



DIGBY WELLS
ENVIRONMENTAL



Sasol Mining Sigma Colliery Ash Backfilling Project, Sasolburg, Free State Province

Fauna and Flora Assessment Report

Project Number:

SAS5184

Prepared for:

Sasol Mining (Pty) Ltd

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I, Rudi Greffrath as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Sasol Mining, other than fair remuneration for work performed, specifically in connection with the Fauna and Flora management process proposed for the Basic Assessment process for the proposed Ash Backfilling Project within the Sasol Sigma Defunct Colliery Project, located in the Free State Province.

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EXECUTIVE SUMMARY

Digby Wells Environmental (DWE) was appointed by Sasol Sigma Coal Mine for the social and environmental documentation required in support of a Mining Right Application for the proposed Sigma ash backfill Project. The Sigma Defunct Colliery is located adjacent (west) to the town of Sasolburg in the Free State Province. It is situated within the Grassland Biome. In order to enable characterisation of the environment, as well as of floral and faunal species that may be impacted on by the proposed activities, floral and faunal groups were investigated.

The objectives of this report are to describe the current state of the flora and fauna within the Sigma ash backfill Project area and assess the impact of the ash backfilling process on the fauna and flora present. The report will deliver various flora and fauna findings in compliance with existing provincial and national legislation.

A desktop study was undertaken as well as a field truthing site visit. The field study comprised of a dry season study only, this took place during late September 2013. The flora component was completed by surveying sample plots throughout the project area as well as general species listing. Faunal sampling was undertaken concurrently with the flora survey. Visual sightings were conducted with binoculars and identification enabled with recognised South African literature. The presence of species was evaluated using tracks, dung, ecological indicators; no trapping was performed.

The affected environment is typical of the region, which lies within the Grassland Biome (Mucina and Rutherford, 2012) which is located in the central part of South Africa. During the field surveys the natural vegetation was found to be predominantly grazed grassveld, with much of the natural vegetation replaced by agricultural activities and mining.

During the field surveys 51 plant species were identified throughout the project area and six vegetation communities were identified. No red data or protected species were encountered.

No protected fauna species were found within the Sigma study area during the site visit. The level of indigenous vegetation and biodiversity was found to be of conservation value within the riparian areas, woodland/savanna and secondary grassland were also found to be of conservation value.

Sensitivity of the Area

Owing to the ecological function of the Grassveld, Woodland/Savanna and Riparian habitat on the Sigma project area, the overall sensitivity of the site was regarded as Medium.

The following areas were regarded as moderately to High Sensitive:

- Riparian areas.

The following areas were regarded as Moderately Sensitive

- Secondary Grassland; and
- Woodland/Savanna.

Impacts

Consideration of the impacts of the proposed Sigma ash backfill and associated activities on the terrestrial ecology forms a large component of this study. The primary anticipated impacts include a minimal loss of vegetation communities and a minimal loss of biodiversity.

Mitigation and Management

Methods of mitigation and better management of the negative impacts have been recommended following the hierarchy of; avoidance, mitigation and offsetting. Major recommendations include;

- Avoidance of sensitive habitats (Riparian vegetation and Grassland and Woodland/Savanna areas);
- Post land use planning and design project, and;
- Compilation and implementation of a monitoring programme.



COMPLIANCE WITH APPENDIX 6 OF GN 326 OF 7 APRIL 2017

Regulatory Requirements	Section of Report
(a) The person who prepared the report; and the expertise of that person to carry out the specialist study or specialised process.	Section 1.5
(b) a declaration that the person is independent	Pages iv
(c) an indication of the scope of, and the purpose for which, the report was prepared	Section 6
(cA) an indication of the quality and age of base data used for the specialist report	Section 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 4
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 2.2.1
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 2
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Section 4
(g) an identification of any areas to be avoided, including buffers	Section 5
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section 5.2.5
(i) a description of any assumptions made and any uncertainties or gaps in knowledge	Section 2.6
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities	Section 4
(k) any mitigation measures for inclusion in the EMPr	Section 6.1
(l) any conditions for inclusion in the environmental authorisation	Section 9
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8



Regulatory Requirements	Section of Report
(n) a reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 7
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	Section 8
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto	N/A
(q) any other information requested by the competent authority	N/A



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1 Introduction

Sasol Mining (Pty) Ltd (hereinafter Sasol) intends to backfill a number of old underground voids in the northern defunct area of the Sigma Defunct Colliery using ash (“the Project”). This process will involve a number of above-ground pipelines which will be used to abstract water from the mine to create voids for the backfilling as well as pipelines to transport ash slurry from the Sasol Ash pump station to the underground voids.

Digby Wells Environmental (hereinafter Digby Wells) undertook a Basic Assessment (BA) process in support of the required Environmental Authorisation (EA), Waste Management Licence (WML) Application and Water Use Licence (WUL) Application in 2013. This process was undertaken in compliance with:

- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA); and
- The Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

The EA was subsequently granted in April 2014, including the condition that Sasol commence with the Project within three years. The WUL and WML were granted in 2017, but the EA lapsed in April 2017 and Sasol have not been able to implement the Project.

Following discussions with the Department of Environmental Affairs, it was agreed that a new BA process must be undertaken, informed by the previously-completed BA process, with the Department of Mineral Affairs (DMR) as the competent authority under the one environmental system. The specialist studies must be updated to comply with the the NEMA Environmental Impact Assessment (EIA) Regulations, 2017 (Government Notice Regulations [GN R] 982, as amended by GN R 326 of 7 April 2017) which were promulgated subsequent to the submission of the original specialist reports. In support of the original BA process, Digby Wells completed the fauna and flora specialist assessment.

1.1 Background

The Sigma Defunct Colliery has been in operation since 1952, holding mineral rights to coal deposits in the Sasolburg district. Underground mining methods have been the primary means of extracting these reserves including bord-and-pillar, total extraction, long walling and rib pillar methods. Access to the underground operations was via the Uitkomst shaft and coal was brought to the surface at the Boshbank incline shaft and then conveyed to a ‘dry’ coal handling plant at 3 Shaft where the coal was screened and fed to silos. In 1992, the Wonderwater strip mine was developed to extract coal from the north-eastern side of the reserves and the underground mining was scaled down and ceased by 1999. The Sigma Defunct Colliery Ashfill Project commenced in 1999. The project was aimed at backfilling mine voids in order to stabilize mine workings located beneath the Sasolburg-Parys Road (R26). Since its commencement, the project has been extended to other areas which are deemed areas of high risk for land subsidence (e.g. underneath the Leeuspruit).



Sigma Defunct Colliery applied to the Department of Water Affairs (DWA) in March 2001 for a Water Use Licence (WUL) to backfill the old mine voids with ash as a safety precaution which was granted in July 2005. An extension on of the existing WUL was requested for which a decision is still pending.

The project lies within the Free State Province, and directly adjacent to the town of Sasolburg. Digby Wells Environmental (Digby Wells) has been requested to submit a Flora and Fauna Assessment for the proposed study area, to form part of the greater Environmental Impact Assessment (EIA).

Biodiversity is defined, according to 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.

The study area is located within the Grassland Biome, which covers much of the Free State province and has a rich biodiversity due largely to the diverse topography and weather conditions.

1.2 Project Description

Digby Wells Environmental (hereafter Digby Wells) has been appointed by Sasol Sigma Defunct Colliery, as the independent Environmental Assessment Practitioner (EAP) to conduct an EIA and associated specialist studies for the Sigma ash backfill Project (hereafter the Project).

1.3 Study Area

The ash backfilling project is located in the Metsimaholo Local Municipality (MLM) which is situated in the Fezile Dabi District Municipality (FDDM) of the Free State and the nearest towns include Sasolburg, Deneysville, Oranjeville and Viljoensdrift. See Figure 1-1 for a regional setting. 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). These grasslands are maintained largely by the combination of relatively high summer rainfall and fires, frost and grazing, which preclude the presence of shrubs and trees.



Much of the grassland biome has been transformed by crop farming, afforestation, and dense human settlement. Sour grassland occurs in the high rainfall eastern grassland regions (average rainfall >625 mm/annum), on relatively acidic (leached) soils, and is characterized by being short and dense in structure, having a high fibre content and a tendency to withdraw its nutrients from its leaves to its roots during the winter, rendering it largely unpalatable to stock during this time. Sweet grassland is found in the relatively low rainfall western areas, is tall but fairly sparse in structure, has low fibre content and retains nutrients in its leaves during the winter. Mixed grassland represents a transition or combination of sour and sweet grassland types (Roberts 2003).

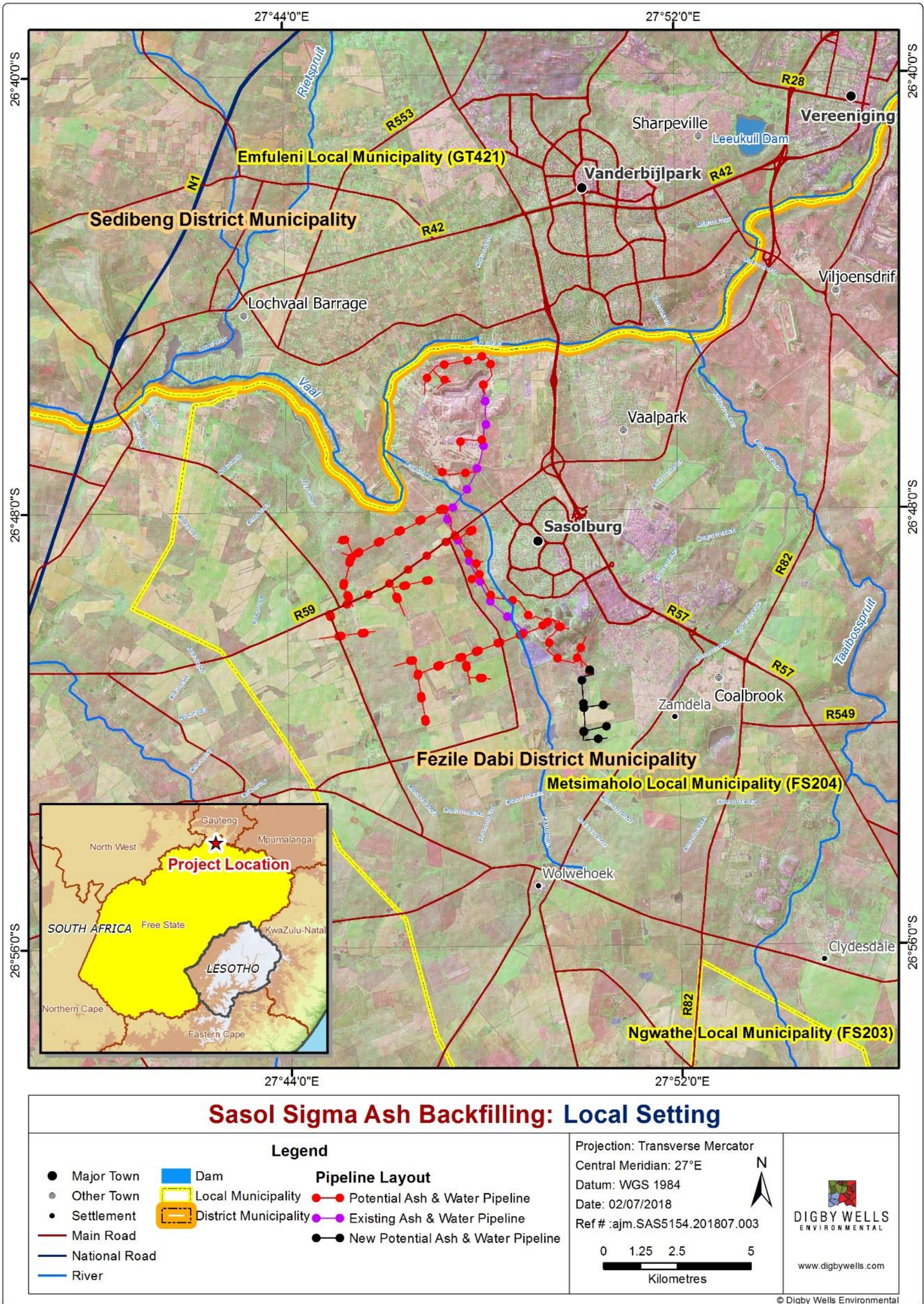


Figure 1-1: Locality of the Sasol Sigma Defunct Colliery Project Area



1.4 Terms of Reference

The agreed Terms of Reference (ToR) include a desktop review, field investigation and report compilation. The precise methodologies employed are elaborated on in Section 2.

- Determine the vegetation communities and faunal habitats occurring within the study area and map;
- Determine the presence of any alien invasive flora species and recommend management plans;
- Determine the presence of any Species of Special Concern (SSC) including SA red list, IUCN red list, CITES species, protected trees, nationally protected species and provincially protected species of both plants and animals;
- Determine the ecological sensitivity of the study area and map;
- Determine the impacts of the proposed project on the flora and fauna of the study area; and
- Recommend mitigation measures to reduce the expected impacts of the proposed project on the flora and fauna of the study area.

1.4.1 Desktop Review

The desktop review required compiling relevant information for the greater study area from reliable and recognised resources. This included the consulting of relevant national and international legislation and best practice approaches as well as the most recent aerial imagery.

1.4.2 Field Investigation

Field investigations took place during the September 2013. The agreed upon ToR for the field work component of the study were to include:

- Characterisation of vegetation in the study area in conjunction with an study including plant species lists, SSC and their locations, declared alien or invasive species present and areas of sensitivity. In addition, all species of ethno-botanical (medicinal or cultural use) importance were recorded;
- A faunal investigation, including the identification of habitats, recording of evidence of faunal activity, opportunistic observations and random transects. Any SSC were recorded, and
- Identification of Areas of Sensitivity based on ecological function and SSC.

1.4.3 Report Compilation

- Review of relevant legislation applicable to the study;
- Explanation of the methodologies used;



- Results of the study including:
 - Delineation of vegetation habitats on site and a description of the structure and condition of these habitats.
 - A description of faunal diversity on site as well as their connection to the vegetation habitats identified.
 - Listing of all SSC and their applicable national and international statuses.
- A sensitivity assessment of habitats identified;
- Maps throughout the report showing significant features of the study area; and
- An Impact Assessment (IA) where all impacts of the construction and operation of the proposed pipeline on the flora and fauna on site are discussed. This includes the impacts on the presence of certain important species as well as the impacts on habitat diversity. The influence on the ecosystems in the area and their interactions are assessed and discussed.

