natural influx of animals is expected to occur, as smaller animals such as insects move into the area, followed by birds, frogs and reptiles.

In conclusion, the field studies revealed that the area is dominated by alien invasive species. The fact that most of these species were found in the vicinity of the pan, is of biological concern as they tend to compete with indigenous vegetation.

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CARA	Conservation of Agricultural Resources Act
CFR	Cape Floristic Region
CITES	Convention on International Trade in Endangered Species
C-Plan	Conservation Plan
CR	Critically Endangered
DD	Data Deficient
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
EW	Extinct in the Wild
EX	Extinct
Ha	Hectares
IBA	Important Birding Area
IUCN	International Union for the Conservation of Nature
km	Kilometres
km^2	Square kilometres
LC	Least Concern
m	Metres
mm	Millimetres
NE	Not Evaluated
NEMBA	National Environmental Management: Biodiversity Act
No.	Number
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
PRECIS	Pretoria Computerised Information System
QDS	Quarter Degree Square
SABAP1	South African Bird Atlas Project 1
SABAP 2	South African Bird Atlas Project 2
SANBI	South African National Biodiversity Institute
SIBIS	South African Biodiversity Information Facility
SSC	Species of Special Concern
ToR	Terms of Reference

1 Introduction

Biodiversity is defined, according the National Environmental Management Biodiversity Act of 2004 (NEMBA), as “the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems”. The NEMBA legislation upholds the country’s commitment to the protection of South Africa’s biological resources and it is imperative that development takes place in a sustainable way in order to achieve this.

South Africa is the third most biologically diverse country in the world, after Indonesia and Brazil. The country occupies about 2% of the world’s land area, but supports nearly 10% of the world’s plants and 7% of the reptiles, birds and mammals. It also has three globally recognised biodiversity hotspots that fall within its boundaries, namely: the Cape Floristic Region (CFR), the Succulent Karroo and Maputaland-Pondoland (Driver *et al,* 2004).

Loss of biodiversity leads to ecosystem degradation and subsequent loss of important ecological services. This puts aspects of the economy and quality of life at risk, and reduces socio-economic options for future generations. Biodiversity provides an important basis for economic growth and development and it is vital to keep it intact to ensure on-going provision of ecosystem services (Driver *et al.,* 2004). Mining is a driving force that exerts pressure on the natural habitat and biological diversity. This pressure arises from both current and past activities since there is often a time lag between human actions and environmental responses.

Biomes found in South Africa include desert, fynbos, succulent, Karroo, Nama Karroo, grassland, savanna, Albany thicket, forest and wetland vegetation (Low & Rebelo 1996). The Grassland biome has the highest biodiversity in South Africa after the Fynbos biome (Driver *et al*, 2004). Mpumalanga falls under the Grassland Biome. The Grassland Biome is found mainly on the high central plateau of South Africa, and the inland areas of KwaZulu Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Grasslands are dominated by a single layer of grasses and the amount of cover depends on rainfall and the degree of grazing. Trees are absent, except in a few localised habitats and geophytes are often abundant (Low & Rebelo, 1996).

Agricultural and mining activities in the region have led to habitat fragmentation (Johnson, 2001) and therefore any further loss of natural habitat is viewed as detrimental to biodiversity functioning in this particular region. The loss of biodiversity leads to ecosystem degradation (Driver *et al.,* 2004) and therefore, in consideration of this, this study will try to address and identify drivers of biodiversity loss, namely existing Red Data species which might occur within the area. The greatest threat to fauna species within this area is the loss of natural habitat, which is a direct result of agricultural and mining activities. Further habitat loss within Mpumalanga is regarded to be an issue of critical concern, particularly from an avifauna perspective, as bird species in the area are under increasing pressure from existing mining activities.

The objectives of the Fauna and Flora study, which are contained in the Terms of Reference (ToR), will be achieved by conducting a desktop and field investigation of the wetland for both Fauna and Flora, delineating plant communities that are found in the area, and also identifying the Species of Special Concern (SSC) that occur on site.

1.1 Terms of Reference

Digby Wells was commissioned by Northern Coal South Africa (Pty) Ltd (Northern Coal) to update the existing Fauna and Flora studies from March 2010 on the farms Weltevreden 381 JT and Zoekop 426 JS in order to determine the current status of these farms. The studies were done in accordance to the Mpumalanga Parks Board minimum requirements. These assessments was done by combining the information and results from wet and dry season flora and fauna surveys into a comprehensive Fauna and Flora Report.

This specialist report serves to undertake a basic ecological assessment of the local Fauna and Flora communities associated with the study areas. Information generated from this survey has been used to address the impacts that the mining activities will have on this environment. The desktop and field results have been included to interpret the results.

This survey was completed in accordance with:

- Section 21 of the Environment Conservation Act, 1989;
- Section 24 of the Constitution – Environment (Act 108 of 1996);
- Conservation of Agricultural Resources Act (CARA) no 43 of 1983;
- Section 5 of the National Environmental Management Act (Act 108 of 1998); and
- National Environmental Management Biodiversity Act (NEMBA, Act 10 of 2004).

2 Study Area

The study area is situated in the Mpumalanga Province, in the Highlands Local Municipality between the N4 and R33 roads. The site consists of maize fields, stands of *Eucalyptus spp.*, pans and grasslands (Figure 2-1). Evidence of agricultural activities that took place on the site (cattle grazing) is evident. A rocky area is present to the north of the pans. Approximately 219 ha will be mined using open cast methods.

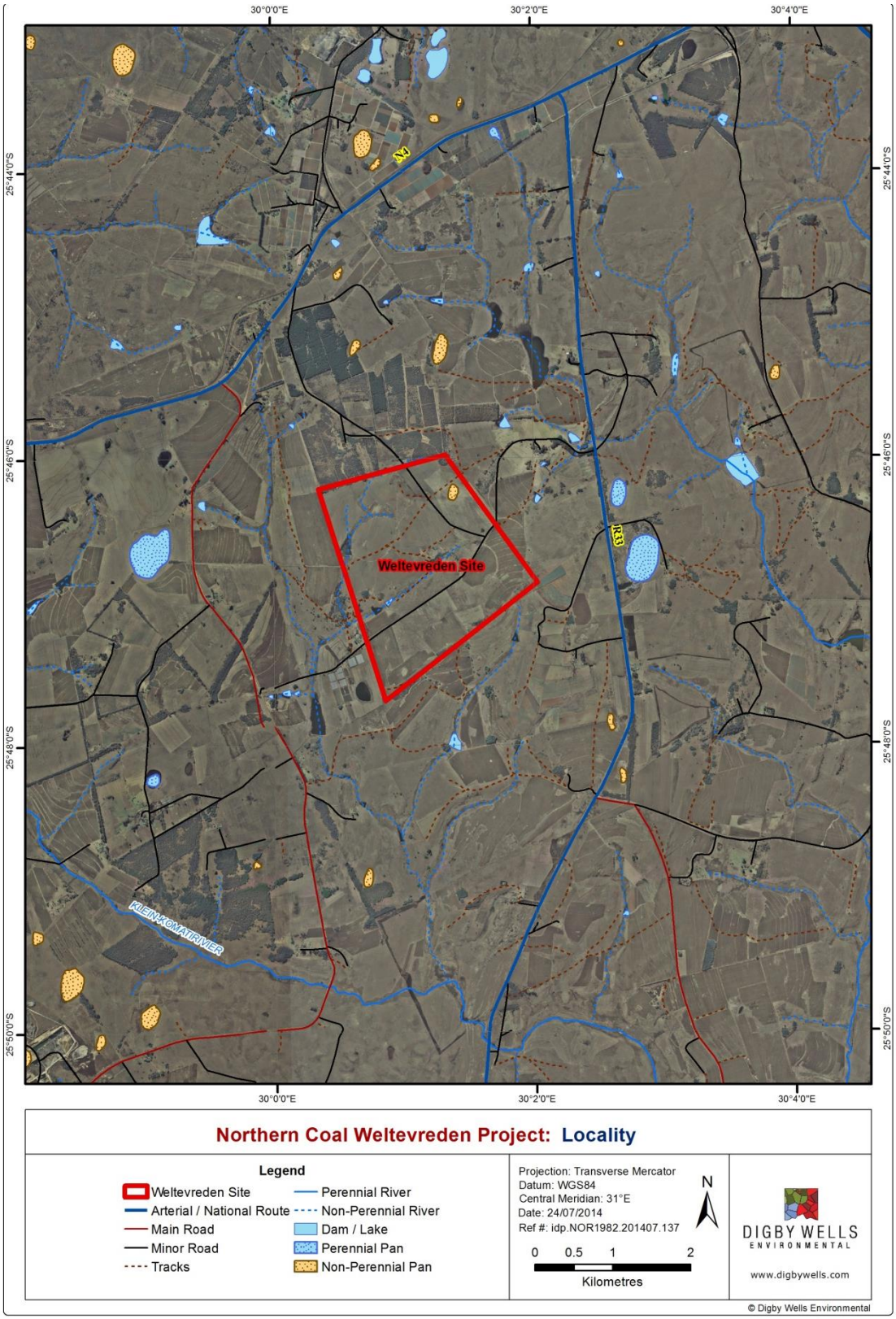

Figure 2-1: Locality

2.1 Regional Vegetation

The study site is located within the Grassland Biome as classified (Rutherford & Westfall 1994), which is found chiefly on the high central plateau of South Africa, the inland regions of KwaZulu-Natal and the Eastern Cape.

The site falls within the Eastern Highveld Grasslands vegetation type (Figure 2-2). The Eastern Highveld Grassland vegetation type, according to Mucina and Rutherford (2006), is situated in slightly to moderately undulating plains, including some low hills and pan depressions. It is made up of short dense grassland dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda* and *Tristachya* spp.) with small, scattered rocky outcrops containing wiry, sour grasses and some woody species (*Acacia caffra, Celtis africana, Diospyros lycioides subsp. lycioides, Parinari capensis, Protea caffra, Protea welwitschii,* and *Searsia magaliesmontanum* spp.). The conservation status of this vegetation type is currently 'Endangered', with 24% of it statutorily conserved. Common and characteristic species are listed in Table 2-1.

Table 2-1: Common and characteristic species of the Eastern Highveld Grassland

Life form	Eastern Highveld Grassland
Graminoids	*Aristida aequiglumis* (d), *Aristida congesta* (d), ***Aristida junciformis*** (d), *Brachiaria serrata* (d), ***Cynodon dactylon*** (d), *Digitaria monodactyla* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), ***Eragrostis curvula*** (d), *Eragrostis plana* (d), *Eragrostis racemosa* (d), *Eragrostis sclerantha* (d), ***Heteropogon contortus*** (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), ***Setaria sphacelata*** (d), ***Sporobolus africanus*** (d), *Sporobolus pectinatus* (d), ***Themeda triandra*** (d), *Trachypogon spicatus* (d), ***Tristachya leucothrix*** (d), *Tristachya rehmannii* (d), *Alloteropsis semialata* subsp.*eckloniana, Andropogon appendiculatus, A. schirensis,* ***Bewsia biflora****, Ctenium concinnum, Diheteropogon amplectens, Eragrostis capensis,* ***E. gummiflua****, E.patentissima, Harpochloa falx, Panicum natalanse, Rendlia altera, Schizachyrium sangiuneum, Setaria nigrirostris, Urelytrum agropyroides.*
Herbs	*Berkheya setifera* (d), ***Haplocarpha scaposa*** (d), *Justicia anagalloides* (d), *Pelargonium luridium* (d), *Acalypha angustata,* ***Aloe ecklonis****, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, Euryops transvaalensis* subsp. *setilobus,* ***Gladiolus crassifolius****, Haemanthus humilis* subsp. *hirsutus,* ***Helichrysum aureonitens****, Helichrysum caespititium, Helichrysum callicomum, Helichrysum oreophilum, Helichrysum rugulosum, Hypoxis rigidula* var. *pilosissima, Ipomoea crassipes, Ledebouria ovatifolia, Pentanisia prunelloides* subsp. *latifolia, Selago denisiflora, Senecio coronatus, Hilliardiella oligocephala, Wahlenbergia undulata.*
Shrubs	*Anthospermum rigidum* subsp. *pumilum,* ***Seriphium plumosum****.*

Key: 'd' denotes dominant species; **Bold** denotes species that were identified during field investigations

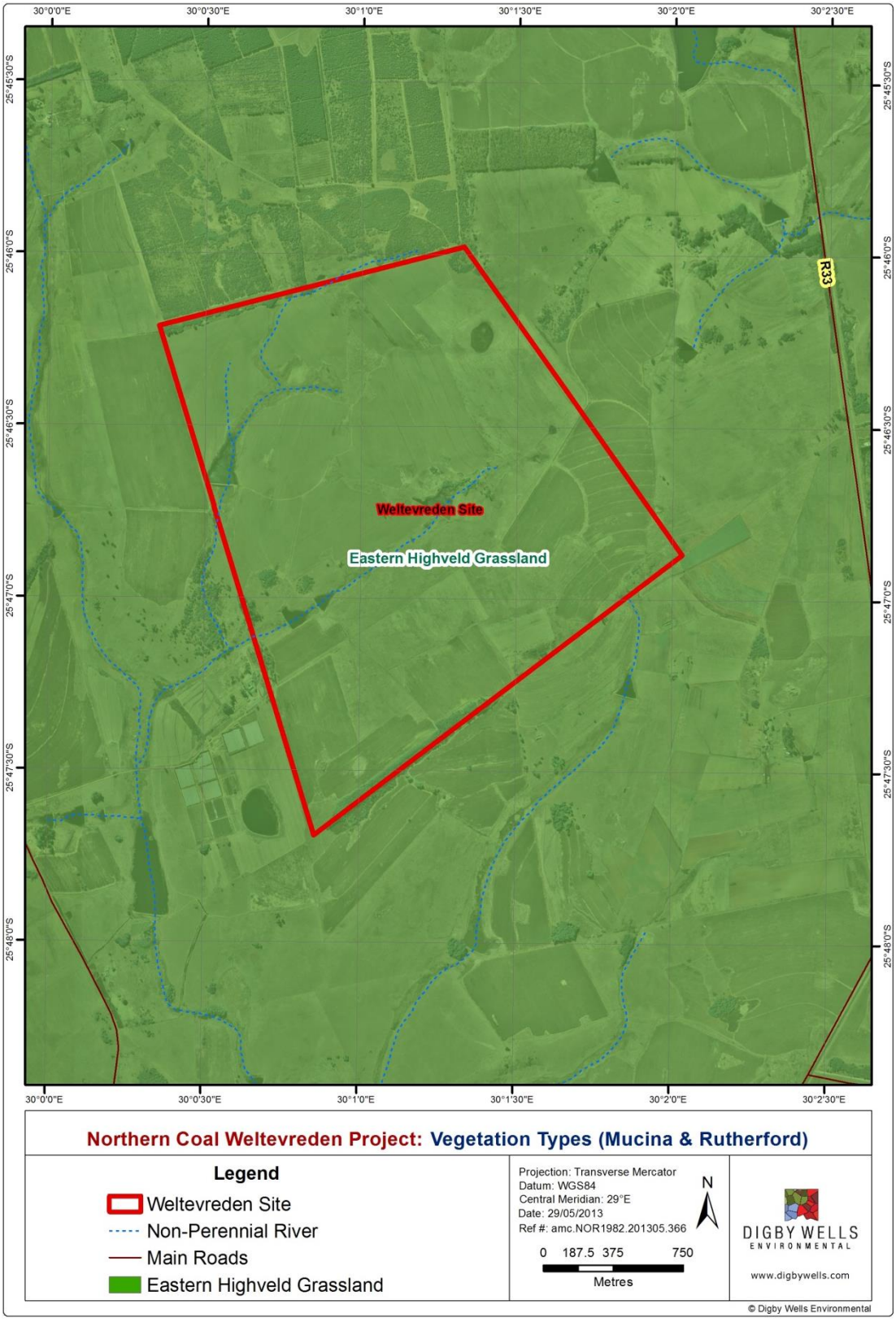

Figure 2-2: Regional Vegetation

3 Methodology

3.1 Fauna

The following lists and databases were consulted in order to complete the fauna desktop assessment, prior to the field visit:

- The SIBIS online interactive species distribution map was used to obtain data for the distribution of mammals, reptiles, amphibians and terrestrial invertebrates within the greater study area. Data was acquired for the Quarter Degree Squares (QDS) in which the study is located;
- The potential occurrence of mammals was supplemented by the species distribution maps in Friedman and Daly (2004);
- Lists of birds found in the Quarter Degree Square (QDS) for the study area were determined using online data from the South African Bird Atlas Project (SABAP 2) for 2012;
- The Convention on International Trade of Endangered Species (CITES) species database;
- The IUCN Red-Data List for South African fauna;
- The International IUCN Red-Data List, and;
- National Environmental Management Biodiversity Act (NEMBA 10 of 2004) listed species.

3.1.1 Avifauna

During the field survey, birds were recorded at several preferred areas, as well as generally throughout and adjacent to the site. In the July 2014 survey, birding was conducted throughout the project area with specific reference to the habitat associated with the opencast pit and mining infrastructure areas, as well as current points of interest on the property such as the farm dams and rocky outcrops. In addition to this points were chosen near avifaunal zones of influence such as areas where bird parties were evident, as well as in areas of less impacted vegetation type as described by the vegetation assessment. Opportunistic sightings were also recorded throughout the mine. It must be noted that the ornithological survey was completed in the dry winter month of July and this is when the southern African bird diversity is at its lowest level due to the summer migrant species not being present.

As per the original avifaunal investigation undertaken in March 2010, the bird distribution data of the Southern African Bird Atlas Project (SABAP1 – Harrison *et al.* 1997) was also obtained for the QDS 2530CC in which the study area is located.

The SABAP1 data was supplemented with SABAP2 data for the relevant pentad where the study area is situated (http://sabap2.adu.org.za, 2009). This data is much more recent, as

SABAP2 was only launched in May 2007, and should therefore be more accurate. For SABAP1, QDS were the geographical sampling units. QDGCs are grid cells that cover 15 minutes of latitude by 15 minutes of longitude (15. × 15.), which correspond to the area shown on a 1:50 000 map. For SABAP2 the sampling unit has been reduced to pentad grid cells (or pentads); these cover 5 minutes of latitude by 5 minutes of longitude (5. × 5.). Each pentad is approximately 8 × 7.6 km. This finer scale has been selected for SABAP2 to obtain more detailed information on the occurrence of species and to give a clearer and better understanding of bird distributions. There are nine pentads in a QDS (Froneman, 2010).

3.1.2 Mammals

Visual sightings and ecological indications were used to identify the mammal inhabitants of the study area; this includes scats, tracks and habitat such as burrows and dens. Scat found was collected (if required), photographed on scale along with any tracks found and identified. Traps were also placed in front of fresh burrows in an attempt to identify smaller animals in the area. For identification purposes a field guides, Mammals of Southern Africa (Smithers, 2000) was used. The following was recorded:

- All mammals encountered and observed during the survey;
- Animals listed in previous studies;
- A list of the most prominent mammal species; and
- A list of threatened or protected species encountered during the survey.

Species of conservation concern and listed by the International Union for the Conservation of Nature (IUCN) or by the South African and Mpumalanga provincial environmental legislation. Although mammals were recorded in areas not specific to the proposed new developments, the ability of mammals to move between areas, means the likelihood of these species occurring in the area of concern is high. Baited Shermann traps were used for small mammal trapping (Figure 3-1).

Figure 3-1: Sherman Traps which were used to identify small mammals within the Weltevreden Study Area

3.1.3 Herpetofauna

The current survey was conducted during the dry winter month of July when the temperatures were at the lowest. Due to the brevity of the survey and the timing (mid-winter), the results of the herpetology survey were minimal. In the previous Digby Wells survey (March 2010) amphibians were sampled by means of active and passive sampling methods. Passive sampling for amphibians involved visual observations as well as audio recordings. Active (non-destructive) sampling methods involved the use of dip-netting, seine netting; pit-fall traps funnel trapping and drift fences, as indicated in Figure 3-2.

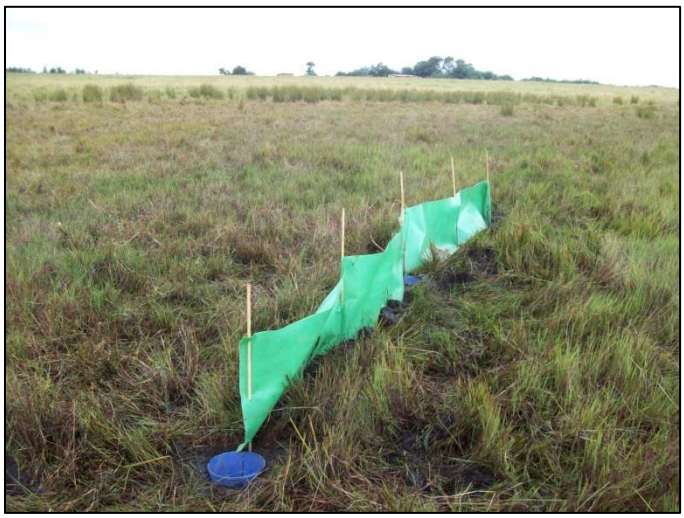

Figure 3-2: Pit-fall traps funnel trapping and drift fences used for amphibians in Weltervreden area. Sampling was predominantly conducted in the pan, wetlands and dams. Amphibian surveys were conducted during the day and night time periods

Signs of reptile activity were noted, such as shed skin, spoor and droppings. Lizard and snake surveys were performed in the late morning and late afternoon, when temperatures are generally conducive to reptile activity and thermoregulation. Data was recorded in a notebook along with the time, date, habitat, weather conditions and a GPS location.