1.5 Expertise of Specialist

Rudi Greffrath (Pr.Sci.Nat.) is Digby Well's Biodiversity Manager and has a National diploma and B-tech in Nature Conservation from Nelson Mandela Metropolitan University's George Campus and is affiliated to the South African Council for Natural Scientific Professions as a *Professional Natural Scientist* in the field of practice *Conservation Science*, registration # 400018/17. He has eleven years' experience in the environmental consulting field specifically in the terrestrial ecology within the Highveld grasslands and Savanna regions of Southern and Central Africa and the forest regions of central and West Africa. He specialises in fauna and flora surveys, biodiversity surveys, environmental management plans, environmental monitoring and rehabilitation for projects in accordance with the International Finance Corporation (IFC) and World Bank. Rudi has gained experience working throughout Africa specifically DRC, Sierra Leone, Ghana, Mali, Botswana, Namibia and Cote D'Ivoire.

1.6 Aims and Objectives

Information generated from this survey was used to identify the potential impacts that the ash backfilling activities will have on the environment. In order to achieve this aim the following objectives were considered for this specialist study:

- To delineate the various vegetation/habitat types and describe their sensitivity, present within the study area;
- To determine if any flora and fauna species or assemblages will be directly impacted upon by the ash backfill activities, this includes flora and fauna communities present, the ecological state of these communities, identification of possible Red Data species



(according to the International Union for the Conservation of Nature (IUCN) as well as considering National and Provincial criteria), and;

- To determine mitigation measures for the identified impacts in order to reduce the severity of these impacts. In cases where impacts cannot be mitigated, areas may be regarded as 'no-go' owing to the presence of critical habitat.

1.7 Legislation and Frameworks

The legislation applicable to this project is listed in Table 1-1.

Table 1-1: Legislation Referenced and Consulted in the Development of this Assessment

Legislation	Description
<i>International frameworks and best practice guidelines</i>	Convention on Biological Diversity (Rio de Janeiro, 1992).
	United Nations Convention to Combat Desertification.
	The Bonn Convention on the Conservation of Migratory Species of Wild Animals.
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
<i>National legislation and frameworks</i>	The National Environmental Management Biodiversity Act (NEMBA) (Act No. 10 of 2004) affords threatened or protected species a legal status and protection.
	National Spatial Biodiversity Assessment: site specific findings.
	Additionally wetlands are protected under various Acts including the National Environmental Management Act (Act No. 107 of 1998), National Water Act (Act No. 36 of 1998), and the Conservation of Agricultural Resources Act (Act No. 43 of 1983).

2 Methodology

2.1 Literature Review and Desktop Study

An original literature review and desktop study of the site was done in order to determine the flora and fauna that have been recorded from the area before, as well as the flora and fauna that could potentially be found in the area. Aerial imagery was also used to determine the state of the vegetation, and where points of interest lie within the study area (including pans, changes in vegetation and riparian areas). Conservation plans and other national planning tools were also consulted to gauge the conservation importance of the area.



2.2 Vegetation Analysis

2.2.1 Sample Plots and Transects

Field investigations took place during September 2013. After broad habitats were delineated on aerial imagery, sample plots were used to determine vegetation distribution in the field. The Braun-Blanquet methodology was employed and a total of 10 relevés were sampled, each covering an approximate area of 20 m². The Braun-Blanquet floristic-sociological approach recognizes units by the floristic composition and abundance. This methodology is easier and quicker to use than the alternative point-survey or wheel-point methodology, results in a reliable estimate of cover abundance and it is the most widely used approach for vegetation studies. The Braun-Blanquet method incorporates seven cover-abundance categories as listed in Table 2-1. A general species list was also compiled from random traversing through the site.

Table 2-1: Braun-Blanquet Analysis Cover Abundance

Cover Abundance	Category
One or few individuals.	r
Occasional and less than 5% of total plot area.	+
Abundant and with very low cover, or less abundant but higher cover; in any case less than 5% cover of total plot area.	1
Very abundant and less than 5%, or 5-25% cover, of a total plot area: <ul style="list-style-type: none"> ▪ 2m – Very abundant ▪ 2a – 5-12.5 % cover, irrespective of number of individuals ▪ 2b – 12.5-25% cover, irrespective of number of individuals 	2
25-50% cover of total plot area, irrespective of number of individuals.	3
50-75% cover of total plot area, irrespective of number of individuals	4
75-100% cover of total plot area, irrespective of number of individuals	5

2.2.2 Vegetation Mapping

Using the vegetation types as defined by the analyses as well as the aerial imagery, the vegetation of the site was mapped. In addition, the intensive site sampling resulted in the mapping of the grazing pressure for the area. This indicates areas that are over grazed, and those which form intact bushveld.



2.3 Flora

2.3.1 Species List

A desktop study was undertaken, aiming to produce a checklist of all species identified on site. The following literature was consulted for this purpose:

- PRECIS (National Herbarium Pretoria Computerised Information System);
- SIBIS: SABIF – South African Biodiversity Information Facility; and
- Mucina and Rutherford, 2012.

2.3.2 Species of special concern

From the overall species list, a list of Species of Special Concern can be drawn up. In order to be fully comprehensive, this list includes plants on each of the following lists:

- The SANBI Red List of South African plants version 2017.1;
- National Environmental Management Biodiversity Act (NEMBA 10 of 2004) listed species;
- National Forests Act, 1998 (Act No. 84 of 1998) (NFA) Protected Trees; and
- Free State Nature Conservation Ordinance 8 of 1969.

An initial list of Species of Special Concern (SSC) expected to be found within the study area comprises Possible Species of Special Concern (PSSC). If any of these (and any additional species on the above lists) are recorded on site, they are ascribed the status Confirmed Species of Special Concern (CSSC).

The South African Red Data list uses the same criteria as that defined by the IUCN. According to the IUCN all species are classified in nine groups, set through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation (IUCN, 2017). The categories are described in Table 2-2 below.

Table 2-2: Red Data Categories

Category		Description
Extinct	(EX)	No known individuals remaining.
Extinct in the Wild	(EW)	Known only to survive in captivity.
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.

Category		Description
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.
Not Evaluated	(NE)	Has not yet been evaluated against the criteria.

(Source: IUCN, 2017)

The online IUCN database was referenced in order to identify Red Data species and their various threat status categorisations.

2.3.3 Alien Invasive Species

Alien invasive species for the site were noted as they were seen.

2.4 Fauna

The faunal study, like the vegetation assessment was comprised of both a desktop and a field survey component:

2.4.1 Desktop Study

2.4.1.1 Regional Species List

The following resources were used for the desktop component of the faunal investigation:

- 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), and
- Lists of birds found in the QDS for the study area were determined using online data from the South African Bird Atlas Project (SABAP 2) for 2017.

2.4.1.2 Species of Special Concern (SSC)

The conservation statuses of fauna identified on site was determined using the following resources (further detailed in Table 2-3 below):

- 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.

Table 2-3: Reference Sources for Species of Special Concern

Reference Document	Description
Red List, South Africa	Listed species of flora and fauna are regarded as species whose representation in the wild, has declined to such an extent that drastic action is needed to ensure their survival.
PRECIS	The Pretoria Computerised Information System (PRECIS) list was obtained from the South African National Biodiversity Institute (SANBI) which lists all the Red Data plant species officially recorded by SANBI. This list represents only those species that may occur in the grid in which the sites fall, thus it is regarded as a guideline as to what is likely to occur. The sites sampled are only a very small portion of the whole grid and habitats suitable for certain species in these PRECIS lists may not be present at the sites sampled. It is therefore not unusual for species in the PRECIS list to be absent from the sampling sites
IUCN	<p>The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable).</p> <p>Plants and animals that have been evaluated to have a low risk of extinction are classified as Least Concern. (IUCN.org).</p>
CITES	<p>Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival (CITES.org).</p> <p>CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the Convention has to be authorized through a licensing system. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species (CITES.org). Specimens are divided into the following appendices according to the restriction on trade.</p>
National Legislation	<p>Of special concern during the field investigations were all protected trees listed by the South African National Forest Act (Act 84 of 1998).</p> <p>All flora and fauna species, listed by the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004).</p>



Reference Document	Description
Provincial Legislation	All specially protected as listed by Free State Nature Conservation Ordinance 8 of 1969.

2.4.2 Field Investigation

Pertinent notes were made during the survey and desktop studies were also conducted for birds, mammals, reptile and frogs. All fauna species encountered on site were identified and recorded. The following methods were used during the survey:

2.4.2.1 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. Scats found were collected (if required), photographed on scale along with any tracks found and identified. For identification purposes a field guide Mammals of Southern Africa (Smithers, 2000) was used.

The following was recorded:

- All mammals encountered, noted or captured during the survey;
- Animals listed by landowners;
- A list of the most prominent mammal species; and
- A list of rare and endangered species encountered during the survey.

2.4.2.2 Birds

The principal ornithological field survey technique used was transect counts. Transect counts were planned based on sites representative of different avifauna habitat, such as open grassland, open areas and wetlands. A transect line was selected at each site to reflect its general habitat conditions. Footpaths, trails and other access ways within each site were used as the transect line. Transect count procedures involve slow attentive walks along transects during which any bird seen or heard is identified and recorded.

The following was recorded:

- All birds encountered or noted during the survey;
- A list of the birds encountered; and
- A list of rare and endangered species encountered.

Because the primary purpose of this work was to establish the presence of species, no distance or time limit was set, and hence any species seen or heard anywhere within each of the sampling sites was recorded for the site. If the project were to go ahead, set transects to



be surveyed in specific timeframes are to be undertaken. Where possible, visual identification was used to confirm calls. Bird species were confirmed using Roberts (2006).

Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2004). Robert's' Multimedia of Birds of Southern Africa (2006) was used to compile a list of possible species that might occur in the project area which falls within the quarter degree square 2627DD.

2.4.2.3 Reptiles and Frogs

Herpetofauna include reptile and amphibian species. Direct / opportunistic observation was done along trails or paths within the project area. Any herpetofauna species seen or heard along such paths or trails within the project area was identified and recorded. Another method used was refuge examinations using visual scanning of terrains to record smaller herpetofaunal species which often conceal themselves under rocks and in fallen logs, rotten tree stumps, under rocks, in leaf litter, rodent burrows, ponds, old termite mounds, etc. Branch (1996) and Carruthers (2001) was used to confirm identification where necessary.

2.4.2.4 Red Data Faunal Assessment

The following parameters were used to assess the Probability of Occurrence of each Red Data species:

- Habitat requirements (HR) – Most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics in the study area was evaluated.
- Habitat status (HS) – The status or ecological condition of available habitat in the area is assessed. Often a high level of habitat degradation prevalent in a specific habitat will negate the potential presence of Red Data species (this is especially evident in wetland habitats).
- Habitat linkage (HL) – Movement between areas for breeding and feeding forms an essential part of the existence of many species. Connectivity of the study area to surrounding habitat and the adequacy of these linkages are evaluated for the ecological functioning of Red Data species habitat within the study area.

Probability of occurrence is presented in four categories, namely:

- Low (will not occur);
- Medium (could possibly occur);
- High (most likely could occur); or
- Recorded (does occur on site).



2.5 Assessment of Sensitive Landscapes and Conservation Importance/Significance

Subsequently all fauna and flora data was collectively assessed to determine areas that are of conservation importance. This was then collaborated with a desktop study and mapping which aimed at describing the proposed ash backfill area and assessing the sensitive landscapes and conservation importance/significance of the proposed mining area. Sensitive areas will include areas with a unique or sensitive ecological system such as wetlands, ridges and Red Data species habitat. Nature reserves or proximity to nature reserves are also taken into account.

2.6 Study Limitations

The following limitations were encountered during this study:

- The time of the beginning of spring study did not coincide with the flowering time of most plant species;
- Faunal activity is generally low during the time when the detailed study took place; and
- Avifaunal activity is reduced due to the lack of the summer migrants that generally start arriving in South Africa in October and early November. This also coincides with the breeding of most of the Southern African species.

2.7 Sensitivity Assessment

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects, and will form an important part of the sensitivity analysis. Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed, and have a high sensitivity as they are necessary for overall functioning. In addition, sensitivity analysis in the field based in much finer scale data can be used to ground-truth the larger scale assessments and put it into a more localised context. The following assessments and assignments were taken into account in determining sensitivity:

- The occurrence of the site within an Internationally recognised Important Bird Area (IBA);
- The National List of Ecosystems that are Threatened and in need of Protection;
- The National Protected Areas Expansion Strategy;
- The National Spatial Biodiversity Assessment, and
- The National Vegetation Map (Mucina and Rutherford, 2012).



The Sensitivity Assessment was conducted based on desktop studies as well as information obtained during the field investigations. Ecological sensitivity was quantified by subjectively assessing two factors, namely ecological function and conservation importance. These were defined as follows:

2.7.1 Ecological Function

- High ecological function: Sensitive ecosystems with either low inherent resistance or resilience towards disturbance factors or highly dynamic systems considered to be stable and important for the maintenance of ecosystem integrity (e.g. pristine grasslands, pristine wetlands and pristine ridges).
- Medium ecological function: Relatively important ecosystems at gradients of intermediate disturbances. An area may be considered of medium ecological function if it is directly adjacent to sensitive/pristine ecosystem.
- Low ecological function: Degraded and highly disturbed systems with little or no ecological function.

Functional Status refers to an indication of the services provided by an area and includes both ecological and human related services. Functional Status depends on the degree to which the area or system still provides a noticeable service.

2.7.2 Conservation importance

- High conservation importance: Ecosystems with high species richness which usually provide suitable habitat for a number of threatened species. Usually termed 'no-go' areas and unsuitable for development, and should be conserved.
- Medium conservation importance: Ecosystems with intermediate levels of species diversity without any threatened species. Low-density development may be accommodated, provided the current species diversity is conserved.
- Low conservation importance: Areas with little or no conservation potential and usually species poor (most species are usually exotic).

Ecological health is an indication of carrying capacity of an ecosystem and therefore its ability to perform ecological services. In order to adequately gauge the ecological health of the study site it was important to give a qualitative definition of the 'perceived biodiversity value' of the land. This is done at a broad level, to simply categorise the total area of land owned based on potential biodiversity value. Sensitivity is understood as being a combination of the conservation status and the functional status of the area.



Conservation Status depends on:

- The amount of the area or system remaining (the extent);
- The diversity in terms of 1. Proportional species composition of the area of the system, and 2. The presence of ecosystems/habitat and species which are endemic, threatened, vulnerable or have particularly high religious/cultural value, and
- The degree to which the area or system reflects/represents its original state.

In addition, the data gathered from the field assessment allows for more fine-scale and accurate view of the vegetation in the study area. This data is pivotal for the determination of sensitivity of the area. Based on this approach the total land surface within the project area is categorised into the following biodiversity classes as listed in Table 2-4 below.

Table 2-4: Score Table Describing the Sensitivity value (Sensitivity) Scores

Score	Biodiversity Value	Percentage Score
1	Very High Biodiversity Value	75 – 100%
2	High Biodiversity Value	50 – 75%
3	Moderate Biodiversity Value	25-50%
4	Low Biodiversity Value	0 - 25%

2.7.3 Threatened Ecosystems

The list of national Threatened Ecosystems has been gazetted (NEM:BA: National list of ecosystems that are threatened and in need of protection) and result in several implications in terms of development within these areas. Four basic principles were established for the identification of threatened ecosystems. These include:

- 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.



Areas were delineated based on as fine a scale as possible and are defined by one of several assessments:

- The South African Vegetation Map (Mucina and Rutherford 2012);
- National forest types recognised by the Department of Water Affairs (DWA);
- Priority areas identified in a provincial systematic biodiversity plan, and;
- High irreplaceability forest patches or clusters identified by DAFF.

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 2-5 below.

Table 2-5: 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

These areas are essential for conservation of the country's ecosystems as well as meeting conservation targets.

2.8 Impact Assessment

Table 2-6 to Table 2-8 describe the Impact Rating Methodology which was applied for the proposed Project area and proposed activities.

2.8.1 Methodology

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.



The significance rating process follows the established impact/risk assessment formula:

$$\text{Significance} = \text{Consequence} \times \text{Probability} \times \text{Nature}$$

Where

$$\text{Consequence} = \text{Intensity} + \text{Extent} + \text{Duration}$$

And

$$\text{Probability} = \text{Likelihood of an impact occurring}$$

And

$$\text{Nature} = \text{Positive (+1) or negative (-1) impact}$$

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 2-8. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 2-7, which is extracted from Table 2-6. The description of the significance ratings is discussed in Table 2-8.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 2-6: Impact Assessment Parameter Ratings

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and/or social benefits which have improved the overall conditions of the baseline.	<u>International</u> The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to highly sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	<u>National</u> Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain/Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	<u>Province/ Region</u> Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures/items of cultural significance.	Average to intense natural and/or social benefits to some elements of the baseline.	<u>Municipal Area</u> Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.



Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
3	Moderate loss and/or damage to biological or physical resources of low to moderately sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	<u>Local</u> Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	<u>Limited</u> Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare/improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.



Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	<u>Very limited/Isolated</u> Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely/None: Expected never to happen. <1% probability.

Table 2-7: Probability/Consequence Matrix

		Significance																																					
		-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Probability	7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
	6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
	5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
	4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
	3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
	2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
	1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21


Table 2-8: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and/or social environment.	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and/or social environment.	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and/or social environment.	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and/or social environment.	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)



3 Description of the Study Area

3.1 Regional Vegetation

The Sigma Defunct Colliery study area is situated within the Grassland Biome, which is the largest biome in Southern Africa. The Grassland Biome, covering roughly a third of the country and occurring mainly across 6 provinces, is the largest of South Africa's 9 biomes. It can be separated into 2 climatically-controlled types: temperate inland grasslands, which includes mountain and Highveld grasslands; and sub-tropical grasslands along the coastal belt of KwaZulu-Natal and the Eastern Cape consists of a grassy ground layer and a woody plant upper layer. It is known as Shrubveld when the woody layer is close the grass layer and as Bushveld in any intermediate phases.

The ash backfill project is located directly west of the town of Sasolburg, Free State Province (Figure 1-1). The project area was identified to occur within two vegetation types that can be seen in (Figure 3-1).

- Central Free State Grassland (Vulnerable) (Mucina&Rutherford, 2006); and
- Soweto Highveld Grassveld (Endangered) (Mucina&Rutherford, 2006).

Plant species recorded within the study area are listed in Appendix B, the PRECIS list obtained from SIBIS can be found in Appendix A.

3.1.1 Central Free State Grassland

This vegetation type consists of undulating plains supporting short grassland, in natural condition dominated by *Themeda triandra* and *E. chloromelas* became dominant in degraded habitats. Dwarf karoo bushes establish themselves in severely degraded clayey bottomlands. Overgrazed and trampled low lying areas with heavy clayey soils are prone to *Acacia karoo* encroachment.

The landscape is mostly undulating plains with short grassland which are dominated by *Themeda triandra*, under natural conditions, while *Eragrostis curvula* and *E. chloromelas* dominate degraded areas. Some areas that are extremely degraded by overgrazing are invaded by dwarf karoo shrubs as well as the small tree *Acacia karoo* (Mucina & Rutherford 2006).

3.1.1.1 Conservation Status

Vulnerable: Target 24%. Only small portions enjoy statutory conservation (Willem Pretorius, Rustfontein and Koppies dam nature reserves, as well as in some nature reserves. Almost a quarter of the area has been transformed, either for cultivation or building of dams (Allemanskraal, Erfenis, Groothoek, Koppies, Kroonstad). No serious infestation by alien flora has been observed, but encroachment of dwarf karoo shrubs becomes a problem in the degraded southern parts of the vegetation type (Mucina & Rutherford 2006).



3.1.2 Soweto Highveld Grassland

This vegetation type occurs on gently to moderately undulating landscape on the Highveld plateau supporting short to medium high, dense, tufted grassland dominated almost entirely by *Themeda triandra* (Rooi grass) and accompanied by a variety of other grasses such as *Elionuris muticus* (Wire grass), *Eragrostis racemosa* (Small heart grass), *Heteropogon contortus* (Spear grass) and *Tristachya leucothrix* (Trident grass).

Only small scattered wetlands, narrow streams and occasional ridges or rocky outcrops interrupt the continuous grassland cover. The geology of the Soweto Integration consists mainly of shale, sandstone or mudstone of the Madzarinwe formation (Karoo supergroup).

3.1.2.1 Conservation Status

Currently considered **endangered**, only a handful of patches are statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, and Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeukuil, Trichardtsfontein, Vaal and Willem Brummer dams). Erosion is generally very low (93%).

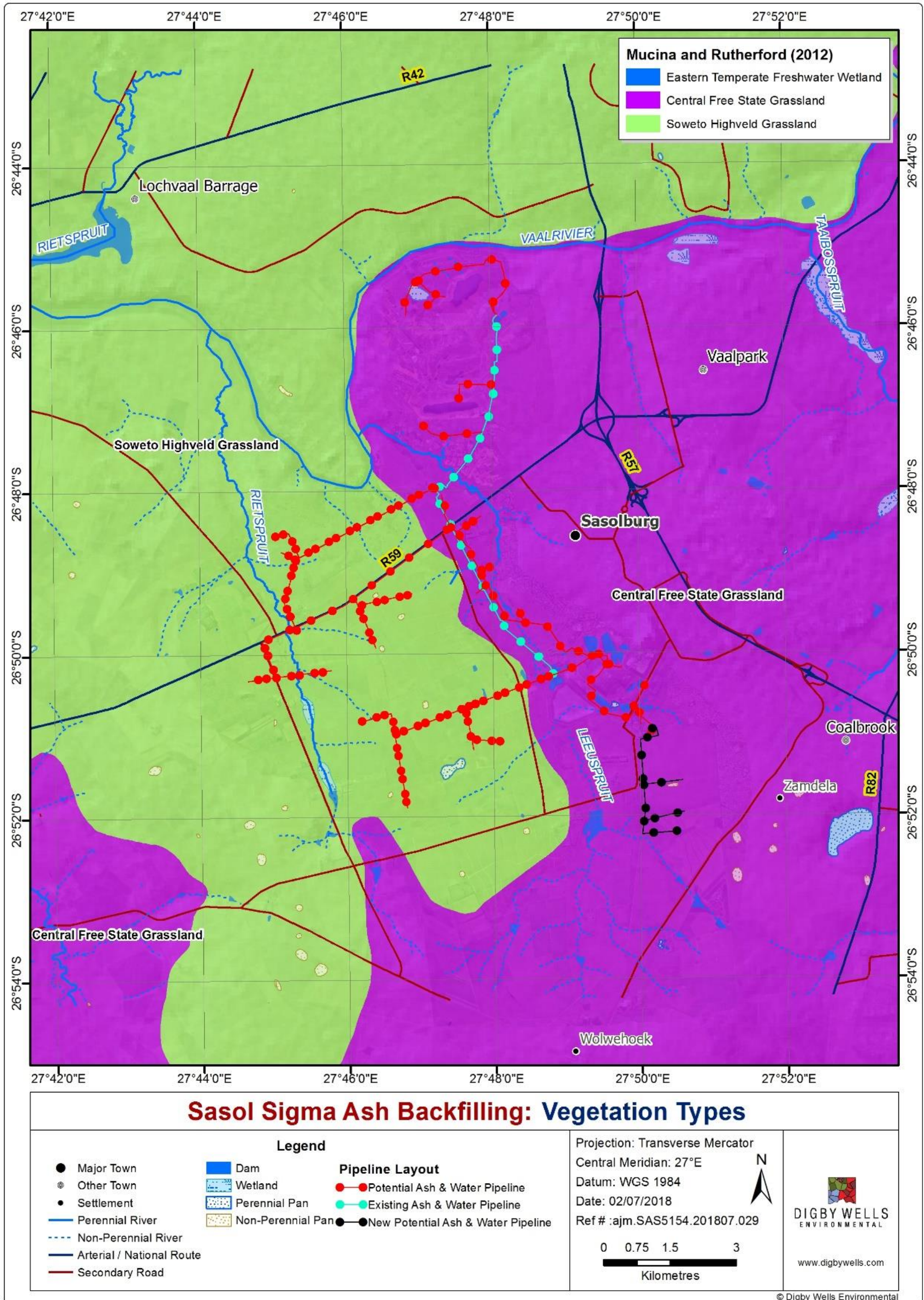


Figure 3-1: Regional Vegetation

(Source: Mucina and Rutherford, 2012)



4 Results

4.1 Vegetation

As a result of current and historical land use, and for the purpose of this report, the study site can be divided into two main sections: Transformed and Degraded land. Large parts of the study site consist of cultivated lands and associated farm buildings and roads. The majority of the study area is covered by maize fields, industry and Sasolburg, with certain areas transformed by alien plants. The remnants of underground mining in the form of subsidence and open disturbed areas can also be found. The remaining land area is often used for cattle grazing and, as such, is degraded from its natural state. A conservation area is located to the east of the study area, and harbours wild herbivores. Areas under cultivation (maize, potatoes and planted grazing), buildings and alien stands, fall into the transformed category. Degraded land includes those grassland areas that are currently being used as grazing land, mainly for cattle, as well as wetlands and woodland areas which are used for grazing. Domestic livestock can have high impacts on natural vegetation, resulting in decreases to species richness and diversity.

Most degraded sites are areas that may have been cleared in the past, or have been heavily overgrazed, resulting in the majority of this vegetation type comprising of pioneer grass species with scattered shrubs. The remaining indigenous species tend to be those that are not favoured by grazing livestock and are noted for their presence in overgrazed areas such as bankrupt bush (*Seriphium plumosum*). Degraded areas are thus a grassland habitat with some wetland species in the low lying areas, with high numbers of plants indicating over grazing and few geophyte species. Common species include *Themeda triandra*, *Digitaria eriantha* and *Eragrostis curvula*. It is important to note that despite the degraded nature of the site, the wetland and grassland areas form important habitat for species such as the grass owl and form process areas that are vital to the functioning of the ecosystem. There are three main vegetation types forming the degraded areas, these are grassland, woodland and wetland.

4.1.1 Vegetation Types

During the field survey the vegetation was found to predominantly Grassland and Cultivation, however residential and farming regions allowed for secondary succession and the growth of pioneer species due to the disturbances. A total of 51 species were identified throughout the project area.



Six vegetation communities (Figure 4-1) were identified including:

- Secondary Grassland;
- Woodland/Savanna;
- Agricultural fields;
- Alien vegetation;
- Riparian/Wetland;
- Infrastructure and Mining.

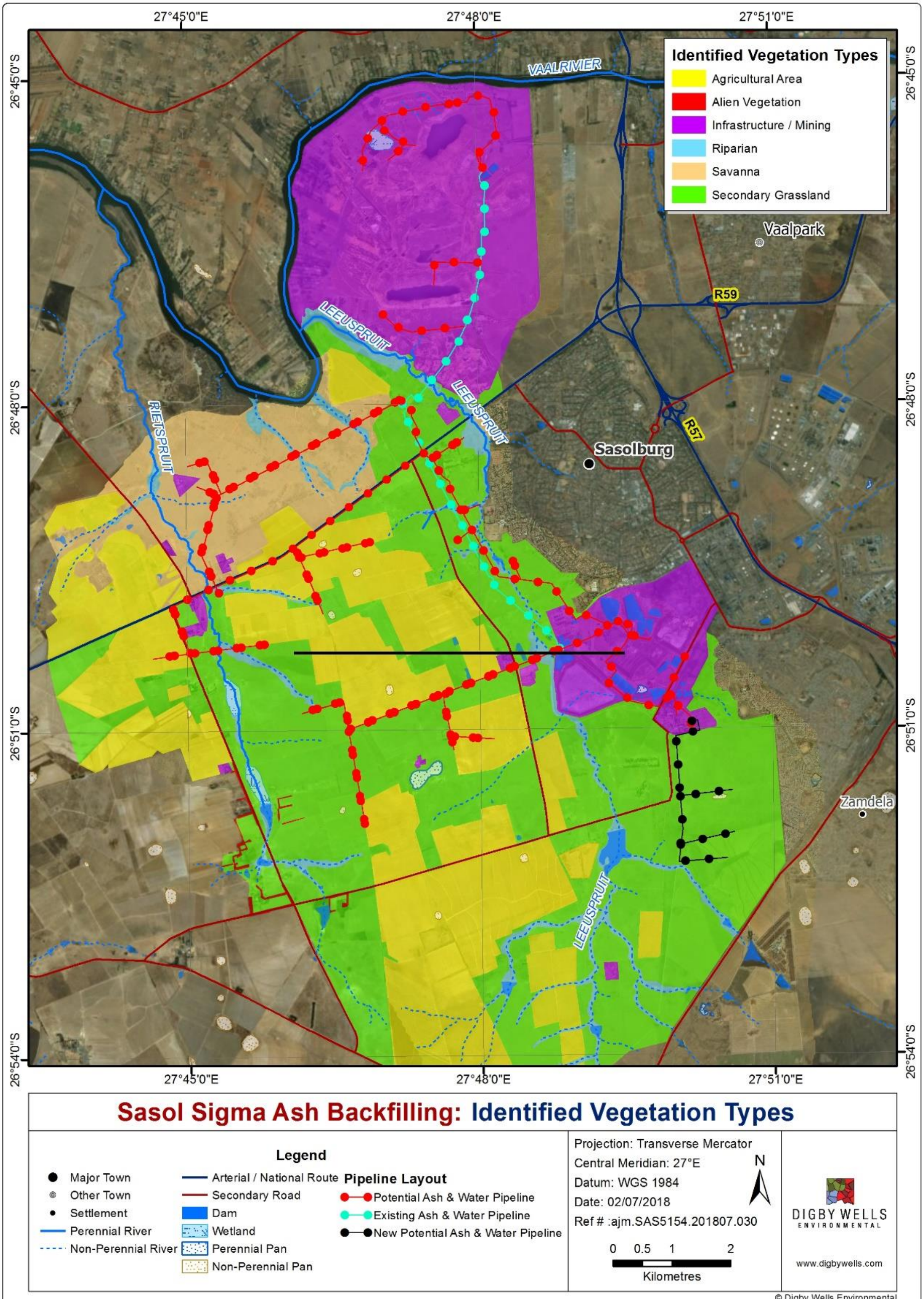


Figure 4-1: Vegetation Communities



4.1.2 Secondary Grassland

The grassland unit was identified as the original or primary vegetation type in the area. This main vegetation type consists of grassland with a well-developed grass layer and fairly developed herb / forb layer (Appendix B). Trees and shrubs are almost absent within this main vegetation type and only scattered individual trees or shrubs occur within this main vegetation type and its associated plant communities. Individual trees and /or shrubs recorded within this main vegetation type consists of species such as *Acacia dealbata*, *Eucalyptus* sp., *Salix* sp, *Melia azederach*, *Diospyros lycioides*, *Populus* sp and *Rhus* sp.