3.1.4 Invertebrates

In the previous Digby Wells survey (March 2010) invertebrates were sampled using a sweep net of 350 mm diameter. At each sample plot 50 sweeps were conducted. Insects were collected from the net using a pooter, placed into a jar filled with 70% ethanol, and were sent to University of Johannesburg (UJ) for identification and species counts. For each sample plot the insects were identified to at least family level and where possible to genus and species level. The number of species within each family was noted as were the number of individuals of each species.

3.1 Flora

For vegetation, broad habitats were defined using aerial imagery for the desktop component. In addition, the following literature and databases were used in order to generate expected species lists and to ascertain the likelihood of the presence of SSC on site:

- PRECIS (PREtoria Computerised Information System). This database provides taxonomic information for plant species occurring in southern Africa and follows the format of Germishuizen and Meyer, 2003. It is updated every two months and is supplied by SANBI. It is accessed on the Plants of Southern Africa (POSA) website;
- SIBIS: SABIF - South African Biodiversity Information Facility established by the Department of Science and Technology (DST) and
- Threatened Species Programme (TSP) listing in collaboration with the National Botanical Institute (NBI)].

For the fieldwork component, where cover was available, the Braun-Blanquet method for cover-abundance was employed. This method makes use of seven cover-abundance categories as listed Table 3-1. Below.

Table 3-1: Braun-Blanquet cover abundance categories

Class	Range of cover (%)
5	75-100
4	50-75
3	25-50
2	5-25
1	1-5
+	<1
r	<<1

3.2 Species of Special Concern

The International Union of Conservation Networks (IUCN) is the international authority for Red Data species. In South Africa, the Threatened Species Programme (TSP) undertakes this role, in collaboration with SANBI. Species of Special Concern (SSC), describes red data, Nationally Protected and Provincially Protected species recorded on site for the purpose of this report. The red data listed flora and fauna species are identified on site were classified according to the following categories:

- Extinct (EX) – No known individuals remaining;
- Extinct in the Wild (EW) – Known only to survive in captivity, or as a naturalized population outside its historic range;

- Critically Endangered (CR) – Extremely high risk of extinction in the wild;
- Endangered (EN) – High risk of extinction in the wild;
- Vulnerable (VU) – High risk of endangerment in the wild;
- Near Threatened (NT) – Likely to become endangered in the near future;
- Least Concern (LC) – Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category;
- Data Deficient (DD) – Not enough data to make an assessment of its risk of extinction and
- Not Evaluated (NE) – Has not yet been evaluated against the criteria.

4 Results

4.1 Fauna

4.1.1 Mammals

Ten (10) mammals have been confirmed to occur within the Weltevreden study area. During the 2010 field survey, undertaken by Digby Wells, three (3) mammals were identified, these were; Common Duiker (*Sylvicapra grimmia),* Rock Dassie (*Procavia capensis)* and Springhare (*Pedetes capensis).* These species are listed in Table 4-1.

During the 2014 survey, undertaken by Digby Wells, evidence of 6 mammal species was found. These species are also listed in Table 4-1. The spoor of various small mammal species was identified as described in

Figure 4-1 below. These findings included common antelope and buck species as well as a number of carnivorous mammals including; African Civet *(Civettictis civetta),* Water Mongoose *(Atilax paludinosus)* and Black-backed Jackal *(Canis mesomelas).* Evidence of Cape Porcupine *(Hystrix africaeaustralis),* Aardvark *(Orycteropus afer)* and a species of Mole Rat *(*Bathyergidae family) was noted.

Table 4-1: Mammals identified within the Weltevreden Study Area, 2010

Family	Species	English name	Threat Status (SA)	Survey Recorded
Bathyergidae	*Unknown*	Mole-rat species	LC	2014
Bovidae	*Sylvicapra grimmia*	Common Duiker	LC	2010
Canidae	*Canis mesomelas*	Black-backed Jackal	LC	2014
Herpestidae	*Ichneumia albicauda*	White-tailed Mongoose	LC	2010
	Atilax paludinosus	Water Mongoose	LC	2014

Family	Species	English name	Threat Status (SA)	Survey Recorded
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC	2014
Orycteropodidae	*Orycteropus afer*	Aardvark	LC	2014
Pedetidae	*Pedetes capensis*	Springhare	LC	2010
Procavidae	*Procavia capensis*	Rock Dassie	LC	2010
Viverridae	*Civettictis civetta*	African Civet	LC	2014

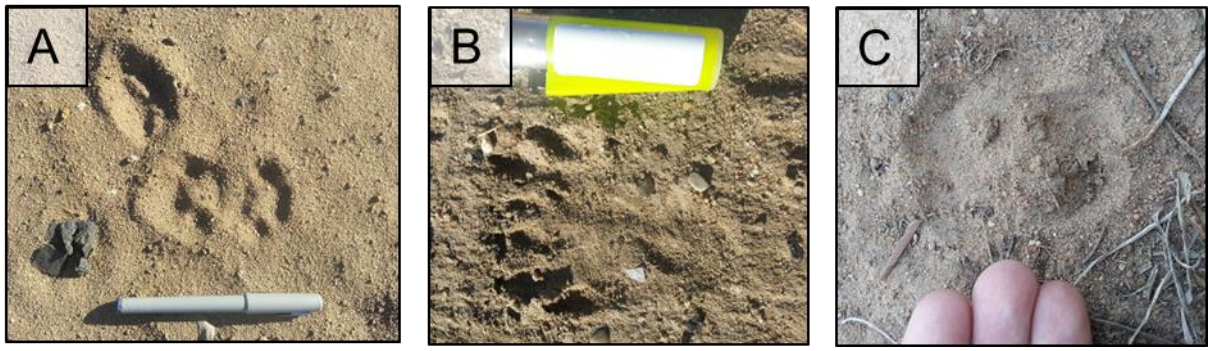

Figure 4-1: The spoor of small carnivorous mammal species identified within the Weltevreden study area (A: African Civet (*Civettictis civetta*), B: Water Mongoose (*Atilax paludinosus*) and Black-backed Jackal (*Canis mesomelas*)

Evidence of Mole Rats *(*Bathyergidae species) in the form of mounds which were densely located near the pans as well as the burrows of Cape Porcupine *(Hystrix africaeaustralis)* and Aardvark *(Orycteropus afer)*, as seen in Figure 4-2 below.

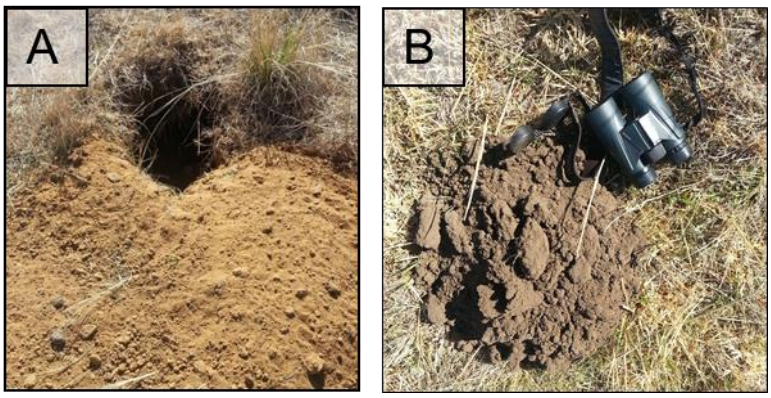

Figure 4-2: Evidence of small mammal activity (A: Aardvark (*Orycteropus afer*) burrow and B: Mole Rat species mound)

4.1.2 Avifauna

In 2010, a total of 15 bird species were identified during the dry season survey and 20 were observed during the wet season survey. Most of these birds were observed in the *Eucalyptus – Pinus* Alien Bushclumps. A total of 6 bird species were observed on Zoekop farm, and most of these birds were found in and around the pan.

In July 2014 a total number of 52 bird species were identified. The site visit was conducted during the mid-winter month of July when South African birdlife reaches one of its lowest densities and species diversities due to the lack of breeding and non-breeding summer migrants (October – March). The habitat of the proposed mining and surrounding area in general includes mesic Highveld grassland dominated by agriculture (sheep grazing and maize production).

During the day of the site visit a number of species were observed; the road infrastructure and entrance areas of the property included species such as Redeyed Dove (*Streptopelia semitorquata*), Laughing Dove (*Spilopelia senegalensis*), Cape Turtle Dove (*Streptopelia capicola*), Common Fiscal (*Lanius collaris*), Cape Sparrow (*Passer melanurus*), Neddicky (*Cisticola fulvicapilla*), Swainsons Spurfowl (Pternistis swainsonii), Helmeted Guineafowl (*Numida meleagris*), Black Shouldered Kite (*Elanus axillaris*) and large numbers of Feral Pigeons (*Columba livia domestica*). Throughout the more natural areas and hillslope seeps of the property a number of suspected Marsh Owl (*Asio capensis*) pellets were also found (the habitat of which is also ideal for African Grass Owl (*Tyto capensis*) (Whittington-Jones *et al.* 2011) which is currently on the red data list as being vulnerable in Southern Africa, with an estimated National population of only about 5000 birds – no signs of this species were observed on Weltevreden). Although not seen on the day of the site visit a number of birds of prey should be present periodically throughout the year and would in all likelihood include endangered summer migrant species such as Pallid and Montagu's Harrier.

The natural grasslands and agricultural fields of the property harbour a number of typical highveld endemics. These included several widow, weaver and bishop species (within the wetter areas). A number of African Quailfinch's (*Ortygospiza fuscocrissa*) were observed within the grasslands – these species generally feed on the seeds of the wetter grass species and are renowned wetland indicators. African Pipit (*Anthus cinnamomeus*) and Cape Longclaw (*Macronyx capensis*) were observed – although there is enough nesting habitat in the surrounding area for the more endangered lark and pipit species it must be noted that any explosives, increased traffic loads and earth movement will negatively impact on the breeding of all lark and pipit species, however this is usually not a permanent impact. The grassland area is also ideal habitat for quail and button-quail species although these species are highly nomadic and were not identified during the site investigation. The altitude and species type of the grassland suggests that the area could be home to some endemic and endangered lark and pipit species such as Rudd's and Botha's Larks. These species were not observed during any of the surveys. The data from the Co-ordinated Road Count project (CAR) of the Avian Demography Unit shows that the wetlands in the Mpumalanga highveld are extensively used by Spurwing Goose (*Plectropterus gambensis)*, Black-headed

Heron *(Ardea melanocephala)* and Grey Crowned Crane *(Balearica regulorum)*. Grey Crowned Cranes and Blue Cranes were recorded in the 2530CC Quarter degree grid cell (Harrison *et al.* 1997) see Figure 4-3 below. It is however very unlikely that they occur in the study area itself.

A number of water birds were identified within the southern farm dam, associated with Hydromorphic Grassland habitat, such as: Sacred Ibis (*Threskiornis aethiopicus)*, Redknobbed Coot *(Fulica cristata)* , Grey Heron (*Ardea cinerea)*, Purple Heron (*Ardea purpurea)*, Egyptian Goose (*Alopochen aegyptiaca*), Cape Shoveler (*Anas smithii*), Spurwinged Goose (*Plectropterus gambensis)*, Yellowbilled Duck (*Anas undulata*), White-faced Duck (*Dendrocygna viduata*), White backed Duck *(Thalassornis leuconotus)*, Cattle Egret (*Bubulcus ibis*) and Three banded Plover *(Charadrius tricollaris)*. These species may at times venture onto the site but due to lack of open water habitat this would not be a common occurrence. During the summer months all areas of standing water within and adjacent to the proposed site could contain a number of wading and water species along with vagrants and due to the close proximity of a larger pan systems in the surrounding vicinity a number of birds will be observed flying from one destination to the other. Appendix E is a complete bird list for the greater area of Weltevreden, although the habitat on the site could not cater for a number of species on this list, it presents an idea of what is and can be found in the vicinity.

It is very likely that any disturbance to the area will impact the birdlife within all habitats of the property. The wetland and grassland areas in the south western corner are regarded as sensitive. It is proposed that should any disturbance occur within the property that the two most sensitive habitats are conserved and managed accordingly. It is also highly recommended that a detailed faunal monitoring system is implemented to assist in the mitigation of disturbance.

Table 4-2: Total list of bird species observed on Weltevreden 2010 and 2014

Common name	Scientific name	Season	IUCN status	Location
Reed Cormorant	*Phalacrocorax africanus*	S/W	LC	Farm dam
Black-headed Heron	*Ardea melanocephala*	S/W	LC	Farm dam
Purple Heron	*Ardea purpurea*	W	UC	Farm dam
Cattle Egret	*Bubulcus ibis*	S/W	LC	Fields
African Spoonbill	*Platalea alba*	S	UC	Lower dam
Sacred Ibis	*Threskiornis aethiopicus*	W	LC	Aerial
Egyptian Goose	*Alopochen aegyptiacus*	S/W	LC	Lower dam
Yellow-billed Duck	*Anas undulata*	S/W	LC	Lower dam
White-backed Duck	*Thalassornis leuconotus*	W	UC	Lower dam

Common name	Scientific name	Season	IUCN status	Location
White-faced Duck	*Dendrocygna viduata*	W	LC	Lower dam
Spur-winged Goose	*Plectropterus gambensis*	S/W	LC	Farm dam
Black-shouldered Kite	*Elanus caeruleus*	S/W	LC	Aerial
Pied Crow	*Corvus albus*	W	LC	Aerial
Helmeted Guineafowl	*Numida meleagris*	S/W	LC	Roads
Red-knobbed Coot	*Fulica cristata*	S/W	LC	Farm dam
Laughing Dove	*Streptopelia senegalensis*	S/W	LC	Agriculture
White-throated Swallow	*Hirundo albigularis*	S	LC	Farm dam
Lesser Striped Swallow	*Hirundo abyssinica*	S	LC	Aerial
Southern Masked-Weaver	*Ploceus velatus*	S	LC	Reedbed
Southern Red Bishop	*Euplectes orix*	S	LC	Reedbed
Yellow-crowned Bishop	*Euplectes afer*	S	LC	Reedbed
Long-tailed Widowbird	*Euplectes progne*	S/W	LC	Grassland
Yellow-billed Egret	*Egretta intermedia*	S/W	LC	Dam
White-faced Duck	*Dendrocygna viduata*	S/W	LC	Farm dam
Red-eyed Dove	*Streptopelia semitorquata*	S/W	LC	Roads
Feral Pigeon	*Columba livia domestica*	S/W	Exotic	Agriculture
Levaillant's Cisticola	*Cisticola tinniens*	W	LC	Reedbed
Fiscal shrike	*Lanius collaris*	S/W	LC	Roads
Cape Wagtail	*Motacilla capensis*	S/W	LC	Dam edge
Cape Sparrow	*Passer melanurus*	W	LC	Roads
Jackal Buzzard	*Buteo rufofuscus*	W	UC	Aerial
Neddicky	*Cisticola fulvicapilla*	W	LC	Rocky outcrop
Crowned Lapwing	*Vanellus coronatus*	W	LC	Agriculture
African Quailfinch	*Ortygospiza fuscocrissa*	W	LC	Aerial (Pan)
Three-banded Plover	*Charadrius tricollaris*	W	LC	Dam edge
Cape Longclaw	*Macronyx capensis*	S/W	LC	Grasslands
Swainsons Spurfowl	*Pternistis swainsonii*	W	LC	Grasslands

Common name	Scientific name	Season	IUCN status	Location
Common Myna	*Acridotheres tristis*	W	Exotic	Settlements
African Pipit	*Anthus cinnamomeus*	W	LC	Grasslands
Yellow-fronted Canary	*Serinus mozambicus*	W	LC	Agriculture
Black-throated Canary	*Crithagra atrogularis*	W	LC	Grasslands/Roadside
White-bellied Sunbird	*Cinnyris talatala*	W	LC	Exotic plantation

4.1.3 Reptiles

A list of reptiles that could potentially occur in the area of interest, based primarily on distribution maps, was sourced according to Branch (2001), these are listed in Appendix C.

The reptile populations in the area are expected to be higher, but since these animals are very sensitive to vibrations and noise, and hide easily in crevices and undergrowth, they are not easily spotted. Only one unidentified lizard was recorded on site.

4.1.4 Amphibians

Of the fifty four amphibians endemic to South Africa, 16 (30%) are found in the Grassland Biome (Passmore and Carruthers, 1995). Of these, eight (8) species (50%) are endemic to the biome. A list of 13 frog species expected to occur within the study area is presented in Appendix D.

3 frog species were identified within the Weltevreden Study Area during the 2010 field survey. No red data frog was recorded during the sampling survey. The species recorded are listed in Table 4-3 below.

Table 4-3: Herpetofauna identified within the Weltevreden Study Area

Family	Species	Common name	Threat Status (South Africa)
Pipidae	*Xenopus laevis*	Common Platana	LC
Ranidae	*Afrana angolensis*	Common River Frog	LC
Ranidae	*Tomoptema cryptotis*	Tremola Sand Frog	LC

4.1.5 Invertebrates

According to the report undertaken in 2010 (Digby Wells, 2010), in consideration of the existing vegetation it is expected that members of the Orthoptera (grasshoppers, locusts and crickets), Hemiptera (bugs, cicadas, and leaf hoppers), Lepidoptera (butterflies and moths), Coleoptera (beetles), Hymenoptera (wasps and ants) and flies (Diptera) (Picker, *et al.*, 2002)

would be present on site. Species within the Chironomidae family had the highest species richness while species within the Reduviidae family had the highest species richness during the wet season.

The invertebrate species collected by Digby Wells during the dry and wet season surveys in 2010 are listed in Appendix F.

4.1.6 Fauna Species of Special Concern

As aforementioned in section 3.2, the TSP undertake the role, in collaboration with SANBI, of assigning red data statuses to fauna and flora in South Africa. The following section describes the faunal SSC recorded and expected for the study area.

4.1.6.1 Mammals

Table 4-4 below indicates the red data mammal species that could be found in the area of interest. The species in bold are species regarded as threatened and if found, measures should be put in place to conserve them and minimise the threats posed to them.

Table 4-4: Red Data mammals that could be found in Weltevreden Study Area

Order	Scientific Name	Common Name	Threat Status
Artiodactyla	*Raphicerus campestris*	Steenbok	LC
	Redunca arundinum	Reedbuck	LC
	Sylvicapra grimmia	Grey /Common Duiker	LC
Carnivora	*Aonyx capensis*	Common Clawless Otter	LC
	Atilax paludinosus	Water Mongoose	LC
	Canis adustus	**Side-striped Jackal**	**NT**
	Canis mesomelas	Black-backed Jackal	LC
	Caracal caracul	Caracal	LC
	Cynictis penicillata	Yellow Mongoose	LC
	Felis nigripes	Black-footed Cat	LC
	Felis silvestris	African Wild Cat	LC
	Galerella sanguinea	Slender Mongoose	LC
	Genetta genetta	Small-spotted Genet	LC
	Genetta tigrina	Large-spotted Genet	LC
	Ictonyx striatus	Striped Polecat	LC
	Leptailurus serval	**Serval**	**NT**
	Suricata suricatta	Suricate	LC

Order	Scientific Name	Common Name	Threat Status
	Vulpes chama	Cape Fox	LC
Insectivora	***Atelerixs frontalis***	**South African Hedgehog**	**NT**
Lagomorpha	*Lepus capensis*	Cape/desert Hare	LC
	Lepus saxatilis	Scrub/Savannah Hare*	LC
Rodentia	*Cryptomys hottentotus*	Common Molerat	LC
	Hystrix africeaustralis	Porcupine	LC
	Otomys angoniensis	Angoni Vlei Rat	LC
	Otomys irroratus	Vlei Rat	LC
	Pedetes capensis	Springhare	LC
	Rhabdomys pumilio	Striped Mouse	LC
	Tatera brantsi	Highveld Gerbil	LC
Tubulidentata	*Orycteropus afer*	Aardvark	LC

4.1.6.2 Avifauna

The Red Data bird species that were recorded by SABAP1 in the relevant QDS is listed in the table below. The squares were quite well surveyed during the SABAP1 period with 75 checklists completed for 2530CC. The total number of SABAP2 checklists that have been completed for 2530CC are 19. It must be noted that no red data species were recorded during the avifaunal surveys in 2010 or 2014. Table 4-5 lists the bird SSC recorded for the QDS in which the study occurs.

Table 4-5: Red Data species recorded in 2530CC by SABAP1 and SABAP2 that could potentially occur on the Weltevreden site *(Froneman, 2010)*

Species	Common Name	Conservation status (Barnes 2000)	Habitat requirements (Barnes 2000; Hockey *et al* 2005; Harrison *et al* 1997; Young *et al* 2003; personal observations)
Geronticus calvus	Southern Bald Ibis	VU	High altitude grassland, also agricultural fields. Often in recently burnt veld. Likely to occur on the study area from time to time when suitable habitat exists either in the grasslands or cultivated fields.
Eupodotis senegalensis	White-bellied Korhaan	VU	Often in the interface between grassland and savanna. Avoids severely grazed and recently burnt sites. Could potentially be present in patches of tall grass.