The grasslands have formed and are maintained as a result of natural factors such as fire and frost, both of which are important in not allowing trees to start dominating the area, thereby creating a savanna landscape. The effects of the anthropogenic activities, in the form of declining habitat, are a major threat to this grassland vegetation type. The grassland was encountered on relatively flat rolling hill slopes. The ecological integrity and sensitivity was found to be high and the grasslands are seen as very important with regards to its biodiversity maintenance function.



Figure 4-2: Secondary Grassland, with Alien Trees in the Background



4.1.3 Woodland/Savanna

The wooded rocky grassland unit (Figure 4-3,) was encountered within the general grassland, in rocky relatively sheltered areas (Appendix B). The occurrence of this vegetation type can be attributed to the fact that the factors that normally exclude trees from grassland do not have a strong influence here. The presence of outcrops within this unit limited its agricultural potential. The ruggedness of the outcrops increased the soil moisture and excluded fires which enabled trees to establish on and in the vicinity of these outcrops.



Figure 4-3: Woodland/Savanna

4.1.4 Riparian/Wetland

The riparian/wetland unit (Figure 4-4) is located in areas where drainage lines are present (Appendix B). This vegetation unit is mainly associated with the moderately deep, poorly drained, dark, moderately structured clay soils, with signs of permanent wetness in the subsoil or in other words drainage lines.

This area represents the sweetveld within the study area and is therefore favoured by the herbivores. The presence of species associated with over utilisation supports this statement. The clayey soil texture is the result of the accumulation of fine sediment within the low-lying areas of the study area. The presence of the drainage line and waterlogged conditions support this statement.



Figure 4-4: Riparian/Wetland

4.1.5 Agricultural Areas

The old fields, cultivated areas and grazing areas are collectively referred to agricultural areas on the relevant maps (Appendix B). Areas utilised as pastures were interspersed with the areas under current cultivation (Appendix B). Evidence (visual, dung) of cattle grazing in these areas was found. These small areas exist where ploughed land has been left to re-vegetate with grass species such as *Eragrostis curvula*, creating a mono culture dominated area.

Pasture areas together with cultivated areas are primarily responsible for the declining grassland habitat in the area. Pastures were encountered on the more flat areas and on the hill slopes where the gradient was gradual.

4.1.6 Infrastructure and Mining

Habitat destruction/transformation and fragmentation through infrastructure and mining development is the most serious threat posed to the survival of plants and habitat types in the study area.

Residential areas encountered during the survey were found to be of three main categories. Firstly informal settlements, these can take the form of new shanty towns or older established residential areas where planned housing densities have been exceeded by the construction of shacks. The informal settlements occurred un-planned and were found within



previously natural grasslands and agricultural areas, however due to the lack of infrastructure in the form of sanitation and running water and roads, the impacts of the informal settlements on natural areas was negative.

Secondly small holdings, these areas were planned and have infrastructure in place, the dominant land use within these areas were small scale agricultural. Open grassland occurs within these areas regularly, however the fragmented nature of these areas was extensive.

Thirdly, formal housing, these areas are planned and has adequate infrastructure, the fragmentation caused by these areas were also noticeable.

4.1.7 Alien Trees

Small areas of invader tree species were encountered throughout the project footprint, the dominant tree species found here were *Eucalyptus* spp., *Populus* spp., *Acacia* spp. and *Pinus* spp. These areas created a different micro habitat where tall tree cover shaded grassy areas (Appendix B). The alien tree species present was as a result of human intervention, these species were intentionally planted by humans, most probably to act as a wind break for a farm house. The alien trees habitat type was encountered on the hill slopes of rolling hills and flat areas between these hills. Due to the effect of the alien invasive plant species that displaces indigenous flora, the ecological functioning of these areas was low. However remnants of indigenous vegetation still exist which, as mentioned, creates microhabitats.

4.2 Flora

A total of 51 species were recorded from the study site. It is likely that a more in-depth study will record more species. The most common species include *Themeda triandra*, *Seriphium plumosum* and *Digitaria eriantha* which occurred in most sample plots. *Poaceae* (the grass family) is well represented with twenty species, in contrast to the *Cyperaceae* (sedge family) with three species. Much of the site comprises problem species especially *Seriphium plumosum* (bankrupt bush). This species is common in overgrazed areas, as it is unpalatable and becomes the dominant species when palatable grass species are grazed, which allows for the invasion of bankrupt bush.

There are limited numbers of geophyte species including *Ledebouria* species. There should be higher numbers of such species but livestock grazing has resulted in their removal in large areas.

4.2.1 Alien and Invasive Species

Alien plant species have been classified according to National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), as published in August 2014 (GN R599 in GG 37886 of 1 August 2014) into the following categories:

- 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 4-1 lists the alien species identified on site as well as their respective alien categories, according to CARA and NEMBA. Plants not listed as Category 1, 2 or 3 plants can still be problem plants, and these are also listed below.

Table 4-1 Alien Species identified on Site

Family	Species Name	Common Name	Category
Agavaceae	<i>Agave americana</i>	Century plant	-
Asparagaceae	<i>Asparagus laricinus</i>	Wild asparagus	-
Asteraceae	<i>Bidens pilosa</i>	Black Jack	-
Asteraceae	<i>Mantiscalca salmantica</i>	Mantiscalca	-
Asteraceae	<i>Schkuhria pinnata</i>	Dwarf marigold	-
Asteraceae	<i>Senecio latifolius</i>	Ragwort	-
Asteraceae	<i>Tagetes minuta</i>	Tall khakhi weed	-
Asteraceae	<i>Xanthium strumarium</i>	Spiny cocklebur	1
Asteraceae	<i>Zinnia peruviana</i>	Redstar zinnia	-
Cactaceae	<i>Opuntia ficus-indica</i>	Prickley pear	1
Caesalpiniaceae	<i>Senna pendula var. glabrata</i>	Easter Cassia	3
Euphorbiaceae	<i>Ricinus communis</i>	Castor oil plant	2
Fabaceae	<i>Indigofera heterotricha</i>	Hairy indigo	-
Meliaceae	<i>Melia azedarach</i>	Chinaberry	3
Papaveraceae	<i>Argemone ochrolauca</i>	Mexican poppy	1
Poacea	<i>Melinis repens</i>	Natal red top	-
Solanaceae	<i>Solanum incanum</i>	Thorn Apple	-
Solanaceae	<i>Solanum panduriform</i>	Bitterappel	-

4.3 Fauna

Fauna expected to occur on site include assemblages within terrestrial and wetland ecosystems: mammals, birds, reptiles and amphibians. Each of these assemblages occurs within unique habitats, the ecological state of these habitats directly relates to the number of species found within them. The main habitats occurring in the project area are Woodland/Savannah, Agricultural fields and Secondary Grassland.



4.3.1 Mammals

For a desktop review of mammals that could possibly occur within the project area, SIBIS was used. SIBIS is part of SANBI's Integrated Biodiversity Information System. Animal species that were previously recorded within the Free State Province and the project area can be seen in Appendix C. The list also indicated the global and national IUCN status, as well as the NEMBA status. By making a comparison between the previously recorded species list and the currently occurring species found during the field survey, the magnitude of impacts resulting in species reduction or loss can be estimated. The Animal Demography Unit's virtual museum of mammal species search produced no results for this QDS. Therefore the Free State list is used to discuss the possible presence of mammals in the study area.

The Red Data species considered for this survey can be seen in Table 4-2. The probability of occurrence was estimated based on habitat requirement and distribution.

Table 4-2: Red Data species of the Study area

Common Name	Scientific name	Nemba Status	Potential to occur
African Clawless Otter	<i>Aonyx capensis</i>	Protected	Low
South African Hedgehog	<i>Atelerix frontalis</i>	Protected	Low
Black Wildebeest	<i>Connochaetes gnou</i>	Protected	Medium
Cape Fox	<i>Vulpes chama</i>	Protected	Low

4.3.1.1 Mammals found during the Field Survey

Burrows and holes of small mammals, which can possibly belong to mice, rats, suricates, etc. were found during the field survey.

A full species list of mammals recorded can be seen in Table 4-3. All the species listed below were found exclusively in the conservation area.

Table 4-3: Mammal Species identified during the Field Survey

Family	Species	English Name
Bovidae	<i>Sylvicapra grimmia</i>	Grey /Common Duiker
Bovidae	<i>Antidorcas marsupialis</i>	Springbok
Bovidae	<i>Aepyceros melampus</i>	Impala
Bovidae	<i>Taurotragus/Tragelaphus oryx</i>	Eland
Bovidae	<i>Connochaetes gnou</i>	Black Wildebeest
Herpestidae	<i>Cynictis penicillata</i>	Yellow Mongoose
Bovidae	<i>Oryx gazella</i>	Gemsbuck
Bovidae	<i>Alcelaphus buselaphus</i>	Red Hartebeest



Family	Species	English Name
Bovidae	<i>Damaliscus pygargus phillipsi</i>	Blesbok
Cervidae	<i>Dama dama</i>	Fallow Dear

4.3.2 Avifauna

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological condition are linked to land cover. As the land cover of an area changes, so do the types of birds in that area (The Bird Community Index, 2007). Land cover is directly linked to habitats within the study area. The diversity of these habitats should give rise to many different species. According to the South African Bird Atlas Project (SABAP2), almost 300 species of birds have been identified in the area; the majority of these birds are comprised of Grassland species. All birds that could be present within QDS 2627DD are listed in Appendix D.

Red Data bird species protected within the Free State Province were also considered during the field survey (Table 4-4). The possibility of occurrence was based on the distribution and habitat requirements of these Red Data species.

Table 4-4: Red Data Species considered during the Field Survey

English Family	Scientific	2018 BLSA Checklist
Crane Blue	<i>Anthropoides paradiseus</i>	NT
Crane Grey Crowned	<i>Balearica regulorum</i>	EN
Duck Maccoa	<i>Oxyura maccoa</i>	NT
Eagle Martial	<i>Polemaetus bellicosus</i>	EN
Falcon Lanner	<i>Falco biarmicus</i>	VU
Flamingo Greater	<i>Phoenicopterus roseus</i>	NT
Flamingo Lesser	<i>Phoeniconaias minor</i>	NT
Godwit Black-tailed	<i>Limosa limosa</i>	NA
Harrier African Marsh	<i>Circus ranivorus</i>	EN
Harrier Black	<i>Circus maurus</i>	EN
Harrier Pallid	<i>Circus macrourus</i>	NT
Heron White-backed Night-	<i>Gorsachius leuconotus</i>	VU
Kingfisher Half-collared	<i>Alcedo semitorquata</i>	NT
Korhaan Blue#	<i>Eupodotis caerulescens</i>	LC
Owl African Grass	<i>Tyto capensis</i>	VU



English Family	Scientific	2018 BLSA Checklist
Plover Chestnut-banded	<i>Charadrius pallidus</i>	NT
Pratincole Black-winged	<i>Glareola nordmanni</i>	NT
Roller European	<i>Coracias garrulus</i>	NT
Secretarybird	<i>Sagittarius serpentarius</i>	VU
Stork Black	<i>Ciconia nigra</i>	VU
Stork Marabou	<i>Leptoptilos crumeniferus</i>	NT
Stork Yellow-billed	<i>Mycteria ibis</i>	EN
Tern Caspian	<i>Hydroprogne caspia</i>	VU
Vulture Cape	<i>Gyps coprotheres</i>	EN

Key: # denotes endemic species

NT – Near Threatened/ VU – Vulnerable/ CR – Critically Endangered/ LC – Least Concerned/ NA – Not Assessed.

4.3.2.1 Bird Species found during the Field Survey

During the field survey 41 species were observed. Table 4-5 summarizes all species of birds recorded. This list cannot be considered as a complete list as many other birds can be present within any given season or day of the year. During the dry season survey, bird activity was greatly reduced.

Table 4-5: Bird Species identified during the Field Survey

Species Name	Common Name	Red Data Listing
<i>Haliaeetus vocifer</i>	African Fish Eagle	Not Listed
<i>Polyboroides typus</i>	African Harrier Hawk	Not Listed
<i>Actophilornis africanus</i>	African Jacana	Not Listed
<i>Gallinago nigripennis</i>	African Snipe	Not Listed
<i>Amaurornis flavirostris</i>	Black Crake	Not Listed
<i>Anas sparsa</i>	Black Duck	Not Listed
<i>Ardea melanocephala</i>	Blackheaded Heron	Not Listed
<i>Vanellus armatus</i>	Blacksmith Lapwing	Not Listed
<i>Himantopus himantopus</i>	Blackwinged Stilt	Not Listed
<i>Uraeginthus angolensis</i>	Blue Waxbill	Not Listed
<i>Lamprotornis nitens</i>	Cape Glossy Starling	Not Listed
<i>Passer melanurus</i>	Cape Sparrow	Not Listed



Species Name	Common Name	Red Data Listing
<i>Streptopelia capicola</i>	Cape Turtle Dove	Not Listed
<i>Gallinula chloropus</i>	Common Moorhen	Not Listed
<i>Estrilda astrild</i>	Common Waxbill	Not Listed
<i>Trachyphonus vaillantii</i>	Crested Barbet	Not Listed
<i>Laniarius atrococcineus</i>	Crimsonbreasted Shrike	Not Listed
<i>Vanellus coronatus</i>	Crowned Lapwing	Not Listed
<i>Pycnonotus barbatus</i>	Darkcapped Bulbul	Not Listed
<i>Alopochen aegyptiacus</i>	Egyptian Goose	Not Listed
<i>Lanius collaris</i>	Fiscal shrike	Not Listed
<i>Casmerodius albus</i>	Great White Egret	Not Listed
<i>Nectarinia afra</i>	Greater Doublecollared Sunbird	Not Listed
<i>Ardea cinerea</i>	Grey Heron	Not Listed
<i>Bostrychia hagedash</i>	Hadedda Ibis	Not Listed
<i>Streptopelia senegalensis</i>	Laughing Dove	Not Listed
<i>Merops pusillus</i>	Little Bee-eater	Not Listed
<i>Oena capensis</i>	Namaqua Dove	Not Listed
<i>Ceryle rudis</i>	Pied Kingfisher	Not Listed
<i>Vidua macroura</i>	Pintaled Whydah	Not Listed
<i>Ardea purpurea</i>	Purple Heron	Not Listed
<i>Anas erythrorhyncha</i>	Redbilled Teal	Not Listed
<i>Urocolius indicus</i>	Redfaced Mousebird	Not Listed
<i>Fulica cristata</i>	Redknobbed Coot	Not Listed
<i>Mirafra sabota</i>	Sabota Lark	Not Listed
<i>Threskiornis aethiopicus</i>	Sacred Ibis	Not Listed
<i>Laniarius ferrugineus</i>	Southern Boubou	Not Listed
<i>Ploceus velatus</i>	Southern Masked Weaver	Not Listed
<i>Phalacrocorax lucidus</i>	White breasted Cormorant	Not Listed
<i>Dendrocygna viduata</i>	Whitefaced Duck	Not Listed
<i>Egretta intermedia</i>	Yellowbilled Egret	Not Listed



4.3.3 Herpetofauna

No Red Data status amphibians or reptiles were found during the site visit. The complete list of reptiles expected to occur on site can be viewed in Appendix E. The expected list for amphibians in the area produced two thus far unnamed species according to SAFAP (the South African frog atlas project); the expected species are depicted in Appendix F.

5 Sensitivity Assessment

5.1 Species of Special Concern

5.1.1 Flora

No Red Data species were identified by the PRECIS data for the grid square 2627DD can be seen in Appendix A.

5.1.1.1 Plant Species with Ethnobotanical Uses

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.

From the list of plant species identified during the field surveys there are 9 species (Table 5-1) that have cultural uses. Medicinal plants are important to many people and have been used traditionally for centuries to cure many ailments. Plants have also been used traditionally for other cultural uses, such as building material, and for spiritual uses such as charms.

Table 5-1: Species with Cultural Uses identified within the Project Area

Species Name	Common Name	Uses
<i>Senegalia caffra</i>	Common hook thorn	Dyes and tanning
<i>Vachellia karroo</i>	Sweet thorn	Dyes and tanning
<i>Asparagus larycinus</i>	Wild asparagus	Vegetable
<i>Bidens pilosa</i>	Black Jack	Herbs
<i>Dichrostachys cinerea</i>	Sickle bush	Medicinal uses, dental care, firewood
<i>Gymnosporia senegalensis</i>	Red spike thorn	Medicinal uses
<i>Hyparrhenia hirta</i>	Common thatching grass	Thatching

Species Name	Common Name	Uses
<i>Opuntia ficus-indica</i>	Prickley pear	Fruits
<i>Zea mays</i>	Mielies	Maize

5.1.2 Fauna

During the site visit no fauna species of special concern was encountered, the conservation area within the Sigma property did contain eleven wild herbivore species, however these are artificially kept and do not represent the natural ecosystem.

5.2 Ecological Sensitivity Assessment

5.2.1 Protected Areas

5.2.1.1 Vaal Dam Nature Reserve

Situated 35km east of Sasolburg on the Vaal River in Vanderbiljpark (Figure 5-1), the Vaal Dam is South Africa's second biggest dam by area and fourth largest by volume. It has more than 800km of shoreline, spans three provinces - Gauteng, Free State and Mpumalanga. The Vaal Dam Nature Reserve is not expected to be impacted on by the normal procedure of ash backfilling.

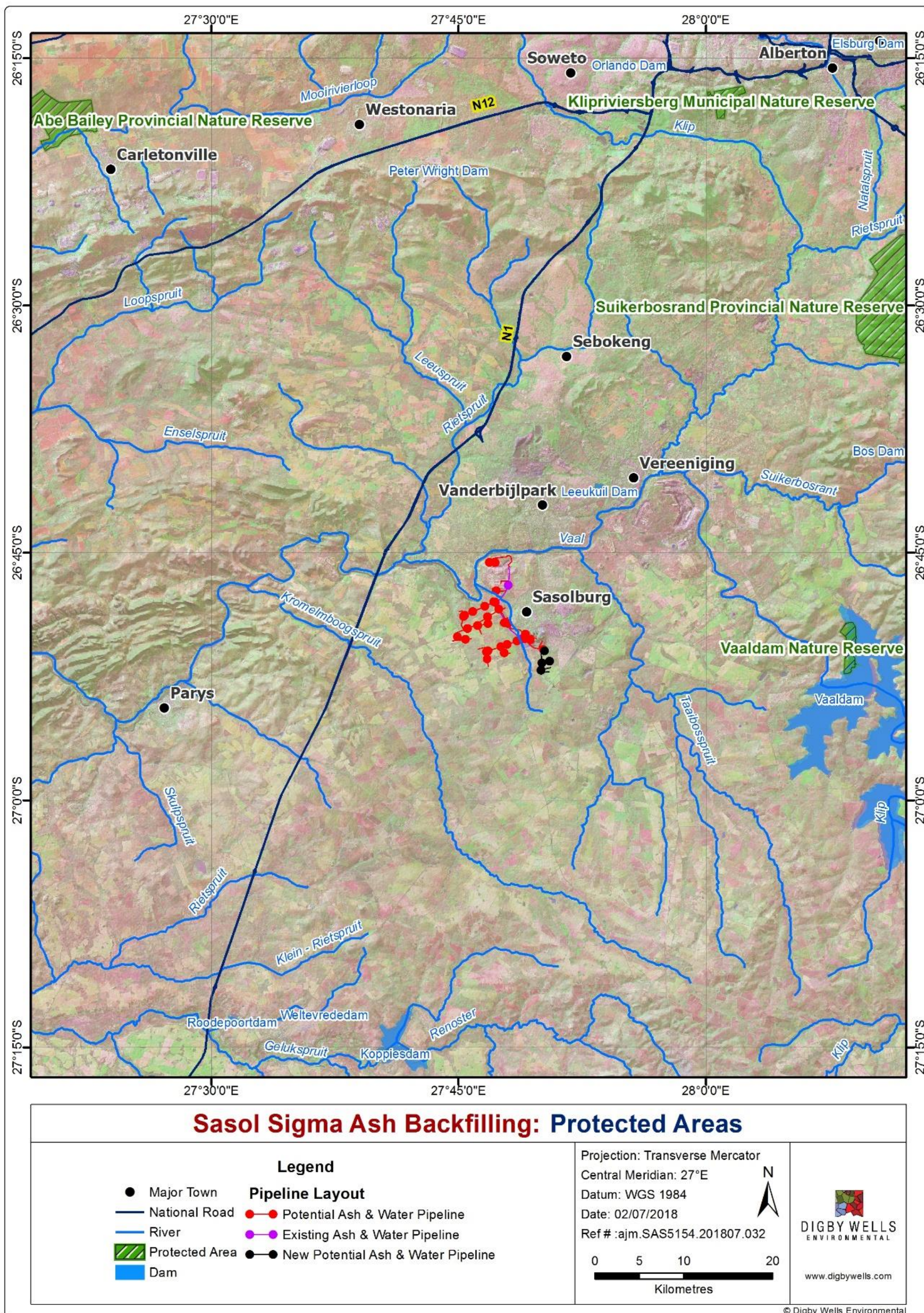


Figure 5-1: Protected Areas in proximity to the Sigma Project Area



5.2.2 Important Bird Areas

The Sigma Ash backfill project area does not fall within any important bird areas; the different categories of IBA's are depicted in Table 5-2.

Table 5-2 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.
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 km ² , 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.



Criterion		Notes
A3.	Biome-restricted species	<p>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.</p>
A4.	Congregations	<p>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, $\geq 1\%$ of a biogeographic population of a congregatory waterbird species.</p> <p>ii). Site known or thought to hold, on a regular basis, $\geq 1\%$ of the global population of a congregatory seabird or terrestrial species.</p> <p>iii). Site known or thought to hold, on a regular basis, $\geq 20,000$ waterbirds or $\geq 10,000$ pairs of seabirds of one or more species.</p> <p>iv). Site known or thought to exceed thresholds set for migratory species at bottleneck sites.</p>

This category applies to groups of species with largely shared distributions of greater than 50,000 km², 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.

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 Criterion 5 of the Ramsar Convention for identifying wetlands of international importance.

iv. Thresholds are set regionally or inter-regionally, as appropriate.



The Sigma ash backfill project site is approximately 40 kilometers from one IBA, the Suikerbosrand Nature Reserve. It is not envisaged that the project will have any effect on the above mentioned IBA area.

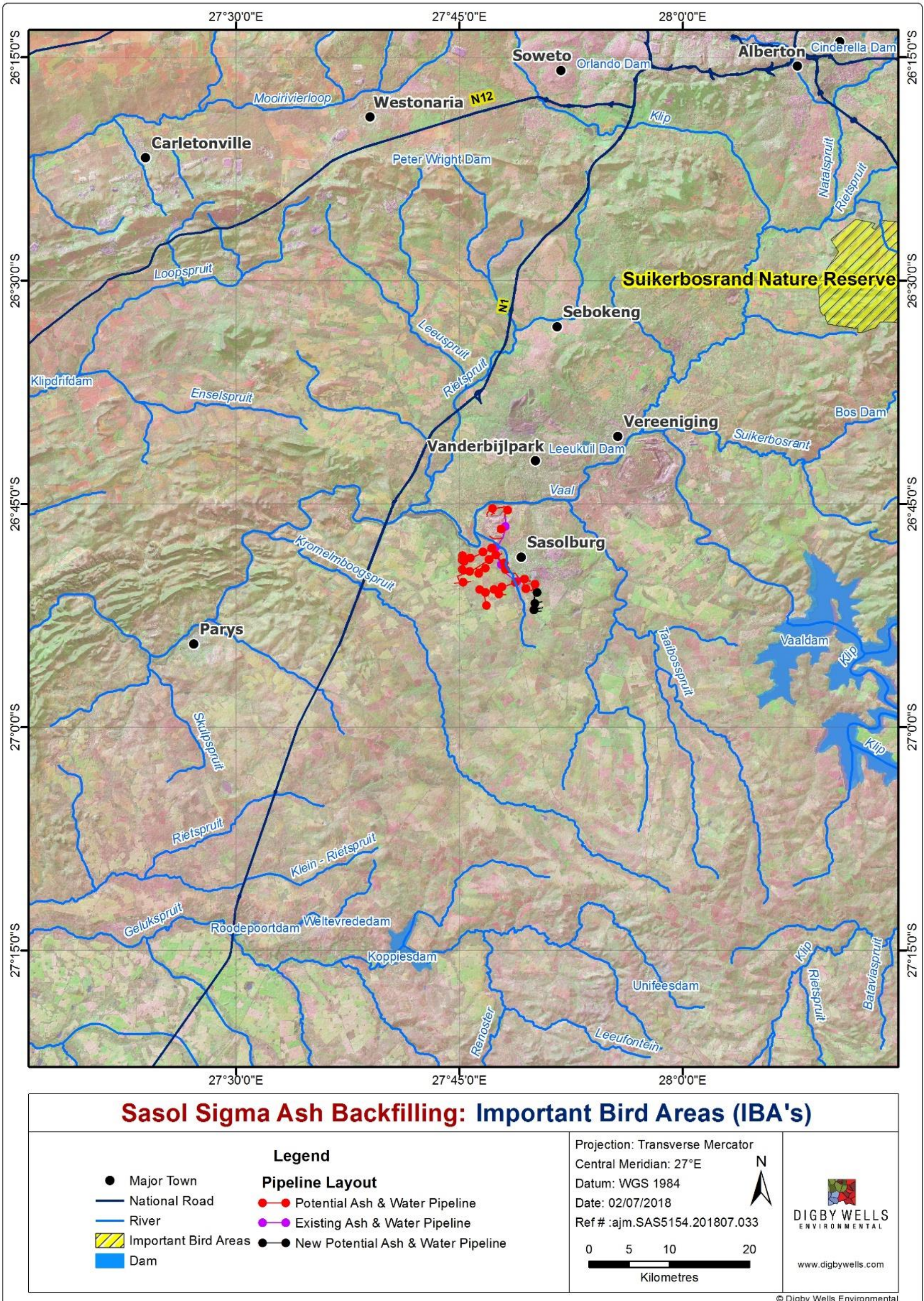


Figure 5-2: The Sigma Defunct Colliery Project Area's proximity to IBA's

5.2.3 Nationally Threatened Ecosystems

The Nationally 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. Four basic principles were established for the identification of threatened ecosystems. These include:

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.

Areas were delineated based on as fine a scale as possible and are defined by one of several assessments:

- The South African Vegetation Map (Mucina and Rutherford 2012);
- 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 study site covers a small portion of the Soweto Highveld Grassland unit National Threatened Ecosystem (Figure 5-3), which is designated as Vulnerable.