Species	Common Name	Conservation status (Barnes 2000)	Habitat requirements (Barnes 2000; Hockey *et al* 2005; Harrison *et al* 1997; Young *et al* 2003; personal observations)
Sagittarius serpentarius	Secretary Bird	NT	Prefer open grassland, densities lower in maize growing areas. Occasional presence confirmed by EWT and landowner.
Anthropoides paradiseus	Blue Crane	VU	Short grassland, pastures, stubble lands and wetlands. Unlikely to occur in the study area due to largely unsuitable fragmented habitat, extensive disturbance, and habitat transformation.
Eupodotis caerulescens	Blue Korhaan	NT	Grasslands, pastures and cultivated fields. Could potentially be present on the study site.
Gyps coprotheres	Cape Vulture	VU	Mountainous areas – inselbergs and escarpments; forages over surrounding open country. Unlikely to occur in the study area.
Falco biarmicus	Lanner Falcon	NT	Occurs in a wide range of habitats. Unlikely to occur regularly on the study site but could pass through from time to time.
Vanellus melanopterus	Black-winged Lapwing	NT	Prefers high altitude short or burnt grasslands. Due to the limited amount of suitable habitat on the study site it is unlikely to occur there. Could sporadically appear in the area shortly after veld fires.
Alcedo semitorquata	Half-collared Kingfisher	NT	Requires clear, fast-flowing streams with overhanging vegetation. Unlikely to occur in the study area due to lack of suitable habitat.
Circus ranivorus	African Marsh Harrier	VU	Large permanent wetlands with dense reed beds. Sometimes forages over smaller wetlands and grassland. Wetland habitat present on the study site too small and fragmented to support this species, therefore unlikely to occur.

Species	Common Name	Conservation status (Barnes 2000)	Habitat requirements (Barnes 2000; Hockey *et al* 2005; Harrison *et al* 1997; Young *et al* 2003; personal observations)
Balearica regulorum	Grey Crowned Crane	VU	Breeds in marshes, pans and dam margins with tall emergent vegetation. Feeds in adjacent short to medium height grassland, wetlands and agricultural lands. Unlikely to occur in the study area due to the limited suitable habitat and fragmented nature thereof. It is known to occur in nearby suitable habitat so could potentially move in and out of the area occasionally.
Falco peregrinus	Pererine Falcon	NT	Usually associated with sheer cliffs that are used as breeding and roosting sites. Unlikely to occur in the study area ~ no suitable habitat.
Phoenicopterus minor	Lesser Flamingo	NT	Occurs on shallow eutrophic wetlands, saltpans and sheltered lagoons. Unlikely to occur in the study area ~ no suitable habitat.
Neotis denhami	Denham's Bustard	VU	High rainfall sour grassland at fairly high altitudes. Unlikely to occur in the study area due to the highly fragmented and disturbed nature of the remaining pockets of potentially suitable habitat.
Mycteria ibis	Yellow-billed Stork	NT	Dams, large mashes, swamps, estuaries, margins of lakes and seasonal wetlands. Unlikely to occur in the study area due to limited suitable habitat.
Phoenicopterus ruber	Greater Flamingo	NT	Open shallow eutrophic wetlands. Unlikely to occur in the study area ~ no suitable habitat.
Certhilauda brevirostris	Agulhas Long-billed Lark	NT	Occurs in a wide range of open habitats on hill slopes and plains. In the region it would prefer more alpine "wiry' grasslands. Unlikely to occur in the study area due to lack of suitable habitat.
Falco naumanni	Lesser Kestrel	VU	Grassland and agricultural lands. Could be present in summer (Palearctic migrant).

4.1.6.3 Herpetofauna

According to Branch (2001), two (2) reptile species; the Southern African Python (*Python natalensis*) (NT) and Aurora House Snake (*Lamprophis aurora*) (NT) are SSC and could potentially occur in the area. However, no sufficient habitat is available for Southern African Python in Weltevreden area. Only one lizard was observed on Zoekop farm but could not be identified. No red data reptiles were observed in the area.

No red data listed amphibians were recorded.

4.2 Flora

The POSA database generated 140 expected plant species for the QDS in which the study area occurs, 2530CC. This list is not complete but is used as a guideline to compare the species diversity of the site to that of the greater area (list of expected species is found in Appendix A).

4.2.1 Vegetation Communities

Results from the vegetation survey yielded 83 plant species recorded for the Weltevreden site (for both studies completed for the area), the majority of which, were grasses. The complete species list is represented in Appendix B and includes species recorded for this survey, as well as those recorded during the initial investigation in 2009. The major land use in the study area is agriculture, with153 ha (30.3%) of the site being employed for Maize (*Zea mays*) and Soy Bean (*Glycine max*) farming. Due to the history of poor land management on site, including crop and livestock agriculture, vegetation has undergone significant transformation from its original state. Further to this, alien bushclumps have established (covering an area of 15 ha).

The natural areas were comprised of terrestrial grassland, divided into two main varieties, namely: *Hyparrhenia – Tristachya* Grassland and *Themeda triandra* Rocky Grassland; as well as: Hydromorphic grassland (associated with the main wetland systems on site), *Agrostis lachnantha – Imperata cylindrica* Seeps and *Juncus effusus* Pan / Depression.

The hydromorphic grassland had been infringed upon by agricultural practices and was characterised by stands of *Typha capensis* (Common Bulrush) in the middle of watercourses. Additional wetlands are characterised by small seeps, associated with aquifers, comprised of *Imperata cylindrica* (Cotton Wool Grass) and *Agrostis lachnantha* (African Bent Grass). Mature stands of *I. cylindrica* (above 1.5m) can provide suitable habitat for the vulnerable African Grass Owl (*Tyto capensis*) (Whittington-Jones *et al.* 2011). The *Juncus effusus* Pan / Depression, referred to as ‘Weltevreden Pan’ has been impacted upon by overgrazing and cannalisation.

Table 4-6 lists the broad habitat units identified on site and Figure 4-4 represents their distribution.

Table 4-6: Vegetation Communities

	Habitat	Area (Ha)	% of site	Common and Characteristic Species
Terrestrial Grasslands	*Hyparrhenia – Tristachya* Grassland	177	35	*Berkheya setifera, Hyparrhenia hirta, Tristachya leucothrix, Sopubia cana.*
	Themeda triandra Rocky Grassland	14	2.7	*Gomphocarpus fruticosus, Sporobolus africana, Themeda triandra,*
Wetland Habitat	Hydromorphic Grassland	94	18.6	*Agrostis lachnantha, Cynodon dactylon, Cyperus longus, Juncus effuses, Schoenoplectus corymbosus, Typha capensis*
	Agrostis lachnantha – Imperata cylindrica Seeps	49	9.7	*Agrostis lachnantha and Imperata cylindrica.*
	Juncus effusus Pan / Depression	2.9	0.5	*Cynodon dactylon, Juncus effuses, Schoenoplectus corymbosus,*
Disturbed Areas	Agricultural Areas	153	30.3	*Argemone Mexicana, Zea mays*
	Eucalyptus – Pinus Alien Bushclumps	15	3	*Acacia mearnsii, Eucalyptus camuldulensis, Pinus patula.*
	Total	**504.9**		

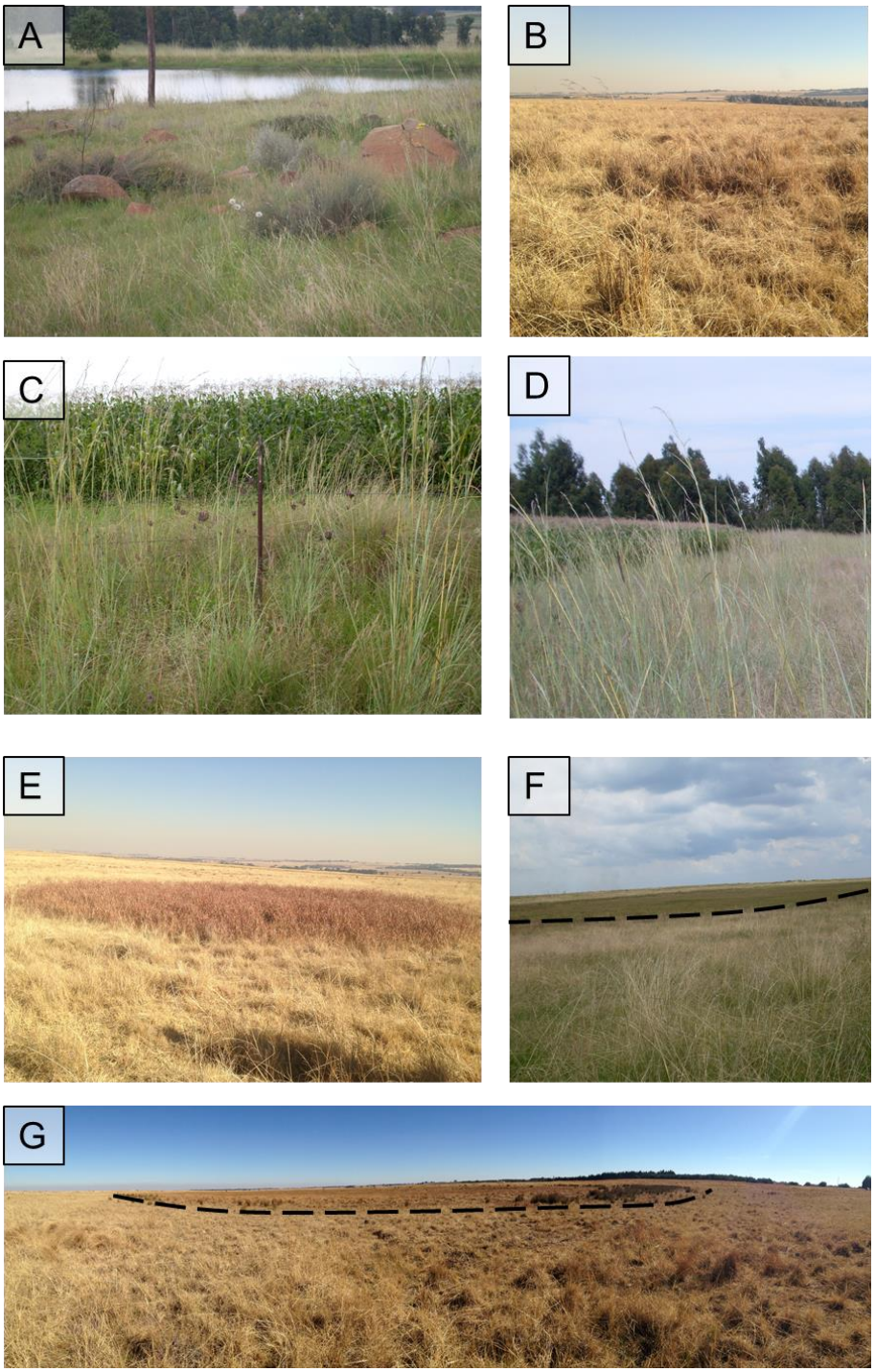

Figure 4-3: Examples of the broad habitats classified for the Weltevreden study area (A: *Themeda triandra* Rocky Grassland[1]; B: *Hyparrhenia – Tristachya* Grassland[2]; C: Agricultural Areas (*Zea mays*)[1] ; D: *Eucalyptus – Pinus* Alien Bushclumps[2]; E: *Agrostis lachnantha – Imperata cylindrica* Seep[2]; F: Hydromorphic Grassland (as indicated above the dotted line in picture) [1]and G: Weltevreden Pan / Depression[2])

Key: 1 denotes photographs captured initial study 2 denotes photographs that were captured during the most recent winter season survey

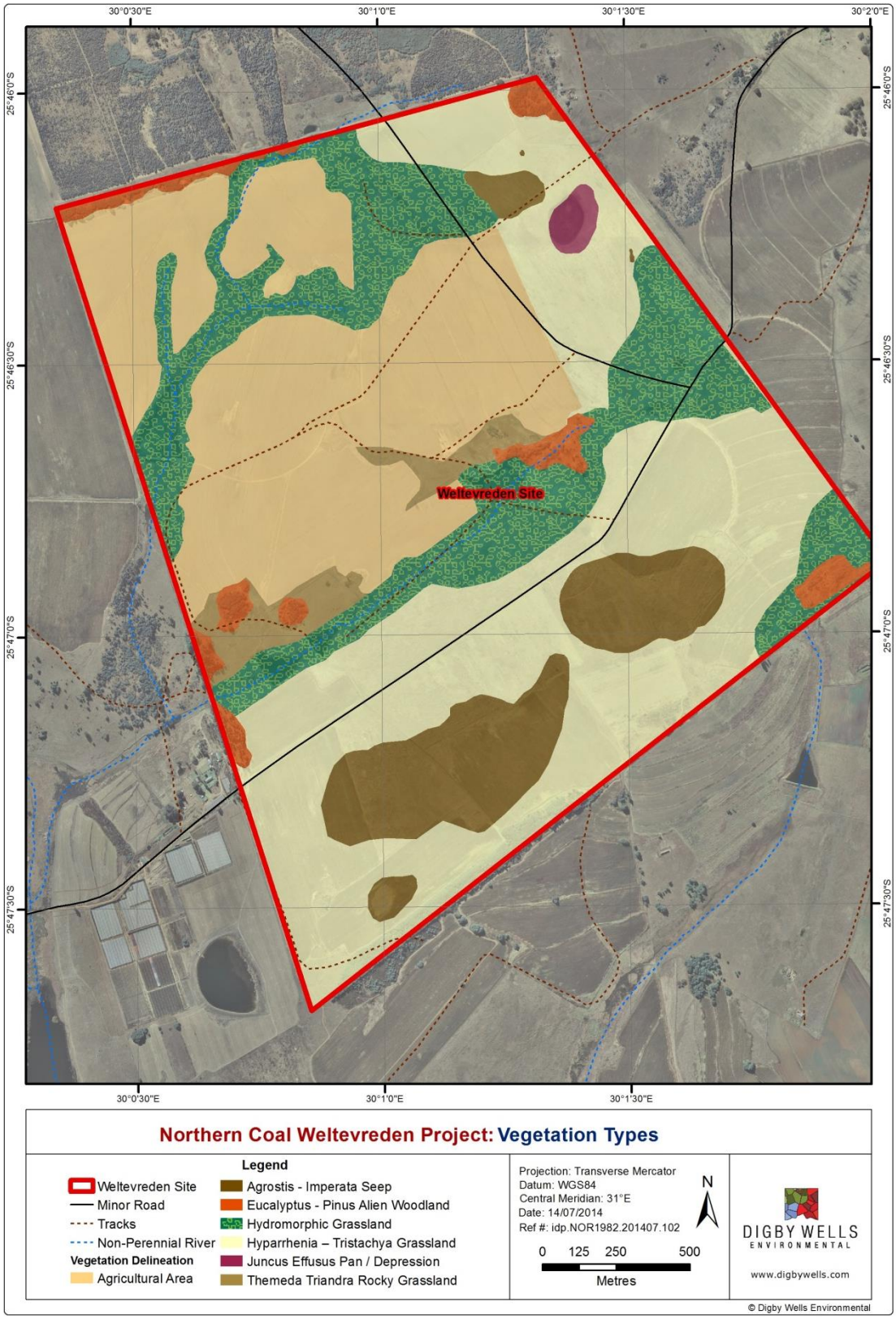

Figure 4-4: Vegetation Units

4.2.2 Flora Species of Special Concern

A POSA database lists a single plant SSC for the study area, *Schizochilus cecilii* (Cecil's Schizochilus). This species is typically found in rocky grassland on **steep ledges**. As no such habitat is recorded for the site, this species is deemed unlikely to occur. Four plant SSC were recorded on site, two 'Declining' species, *Boophone disticha* (Tumbleweed) and *Eucomis autumnalis* (Pineapple Flower); and four species (including *B. disticha and E. autumnalis*) listed as Protected according to Schedule 12 of the Mpumalanga Nature Conservation Act, No. 10 of 1998.

B. disticha has been classified as a red-data species due to over-exploitation as a medicinal plant resource, in Gauteng and Kwazulu-Natal, for use in traditional medicine. This extremely toxic bulb has an extensive range and is found in found in Grassland, Savanna, Nama Karoo, Succulent Karoo, Fynbos and Thicket biomes. Despite this, population numbers are dwindling in South Africa.

Aloe ecklonis (Grass Aloe) is a common grassland aloe (Raimondo *et al.* 2009) and is a hardy, drought-tolerant species. In South Africa, most Aloe species are protected by provincial legislation, with few exceptions. Further to this, all Aloes except *Aloe ferox* haven been CITES (Convention on the International Trade in Endangered Species of Wild Fauna and Flora) Appendices, indicating that there is control of the trade of these species.

CITES

The Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments to control the trade of these species. The primary aim is to ensure that international trade of specimens does not hamper the survival of species.

Eucomis autumnalis (Pineapple Flower) is a highly sought after species in 'muthi' markets in South Africa and as a consequence, population numbers have seen a decline (Raimondo *et al.* 2009). *E. autumnalis* is found in grassland and wetland habitat.

Gladiolus crassifolius is one of the more commonly found members of the genus *Gladiolus* in the Mpumalanga Province. The entire genus is, however, provincially protected.

Table 4-7 lists plant SSC, flowering times are represented in Figure 4-5 and examples are shown in Figure 4-6.

Table 4-7: Plant SSC recorded for the Weltevreden site

Family	Species Name	Common Name	Threat Status	Vegetation Unit
Amaryllidaceae	*Boophone disticha*	Tumbleweed	Declining; Protected	Hydromorphic Grassland
Asphodelaceae	*Aloe ecklonis*	Grass Aloe	Protected	*Themeda triandra* Rocky Grassland
Hyacinthaceae	*Eucomis autumnalis*	Pineapple Flower	Declining; Protected	Hydromorphic Grassland

Family	Species Name	Common Name	Threat Status	Vegetation Unit
Iridaceae	*Gladiolus crassifolius*		Protected	*Hyparrhenia – Tristachya* Grassland

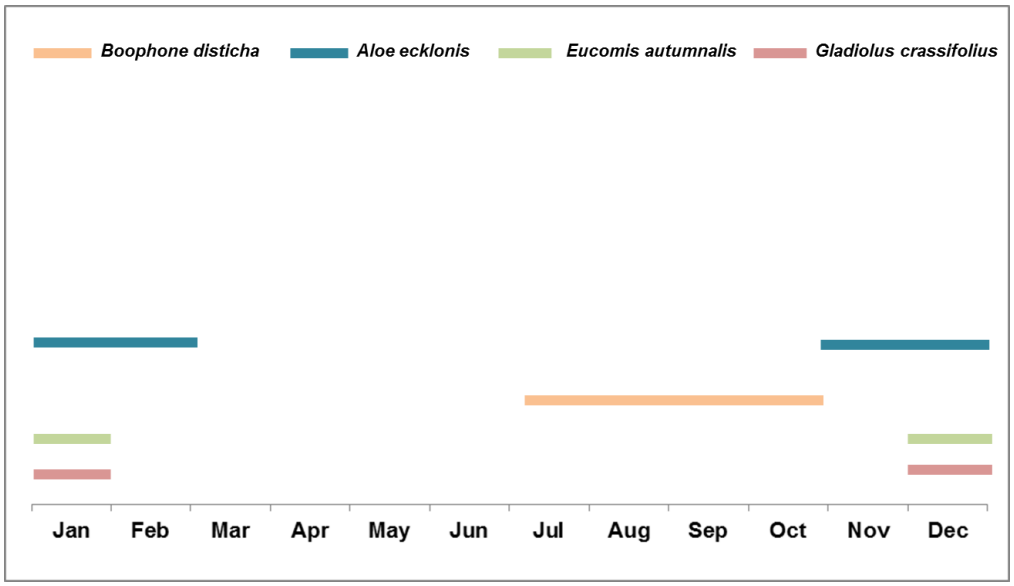

Figure 4-5: Flowering times for SSC recorded on site

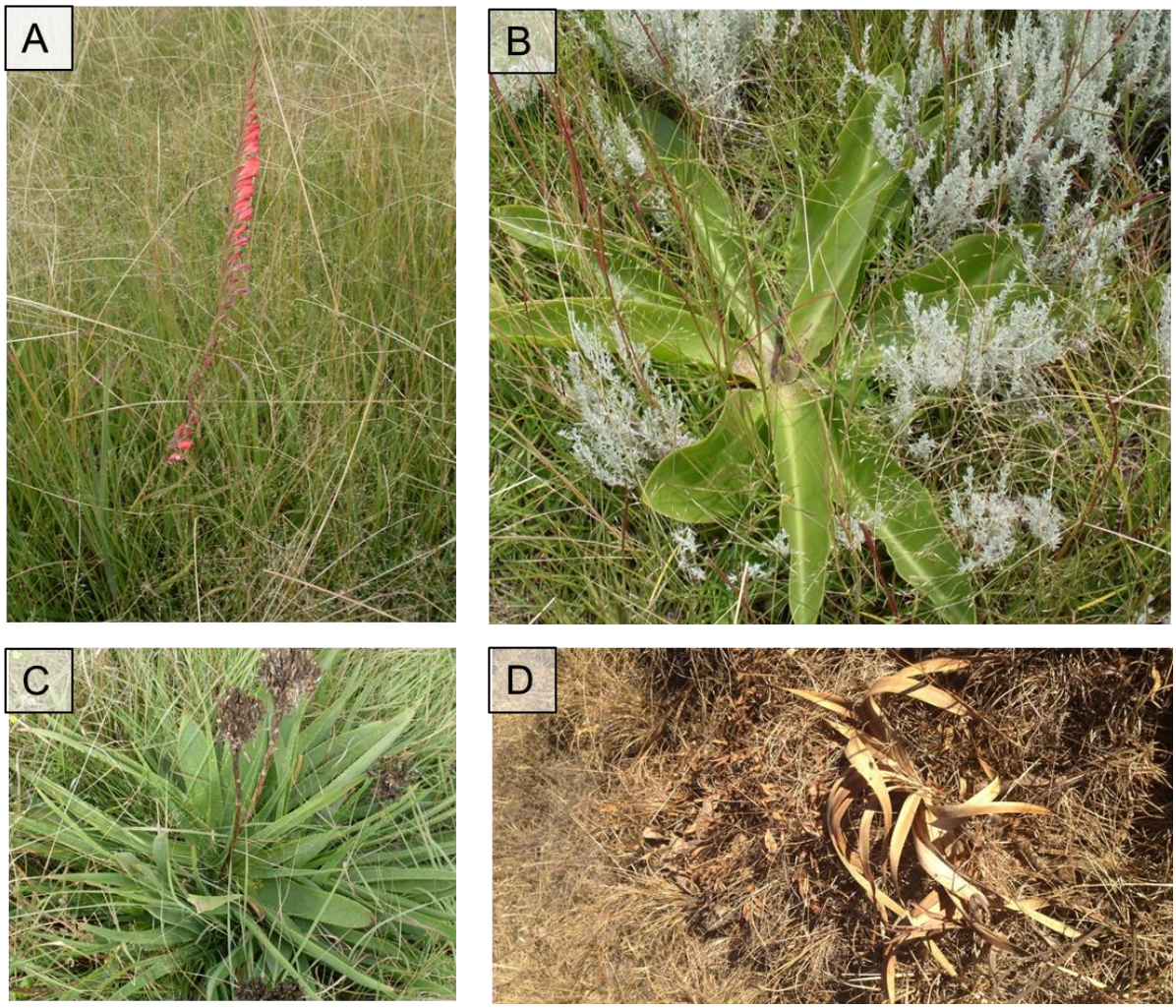

Figure 4-6: Examples of plant SCC recorded on site (A: *Gladiolus dalenii* (African Gladiolus); B: *Eucomis autumnalis* (Pineapple Flower): C: *Aloe ecklonis* (Grass Aloe) and D: *Boophone disticha* (Tumbleweed))

4.2.2.1 Plant Species of Ethnobotanical Use

Ethnobotany is a branch of botany that places focus on the use of plants for medicines and other practical purposes. The use of native plants for ethnobotanical uses can be detrimental to populations that are overexploited.

South Africa has a rich diversity of medicinal plants that not only have a global significance, but also have a cultural and historical role (van Wyk *et al.* 2009). There is a rapidly growing concern for conservation of medicinal plants that are dwindling in number due to illegal harvesting (Institute of Natural Resources 2003). This is particularly apparent in rural areas where medicinal plants are overexploited by traditional doctors.

Plant species of medicinal importance that were recorded on site incude:

***Boophone disticha* (Tumbleweed) - Declining**

Used as a dressing to alleviate pain on septic wounds and boils. Weaker concoctions are administered through the mouth to alleviate pain from headaches, abdominal pain and eye conditions.

***Datura stramonium* (Common Thorn Apple) - Alien**

Used to relieve asthma and reduce pain.

***Gomphocarpus fruticosus* (Milkweed) - LC**

Used to relieve headaches and general aches in body and treat tuberculosis.

***Typha capensis* (Common Bulrush) - LC**

Used to treat conditions of sexual organs/parts and aid during pregnancy for easier delivery. Traditionally used to increase male potency and libido as well increase fertility in women.

4.2.3 Alien Plant Species

Alien species in South Africa are categorised according to the Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983) (CARA) and the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA).

Declared alien and invasive species have been divided according to CARA into three categories:

- Category 1: Declared weeds that are prohibited on any land or water surface in South Africa. These species must be controlled, or eradicated where possible;
- Category 2: Declared invader species that are only allowed in demarcated areas under controlled conditions and prohibited within 30m of the 1:50 year flood line of any watercourse or wetland; and
- Category 3: Declared invader species that may remain, but must be prevented from spreading. No further planting of these species are allowed.

In addition draft NEMBA Regulations (Government Gazette Vol. 526, No. 32090) were issued on the 3rd of April 2009. Although these regulations are yet to be promulgated as law, they are useful and relevant for categorising alien plant species found on site in this study. The draft NEMBA categories for invasive species according to Section 21 are as follows:

- Category 1a: Species requiring compulsory control;
- Category 1b: Invasive species controlled by an invasive species management programme;

- Category 2: Invasive species controlled by area, and;
- Category 3: Invasive species controlled by activity.

Certain species have different alien invasive categories for different provinces in South Africa. Table 4-8 lists the alien plant species recorded on site and Figure 4-7 shows examples. Four category aliens were recorded, including the category 2 (according to CARA) *Eucalyptus camuldulensis* (Red River Gum); which formed tall bushclumps with *Acacia mearnsii* (Black Wattle). *E. camuldulensis* is notorious for invading riparian habitat, out-competing native species and often causing a reduction in water flow. *A. mearnsii* is a seed-dispersing alien that invades grasslands, reducing grazing land area and competing with indigenous species.

Table 4-8: Alien plant species recorded on site

Family	Species	Common Name	Invasive Category (CARA; NEMBA)
Amaranthaceae	*Amaranthus hibridus*	Pigweed	No category
	Gomphrena celosioides	Batchelor's Button	No category
Asteraceae	*Bidens pilosa*	Common Black-jack	No category
	Cirsium vulgare	Scotch Thistle	1; 1b
	Tagetes minuta	Khakibos	No category
Fabaceae	*Acacia mearnsii*	Black Wattle	2; 2
Fabaceae	*Glycine max*	Soy Bean	Crop Species
Myrtaceae	*Eucalyptus camaldulensis*	Red River Gum	2
Papaveraceae	*Argemone mexicana*	Mexican Poppy	1;1b
Pinaceae	*Pinus patula*	Patula Pine	No category
Poaceae	*Pennisetum clandestinum*	Kikuyu grass	No category

Family	Species	Common Name	Invasive Category (CARA; NEMBA)
	Stenotaphrum secundatum	Buffalo-turf Grass	No category
	Zea mays	Maize	Crop Species
Solanaceae	*Datura stramonium*	Common Thorn Apple	1
	Nicandra physalodes	Apple of Peru	No category
Verbenaceae	*Verbena bonariensis*	Tall Verbena	No category
	Verbena officinalis	Common Vervain	No category

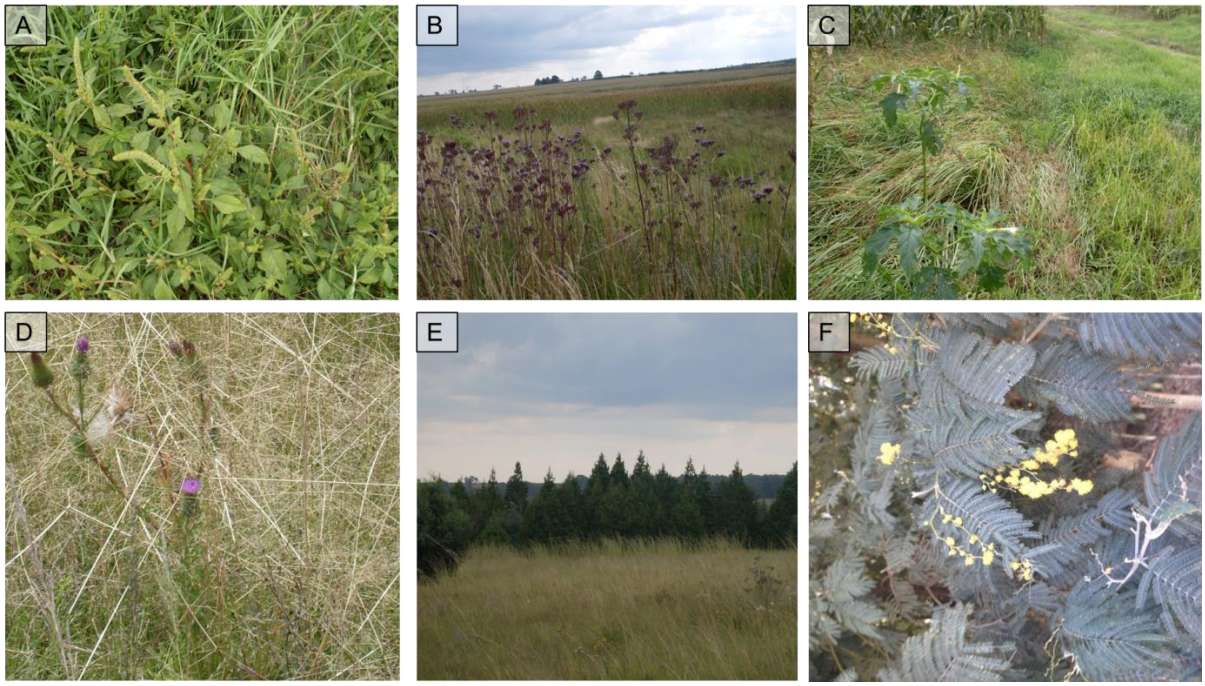

Figure 4-7: Examples of alien plant species recorded on site (A: *Amaranthus hybridus* (Pigweed); *Verbena bonariensis* (Tall Verbena); C: *Datura stramonium* (Common Thorn Apple); D: *Cirsium vulgare* (Scotch Thistle); E: *Pinus patula* (Patula Pine) stand and *Acacia mearnsii* (Black Wattle))

5 Sensitivity Assessment

5.1 Important Bird Areas

An Important Bird Area (IBA) is an area recognised as being globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide, the criteria for the declaration of an IBA is shown in Table 5-1 below. The study area is located within the Steenkampsberg IBA (Figure 5-2). This IBA includes private farms in the Belfast–Dullstroom region and falls predominantly within the Emakhazeni Local Municipality. Mining in the form of open-cast coal mining, and to a lesser extent sand and diamond mining is one of the biggest threats to the area. Other general threats to the area include afforestation of the grasslands with Pine and Blue Gum, wetland degradation, increased acid rain and sulphur emissions from local power stations, and accidental and targeted poisoning of cranes.

Table 5-1: IBA Criteria according to Birdlife International

		Criterion	Notes
A1.	**Globally threatened species**	The site is known or thought regularly to hold significant numbers of a globally threatened species, or other species of global conservation concern.	The site qualifies if it is known, estimated or thought to hold a population of a species categorized by the IUCN Red List as Critically Endangered, Endangered or Vulnerable. In general, the regular presence of a Critical or Endangered species, irrespective of population size, at a site may be sufficient for a site to qualify as an IBA. For Vulnerable species, the presence of more than threshold numbers at a site is necessary to trigger selection. Thresholds are set regionally, often on a species by species basis. The site may also qualify if holds more than threshold numbers of other species of global conservation concern in the Near Threatened, Data Deficient and, formerly, in the no-longer recognized Conservation Dependent categories. Again, thresholds are set regionally.

		Criterion	Notes
A2.	**Restricted-range species**	The site is known or thought to hold a significant component of a group of species whose breeding distributions define an Endemic Bird Area (EBA) or Secondary Area (SA).	**Notes:** This category is for species of Endemic Bird Areas (EBAs). EBAs are defined as places where two or more species of restricted range, i.e. with world distributions of less than 50,000 km2, occur together. More than 70% of such species are also globally threatened. Also included here are species of Secondary Areas. A Secondary Area (SA) supports one or more restricted-range species, but does not qualify as an EBA because less than two species are entirely confined to it. Typical SAs include single restricted-range species which do not overlap in distribution with any other such species, and places where there are widely disjunct records of one or more restricted-range species, which are clearly geographically separate from any of the EBAs.
A3.	**Biome-restricted species**	The site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome.	This category applies to groups of species with largely shared distributions of greater than 50,000 km^2, which occur mostly or wholly within all or part of a particular biome and are, therefore, of global importance. As with EBAs, it is necessary that a network of sites be chosen to protect adequately all species confined to each biome and, as necessary, in each range state in which the biome occurs. The 'significant component' term in the Criterion is intended to avoid selecting sites solely on the presence of one or more biome-restricted species that are common and adaptable within the EBA and, therefore, occur at other chosen sites. Additional sites may, however, be chosen for the presence of one or a few species which would, e.g. for reasons of particular habitat requirements, be otherwise under-represented.

		Criterion	Notes
A4.	**Congregations**	A site may qualify on any one or more of the four criteria listed below). Site known or thought to hold, on a regular basis, ≥ 1% of a biogeographic population of a congregatory waterbird species. ii). Site known or thought to hold, on a regular basis, ≥ 1% of the global population of a congregatory seabird or terrestrial species. iii). Site known or thought to hold, on a regular basis, ≥ 20,000 waterbirds or ≥ 10,000 pairs of seabirds of one or more species. iv). Site known or thought to exceed thresholds set for migratory species at bottleneck sites.	i. This applies to 'waterbird' species as defined by Delaney and Scott (2006) Waterbird Population Estimates, Fourth Edition, Wetlands International, Wageningen, The Netherlands, and is modelled on Criterion 6 of the Ramsar Convention for identifying wetlands of international importance. Depending upon how species are distributed, the 1% thresholds for the biogeographic populations may be taken directly from Delaney & Scott, they may be generated by combining flyway populations within a biogeographic region or, for those for which no quantitative thresholds are given, they are determined regionally or inter-regionally, as appropriate, using the best available information. ii. This includes those seabird species not covered by Delaney and Scott (2002). Quantitative data are taken from a variety of published and unpublished sources. iii. This is modelled on Citerion 5 of the Ramsar Convention for identifying wetlands of international importance. iv. Thresholds are set regionally or inter-regionally, as appropriate.

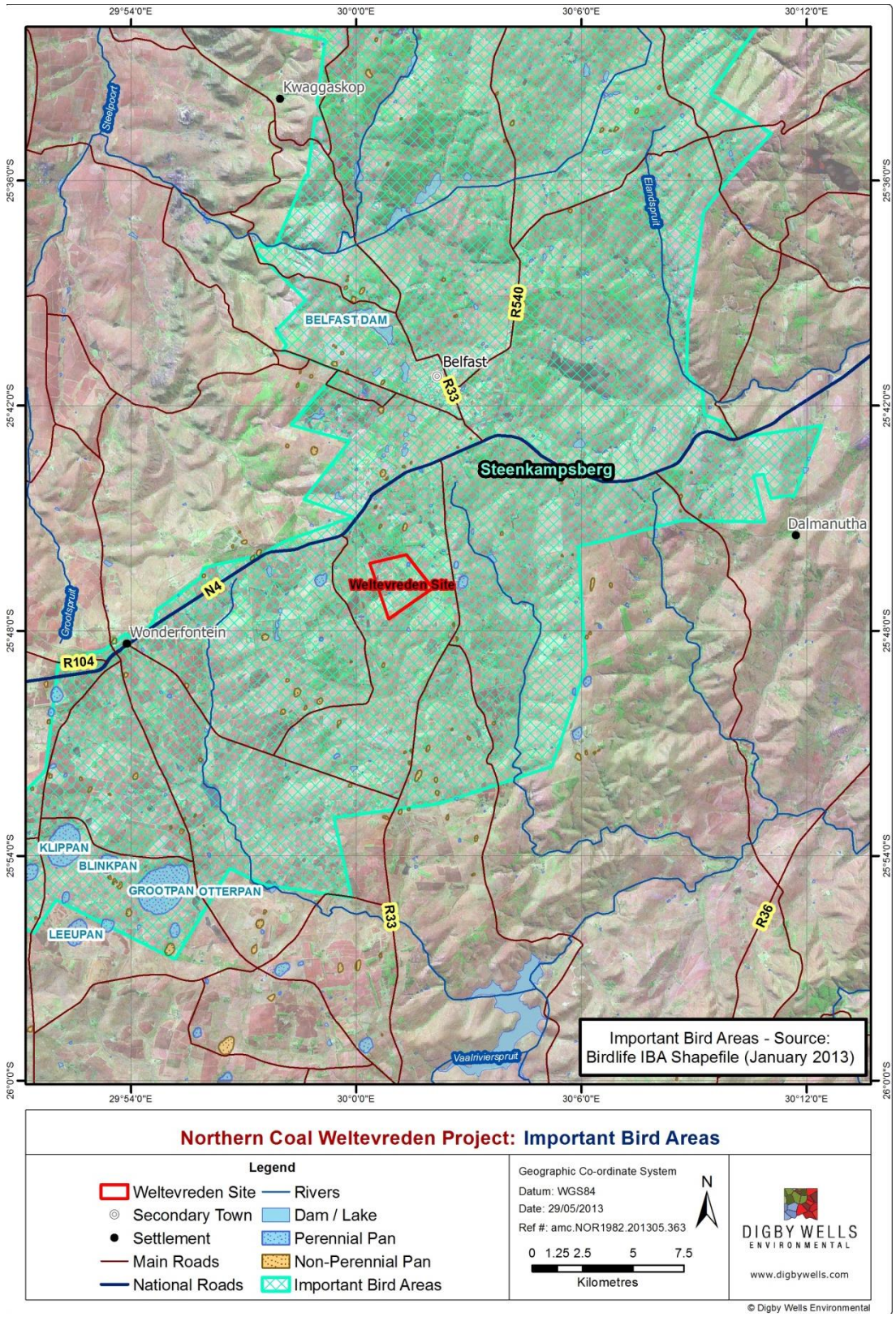

Table 5-2: Important Bird Areas in relation to the study site

5.2 Threatened Ecosystems

The National threatened ecosystems list (National Environmental Management: Biodiversity Act, Act 10 of 2004) was referenced in order to ascertain the level of ecosystem threat of the ecosystems present within the study area. The list of national Threatened Ecosystems has been gazetted (NEMBA: National list of ecosystems that are threatened and in need of protection) and result in several implications in terms of development within these areas. These include areas were delineated based on as fine a scale as possible and are defined by one of several assessments:

- The approach must be explicit and repeatable;
- The approach must be target driven and systematic, especially for threatened ecosystems;
- The approach must follow the same logic as the IUCN approach to listing threatened species, whereby a number of criteria are developed and an ecosystem is listed based on its highest ranking criterion; and
- The identification of ecosystems to be listed must be based on scientifically credible, practical and simple criteria, which must translate into spatially explicit identification of ecosystems.
- The criteria for identifying threatened terrestrial ecosystems include six criteria overall, two of which are dormant due to lack of data (criteria B and E). The criteria are presented in Table 5-3 below.
- The South African Vegetation Map (Mucina and Rutherford 2006);
- National forest types recognised by the Department of Water Affairs and Forestry (DWAF);
- Priority areas identified in a provincial systematic biodiversity plan; and
- High irreplaceability forest patches or clusters identified by DWAF.

The Weltevreden site coincides with the Threatened Ecosystem: Eastern Highveld Grasslands, as indicated in Figure 5-1.