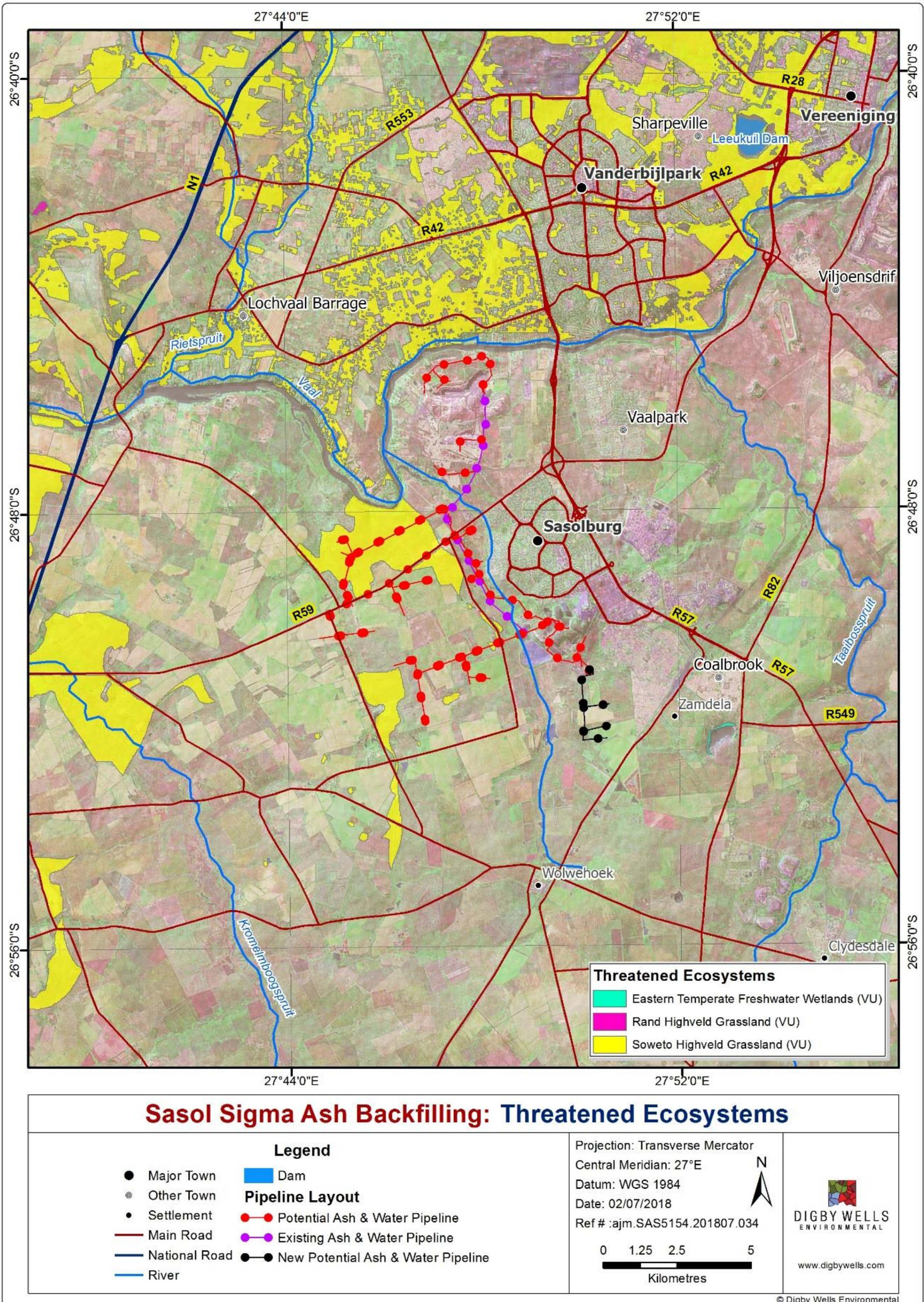


Figure 5-3 Ecosystems in need of Protection in relation to the Sigma Project Area

5.2.4 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. Figure 5-4 indicates the proximity of the Sigma ash backfill project site to existing expansion focus areas, approximately 60 km from the Vaal Grasslands and 45 km from Free State Highveld Grassland.

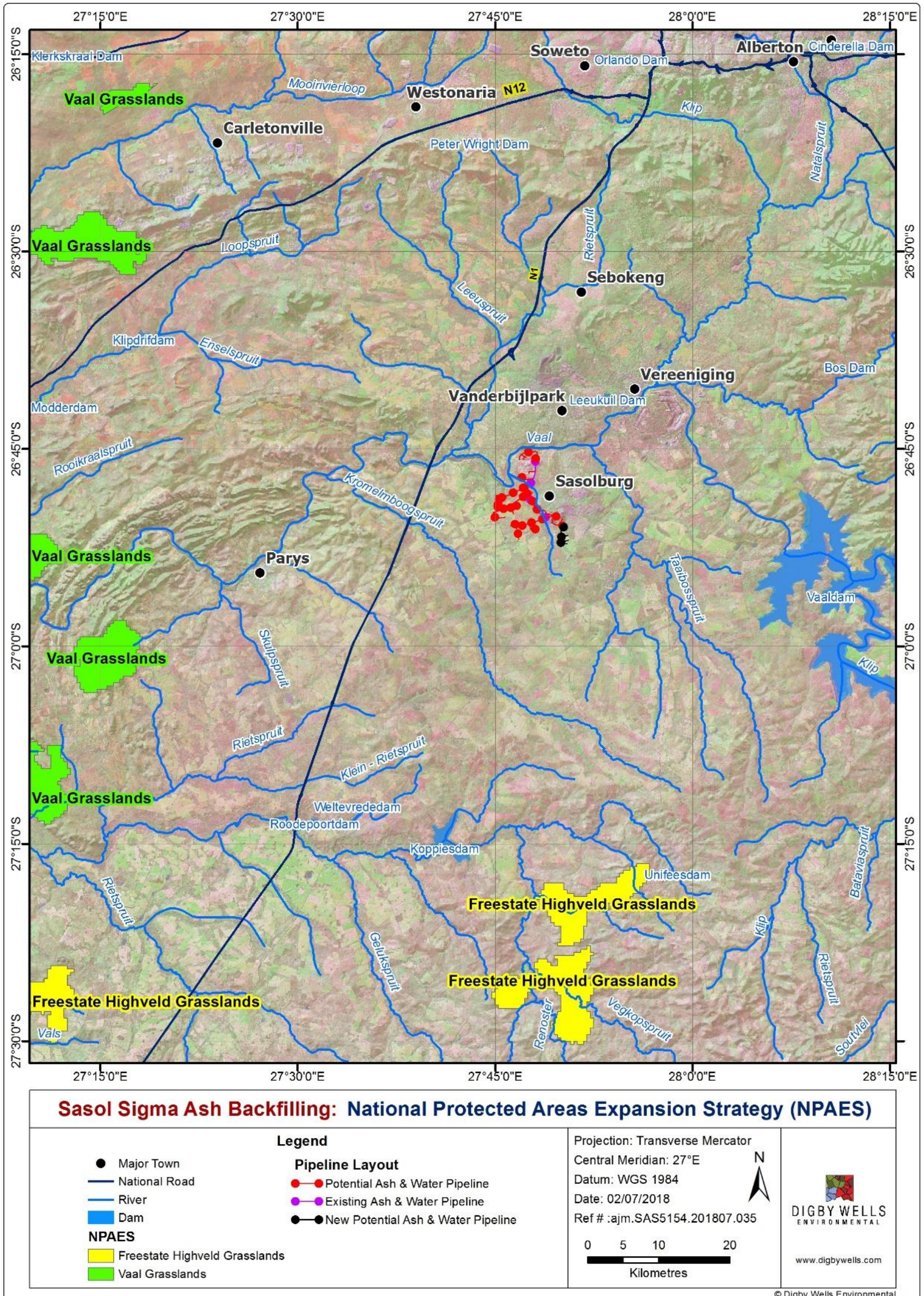


Figure 5-4: National Protected Area Expansion Strategy Focus Areas proximity to the Sigma Project Area



5.2.5 Sensitivity Assessment

The biodiversity value or sensitivity assessment takes into account all of the plans mentioned above (Threatened Ecosystems and NPAES), as well as the field data gathered during the site visits. The outcomes of these assessments are one sensitivity map, incorporating vegetation and flora and fauna. These are presented in Figure 5-5. A Medium High Sensitivity was assigned to the Riparian Areas owing to the ecosystem services provided by these as well as their irreplaceability as unique biodiversity features. The Woodland/Savannah vegetation on site is in disturbed ecological condition and was mostly allocated a Moderately Sensitivity, due to it falling inside the Soweto Highveld Grassland unit which is designated as Vulnerable Nationally; it was assigned a Medium Sensitivity. The Secondary Grassland vegetation occurring on flat lower lying areas was overgrazed or cultivated and was in relatively poor condition. However within the protected area and surrounds this vegetation type was designated as important for supporting ecosystems functioning. The lower lying areas identified as Agricultural fields and scored as low sensitivity and contain the majority of the infrastructure planned.

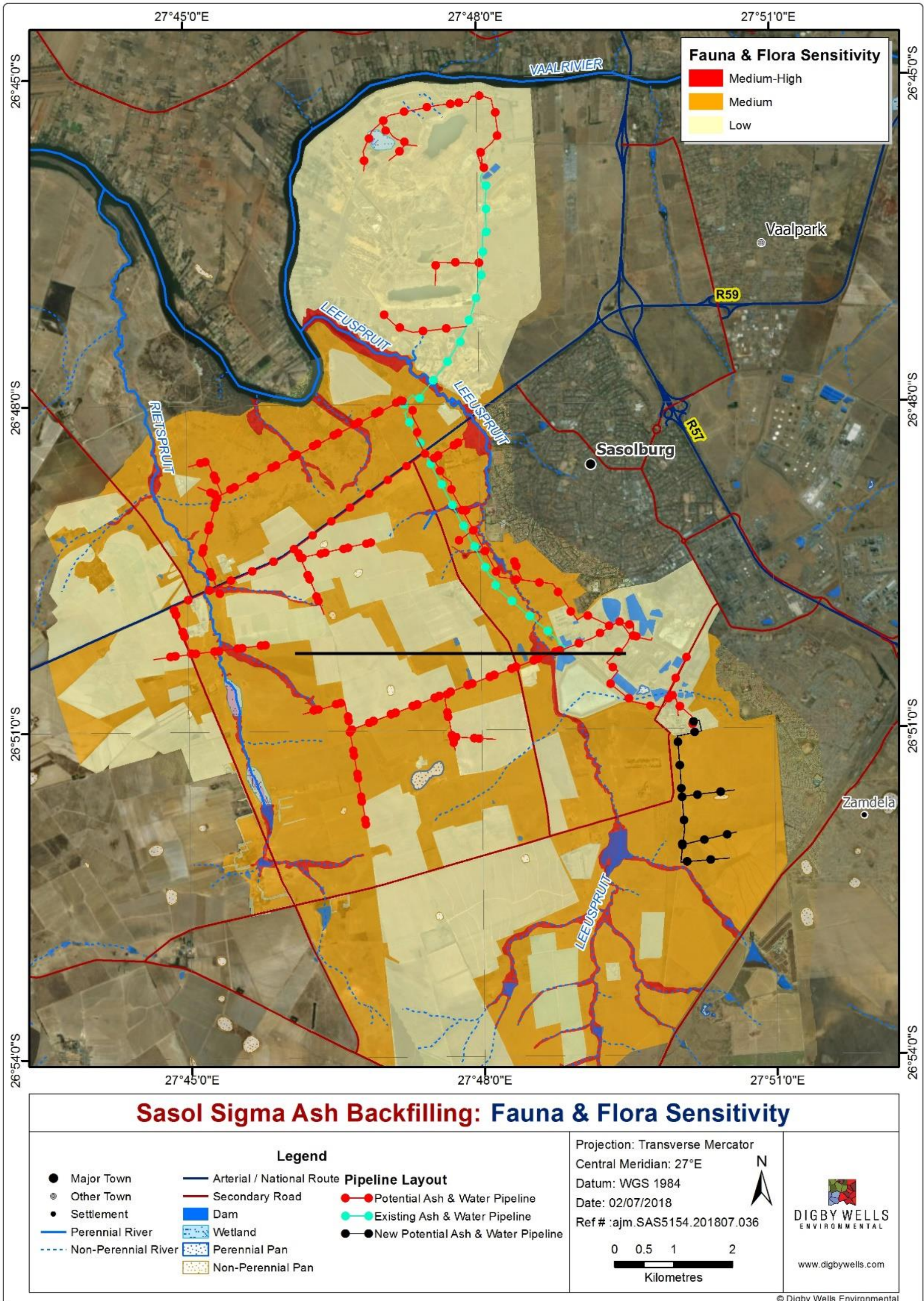


Figure 5-5: Vegetation Sensitivity and Planned Infrastructure for the Sasol Sigma Project Area



6 Impact Assessment

6.1 Issues and Impacts

The following section describes the flora and fauna issues and impacts for;

- Current land use (the no-go option); and
- Proposed Sasol Sigma Ash Backfill.

6.1.1 Impacts of current land use (the no-go option)

The current land use in the project area is mostly subsistence farming, Industrial and the town of Sasolburg, and also cattle farming. The more natural areas have been overgrazed and signs of bush encroachment and erosion (due to vegetation removal) occur in the study area. The overstocking that have occurred has resulted in degradation of the vegetation, resulting in a loss of plant abundance (habitat) and diversity.

6.1.1.1 Issue 1: Loss of Plant Communities

- Impact 1: Loss of Secondary Grassland;
- Impact 2: Loss of Degraded Woodland/Savanna; and
- Impact 3: Loss of Riparian Vegetation.

Table 6-1: Issue 1 Loss of Plant Communities

Issue 1	Loss of Plant Communities				
Parameters	Severity	Spatial scale	Duration	Probability	Significance
Impact 1	Loss of Secondary Grassland				
Pre- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Post- Mitigation	N/A				
Impact 2	Loss of Degraded Woodland/Savannah				
Pre- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Post- Mitigation	N/A				
Impact 3	Loss of Riparian Vegetation				
Pre- Mitigation	Moderate (3)	Local (3)	Short-term (3)	Likely (5)	Low (40)
Post -Mitigation	N/A				



6.1.1.2 Issue 2: Loss of Biodiversity

The loss of biodiversity is gradual within the already disturbed areas, such as the agricultural fields, as it is already seen as low; the actual effect on biodiversity will not be significant

- Impact 4: Loss General Biodiversity.

Table 6-2: Issue 2 Loss of Biodiversity

Issue 2	Loss of Biodiversity				
Parameters	Severity	Spatial scale	Duration	Probability	Significance
Impact 4	Loss of General Biodiversity				
Pre- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Post- Mitigation	N/A				

6.1.1.3 Issue 3: Loss of Ecosystem Function

- Impact 5: Fragmentation and Edge Effect; and
- Impact 6: Alien vegetation colonisation.

Table 6-3: Loss of Ecosystems Function

Issue 3	Loss of Ecosystem Function				
Parameters	Severity	Spatial scale	Duration	Probability	Significance
Impact 5	Fragmentation and edge effect				
Pre- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Post- Mitigation	N/A				
Impact 6	Colonisation by aliens				
Pre- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Post- Mitigation	N/A				



6.1.2 Impacts of Proposed Ash Backfill Activities

6.1.2.1 Construction Phase

6.1.2.1.1 *Issue 1: Loss of Plant Communities*

Construction of the ash backfill pipeline will lead to the direct loss of the vegetation on site. There are five different broad vegetation units found on site, which include three main types of habitat (Figure 4-1): Loss of Secondary Grassland, Degraded Woodland/Savanna and Riparian Vegetation, with Riparian areas rated as Highly Sensitive for the majority of the site owing to a lack of major disturbance and a predominantly un-altered state. Vegetation is considered as a whole, and individual plant species (and SSC) are not taken into account for this impact. Anticipated impacts include:

- Impact 1: Loss of Riparian areas (Moderately high sensitivity);
- Impact 2: Loss of Secondary Grassland and Degraded Woodland/Savanna vegetation type (Moderately high sensitivity); and
- Impact 3: Loss of Alien Vegetation and Agricultural fields (Low sensitivity).