Table 5-3: Criteria for the listing of National Threatened Ecosystems

Criterion	Details
A1	Irreversible loss of natural habitat
A2	Ecosystem degradation and loss of integrity
B	Rate of loss of natural habitat
C	Limited extent and imminent threat
D1	Threatened plant species associations
D2	Threatened animal species associations
E	Fragmentation
F	Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan

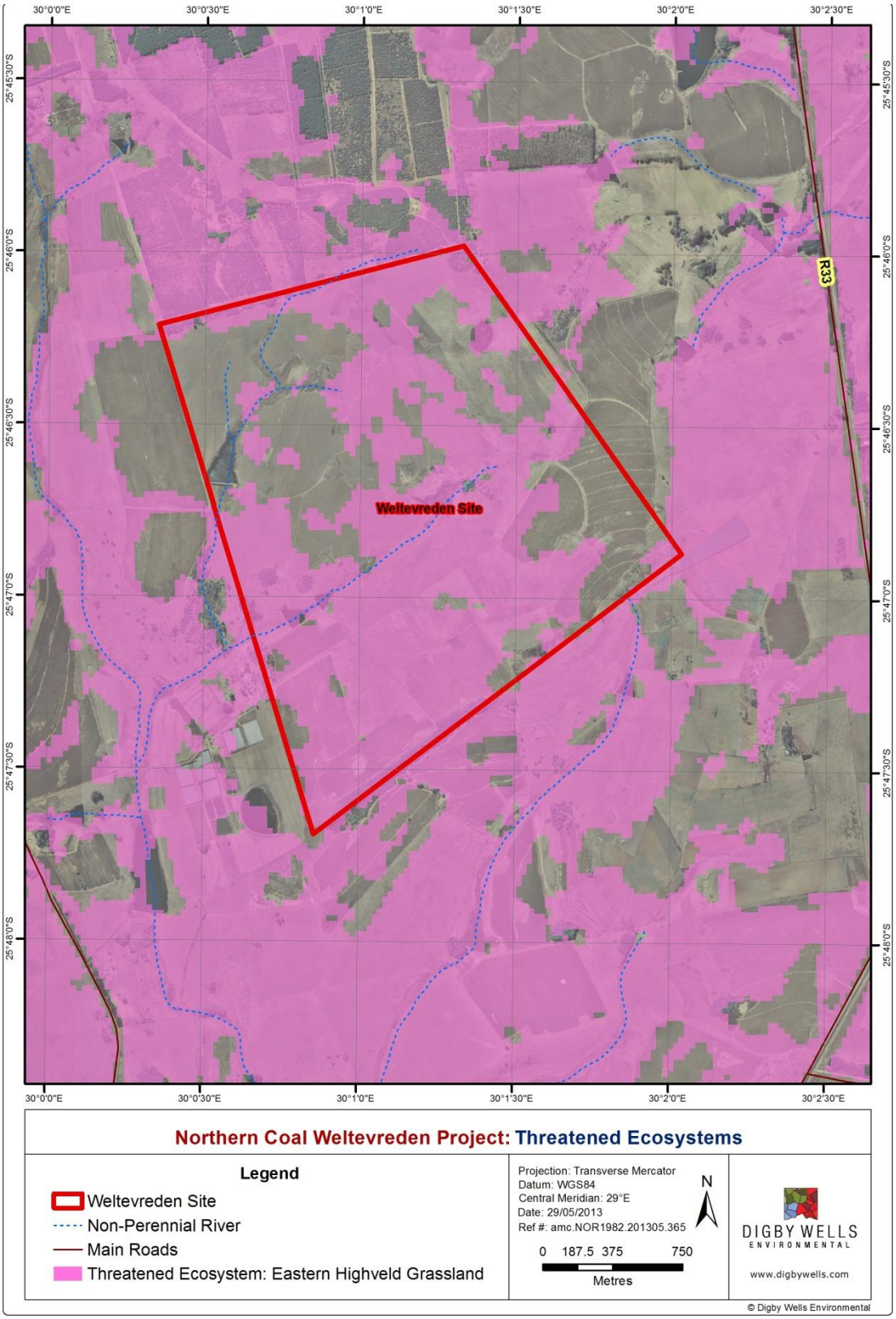

Figure 5-1: Threatened Ecosystems

5.3 Protected Areas

The Weltevreden site does not coincide with any formally Protected Areas (Figure 5-2

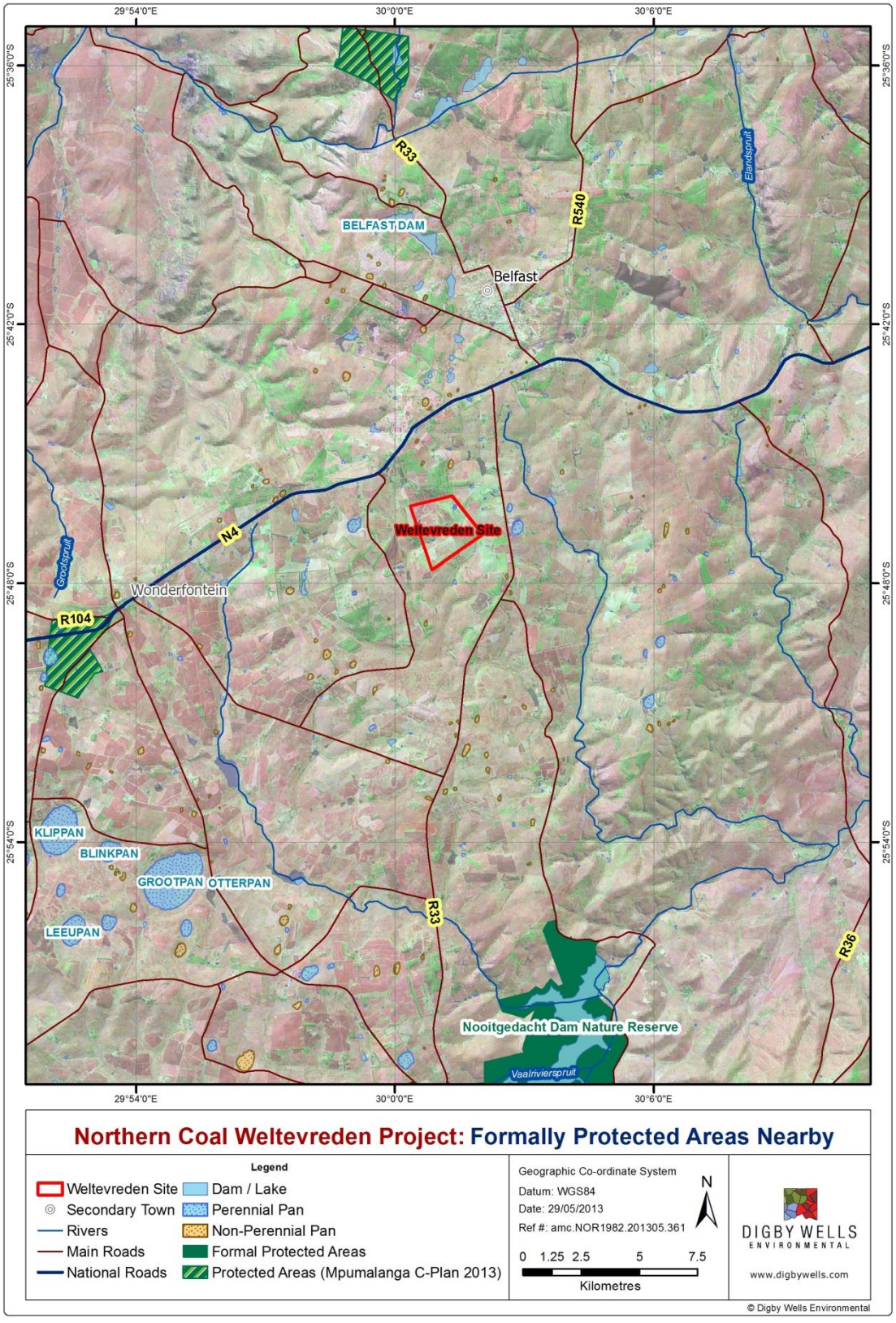

Figure 5-2). The nearest formally Protected Area to the site is the Nooitgedacht Dam Nature Reserve, which provides habitat for a diverse range of fauna, including animal SSC: Oribi (*Ourebia ourebia*) (EN) and Spotted-necked Otter (*Hydrictis maculicollis*). None of these species have been recorded on site and based on habitat present, are unlikely to occur.

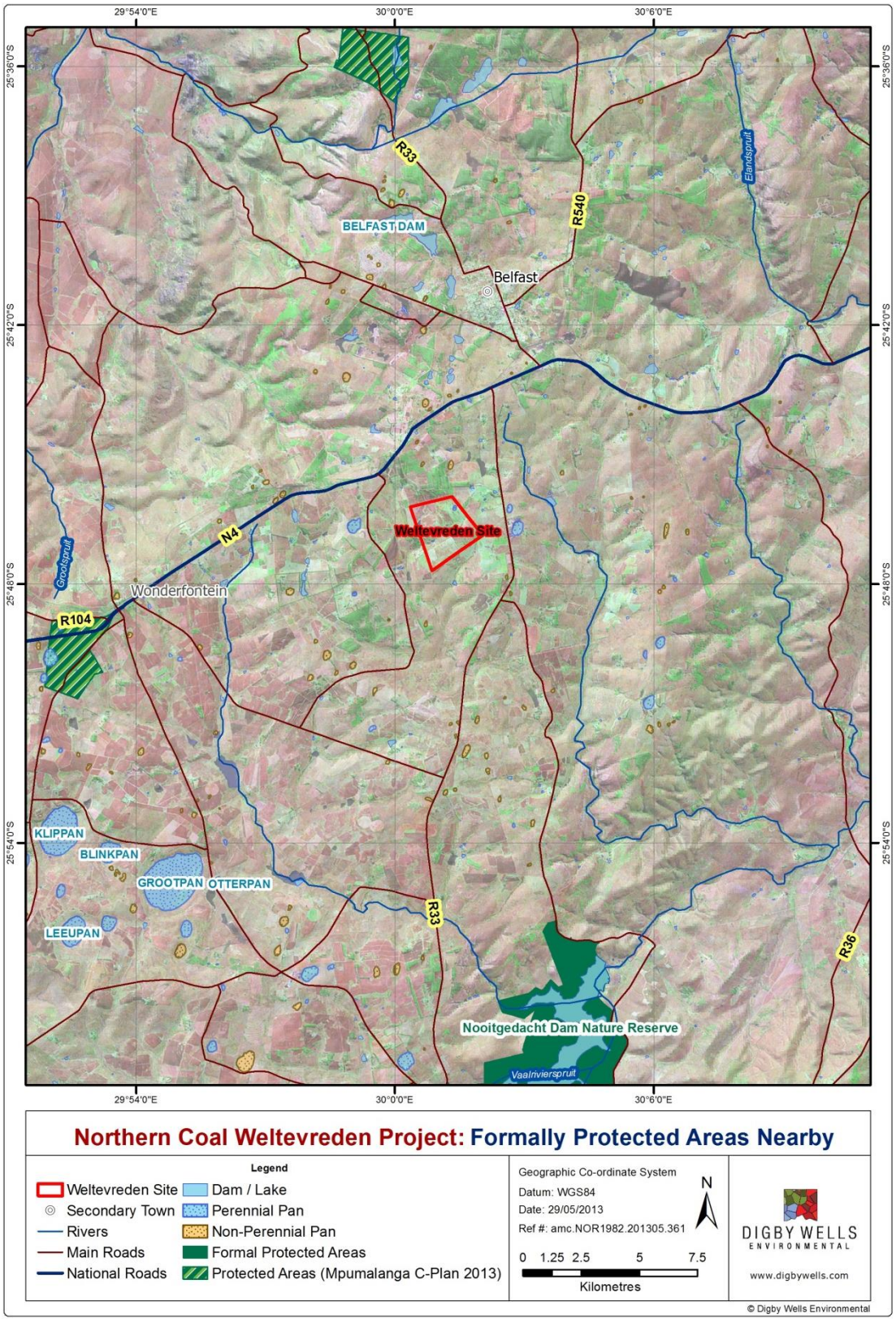

Figure 5-2: Protected Areas

5.4 National Protected Areas Expansion Strategy (NPAES)

The NPAES are areas designated for future incorporation into existing protected areas (both National and Informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning. No areas recognised by the NPAES coincide with the study site, as indicated in Figure 5-3.

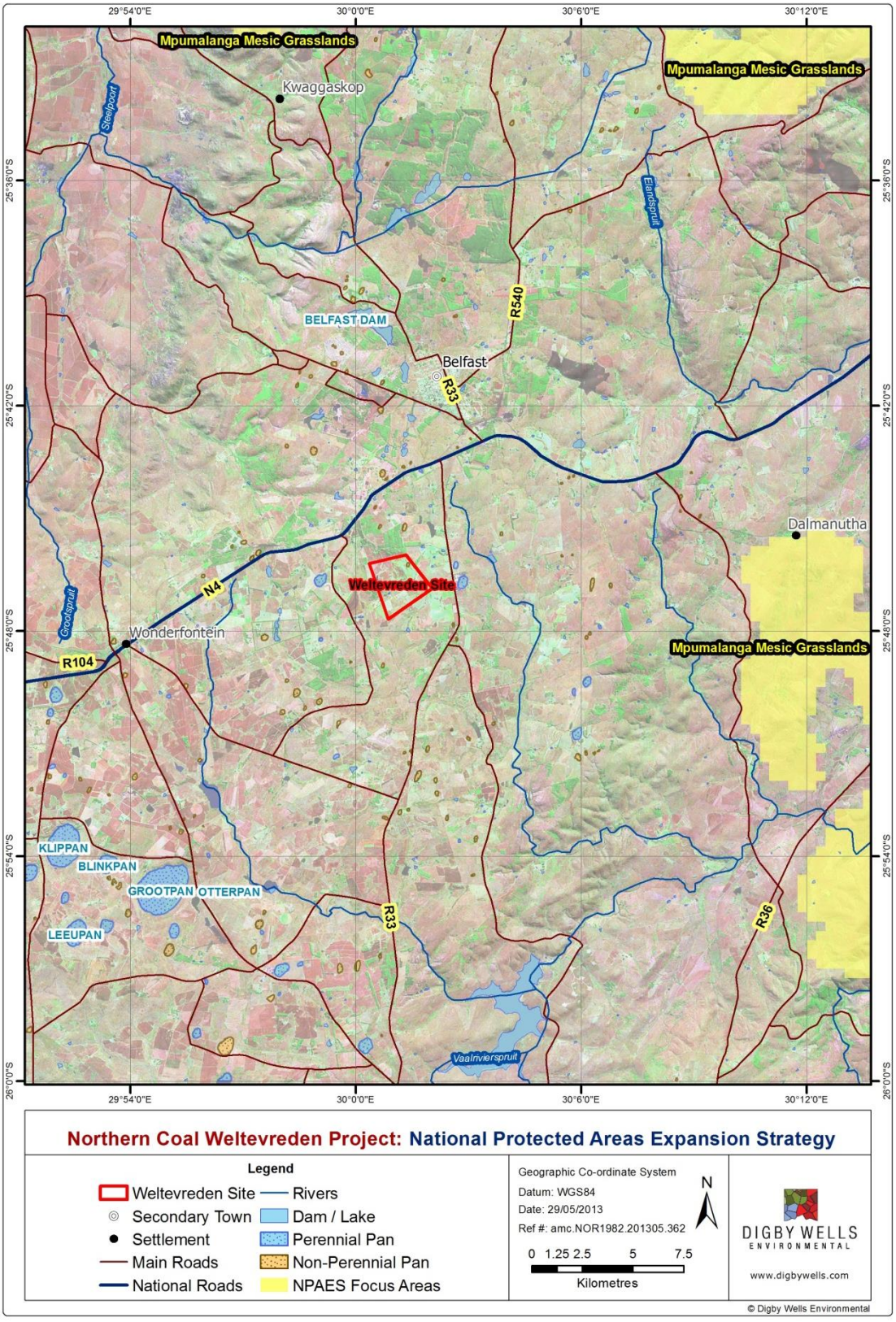

Figure 5-3: NPAES Areas

5.5 Site-Specific Sensitivity

Based on the distribution of fauna and flora SSC on site, as well as the relative ecological significance of habitat units delineated, sensitivity rankings were assigned, as indicated in Figure 5-4 The *Juncus effusus* Pan / Depression (Weltevreden Pan) and Hydromorphic Grasslands were regarded as very sensitive. These habitats fall within wetlands, which are protected according to the National Water Act (No. 10 of 1998) and are regarded as irreplaceable habitats in South Africa. In addition, they provide important habitat for water birds species (as listed in Section 4.1.2), amphibians and plant SSC (as listed in Table 4-7). *Agrostis – Imperata* Seeps were allocated a high sensitivity, owing also to the fact that they are forms of wetlands (associated with a perched aquifer) but also because they may potentially provide habitat for the African Grass Owl (*Tyto capensis*) (Whittington-Jones *et al.* 2011) as referred to in section 4.2.1.

Diversity within the alien bushclumps and agricultural areas is considerably poor and as a consequence these habitats were allocated a low sensitivity.

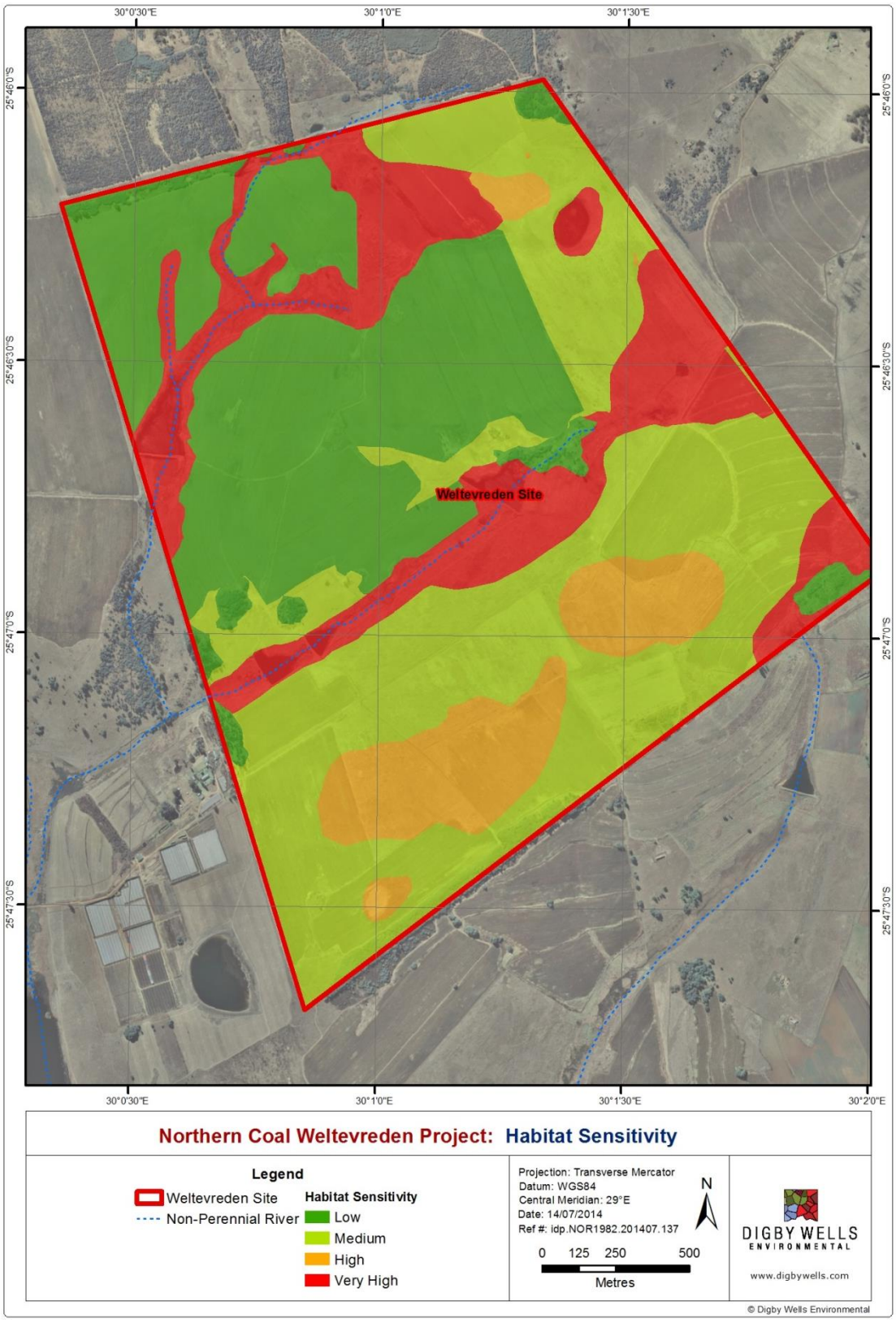

Figure 5-4: Ecological Sensitivity of habitats in the Weltevreden study area

5.6 Mpumalanga C-Plan

The Mpumalanga Biodiversity Conservation Plan (MBCP) is a plan developed conjointly by the Mpumalanga Tourism and Parks Agency (MPTA) and Department of Agriculture and land Administration (DALA) to guide conservation and land-use decisions in the province in order to support sustainable development. The MPTA recognises that wetlands are specialised systems that perform ecological functions that are crucial for human and environmental welfare. The site is not situated within any irreplaceable areas and the majority of the site is regarded as transformed (Figure 5-5).

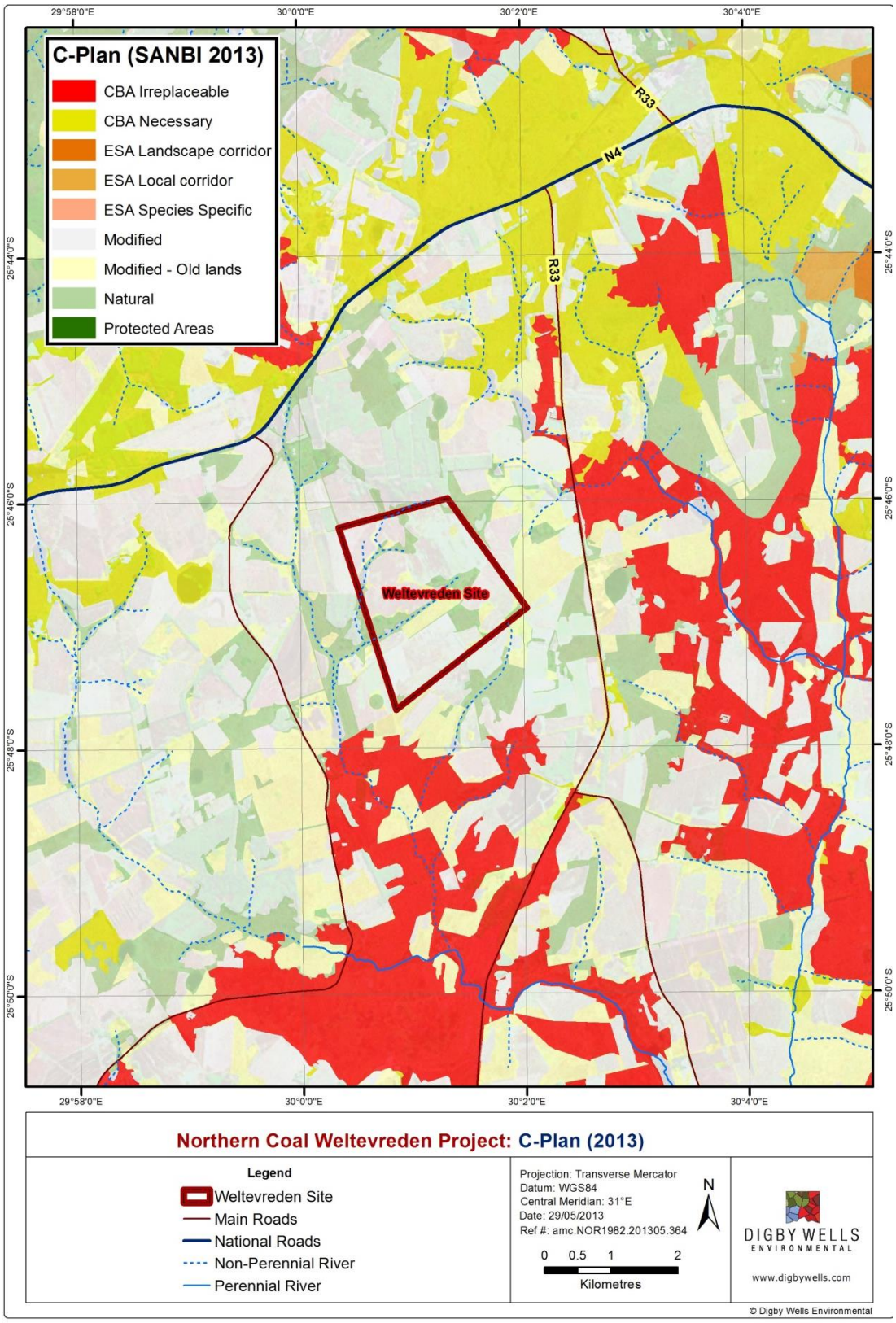

Figure 5-5: Mpumalanga C-Plan

6 Impacts Assessment

The impact assessment describes the potential impacts of the proposed opencast coal mine on the flora and fauna found on site. Figure 6-1 represents the site sensitivity overlaid with proposed mine plan layout. Pit 1 will cover an area of 112.65 ha, Pit 2 an area of 37.86 ha and Pit 3 and area of 27.84 ha. Table 6-1 shows the area of habitat that will be lost due to the opencast pits. Loss of very high and high sensitivity habitat is regarded as highly significant, due to the impact on biodiversity and potential loss of plant and animal SSC.

Table 6-1: Area of habitat anticipated to be lost to the opencast pits

Impacted Habitats	Sensitivity	Area anticipated to be lost (ha)
Hyparrhenia – Tristachya Grassland	Medium	99.16
Themeda triandra Rocky Grassland	Medium	1.34
Hydromorphic Grassland	Very High	33.5
Agrostis lachnantha – Imperata cylindrica Seeps	High	28.14
Agricultural Areas	Low	26
Eucalyptus – Pinus Alien Bushclumps	Low	12.28
Total		**200.42**

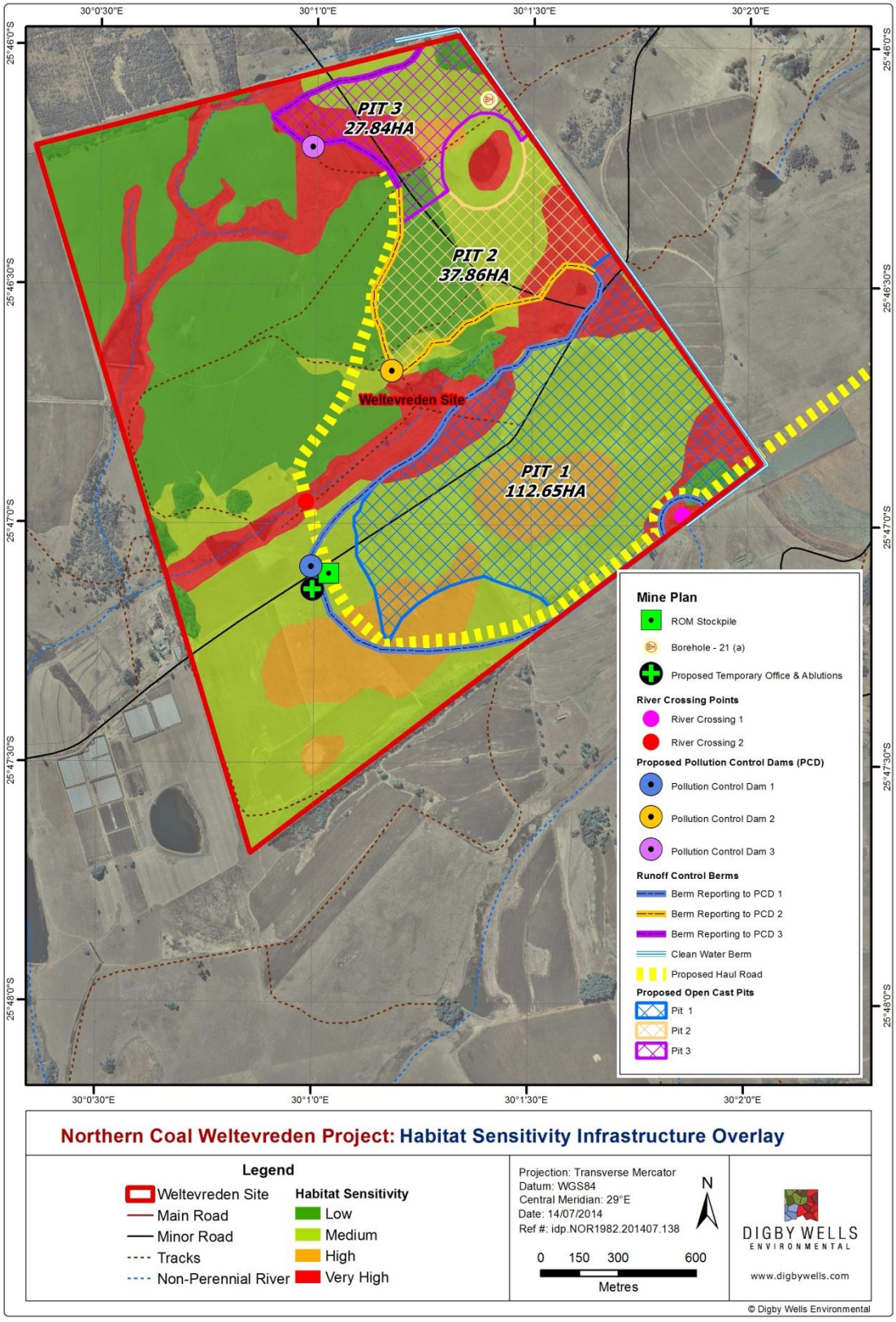

Figure 6-1: Impacts Assessment

6.1 Issue 1: Loss of habitat

Loss of wetland habitat in particular will result in loss of eco-services such as maintenance of biodiversity, nutrient processing and toxicant removal. The Hydromorphic Grassland and *Agrostis lachnantha – Imperata cylindrica* Seep units will be impacted upon. Wetlands are an important habitat for water birds such as: Sacred Ibis (*Threskiornis aethiopicus*), Redknobbed Coot (*Fulica cristata*), Grey Heron (*Ardea cinerea)*, Purple Heron (*Ardea purpurea*), Egyptian Goose, Cape Shoveler (*Anas smithii*), Spurwinged Goose (*Plectropterus gambensis)*, Yellowbilled Duck (*Anas undulata*), White-faced Duck (*Dendrocygna viduata*), White backed Duck *(Thalassornis leuconotus)*, Cattle Egret (*Bubulcus ibis*) and Three banded Plover *(Charadrius tricollaris)*: and the seeps provide potential habitat for the vulnerable species, African Grass Owl (*Tyto capensis*). The *Juncus effusus* Pan / Depression (Weltevreden Pan) has been excluded from the mine plan, which will ensure that impacts to this wetland system are limited. Furthermore, loss of habitat will reduce the area available for fauna and flora SSC.

- Impact 1: Loss of wetland habitat (Hydromorphic Grassland and *Agrostis lachnantha – Imperata cylindrica* Seeps) ;
- Impact 2: Loss of natural terrestrial habitats (*Hyparrenia hirta – Tristachya leucothrix* Grassland and *Themeda triandra* Rocky Grassland) and
- Impact 3: Loss of disturbed areas (Agricultural Areas and *Eucalyptus – Pinus* Alien Bushclumps)

6.1.1 Mitigation measures

There is no mitigation for the loss of habitat. Efforts should be made, however, to reduce the footprint areas as far as possible to decrease the impacts on biodiversity on site. A 100m buffer should be placed around the wetlands associated with the Hydromorphic Grassland, as stipulated by the National Water Act (Act no. 36 of 1998). This is further elaborated on in the Wetlands Assessment for Areas Associated with the Weltevreden Site (Digby Wells, 2014).

Loss of disturbed areas is regarded as negligible to low, as alien plant species, as well as crops, represent poor biodiversity.

Should all efforts to avoid and minimise impacts on natural habitat be avoided, rehabilitation should be aimed at reinstating the natural state of the habitats on site as far as possible. Re-seeding should include the use of mixed-seed sprays, with a diversity of grass species that are native to the area. Wetland areas should be re-seeded with hydromorphic plants species including grasses and sedges. A qualified vegetation specialist should oversee this process.

Issue 1	Loss of habitat				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Impact 1	**Loss of wetland habitat**				
Pre- Mitigation	7	6	6	7	High (108)
Post- Mitigation	2	1	1	3	Low (10)
Impact 2	**Loss of natural terrestrial habitat**				
Pre-Mitigation	4	3	1	7	Medium – Low (32)
Post- Mitigation	No Mitigation				
Impact 3	**Loss of disturbed areas**				
Pre-mitigation	**2**	**1**	**1**	**7**	**Low (20)**
Post-mitigation	No Mitigation				

6.2 Issue 2: Ecosystem Function

Ecosystem function is the measure of the combined functioning of the vegetation and associated species, faunal habitats and wetlands, all of which result in the ecosystem health. The construction of the mining infrastructure and initial pit will affect the ecosystem function in two main ways. The first is the fragmentation of the ecosystem, which will occur with large land surface changes. Fragmentation occurs conjointly with edge-effects, which change the composition of the ecosystem on the edge of structures such as buildings and roads. The consequence of this is a loss of cohesiveness between larger fragments of habitat which limits the exchange of genes and resources across them.

An additional contributor to loss of ecosystem function is the introduction of alien and invasive species. Disturbance to the soil after vegetation clearing results in the establishment of alien species, that may form dense monospecific stands. Anticipated impacts include:

- Impact 3: Fragmentation and edge effects and
- Impact 4: Colonisation by alien vegetation

6.2.1 Mitigation measures

An alien invasive plant management plan should be implemented in order to control alien plant establishment on site. Category listed species should be prioritised for removal and seedlings should be removed before they become mature, seed-bearing individuals. The seed-bank may still remain in the soil for a number of years and the area will have to be monitored regularly for seedlings that may appear. Forbs such as *Cirsium vulgare* (Scotch Thistle) and *Datura stramonium* (Common Thorn Apple) can be removed via foliar application of pesticides. Trees such as *Acacia mearnsii* (Black Wattle), *Eucalyptus*

camuldulensis (Red River Gum) and *Pinus patula* (Patula Pine) can be removed by employing a combination of mechanical and chemical removal measures such as ring-barking and application of a pesticide.

Issue 2	**Loss of Ecosystem Function**				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Impact 3	**Fragmentation and Edge Effects**				
Pre- Mitigation	Minor (2)	Local (3)	Project Life (5)	Likely (5)	Medium - Low
Post- Mitigation	*No Mitigation*				
Impact 4	**Colonisation by Alien Vegetation**				
Pre-Mitigation	Significant (6)	Local (3)	Permanent (6)	Almost Certain (6)	Medium - High (90)
Post- Mitigation	*No Mitigation*				

- Issue 3: Loss of flora SSC

The significance of loss of habitat for fauna and flora SSC is rated for Impact 1. Plant SSC that occur on site are found in habitats that coincide with the proposed pit area.

Issue 2	**Loss of plant SSC**				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Impact 5	**Fragmentation and Edge Effects**				
Pre- Mitigation	Significant (6)	Local (3)	Permanent (6)	Likely (5)	Medium – High (75)
Post- Mitigation	Limited (1)	Limited (1)	Immediate (1)	Unlikely (1)	Low (3)

6.2.2 Mitigation measures

Plant SSC that occur within the proposed infrastructure and opencast pit areas should be conserved and relocated. A permit should be obtained from the provincial authorities in order to remove the plant SSC. The translocation should be advised and managed by a trained botanist and the habitat to which the plants are relocated should be as similar as possible to the donor habitat. Translocations are not always successful and there is a risk that plant species may not survive.

7 Discussion

The Weltevreden study area is situated within the Eastern Highveld Grasslands vegetation type, however much of the natural vegetation on the site has been transformed as a result of agricultural use. The natural grassland has been overgrazed and additionally has been invaded by alien forbs. Alien bushclumps occupy 15 ha of the site and is comprised of. *Acacia mearnsii, Euclyptus camuldulensis* and *Pinus patula.*

Plant and animal diversity was regarded to be low due to a history of disturbance and poor land management 4 plant SSC and no animal SSC were recorded for the site. 7 broad habitats were delineated. The Hydromorphic Grassland and *Juncus effusus* Pan / Depression were regarded as highly sensitive, owing to their national importance as wetlands and also for SSC found within them.

The animal survey revealed a very poor abundance and diversity of fauna in the area. For this reason management of fauna during the operation will be minimal. It is likely that small mammals such as mongoose or hares are living on the site, as there was evidence of dung found. However, should any such animals be disturbed by the activities, the operators will be required to call in qualified people to handle and relocate the animals in question. The same methodology must be applied to bird life. A number of birds were spotted during the site visit but the species were of the common garden variety thereby making it easier for them to relocate naturally to nearby residential areas.

It is unavoidable that birds will get displaced by mining operations, despite the best possible mitigation measures. It is therefore important to direct risk assessments and mitigation efforts towards species that have a high biological significance, in order to achieve maximum results with the available resources at hand. In accordance with this principle, the risk assessment is primarily aimed at assessing the potential threat to red data species. It is important to note though, that any proposed measures aimed at mitigation impacts on red data species will also benefit the non-threatened species.

The proposed opencast pit is anticipated to result in the loss of 200.42 ha of habitat, 33.5 ha of which coincides with very sensitive wetland area. The expected impacts of the proposed project include loss of SSC, loss of important habitat for biodiversity and habitat fragmentation.

8 Conclusion

The following conclusions can be drawn from the 2010 and the 2014 avifaunal investigation:

- The natural habitat in the study area has been subjected to significant impacts, particularly habitat transformation through agricultural activity, grazing pressure in and regular burning of grasslands and wetlands, which has led to high levels of fragmentation and degradation. This makes the regular occurrence of Red Data species such as Blue Crane and Grey Crowned Crane unlikely.

- Undisturbed, relatively pristine grassland and wetland habitat does exist to the south and east of the study area. These areas could support red data avifauna and the cumulative impact of proposed mining operations in the area, would potentially have significant negative consequences for these species. There is however similar and more expansive habitat in the immediate vicinity to the project area for birds to relocate.
- Despite the significant impacts already evident in the study area, potentially medium to higher sensitive areas remain, in which certain red data species could occasionally use for foraging. These sensitive areas are in particular some of the wetland habitat and grassland areas. Red data species that could occur from time include Secretarybird (*Sagittarius serpentarius)*, Southern Bald Ibis (*Geronticus calvus*), White-bellied Korhaan (*Eupodotis senegalensis*), Blue Korhaan (*Eupodotis caerulescens*), Black-winged Lapwing *(m. melanopterus)*, and Grey Crowned Crane (*Balearica regulorum*).

The concentration of evidence of mammal species in the form of spoor, burrows and mounds around the pan leads to the conclusion that this area is a more sensitive habitat than the surrounding area. However, the low numbers of mammals observed during the field survey results in the conclusion that the area is not highly sensitive in terms of habitat.

Reptiles were not found during dry season survey, however this could be due to low temperatures. Frogs were recorded during the wet season survey, and it appears these frog species are closely associated to the habitat in which they breed. Thus the preservation of this pan, which provides viable breeding sites as well as areas for foraging could be very effective in maintaining and protecting frog species. In addition to this some frog species have very specific breeding requirements and thus any impact or alteration to the breeding environment could be significant.

Insects are normally found in abundance after big rains and they stay dormant during colder or winter season (Elzinga 2000). Even though there were no rains and the temperatures were below zero, insects species from the family Reduviidae were abundant.

9 Recommendations

Reference has been made to the flowering times of plant SSC recorded on site. Efforts should be made to avoid the removal of these species and should additional ones occur (that were not found during field investigations) their locations should be recorded. As a last resort, if avoidance of these species cannot be achieved, a qualified botanical specialist should be employed in order to implement a translocation programme. It is important to note that it is illegal to remove plant SSC from their natural habitat without the necessary collecting and transport permits issued by a provincial or other nature conservation authority.

A 100m buffer should be placed around wetland areas that are linked to the greater stream network.

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Appendix A: Regional Plant Species List

Family	Species	Threat status
ACHARIACEAE	*Kiggelaria africana L.*	LC
AMARANTHACEAE	*Amaranthus hybridus L. subsp. hybridus var. hybridus*	Not Evaluated
AMARYLLIDACEAE	*Haemanthus humilis Jacq. subsp. hirsutus (Baker) Snijman*	LC
ANACARDIACEAE	*Searsia tumulicola (S.Moore) Moffett var. meeuseana (R.& A.Fern.) Moffett forma meeuseana*	Not Evaluated
ANTHERICACEAE	*Chlorophytum haygarthii J.M.Wood & M.S.Evans*	LC
APIACEAE	*Alepidea peduncularis A.Rich.*	DDT
APIACEAE	*Pimpinella transvaalensis H.Wolff*	LC
APOCYNACEAE	*Asclepias aurea (Schltr.) Schltr.*	LC
APOCYNACEAE	*Asclepias cucullata (Schltr.) Schltr. subsp. cucullata*	LC
APOCYNACEAE	*Asclepias eminens (Harv.) Schltr.*	LC
APOCYNACEAE	*Asclepias gibba (E.Mey.) Schltr. var. gibba*	LC
APOCYNACEAE	*Aspidoglossum lamellatum (Schltr.) Kupicha*	LC
APOCYNACEAE	*Brachystelma coddii R.A.Dyer*	LC
APOCYNACEAE	*Brachystelma foetidum Schltr.*	LC
APOCYNACEAE	*Brachystelma macropetalum (Schltr.) N.E.Br.*	LC
APOCYNACEAE	*Brachystelma rubellum (E.Mey.) Peckover*	LC
APOCYNACEAE	*Pentarrhinum insipidum E.Mey.*	LC
APOCYNACEAE	*Xysmalobium undulatum (L.) Aiton f. var. undulatum*	LC
ARACEAE	*Zantedeschia albomaculata (Hook.) Baill. subsp. macrocarpa (Engl.) Letty*	LC
ARACEAE	*Zantedeschia rehmannii Engl.*	LC
ASPHODELACEAE	*Kniphofia porphyrantha Baker*	LC
ASPHODELACEAE	*Kniphofia rigidifolia E.A.Bruce*	LC
ASPHODELACEAE	*Trachyandra asperata Kunth var. nataglencoensis (Kuntze) Oberm.*	LC
ASPHODELACEAE	*Trachyandra saltii (Baker) Oberm. var. saltii*	LC
ASPLENIACEAE	*Asplenium rutifolium (P.J.Bergius) Kunze*	LC
ASTERACEAE	*Brachylaena transvaalensis E.Phillips & Schweick.*	LC
ASTERACEAE	*Cineraria geraniifolia DC.*	LC
ASTERACEAE	*Euryops laxus (Harv.) Burtt Davy*	LC

Family	Species	Threat status
ASTERACEAE	*Euryops pedunculatus N.E.Br.*	LC
ASTERACEAE	*Euryops transvaalensis Klatt subsp. transvaalensis*	LC
ASTERACEAE	*Felicia filifolia (Vent.) Burtt Davy subsp. filifolia*	LC
ASTERACEAE	*Gerbera ambigua (Cass.) Sch.Bip.*	LC
ASTERACEAE	*Gerbera galpinii Klatt*	LC
ASTERACEAE	*Helichrysum acutatum DC.*	LC
ASTERACEAE	*Helichrysum argyrolepis MacOwan*	LC
ASTERACEAE	*Helichrysum obductum Bolus*	LC
ASTERACEAE	*Helichrysum reflexum N.E.Br.*	LC
ASTERACEAE	*Helichrysum spiralepis Hilliard & B.L.Burtt*	LC
ASTERACEAE	*Helichrysum subglomeratum Less.*	LC
ASTERACEAE	*Helichrysum truncatum Burtt Davy*	LC
ASTERACEAE	*Hypochaeris radicata L.*	Not Evaluated
ASTERACEAE	*Senecio madagascariensis Poir.*	LC
ASTERACEAE	*Vernonia galpinii Klatt*	LC
BRYACEAE	*Bryum andicola Hook.*	
BRYACEAE	*Bryum argenteum Hedw.*	
CAMPANULACEAE	*Wahlenbergia epacridea Sond.*	LC
CONVOLVULACEAE	*Ipomoea oblongata E.Mey. ex Choisy*	LC
CONVOLVULACEAE	*Ipomoea transvaalensis A.Meeuse*	LC
CRASSULACEAE	*Crassula setulosa Harv. var. rubra (N.E.Br.) G.D.Rowley*	LC
CRASSULACEAE	*Crassula vaginata Eckl. & Zeyh. subsp. vaginata*	LC
CUCURBITACEAE	*Cucumis hirsutus Sond.*	LC
CYPERACEAE	*Cyperus esculentus L. var. esculentus*	LC
CYPERACEAE	*Pycreus rehmannianus C.B.Clarke*	LC
DICRANACEAE	*Campylopus flaccidus Renauld & Cardot*	
ERICACEAE	*Erica caffrorum Bolus var. caffrorum*	LC
ERIOCAULACEAE	*Eriocaulon africanum Hochst.*	LC
FABACEAE	*Argyrolobium transvaalense Schinz*	LC
FABACEAE	*Chamaecrista mimosoides (L.) Greene*	LC