Mitigation and Management

The plan as of the date of this report indicates that the pipeline infrastructure that will be transporting the ash will be following existing roads, servitudes and pipeline routes as far as possible. Provided that the plans do not change, the areas of Moderately High Sensitivity (wetlands and riparian edges) and Medium (Secondary Grassland and Degraded Woodland/Savanna) will be avoided, due to the routes chosen. All Highly Sensitive Areas should be avoided and these include all Wetland and Riparian habitat on site.

Areas that are not directly affected by the project activities should be conserved. This entails restricting access, and controlling any alien invasives as well as keeping clearing to a minimum. Rehabilitation of areas small areas disturbed during construction and not needed for operation should occur concurrent to pipeline construction activity.

Table 6-4: Loss of Plant Communities

Issue 1	Loss of Plant Communities				
Parameters	Severity	Spatial scale	Duration	Probability	Significance
Impact 1	Loss of Riparian areas (Moderately high sensitivity)				
Pre- Mitigation	Minor Effects (3)	Local (3)	Short-term (3)	Likely (5)	Low (45)
Post- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Impact 2	Loss of Secondary Grassland and Degraded Woodland/Savanna				



Issue 1	Loss of Plant Communities				
Parameters	Severity	Spatial scale	Duration	Probability	Significance
Pre- Mitigation	Minor Effects (3)	Local (3)	Short-term (3)	Likely (5)	Low (45)
Post- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Impact 3	Loss of Alien Vegetation and Agricultural fields				
Pre- Mitigation	Minor Effects (3)	Local (3)	Short-term (3)	Likely (5)	Low (45)
Post- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)

6.1.2.2 Issue 2: Loss of biodiversity

The construction of the backfill pipeline will result in the loss of certain biodiversity aspects. General Biodiversity will be affected (this includes individual species associated with vegetation). The areas rated as having Moderately High Sensitivity are in relatively good ecological condition and/or plays a role in ecosystems functioning. For these reasons, destruction of these habitats, which occupy the small areas of the site, is regarded as detrimental to biodiversity in the area. Anticipated impacts include:

- Impact 4: Loss general biodiversity.

Mitigation and Management

Provided that the pipeline plans do not change, the areas of Moderately High Sensitivity (wetlands and riparian edges) will be avoided. If encountered all SSC, as well as the immediate habitat surrounding them, should be preserved and construction of the pipeline should be restricted to areas outside of their immediate habitat. In the case where this is not possible, and all efforts to avoid these areas have been exhausted, permits may be applied for from the provincial authorities to translocate these species. It is imperative however, that the habitat in which these species are translocated to is as similar to the donor habitat as possible and is also within close proximity to the site. It must be noted, regardless of the potential relocation of SSC, if the original natural habitat in which these species occur is destroyed, the negative impact still exists. Post land use planning and design project must be addressed and completed before this project commences.

Table 6-5: Loss of Biodiversity

Issue 2	Loss of Biodiversity				
Parameters	Severity	Spatial scale	Duration	Probability	Significance
Impact 4	Loss of general biodiversity				
Construction Phase					
Pre- Mitigation	Minor Effects (3)	Local (3)	Short-term (3)	Likely (5)	Low (45)
Post- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)
Operational Phase					
Pre- Mitigation	Minor Effects (3)	Local (3)	Short-term (3)	Likely (5)	Low (45)
Post- Mitigation	Minor Effects (2)	Local (3)	Short-term (3)	Likely (5)	Low (35)

6.2 Cumulative Impacts

It is necessary to consider the impacts that the development will have from a broad area perspective, by considering land-use and transformation of natural habitat in areas surrounding the site. Cumulative impacts are assessed by considering past, present and anticipated changes to biodiversity.

Albeit the vegetation types present are in a degraded status, the Soweto Highveld Grassland does fall within the study area, the actual effect in this vegetation type will however be low.

The impacts on the ecology of the area will not be significant, if all backfilling processes go according to plan and spillages occur. It is expected that there will be losses of vegetation and flora along with associated faunal habitat, in the case of spillages. The primary impacts will be the destruction of all vegetation and animal habitat that is affected during such an occurrence.

7 Reasoned Opinion

The impacts as described rated and mitigated in this document does not pose a risk to large natural areas of Medium high or Medium sensitivity, neither is SSC with restricted ranges being threatened with destruction. All vegetation, habitat and species present on site that could be affected by the activities proposed are of stable populations. With strict adherence to the mitigation measures prescribed in this document, the impacts have been rated as acceptable and the proposed project can go ahead.



8 Consultation Process Undertaken

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. The objectives of the Stakeholder Engagement Process (SEP) include the following:

- To ensure that the I&APs are informed of the Project;
- To provide the I&APs with an opportunity to engage and provide comment on the Project;
- To draw on local knowledge by identifying environmental and social concerns associated with the Project;
- To involve the I&APs in identifying methods in which concerns can be addressed;
- To verify stakeholder comments have been recorded accurately; and
- To comply with legal requirements.

No comments relating to fauna and flora were received during the SEP undertaken during the original EIA process.

9 Conclusions

The area of study was found to be under pressure from surrounding land use, most notably, remnants of mining and agriculture including maize and cattle farming. Despite these threats, it was found that the area of study provided an ecological service to the plant and animal species encountered during the field survey and possibly to the plant and animal species that were identified during the desktop survey.

The area is either transformed or degraded but wetlands and associated grasslands from important process and habitat areas. These areas are of conservation importance and the opportunity exists for Sigma to conserve some biodiversity corridors maintaining ecosystem functionality and potentially having an overall positive impact on biodiversity.

10 Recommendations

As illustrated in this report the study area consists of different levels of sensitivity from a biodiversity standpoint these areas have been delineated and described. It is therefore important that the placement of the pipeline infrastructure is done with these sensitive areas in mind. The opportunity exists however, for the Sigma to contribute to conservation of biodiversity within the region. If efforts are made to initiate conservation of this habitat, and conservation is maintained after the decommissioning of the pipelines, the net impacts on biodiversity will be positive.



The biodiversity management actions of the proposed ash backfill project should be focussed on the vegetation units as described in this report. These vegetation units also justify some effort in terms of biodiversity management on the proposed ash backfill project.

- Adherence to the mitigation measures as stipulated in the Impact Assessment;
- Pipeline infrastructure should be restricted to areas of low sensitivity;
- Rehabilitation of areas;
- The footprint of the ash backfill pipelines should be as small as possible;
- Alien plants must be identified and removed throughout the phases, design a specialist alien plant monitoring plan;
- Monitoring of the fauna and flora present on the project site;
- Design and implement a fire management plan.



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Fauna and Flora Assessment Report

Sasol Mining Sigma Colliery Ash Backfilling Project, Sasolburg, Free State Province

SAS5184



DIGBY WELLS
ENVIRONMENTAL

Appendix A: PRECIS data for the 2627DD



Family Name	Species Name	Common Name	IUCN	CITES	NEMBA
ACANTHACEAE	<i>Crabbea hirsuta</i>	Prickle head	LC		
ALLIACEAE	<i>Tulbaghia leucantha</i>	Wild garlic	LC		
AMARYLLIDACEAE	<i>Ammocharis coranica</i>	Ammocharis	LC		
AMARYLLIDACEAE	<i>Ammocharis coranica</i>	berg lily	LC		
AMARYLLIDACEAE	<i>Ammocharis coranica</i>	Ground lily	LC		
AMARYLLIDACEAE	<i>Cyrtanthus breviflorus</i>	Wild Crocus	LC		
AMARYLLIDACEAE	<i>Cyrtanthus breviflorus</i>	Yellow fire lily	LC		
APIACEAE	<i>Centella asiatica</i>	Ibdiab pennywort	LC		
APIACEAE	<i>Centella asiatica</i>	Marsh pennywort	LC		
APIACEAE	<i>Centella asiatica</i>	Pennywort	LC		
APIACEAE	<i>Centella asiatica</i>	pepperwort	LC		
APOCYNACEAE	<i>Pentarrhinum insipidum</i>	African heartvine	LC		
APOCYNACEAE	<i>Raphionacme hirsuta</i>	False gentian	LC		
APOCYNACEAE	<i>Schizoglossum nitidum</i>	Split-tongue	LC		
ASPHODELACEAE	<i>Bulbine narcissifolia</i>	Strap-leaved bulbine	LC		
ASPHODELACEAE	<i>Kniphofia porphyrantha</i>	red-hot poker	LC		
ASTERACEAE	<i>Arctotis venusta</i>	Free State Daisy	LC		
ASTERACEAE	<i>Felicia muricata subsp. muricata</i>	wild aster	LC		
ASTERACEAE	<i>Gazania krebsiana subsp. krebsiana</i>	butter flower	LC		
ASTERACEAE	<i>Gazania krebsiana subsp. krebsiana</i>	common Gazania	LC		
ASTERACEAE	<i>Gazania krebsiana subsp. krebsiana</i>	Gazania	LC		
ASTERACEAE	<i>Gazania krebsiana subsp. serrulata</i>	grassland gazania	LC		
ASTERACEAE	<i>Haplocarpha scaposa</i>	common haplocarpha	LC		
ASTERACEAE	<i>Helichrysum argyrosphaerum</i>	Wild everlasting	LC		
ASTERACEAE	<i>Helichrysum nudifolium var. nudifolium</i>	Hottentot's tea	LC		
ASTERACEAE	<i>Helichrysum nudifolium var. nudifolium</i>	Wild tea	LC		
ASTERACEAE	<i>Pentzia globosa</i>	bitter karoo bush	LC		
ASTERACEAE	<i>Pentzia globosa</i>	hair karoo	LC		
ASTERACEAE	<i>Senecio burchellii</i>	Burchell-senecio	LC		
ASTERACEAE	<i>Senecio burchellii</i>	Guanobush	LC		
ASTERACEAE	<i>Senecio burchellii</i>	Molteno disease plant	LC		
ASTERACEAE	<i>Senecio burchellii</i>	Molteno-disease-plant	LC		



Family Name	Species Name	Common Name	IUCN	CITES	NEMBA
ASTERACEAE	<i>Senecio burchellii</i>	ragwort	LC		
ASTERACEAE	<i>Senecio consanguineus</i>	ragwort	LC		
ASTERACEAE	<i>Senecio consanguineus</i>	starvation bush	LC		
ASTERACEAE	<i>Senecio inaequidens</i>	canary weed	LC		
ASTERACEAE	<i>Senecio inaequidens</i>	canaryseed	LC		
ASTERACEAE	<i>Sonchus dregeanus</i>	sowthistle	LC		
CAMPANULACEAE	<i>Wahlenbergia androsaeca</i>	hare-bell	LC		
CAMPANULACEAE	<i>Wahlenbergia undulata</i>	african bluebell	LC		
CAMPANULACEAE	<i>Wahlenbergia undulata</i>	african harebell	LC		
CAPPARACEAE	<i>Cleome monophylla</i>	single-leaved Cleome	LC		
CAPPARACEAE	<i>Cleome monophylla</i>	spider flower	LC		
CAPPARACEAE	<i>Cleome monophylla</i>	Spindlepod	LC		
CAPPARACEAE	<i>Cleome rubella</i>	pretty lady	LC		
CARYOPHYLLACEAE	<i>Dianthus basuticus</i> subsp. <i>basuticus</i> var. <i>basuticus</i>	Lesotho carnation	LC		
CARYOPHYLLACEAE	<i>Pollichia campestris</i>	Barley sugar bush	LC		
CARYOPHYLLACEAE	<i>Pollichia campestris</i>	wax berry	LC		
CARYOPHYLLACEAE	<i>Pollichia campestris</i>	wax berry plant	LC		
CARYOPHYLLACEAE	<i>Pollichia campestris</i>	Waxberry	LC		
CELASTRACEAE	<i>Gymnosporia buxifolia</i>	common spike-thorn	LC		
CELASTRACEAE	<i>Gymnosporia buxifolia</i>	spike-thorn	LC		
CELTIDACEAE	<i>Celtis africana</i>	african elm	LC		
CELTIDACEAE	<i>Celtis africana</i>	camdeboo	LC		
CELTIDACEAE	<i>Celtis africana</i>	camdeboo stinkwood	LC		
CELTIDACEAE	<i>Celtis africana</i>	Camdeboo-stinkhout	LC		
CELTIDACEAE	<i>Celtis africana</i>	Camdeboostinkwood	LC		
CELTIDACEAE	<i>Celtis africana</i>	cannibal stinkwood	LC		
CELTIDACEAE	<i>Celtis africana</i>	cannibal-stinkwood	LC		
CELTIDACEAE	<i>Celtis africana</i>	white stinkwood	LC		
COMBRETACEAE	<i>Combretum erythrophyllum</i>	Bush willow	LC		
COMBRETACEAE	<i>Combretum erythrophyllum</i>	Bushveld willow	LC		
COMBRETACEAE	<i>Combretum erythrophyllum</i>	River bushwillow	LC		
COMBRETACEAE	<i>Combretum erythrophyllum</i>	River Combretum	LC		



Family Name	Species Name	Common Name	IUCN	CITES	NEMBA
COMMELINACEAE	<i>Commelina benghalensis</i>	Benghal Commelina wandering Jew	LC		
COMMELINACEAE	<i>Commelina benghalensis</i>	Benghal wandering Jew	LC		
COMMELINACEAE	<i>Commelina benghalensis</i>	blue wandering Jew	LC		
COMMELINACEAE	<i>Commelina benghalensis</i>	venus's bath	LC		
COMMELINACEAE	<i>Commelina benghalensis</i>	wandering Jew	LC		
COMMELINACEAE	<i>Cyanotis speciosa</i>	Doll's powderpuff	LC		
COMMELINACEAE	<i>Cyanotis speciosa</i>	Job's tears	LC		
COMMELINACEAE	<i>Cyanotis speciosa</i>	wandering Jew	LC		
CONVOLVULACEAE	<i>Convolvulus sagittatus</i>	wild bindweed	LC		
CONVOLVULACEAE	<i>Ipomoea ommanneyi</i>	ox potato	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	bitter apple	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	Bitter melon	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	colocynth	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	sweet melon	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	sweet watermelon	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	tsama melon	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	Tsamma melon	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	white watermelon	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	wild melon	LC		
CUCURBITACEAE	<i>Citrullus lanatus</i>	wild watermelon	LC		
CYPERACEAE	<i>Bulbostylis humilis</i>	shy sedge	LC		
CYPERACEAE	<i>Cyperus difformis</i>	smallflower umbrella plant	LC		
CYPERACEAE	<i>Cyperus esculentus var. esculentus</i>	earth almond	LC		
CYPERACEAE	<i>Cyperus esculentus var. esculentus</i>	edible galingale	LC		
CYPERACEAE	<i>Cyperus esculentus var. esculentus</i>	nutgrass	LC		
CYPERACEAE	<i>Cyperus esculentus var. esculentus</i>	sedge	LC		
CYPERACEAE	<i>Cyperus esculentus var. esculentus</i>	water grass	LC		
CYPERACEAE	<i>Cyperus esculentus var. esculentus</i>	yellow nut grass	LC		
CYPERACEAE	<i>Cyperus esculentus var. esculentus</i>	Yellow nut sedge	LC		