Family	Species	Threat status
FABACEAE	*Crotalaria recta Steud. ex A.Rich.*	LC
FABACEAE	*Eriosema cordatum E.Mey.*	LC
FABACEAE	*Erythrina zeyheri Harv.*	LC
FABACEAE	*Melolobium wilmsii Harms*	LC
FABACEAE	*Microcharis galpinii N.E.Br.*	LC
FABACEAE	*Neonotonia wightii (Wight. ex Arn.) J.A.Lackey*	LC
FABACEAE	*Rhynchosia caribaea (Jacq.) DC.*	LC
FABACEAE	*Rhynchosia totta (Thunb.) DC. var. totta*	LC
FABACEAE	*Stylosanthes fruticosa (Retz.) Alston*	LC
FABACEAE	*Tephrosia longipes Meisn. subsp. longipes var. longipes*	LC
FABACEAE	*Teramnus labialis (L.f.) Spreng. subsp. labialis*	LC
FABACEAE	*Vigna vexillata (L.) A.Rich. var. vexillata*	LC
FABACEAE	*Zornia capensis Pers. subsp. capensis*	LC
FABACEAE	*Zornia milneana Mohlenbr.*	LC
FISSIDENTACEAE	*Fissidens ovatus Brid.*	
FUNARIACEAE	*Funaria hygrometrica Hedw.*	
GERANIACEAE	*Monsonia angustifolia E.Mey. ex A.Rich.*	LC
GERANIACEAE	*Monsonia attenuata Harv.*	LC
HYACINTHACEAE	*Dipcadi brevifolium (Thunb.) Fourc.*	LC
HYACINTHACEAE	*Ledebouria cooperi (Hook.f.) Jessop*	LC
HYACINTHACEAE	*Ledebouria revoluta (L.f.) Jessop*	LC
HYACINTHACEAE	*Ornithogalum flexuosum (Thunb.) U.& D.Müll.-Doblies*	LC
HYPERICACEAE	*Hypericum lalandii Choisy*	LC
HYPERICACEAE	*Hypericum revolutum Vahl subsp. revolutum*	LC
IRIDACEAE	*Freesia laxa (Thunb.) Goldblatt & J.C.Manning subsp. laxa*	LC
JUNCACEAE	*Juncus dregeanus Kunth subsp. dregeanus*	LC
JUNCACEAE	*Juncus oxycarpus E.Mey. ex Kunth*	LC
LAMIACEAE	*Aeollanthus rehmannii Gürke*	LC
LAMIACEAE	*Endostemon obtusifolius (E.Mey. ex Benth.) N.E.Br.*	LC

Family	Species	Threat status
LAMIACEAE	*Plectranthus fruticosus L'Hér.*	LC
LAMIACEAE	*Plectranthus laxiflorus Benth.*	LC
LAMIACEAE	*Stachys natalensis Hochst. var. galpinii (Briq.) Codd*	LC
LAMIACEAE	*Stachys natalensis Hochst. var. natalensis*	LC
LAMIACEAE	*Syncolostemon albiflorus (N.E.Br.) D.F.Otieno*	LC
LYCOPODIACEAE	*Lycopodium clavatum L.*	LC
MALVACEAE	*Hermannia cristata Bolus*	LC
MALVACEAE	*Hermannia gerrardii Harv.*	LC
MALVACEAE	*Hermannia oblongifolia (Harv.) Hochr.*	LC
MALVACEAE	*Hibiscus microcarpus Garcke*	LC
MALVACEAE	*Melhania prostrata DC.*	LC
MALVACEAE	*Pavonia columella Cav.*	LC
MORACEAE	*Ficus sur Forssk.*	LC
OLEACEAE	*Jasminum quinatum Schinz*	LC
ORCHIDACEAE	*Corycium dracomontanum Parkman & Schelpe*	LC
ORCHIDACEAE	*Disa fragrans Schltr. subsp. fragrans*	LC
ORCHIDACEAE	*Eulophia ovalis Lindl. var. ovalis*	LC
ORCHIDACEAE	*Schizochilus cecilii Rolfe subsp. culveri (Schltr.) H.P.Linder*	Rare
ORCHIDACEAE	*Schizochilus zeyheri Sond.*	LC
OROBANCHACEAE	*Cycnium tubulosum (L.f.) Engl. subsp. tubulosum*	LC
OROBANCHACEAE	*Harveya huttonii Hiern*	LC
OROBANCHACEAE	*Striga bilabiata (Thunb.) Kuntze subsp. bilabiata*	LC
OROBANCHACEAE	*Striga elegans Benth.*	LC
PEDALIACEAE	*Dicerocaryum senecioides (Klotzsch) Abels*	LC
POACEAE	*Chloris virgata Sw.*	LC
POACEAE	*Eragrostis plana Nees*	LC
POACEAE	*Leptochloa fusca (L.) Kunth*	LC
POACEAE	*Monocymbium ceresiiforme (Nees) Stapf*	LC
POACEAE	*Panicum natalense Hochst.*	LC
POACEAE	*Paspalum scrobiculatum L.*	LC

Family	Species	Threat status
POACEAE	*Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. torta (Stapf) Clayton*	LC
POACEAE	*Sporobolus centrifugus (Trin.) Nees*	LC
PODOCARPACEAE	*Podocarpus latifolius (Thunb.) R.Br. ex Mirb.*	LC
POLYGALACEAE	*Polygala hottentotta C.Presl*	LC
POLYGONACEAE	*Rumex acetosella L. subsp. angiocarpus (Murb.) Murb.*	
POTTIACEAE	*Trichostomum brachydontium Bruch*	
PROTEACEAE	*Faurea rochetiana (A.Rich.) Chiov. ex Pic.Serm.*	LC
PROTEACEAE	*Protea gaguedi J.F.Gmel.*	LC
RHAMNACEAE	*Phylica paniculata Willd.*	LC
RUBIACEAE	*Pentanisia angustifolia (Hochst.) Hochst.*	LC
RUBIACEAE	*Pygmaeothamnus chamaedendrum (Kuntze) Robyns var. chamaedendrum*	LC
RUBIACEAE	*Pygmaeothamnus chamaedendrum (Kuntze) Robyns var. setulosus Robyns*	LC
SCROPHULARIACEAE	*Jamesbrittenia aurantiaca (Burch.) Hilliard*	LC
SCROPHULARIACEAE	*Melanospermum transvaalense (Hiern) Hilliard*	LC
SCROPHULARIACEAE	*Teedia lucida (Sol.) Rudolphi*	LC
SCROPHULARIACEAE	*Tetraselago longituba (Rolfe) Hilliard & B.L.Burtt*	LC
SELAGINELLACEAE	*Selaginella mittenii Baker*	LC
SINOPTERIDACEAE	*Cheilanthes multifida (Sw.) Sw. subsp. lacerata N.C.Anthony & Schelpe*	
SOLANACEAE	*Solanum sisymbriifolium Lam.*	Not Evaluated
THYMELAEACEAE	*Gnidia albosericea Moss ex B.Peterson*	LC
THYMELAEACEAE	*Gnidia kraussiana Meisn. var. kraussiana*	LC
VIOLACEAE	*Hybanthus capensis (Thunb.) Engl.*	LC
XYRIDACEAE	*Xyris capensis Thunb.*	LC

Appendix B: Plant Species Recorded on Site

Family	Species	Common Name	2014	2009
Amaranthaceae	*Gomphrena celosioides*	Batchelor's button		x
	Amaranthus hybridus	Pigweed	x	x
Amaryllidaceae	*Boophane disticha*	Fan-leaved boophane	x	
Asclepiadaceae	*Gomphocarpus fruticosus*	Milkweed	x	x
Asphodelaceae	*Aloe ecklonis*	Grass Aloe		x
Asteraceae	*Berkheya setifera*	Buffalo-tongue Berkheya	x	x
	Bidens formosa	Cosmos	x	x
	Bidens pilosa	Common black-jack	x	x
	Cirsium vulgare	Scotch Thistle	x	x
	Conyza bonariensis	Flax-leaf fleabane	x	x
	Gerbera ambigua	Pink and white gerbera		x
	Gerbera piloselloides	Small yellow gerbera		x
	Haplocarpha scaposa	False gerbera	x	
	Helichrysum acutatum			x
	Helichrysum aureonitens	Golden everlasting	x	x
	Helichrysum kraussii	Straw everlasting		x
	Helichrysum rugulosum	Marotole		x
	Hypochaeris radicata	Hairy wild lettuce/Spotted cat's ear		x
	Pseudognaphalium luteo-album	Jersey Cudweed	x	x
	Seriphium plumosum	Bankrupt bush	x	x
	Tagetes minuta	Khakibos	x	x
Cyperaceae	*Cyperus esculentus*	Yellow Nut Sedge		x
	Cyperus longus	Waterbiesie	x	x
	Schoenoplectus corymbosus		x	x
Ebenaceae	*Diospyros mespiliformis*	Jakkalsbessie		x
Fabaceae	*Acacia mearnsii*	Black wattle	x	
	Chamaesyce inaequilatera			x
	Elephantorrhiza elephantina	Elephant's root		x
	Sutherlandia frutescens	Balloon pea		x

Family	Species	Common Name	2014	2009
	Sutherlandia montana	Mountain balloon pea		x
Gentianaceae	*Sebaea grandis*	Large-Flowered Sebaea/Primrose Gentian		x
Hyacinthaceae	*Eucomis autumnalis*	Pineapple Flower		x
Hypoxidaceae	*Hypoxis hemerocallidea*	Star-flower		x
Iridicaceae	*Gladiolus crassifolius*	African gladiolus		x
Lamiaceae	*Stachys aethiopica*	African stachys		x
Malvaceae	*Hibiscus trionum*	Bladder Hibiscus		x
Myrtaceae	*Eucalyptus camaldulensis*	Red gum	x	x
Oxalidaceae	*Oxalis obliquifolia*	Oblique-leaved Sorrel	x	x
Pinaceae	*Pinus patula*	Patula pine	x	x
Poaceae	*Andropogon appendiculatus*	Vlei Bluestem		x
	Andropogon eucomus	Snowflake grass	x	x
	Andropogon huillensis	Large silver andropogon	x	
	Aristida congesta ssp. congesta	Tassel Tree-awn	x	x
	Aristida junciformis	Gangoni three-awn	x	
	Bewsia biflora	False love grass		x
	Bothriochloa radicans	Stinking grass		x
	Brachiaria brizantha	Common signal grass		x
	Cortaderia selloana		x	x
	Cymbopogon excavatus	Broad-leaved turpentine grass	x	
	Cynodon dactylon	Couch grass	x	x
	Digitaria eriantha	Common Finger Grass	x	x
	Enneapogon cenchroides	Nine awned grass		x
	Eragrostis curvula	Weeping love grass	x	
	Eragrostis gummiflua	Gum Grass	x	x
	Eragrostis racemosa	Narrow heart love grass	x	x
	Eragrostis superba	Saw-tooth love grass		x

Family	Species	Common Name	2014	2009
	Heteropogon contortus	Spear grass		x
	Hyparrhenia hirta	Common thatching grass	x	x
	Imperata cylindrica	Cottonwool grass	x	
	Melinis nerviglumis	Bristle leaved red top		x
	Miscanthus junceus	Wireleaf daba grass	x	x
	Monocymbium ceresiiforme	Boat grass		x
	Panicum maximum	Guinea grass		x
	Panicum natalense	Natal panicum		
	Paspalum dilatatum	Dallis Grass		x
	Pennisetum clandestinum	Kikuyu grass	x	x
	Pinus patula	Patula pine	x	
	Pogonarthria squarrosa	Herringbone grass	x	
	Setaria pallide-fusca	garden bristle grass		x
	Setaria sphacelata	Bristle grass	x	x
	Sporobolus africanus	Ratstail dropseed	x	x
	Sporobolus pyramidalis	Catstail dropseed	x	x
	Stenotaphrum secundatum	Buffalo-turf grass	x	
	Themeda triandra	Red grass	x	x
	Tristachya leucothrix	Hairy Trident Grass	x	x
	Zea mays	Maize	x	x
Solanaceae	*Datura stramonium*	Common thorn apple	x	x
	Nicandra physalodes	Apple of Peru		x
	Solanum sisymbrifolium		x	
Typhaceae	*Typha capensis*	Bulrush	x	x
Verbenaceae	*Lippia javanica*	Fever-tea		x
	Verbena bonariensis	Tall Verbena	x	x
	Verbena officinalis		x	x

Appendix C: Expected Reptiles List

Family	Species name	Common Name	Threat Status (South Africa)
Typhlopidae	*Typhlops bibronii*	Bibron's Blind Snake	LC
Leptotyphlopidae	*Leptotyphlops scutifrons*	Peter's Thread Snake	LC
Boidae	*Python natalensis*	Southern African Python	VU
Colubridae	*Lycodonomorphus rufulus*	Brown Water Snake	LC
Colubridae	*Lamprophis capensis*	Southern House Snake	LC
Colubridae	*Lamprophis aurora*	Aurora House Snake	Rare
Colubridae	*Lamprophis guttatus*	Spotted House Snake	LC
Colubridae)	*Lycophidion capense*	Cape Wolf Snake	LC
Colubridae	*Mehelya nyassae*	Black File Snake	LC
Colubridae	*Duberria lutrix*	Common Slug Eater	LC
Colubridae	*Pseudaspis cana*	Mole Snake	LC
Colubridae	*Psammophylax rhombeatus*	Rhombic Skaapsteker	LC
Colubridae	*Psammophylax tritaeniatus*	Striped Skaapsteker	LC
Colubridae	*Psammophis crucifer*	Cross-Marked Grass Snake	LC
Colubridae	*Aparallactus capensis*	Cape Centipede Eater	LC
Colubridae	*Atractaspis bibronii*	Bibron's Burrowing Asp	LC
Colubridae	*Homoroselaps lacteus*	Spotted Harlequin Snake	LC
Colubridae	*Dasypeltis scabra*	Common Egg Eater	LC
Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake	LC
Colubridae	*Philothamnus natalensis*	Natal Green Snake	LC
Colubridae	*Philothamnus hoplogaster*	Green Water Snake	LC
Colubridae	*Crotaphopeltis hotamboei*	Red-Lipped Snake	LC
Elapidae	*Elapsoidae sundevallii*	Sundevall's Garter Snake	LC
Elapidae	*Hemachatus haemachatus*	Rinkhals	LC
Elapidae	*Naja mossambica*	Mozambique Spitting Cobra	LC
Viperidae	*Causus rhombeatus*	Rhombic Night Adder	LC
Viperidae	*Bitis arietans*	Puff Adder	LC
Scincidae	*Mabuya capensis*	Cape Skink	LC
Scincidae	*Mabuya varia*	Variable Skink	LC
Scincidae	*Mabuya striata complex*	Striped Skink	LC

Family	Species name	Common Name	Threat Status (South Africa)
Scincidae	*Panaspis wahlbergii*	Wahlberg's Snake-Eyed Skink	LC
Lacertidae	*Ichnotropis squamulosa*	Common Rough-Scaled Lizard	LC
Lacertidae	*Pedioplanis lineoocellata*	Spotted Sand Lizard	LC
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-Throated Plated Lizard	LC
Cordylidae	*Chamaesaura aenea*	Highveld Grass Lizard	LC
Cordylidae	*Cordylus vittifer*	Highveld Girdled Lizard	LC
Varanidae	*Varanus niloticus*	Water Monitor	LC
Varanidae	*Varanus albigularis*	Rock Monitor	LC
Agamidae	*Agama atra*	Southern Rock Agama	LC
Agamidae	*Agama aculeata*	Ground Agama	LC
Chamaeleonidae	*Chamaeleo dilepsis*	Flap-Necked Chameleon	LC
Gekkonidae	*Hemidactylus mabouia*	Tropical House Gecko	LC
Gekkonidae	*Lygodactylus capensis*	Cape Dwarf Day Gecko	LC
Gekkonidae	*Pachydactylus vansoni*	Van Son's Thick-Toed Gecko	LC
Pelomedusidae	*Pelomedusa subrufa*	Marsh Terrapin	LC

Appendix D: Expected Amphibian Species List

Family name	Genus Species	Common name	Threat Status (South Africa)
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	LC
Ranidae	*Cacosternum boettgeri*	Common Caco	LC
Pipidae	*Xenopus laevis*	Common Platana	LC
Ranidae	*Afrana angolensis*	Common River Frog	LC
Ranidae	*Pyxicephalus adspersus*	Giant Bullfrog	LC
Hyperoliidae	*Afrixalis fornasinii*	Greater Leaf Folding Frog	LC
Bufonidae	*Bufo gutturalis*	Gutteral Toad	LC
Heleophrynidae	*Heleophryne natalensis*	Natal Ghost Frog	LC
Ranidae	*Strongylopus wageri*	Plain Stream Frog	LC
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	LC
Ranidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	LC
Ranidae	*Strongylopus fasciatus*	Striped Stream Frog	LC
Ranidae	*Tomoptema cryptotis*	Tremola Sand Frog	LC

Appendix E: Expected Bird Species List

Title:	QDS	2530CC
Species:	388	
Rob	English Name	Scientific
1	Ostrich	*Struthio camelus*
6	Great Crested Grebe	*Podiceps cristatus*
8	Dabchick	*Tachybaptus ruficollis*
55	Whitebreasted Cormorant	*Phalacrocorax lucidus*
58	Reed Cormorant	*Phalacrocorax africanus*
60	Darter	*Anhinga rufa*
62	Grey Heron	*Ardea cinerea*
63	Blackheaded Heron	*Ardea melanocephala*
64	Goliath Heron	*Ardea goliath*
65	Purple Heron	*Ardea purpurea*
66	Great White Egret	*Egretta alba*
67	Little Egret	*Egretta garzetta*
68	Yellowbilled Egret	*Egretta intermedia*
69	Black Egret	*Egretta ardesiaca*
71	Cattle Egret	*Bubulcus ibis*
72	Squacco Heron	*Ardeola ralloides*
74	Greenbacked Heron	*Butorides striatus*
76	Blackcrowned Night Heron	*Nycticorax nycticorax*
78	Little Bittern	*Ixobrychus minutus*
80	Bittern	*Botaurus stellaris*
81	Hamerkop	*Scopus umbretta*
83	White Stork	*Ciconia ciconia*
84	Black Stork	*Ciconia nigra*
85	Abdim's Stork	*Ciconia abdimii*
89	Marabou Stork	*Leptoptilos crumeniferus*
90	Yellowbilled Stork	*Mycteria ibis*
91	Sacred Ibis	*Threskiornis aethiopicus*
92	Bald Ibis	*Geronticus calvus*
93	Glossy Ibis	*Plegadis falcinellus*

Title:	QDS	2530CC
94	Hadeda Ibis	*Bostrychia hagedash*
95	African Spoonbill	*Platalea alba*
96	Greater Flamingo	*Phoenicopterus ruber*
97	Lesser Flamingo	*Phoenicopterus minor*
99	Whitefaced Duck	*Dendrocygna viduata*
100	Fulvous Duck	*Dendrocygna bicolor*
101	Whitebacked Duck	*Thalassornis leuconotus*
102	Egyptian Goose	*Alopochen aegyptiacus*
103	South African Shelduck	*Tadorna cana*
104	Yellowbilled Duck	*Anas undulata*
105	African Black Duck	*Anas sparsa*
106	Cape Teal	*Anas capensis*
107	Hottentot Teal	*Anas hottentota*
108	Redbilled Teal	*Anas erythrorhyncha*
112	Cape Shoveller	*Anas smithii*
113	Southern Pochard	*Netta erythrophthalma*
114	Pygmy Goose	*Nettapus auritus*
115	Knobbilled Duck	*Sarkidiornis melanotos*
116	Spurwinged Goose	*Plectropterus gambensis*
117	Maccoa Duck	*Oxyura maccoa*
118	Secretarybird	*Sagittarius serpentarius*
122	Cape Vulture	*Gyps coprotheres*
126	Black Kite	*Milvus migrans*
126.1	Yellowbilled Kite	*Milvus aegyptius*
127	Blackshouldered Kite	*Elanus caeruleus*
128	Cuckoo Hawk	*Aviceda cuculoides*
130	Honey Buzzard	*Pernis apivorus*
131	Black Eagle	*Aquila verreauxii*
133	Steppe Eagle	*Aquila nipalensis*
136	Booted Eagle	*Hieraaetus pennatus*
137	African Hawk Eagle	*Hieraaetus spilogaster*

Title:	QDS	2530CC
138	Ayres' Eagle	*Hieraaetus ayresii*
140	Martial Eagle	*Polemaetus bellicosus*
141	Crowned Eagle	*Stephanoaetus coronatus*
142	Brown Snake Eagle	*Circaetus cinereus*
143	Blackbreasted Snake Eagle	*Circaetus pectoralis*
148	African Fish Eagle	*Haliaeetus vocifer*
149	Steppe Buzzard	*Buteo vulpinus*
150	Forest Buzzard	*Buteo trizonatus*
152	Jackal Buzzard	*Buteo rufofuscus*
155	Redbreasted Sparrowhawk	*Accipiter rufiventris*
157	Little Sparrowhawk	*Accipiter minullus*
158	Black Sparrowhawk	*Accipiter melanoleucus*
159	Little Banded Goshawk	*Accipiter badius*
160	African Goshawk	*Accipiter tachiro*
161	Gabar Goshawk	*Melierax gabar*
164	Eurasian Marsh Harrier	*Circus aeruginosus*
165	African Marsh Harrier	*Circus ranivorus*
166	Montagu's Harrier	*Circus pygargus*
167	Pallid Harrier	*Circus macrourus*
168	Black Harrier	*Circus maurus*
169	Gymnogene	*Polyboroides typus*
170	Osprey	*Pandion haliaetus*
171	Peregrine Falcon	*Falco peregrinus*
172	Lanner Falcon	*Falco biarmicus*
173	Northern Hobby Falcon	*Falco subbuteo*
179	Western Redfooted Kestrel	*Falco vespertinus*
180	Eastern Redfooted Kestrel	*Falco amurensis*
181	Rock Kestrel	*Falco rupicolis*
182	Greater Kestrel	*Falco rupicoloides*
183	Lesser Kestrel	*Falco naumanni*
188	Coqui Francolin	*Peliperdix coqui*

Title:	QDS	2530CC
190	Greywing Francolin	*Scleroptila africanus*
191	Shelley's Francolin	*Scleroptila shelleyi*
192	Redwing Francolin	*Scleroptila levaillantii*
196	Natal Francolin	*Pternistis natalensis*
198	Rednecked Francolin	*Pternistis afer*
199	Swainson's Francolin	*Pternistis swainsonii*
200	Common Quail	*Coturnix coturnix*
201	Harlequin Quail	*Coturnix delegorguei*
203	Helmeted Guineafowl	*Numida meleagris*
205	Kurrichane Buttonquail	*Turnix sylvatica*
207	Wattled Crane	*Grus carunculatus*
208	Blue Crane	*Anthropoides paradisea*
209	Crowned Crane	*Balearica regulorum*
210	African Rail	*Rallus caerulescens*
211	Corncrake	*Crex crex*
213	Black Crake	*Amaurornis flavirostris*
215	Baillon's Crake	*Porzana pusilla*
217	Redchested Flufftail	*Sarothrura rufa*
222	Whitewinged Flufftail Rare	*Sarothrura ayresi*
223	Purple Gallinule	*Porphyrio madagascariensis*
226	Common Moorhen	*Gallinula chloropus*
228	Redknobbed Coot	*Fulica cristata*
229	African Finfoot	*Podica senegalensis*
231	Stanley's Bustard	*Neotis denhami*
233	Whitebellied Korhaan	*Eupodotis barrowii*
234	Blue Korhaan	*Eupodotis caerulescens*
238	Blackbellied Korhaan	*Eupodotis melanogaster*
240	African Jacana	*Actophilornis africanus*
242	Old World Painted Snipe	*Rostratula benghalensis*
245	Ringed Plover	*Charadrius hiaticula*
248	Kittlitz's Plover	*Charadrius pecuarius*

Title:	QDS	2530CC
249	Threebanded Plover	*Charadrius tricollaris*
252	Caspian Plover	*Charadrius asiaticus*
255	Crowned Plover	*Vanellus coronatus*
257	Blackwinged Plover	*Vanellus melanopterus*
258	Blacksmith Plover	*Vanellus armatus*
260	Wattled Plover	*Vanellus senegallus*
262	Ruddy Turnstone	*Arenaria interpres*
264	Common Sandpiper	*Actitis hypoleucos*
265	Green Sandpiper	*Tringa ochropus*
266	Wood Sandpiper	*Tringa glareola*
269	Marsh Sandpiper	*Tringa stagnatilis*
270	Greenshank	*Tringa nebularia*
272	Curlew Sandpiper	*Calidris ferruginea*
274	Little Stint	*Calidris minuta*
281	Sanderling	*Calidris alba*
284	Ruff	*Philomachus pugnax*
286	Ethiopian Snipe	*Gallinago nigripennis*
290	Whimbrel	*Numenius phaeopus*
294	Pied Avocet	*Recurvirostra avosetta*
295	Blackwinged Stilt	*Himantopus himantopus*
297	Spotted Dikkop	*Burhinus capensis*
298	Water Dikkop	*Burhinus vermiculatus*
300	Temminck's Courser	*Cursorius temminckii*
305	Blackwinged Pratincole	*Glareola nordmanni*
315	Greyheaded Gull	*Larus cirrocephalus*
322	Caspian Tern	*Sterna caspia*
338	Whiskered Tern	*Chlidonias hybridus*
339	Whitewinged Tern	*Chlidonias leucopterus*
348	Feral Pigeon	*Columba livia*
349	Rock Pigeon	*Columba guinea*
350	Rameron Pigeon	*Columba arquatrix*

Title:	QDS	2530CC
352	Redeyed Dove	*Streptopelia semitorquata*
354	Cape Turtle Dove	*Streptopelia capicola*
355	Laughing Dove	*Streptopelia senegalensis*
356	Namaqua Dove	*Oena capensis*
358	Greenspotted Dove	*Turtur chalcospilos*
359	Tambourine Dove	*Turtur tympanistria*
361	African Green Pigeon	*Treron calva*
371	Purplecrested Lourie	*Musophaga porphyreolopha*
373	Grey Lourie	*Corythaixoides concolor*
374	Eurasian Cuckoo	*Cuculus canorus*
375	African Cuckoo	*Cuculus gularis*
377	Redchested Cuckoo	*Cuculus solitarius*
378	Black Cuckoo	*Cuculus clamosus*
380	Great Spotted Cuckoo	*Clamator glandarius*
381	Striped Cuckoo	*Clamator levaillantii*
382	Jacobin Cuckoo	*Clamator jacobinus*
385	Klaas's Cuckoo	*Chrysococcyx klaas*
386	Diederik Cuckoo	*Chrysococcyx caprius*
391	Burchell's Coucal	*Centropus burchellii*
392	Barn Owl	*Tyto alba*
393	Grass Owl	*Tyto capensis*
395	Marsh Owl	*Asio capensis*
397	Whitefaced Owl	*Ptilopsus granti*
400	Cape Eagle Owl	*Bubo capensis*
401	Spotted Eagle Owl	*Bubo africanus*
404	Eurasian Nightjar	*Caprimulgus europaeus*
405	Fierynecked Nightjar	*Caprimulgus pectoralis*
408	Freckled Nightjar	*Caprimulgus tristigma*
411	Eurasian Swift	*Apus apus*
412	Black Swift	*Apus barbatus*
415	Whiterumped Swift	*Apus caffer*

Title:	QDS	2530CC
416	Horus Swift	*Apus horus*
417	Little Swift	*Apus affinis*
418	Alpine Swift	*Tachymarptis melba*
421	Palm Swift	*Cypsiurus parvus*
424	Speckled Mousebird	*Colius striatus*
426	Redfaced Mousebird	*Urocolius indicus*
428	Pied Kingfisher	*Ceryle rudis*
429	Giant Kingfisher	*Megaceryle maxima*
430	Halfcollared Kingfisher	*Alcedo semitorquata*
431	Malachite Kingfisher	*Alcedo cristata*
432	Pygmy Kingfisher	*Ispidina picta*
433	Woodland Kingfisher	*Halcyon senegalensis*
435	Brownhooded Kingfisher	*Halcyon albiventris*
438	Eurasian Bee-eater	*Merops apiaster*
443	Whitefronted Bee-eater	*Merops bullockoides*
444	Little Bee-eater	*Merops pusillus*
446	Eurasian Roller	*Coracias garrulus*
451	African Hoopoe	*Upupa africana*
452	Redbilled Woodhoopoe	*Phoeniculus purpureus*
454	Scimitarbilled Woodhoopoe	*Rhinopomastus cyanomelas*
464	Blackcollared Barbet	*Lybius torquatus*
465	Pied Barbet	*Tricholaema leucomelas*
470	Yellowfronted Tinker Barbet	*Pogoniulus chrysoconus*
473	Crested Barbet	*Trachyphonus vaillantii*
474	Greater Honeyguide	*Indicator indicator*
475	Scalythroated Honeyguide	*Indicator variegatus*
476	Lesser Honeyguide	*Indicator minor*
478	Sharpbilled Honeyguide	*Prodotiscus regulus*
480	Ground Woodpecker	*Geocolaptes olivaceus*
483	Goldentailed Woodpecker	*Campethera abingoni*
486	Cardinal Woodpecker	*Dendropicos fuscescens*

Title:	QDS	2530CC
488	Olive Woodpecker	*Dendropicos griseocephalus*
489	Redthroated Wryneck	*Jynx ruficollis*
494	Rufousnaped Lark	*Mirafra africana*
495.2	Eastern Clapper Lark	*Mirafra fasciolata*
496	Flappet Lark	*Mirafra rufocinnamomea*
498	Sabota Lark	*Calendulauda sabota*
499	Rudd's Lark	*Heteromirafra ruddi*
500.2	Eastern Longbilled Lark	*Certhilauda semitorquata*
506	Spikeheeled Lark	*Chersomanes albofasciata*
507	Redcapped Lark	*Calandrella cinerea*
508	Pinkbilled Lark	*Spizocorys conirostris*
518	Eurasian Swallow	*Hirundo rustica*
520	Whitethroated Swallow	*Hirundo albigularis*
523	Pearlbreasted Swallow	*Hirundo dimidiata*
524	Redbreasted Swallow	*Hirundo semirufa*
526	Greater Striped Swallow	*Hirundo cucullata*
528	South African Cliff Swallow	*Hirundo spilodera*
529	Rock Martin	*Hirundo fuligula*
530	House Martin	*Delichon urbica*
531	Greyrumped Swallow	*Pseudhirundo griseopyga*
532	Sand Martin	*Riparia riparia*
533	Brownthroated Martin	*Riparia paludicola*
534	Banded Martin	*Riparia cincta*
536	Black Sawwing Swallow	*Psalidoprocne holomelaena*
538	Black Cuckooshrike	*Campephaga flava*
541	Forktailed Drongo	*Dicrurus adsimilis*
542	Squaretailed Drongo	*Dicrurus ludwigii*
545	Blackheaded Oriole	*Oriolus larvatus*
547	Black Crow	*Corvus capensis*
548	Pied Crow	*Corvus albus*
554	Southern Black Tit	*Parus niger*

Title:	QDS	2530CC
558	Grey Penduline Tit	*Anthoscopus caroli*
560	Arrowmarked Babbler	*Turdoides jardineii*
568	Blackeyed Bulbul	*Pycnonotus tricolor*
576	Kurrichane Thrush	*Turdus libonyanus*
577	Olive Thrush	*Turdus olivaceus*
579	Orange Thrush	*Zoothera gurneyi*
580	Groundscraper Thrush	*Psophocichla litsipsirupa*
581	Cape Rockthrush	*Monticola rupestris*
582	Sentinel Rockthrush	*Monticola explorator*
586	Mountain Chat	*Oenanthe monticola*
587	Capped Wheatear	*Oenanthe pileata*
588	Buffstreaked Chat	*Oenanthe bifasciata*
589	Familiar Chat	*Cercomela familiaris*
593	Mocking Chat	*Thamnolaea cinnamomeiventris*
595	Anteating Chat	*Myrmecocichla formicivora*
596	Stonechat	*Saxicola torquata*
598	Chorister Robin	*Cossypha dichroa*
600	Natal Robin	*Cossypha natalensis*
601	Cape Robin	*Cossypha caffra*
602	Whitethroated Robin	*Cossypha humeralis*
613	Whitebrowed Robin	*Cercotrichas leucophrys*
619	Garden Warbler	*Sylvia borin*
621	Titbabbler	*Parisoma subcaeruleum*
625	Icterine Warbler	*Hippolais icterina*
628	Great Reed Warbler	*Acrocephalus arundinaceus*
631	African Marsh Warbler	*Acrocephalus baeticatus*
633	Eurasian Marsh Warbler	*Acrocephalus palustris*
634	Eurasian Sedge Warbler	*Acrocephalus schoenobaenus*
635	Cape Reed Warbler	*Acrocephalus gracilirostris*
637	Yellow Warbler	*Chloropeta natalensis*
638	African Sedge Warbler	*Bradypterus baboecala*

Title:	QDS	2530CC
643	Willow Warbler	*Phylloscopus trochilus*
645	Barthroated Apalis	*Apalis thoracica*
648	Yellowbreasted Apalis	*Apalis flavida*
651	Longbilled Crombec	*Sylvietta rufescens*
661	Grassbird	*Sphenoeacus afer*
664	Fantailed Cisticola	*Cisticola juncidis*
665	Desert Cisticola	*Cisticola aridulus*
666	Cloud Cisticola	*Cisticola textrix*
667	Ayres' Cisticola	*Cisticola ayresii*
668	Palecrowned Cisticola	*Cisticola cinnamomeus*
670	Wailing Cisticola	*Cisticola lais*
677	Levaillant's Cisticola	*Cisticola tinniens*
678	Croaking Cisticola	*Cisticola natalensis*
679	Lazy Cisticola	*Cisticola aberrans*
681	Neddicky	*Cisticola fulvicapillus*
683	Tawnyflanked Prinia	*Prinia subflava*
685	Blackchested Prinia	*Prinia flavicans*
686.1	Spotted Prinia	*Prinia hypoxantha*
689	Spotted Flycatcher	*Muscicapa striata*
690	Dusky Flycatcher	*Muscicapa adusta*
693	Fantailed Flycatcher	*Myioparus plumbeus*
694	Black Flycatcher	*Melaenornis pammelaina*
698	Fiscal Flycatcher	*Sigelus silens*
700	Cape Batis	*Batis capensis*
706	Fairy Flycatcher	*Stenostira scita*
708	Bluemantled Flycatcher	*Trochocercus cyanomelas*
710	Paradise Flycatcher	*Terpsiphone viridis*
711	African Pied Wagtail	*Motacilla aguimp*
712	Longtailed Wagtail	*Motacilla clara*
713	Cape Wagtail	*Motacilla capensis*
714	Yellow Wagtail	*Motacilla flava*

Title:	QDS	2530CC
716	Grassveld Pipit	*Anthus cinnamomeus*
717	Longbilled Pipit	*Anthus similis*
718	Plainbacked Pipit	*Anthus leucophrys*
719	Buffy Pipit	*Anthus vaalensis*
720	Striped Pipit	*Anthus lineiventris*
725	Yellowbreasted Pipit	*Anthus chloris*
727	Orangethroated Longclaw	*Macronyx capensis*
728	Yellowthroated Longclaw	*Macronyx croceus*
731	Lesser Grey Shrike	*Lanius minor*
732	Fiscal Shrike	*Lanius collaris*
733	Redbacked Shrike	*Lanius collurio*
736	Southern Boubou	*Laniarius ferrugineus*
740	Puffback	*Dryoscopus cubla*
741	Brubru	*Nilaus afer*
743	Threestreaked Tchagra	*Tchagra australis*
744	Blackcrowned Tchagra	*Tchagra senegala*
746	Bokmakierie	*Telophorus zeylonus*
748	Orangebreasted Bush Shrike	*Telophorus sulfureopectus*
750	Olive Bush Shrike	*Telophorus olivaceus*
751	Greyheaded Bush Shrike	*Malaconotus blanchoti*
753	White Helmetshrike	*Prionops plumatus*
758	Indian Myna	*Acridotheres tristis*
759	Pied Starling	*Spreo bicolor*
760	Wattled Starling	*Creatophora cinerea*
761	Plumcoloured Starling	*Cinnyricinclus leucogaster*
764	Glossy Starling	*Lamprotornis nitens*
769	Redwinged Starling	*Onychognathus morio*
772	Redbilled Oxpecker	*Buphagus erythrorhynchus*
775	Malachite Sunbird	*Nectarinia famosa*
783	Lesser Doublecollared Sunbird	*Cinnyris chalybea*
785	Greater Doublecollared Sunbird	*Cinnyris afra*

Title:	QDS	2530CC
787	Whitebellied Sunbird	*Cinnyris talatala*
791	Scarletchested Sunbird	*Chalcomitra senegalensis*
792	Black Sunbird	*Chalcomitra amethystina*
796	Cape White-eye	*Zosterops virens*
799	Whitebrowed Sparrowweaver	*Plocepasser mahali*
801	House Sparrow	*Passer domesticus*
803	Cape Sparrow	*Passer melanurus*
804	Southern Greyheaded Sparrow	*Passer diffusus*
805	Yellowthroated Sparrow	*Petronia superciliaris*
807	Thickbilled Weaver	*Amblyospiza albifrons*
810	Spectacled Weaver	*Ploceus ocularis*
811	Spottedbacked Weaver	*Ploceus cucullatus*
813	Cape Weaver	*Ploceus capensis*
814	Masked Weaver	*Ploceus velatus*
815	Lesser Masked Weaver	*Ploceus intermedius*
816	Golden Weaver	*Ploceus xanthops*
819	Redheaded Weaver	*Anaplectes rubriceps*
820	Cuckoofinch	*Anomalospiza imberbis*
821	Redbilled Quelea	*Quelea quelea*
824	Red Bishop	*Euplectes orix*
826	Golden Bishop	*Euplectes afer*
827	Yellowrumped Widow	*Euplectes capensis*
828	Redshouldered Widow	*Euplectes axillaris*
829	Whitewinged Widow	*Euplectes albonotatus*
831	Redcollared Widow	*Euplectes ardens*
832	Longtailed Widow	*Euplectes progne*
840	Bluebilled Firefinch	*Lagonosticta rubricata*
842	Redbilled Firefinch	*Lagonosticta senegala*
844	Blue Waxbill	*Uraeginthus angolensis*
845	Violeteared Waxbill	*Granatina granatina*
846	Common Waxbill	*Estrilda astrild*

Title:	QDS	2530CC
850	Swee Waxbill	*Estrilda melanotis*
852	Quail Finch	*Ortygospiza atricollis*
854	Orangebreasted Waxbill	*Amandava subflava*
855	Cutthroat Finch	*Amadina fasciata*
856	Redheaded Finch	*Amadina erythrocephala*
857	Bronze Mannikin	*Lonchura cucullata*
860	Pintailed Whydah	*Vidua macroura*
862	Paradise Whydah	*Vidua paradisaea*
864	Black Widowfinch	*Vidua funerea*
867	Steelblue Widowfinch	*Vidua chalybeata*
869	Yelloweyed Canary	*Serinus mozambicus*
870	Blackthroated Canary	*Serinus atrogularis*
872	Cape Canary	*Serinus canicollis*
877	Bully Canary	*Serinus sulphuratus*
881	Streakyheaded Canary	*Serinus gularis*
884	Goldenbreasted Bunting	*Emberiza flaviventris*
885	Cape Bunting	*Emberiza capensis*
886	Rock Bunting	*Emberiza tahapisi*

Appendix F: Invertebrate Species List

Site Name	Family	Abundance
WELTE 1	Acrididae	4
	Asilidae	1
	Cercopidae	1
	Chironomidae	2
	Cicadellidae	3
	Mantidae	4
	Meloidae	2
	Muscidae	6
	Reduviidae	20
		43
WELTE 2	Chironomidae	4
	Coenagrionidae	2
	Curculionidae	4
	Formicidae	3
	Meloidae	1
	Reduviidae	10
	Tenebrionidae	1
		25
WELTE 3	Acrididae	1
	Chironomidae	3
	Curculionidae	5
	Elateridae	1
	Formicidae	1
	Meloidae	1
	Muscidae	6
	Reduviidae	5
	Sepsidae	2
	Tenebrionidae	4
	Tipulidae	2
		31
WELTE 4	Chironomidae	4

Site Name	Family	Abundance
	Chrysomelidae	8
	Coccinellidae	1
	Coenagrionidae	1
	Curculionidae	4
	Muscidae	1
	Reduviidae	11
	Scarabaeidae	1
	Staphylinidae	2
	Tenebrionidae	3
		36
WELTE 5	Acrididae	1
	Alydidae	1
	Chironomidae	1
	Chrysomelidae	3
	Coenagrionidae	1
	Curculionidae	1
	Formicidae	2
	Muscidae	2
	Pentatomidae	1
	Reduviidae	13
	Sepsidae	1
	Tenebrionidae	3
	Tipulidae	4
		34
WELTE 6	Acrididae	2
	Aradidae	2
	Asilidae	1
	Chironomidae	1
	Chrysomelidae	2
	Coenagrionidae	1
	Dictyopharidae	4

Site Name	Family	Abundance
	Formicidae	4
	Muscidae	12
	Reduviidae	7
	Sepsidae	3
	Staphylinidae	2
	Tenebrionidae	2
	Tipulidae	8
		51
WELTE 7	Alydidae	2
	Carabidae	1
	Chrysomelidae	5
	Curculionidae	6
	Formicidae	2
	Meloidae	1
	Muscidae	5
	Reduviidae	7
	Sepsidae	2
	Sphecidae	1
	Tenebrionidae	2
		34
WELTE 8	Acrididae	1
	Aradidae	2
	Chrysomelidae	2
	Curculionidae	15
	Muscidae	1
	Pentatomidae	1
	Pompilidae	1
	Reduviidae	4
	Scarabaeidae	3
	Tenebrionidae	1
		31

Site Name	Family	Abundance
WELTE 9	Acrididae	3
	Chironomidae	1
	Coccinellidae	1
	Coenagrionidae	1
	Curculionidae	7
	Formicidae	2
	Meloidae	2
	Muscidae	2
	Pentatomidae	1
	Reduviidae	23
	Scarabaeidae	1
		44
WELTE 10	Alydidae	1
	Asilidae	1
	Carabidae	1
	Chironomidae	1
	Cicadellidae	1
	Coccinellidae	3
	Curculionidae	1
	Languriidae	1
	Meloidae	10
	Muscidae	4
	Pentatomidae	1
	Tenebrionidae	2
	Tipulidae	2
		29
WELTE 11	Asilidae	1
	Chironomidae	1
	Coccinellidae	1
	Coenagrionidae	1
	Muscidae	8

Site Name	Family	Abundance
	Reduviidae	51
	Sphecidae	1
		64