Family Name	Species Name	Common Name	IUCN	CITES	NEMBA
CYPERACEAE	<i>Cyperus esculentus</i> var. <i>esculentus</i>	yellow nut-grass	LC		
CYPERACEAE	<i>Cyperus fastigiatus</i>	sedges	LC		
CYPERACEAE	<i>Cyperus longus</i> var. <i>tenuiflorus</i>	sweet cyperus	LC		
CYPERACEAE	<i>Cyperus usitatus</i>	Indian grass	LC		
CYPERACEAE	<i>Kyllinga erecta</i> var. <i>erecta</i>	greater Kyllinga	LC		
CYPERACEAE	<i>Kyllinga erecta</i> var. <i>erecta</i>	white Kyllinga	LC		
CYPERACEAE	<i>Kyllinga erecta</i> var. <i>erecta</i>	white sedge	LC		
DIPSACACEAE	<i>Scabiosa columbaria</i>	Morning bride	LC		
DIPSACACEAE	<i>Scabiosa columbaria</i>	Perennial scabious	LC		
DIPSACACEAE	<i>Scabiosa columbaria</i>	Rice flower	LC		
DIPSACACEAE	<i>Scabiosa columbaria</i>	Scabious	LC		
DIPSACACEAE	<i>Scabiosa columbaria</i>	Wild scabiosa	LC		
DIPSACACEAE	<i>Scabiosa columbaria</i>	Wild scabious	LC		
EBENACEAE	<i>Diospyros lycioides</i> subsp. <i>lycioides</i>	star apple	LC		
EBENACEAE	<i>Euclea crispa</i> subsp. <i>crispa</i>	bush guarri	LC		
EQUISETACEAE	<i>Equisetum ramosissimum</i> subsp. <i>ramosissimum</i>	drill grass	LC		
EQUISETACEAE	<i>Equisetum ramosissimum</i> subsp. <i>ramosissimum</i>	horse-tail	LC		
EQUISETACEAE	<i>Equisetum ramosissimum</i> subsp. <i>ramosissimum</i>	horsetail	LC		
EQUISETACEAE	<i>Equisetum ramosissimum</i> subsp. <i>ramosissimum</i>	mare's tail	LC		
EQUISETACEAE	<i>Equisetum ramosissimum</i> subsp. <i>ramosissimum</i>	scouring rush	LC		
EQUISETACEAE	<i>Equisetum ramosissimum</i> subsp. <i>ramosissimum</i>	Transvaal horsetail	LC		
EUPHORBIACEAE	<i>Euphorbia inaequilatera</i> var. <i>inaequilatera</i>	prostrate spurge	LC		
EUPHORBIACEAE	<i>Euphorbia inaequilatera</i> var. <i>inaequilatera</i>	smooth creeping milkweed	LC		
EUPHORBIACEAE	<i>Euphorbia inaequilatera</i> var. <i>inaequilatera</i>	smooth prostrate Euphorbia	LC		
EUPHORBIACEAE	<i>Euphorbia striata</i> var. <i>striata</i>	Milkweed	LC		
EUPHORBIACEAE	<i>Euphorbia striata</i> var. <i>striata</i>	Spurge	LC		
FABACEAE	<i>Acacia karroo</i>	Cape gum	LC		
FABACEAE	<i>Acacia karroo</i>	Cape Mimosa	LC		
FABACEAE	<i>Acacia karroo</i>	Cape thorn tree	LC		



Family Name	Species Name	Common Name	IUCN	CITES	NEMBA
FABACEAE	<i>Acacia karroo</i>	Cape thorn-tree	LC		
FABACEAE	<i>Acacia karroo</i>	Gum-arabic tree	LC		
FABACEAE	<i>Acacia karroo</i>	Karoo mimosa	LC		
FABACEAE	<i>Acacia karroo</i>	Karoo thorn	LC		
FABACEAE	<i>Acacia karroo</i>	Mimosa	LC		
FABACEAE	<i>Acacia karroo</i>	Mimosa thorn	LC		
FABACEAE	<i>Acacia karroo</i>	Sweet thorn	LC		
FABACEAE	<i>Acacia karroo</i>	thorn tree	LC		
FABACEAE	<i>Acacia karroo</i>	Umbrella thorn	LC		
FABACEAE	<i>Acacia karroo</i>	White-thorn	LC		
FABACEAE	<i>Acacia karroo</i>	Whitethorn	LC		
FABACEAE	<i>Elephantorrhiza elephantina</i>	dwarf elephant-root	LC		
FABACEAE	<i>Elephantorrhiza elephantina</i>	Eland's wattle	LC		
FABACEAE	<i>Elephantorrhiza elephantina</i>	Elephant's root	LC		
FABACEAE	<i>Trifolium burchellianum subsp. burchellianum</i>	Wild clover	LC		
FABACEAE	<i>Zornia milneana</i>	zornia	LC		
GENTIANACEAE	<i>Chironia palustris subsp. palustris</i>	Cerise stars	LC		
GERANIACEAE	<i>Monsonia angustifolia</i>	crane's bill	LC		
GERANIACEAE	<i>Monsonia burkeana</i>	Crane's Bill	LC		
GERANIACEAE	<i>Pelargonium luridum</i>	Stork's bill	LC		
GERANIACEAE	<i>Pelargonium luridum</i>	variable stork's bill	LC		
GERANIACEAE	<i>Pelargonium luridum</i>	wild geranium	LC		
HYACINTHACEAE	<i>Dipcadi viride</i>	Dainty green bells	LC		
HYACINTHACEAE	<i>Dipcadi viride</i>	Green lily	LC		
HYACINTHACEAE	<i>Ledebouria cooperi</i>	Cooper's squill	LC		
HYACINTHACEAE	<i>Ledebouria cooperi</i>	wild squill	LC		
HYDROCHARITACEAE	<i>Lagarosiphon major</i>	coarse oxygen weed	LC		
HYDROCHARITACEAE	<i>Lagarosiphon muscoides</i>	fine oxygen weed	LC		
HYPOXIDACEAE	<i>Hypoxis rigidula var. rigidula</i>	Farmer's string	LC		
HYPOXIDACEAE	<i>Hypoxis rigidula var. rigidula</i>	Silver-leaved star-flower	LC		
HYPOXIDACEAE	<i>Hypoxis rigidula var. rigidula</i>	Yellow star	LC		
IRIDACEAE	<i>Gladiolus sericeovillosus subsp. sericeovillosus</i>	Shaggy-stemmed cornflag	LC		
LAMIACEAE	<i>Acrotome inflata</i>	tumble weed	LC		



Family Name	Species Name	Common Name	IUCN	CITES	NEMBA
LAMIACEAE	<i>Acrotome inflata</i>	Tumbleweed	LC		
LAMIACEAE	<i>Salvia verbenaca</i>	vervain Salvia	LC		
LAMIACEAE	<i>Salvia verbenaca</i>	wild clary	LC		
LEMNACEAE	<i>Spirodela punctata</i>	duckweed	LC		
LEMNACEAE	<i>Wolffia arrhiza</i>	duckweed	LC		
LINACEAE	<i>Linum thunbergii</i>	Wild flax	LC		
LOBELIACEAE	<i>Lobelia erinus</i>	edging Lobelia	LC		
LOBELIACEAE	<i>Lobelia erinus</i>	garden Lobelia	LC		
LOBELIACEAE	<i>Lobelia erinus</i>	wild Lobelia	LC		
MALVACEAE	<i>Corchorus asplenifolius</i>	gusha	LC		
MALVACEAE	<i>Hibiscus pusillus</i>	bladderweed	LC		
MALVACEAE	<i>Sida rhombifolia</i> subsp. <i>rhombifolia</i>	arrowleaf Sida	LC		
MALVACEAE	<i>Sida rhombifolia</i> subsp. <i>rhombifolia</i>	common Sida	LC		
MALVACEAE	<i>Sida rhombifolia</i> subsp. <i>rhombifolia</i>	Pretoria Sida	LC		
MALVACEAE	<i>Sida rhombifolia</i> subsp. <i>rhombifolia</i>	Queenslandhemp	LC		
MELIANTHACEAE	<i>Melianthus comosus</i>	Touch-me-not	LC		
NYMPHAEACEAE	<i>Nymphaea nouchali</i> var. <i>caerulea</i>	blue waterlily	LC		
OROBANCHACEAE	<i>Striga gesnerioides</i>	purple witchweed	LC		
OROBANCHACEAE	<i>Striga gesnerioides</i>	tobacco witchweed	LC		
PAPAVERACEAE	<i>Papaver aculeatum</i>	Californian poppy	LC		
PAPAVERACEAE	<i>Papaver aculeatum</i>	Californian poppy	LC		
PAPAVERACEAE	<i>Papaver aculeatum</i>	poppy	LC		
PAPAVERACEAE	<i>Papaver aculeatum</i>	red poppy	LC		
PAPAVERACEAE	<i>Papaver aculeatum</i>	Thorny poppy	LC		
PAPAVERACEAE	<i>Papaver aculeatum</i>	wild poppy	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	buckhorn plantain	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	English plantain	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	german psyllium	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	lamb's tongue	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	narrow-leaved plantain	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	narrow-leaved ribwort	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	rib grass	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	Ribwort Plantain	LC		



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PLANTAGINACEAE	<i>Plantago lanceolata</i>	ripplegrass	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	small plantain	LC		
PLANTAGINACEAE	<i>Plantago lanceolata</i>	wild sago	LC		
POACEAE	<i>Agrostis lachnantha</i> var. <i>lachnantha</i>	S.A. bent grass	LC		
POACEAE	<i>Agrostis lachnantha</i> var. <i>lachnantha</i>	South African Bent grass	LC		
POACEAE	<i>Aristida bipartita</i>	Rolling three-awned grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	Buffalo grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	piercing grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	spreading three awn	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	stickgrass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	tassel bristle grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	tassel three-awn	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	white stick grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>congesta</i>	buffalo grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>congesta</i>	cat's-tail three-awned grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>congesta</i>	piercing grass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>congesta</i>	stickgrass	LC		
POACEAE	<i>Aristida congesta</i> subsp. <i>congesta</i>	tassel three-awned grass	LC		
POACEAE	<i>Aristida junciformis</i> subsp. <i>junciformis</i>	bristle grass	LC		
POACEAE	<i>Aristida junciformis</i> subsp. <i>junciformis</i>	congoni grass	LC		
POACEAE	<i>Aristida junciformis</i> subsp. <i>junciformis</i>	gongoni grass	LC		
POACEAE	<i>Aristida junciformis</i> subsp. <i>junciformis</i>	gongoni three-awn	LC		
POACEAE	<i>Aristida junciformis</i> subsp. <i>junciformis</i>	Ngongoni bristle grass	LC		



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POACEAE	<i>Aristida junciformis</i> subsp. <i>junciformis</i>	wire grass	LC		
POACEAE	<i>Aristida sciurus</i>	bristle grass	LC		
POACEAE	<i>Brachiaria eruciformis</i>	sweet signal grass	LC		
POACEAE	<i>Brachiaria serrata</i>	velvet grass	LC		
POACEAE	<i>Brachiaria serrata</i>	velvet signal grass	LC		
POACEAE	<i>Chloris gayana</i>	Hunyani grass	LC		
POACEAE	<i>Chloris gayana</i>	Rhode's grass	LC		
POACEAE	<i>Chloris gayana</i>	Rhodes grass	LC		
POACEAE	<i>Chloris gayana</i>	Rhodesian blue grass	LC		
POACEAE	<i>Chloris pycnothrix</i>	orchard grass	LC		
POACEAE	<i>Chloris pycnothrix</i>	radiate fingergrass	LC		
POACEAE	<i>Chloris pycnothrix</i>	spider-web grass	LC		
POACEAE	<i>Chloris pycnothrix</i>	spiderweb chloris	LC		
POACEAE	<i>Chloris pycnothrix</i>	spiderweb grass	LC		
POACEAE	<i>Chloris virgata</i>	blue grass	LC		
POACEAE	<i>Chloris virgata</i>	feather fingergrass	LC		
POACEAE	<i>Chloris virgata</i>	feathertop Chloris	LC		
POACEAE	<i>Chloris virgata</i>	hay grass	LC		
POACEAE	<i>Chloris virgata</i>	haygrass	LC		
POACEAE	<i>Chloris virgata</i>	old land grass	LC		
POACEAE	<i>Chloris virgata</i>	old land's grass	LC		
POACEAE	<i>Chloris virgata</i>	oldlandsgrass	LC		
POACEAE	<i>Chloris virgata</i>	sweet grass	LC		
POACEAE	<i>Chloris virgata</i>	sweet hay	LC		
POACEAE	<i>Chloris virgata</i>	sweet hay grass	LC		
POACEAE	<i>Chloris virgata</i>	sweetgrass	LC		
POACEAE	<i>Chloris virgata</i>	sweethay grass	LC		
POACEAE	<i>Chloris virgata</i>	white grass	LC		
POACEAE	<i>Cynodon dactylon</i>	Bataviesekweek	LC		
POACEAE	<i>Cynodon dactylon</i>	Bermuda grass	LC		
POACEAE	<i>Cynodon dactylon</i>	Bermuda quick grass	LC		
POACEAE	<i>Cynodon dactylon</i>	coarse kweek	LC		
POACEAE	<i>Cynodon dactylon</i>	common couch grass	LC		
POACEAE	<i>Cynodon dactylon</i>	common quickgrass	LC		
POACEAE	<i>Cynodon dactylon</i>	couch grass	LC		



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POACEAE	<i>Cynodon dactylon</i>	dog's tooth	LC		
POACEAE	<i>Cynodon dactylon</i>	doob grass	LC		
POACEAE	<i>Cynodon dactylon</i>	dub grass	LC		
POACEAE	<i>Cynodon dactylon</i>	fince couch grass	LC		
POACEAE	<i>Cynodon dactylon</i>	finegrass	LC		
POACEAE	<i>Cynodon dactylon</i>	finger grass	LC		
POACEAE	<i>Cynodon dactylon</i>	fingergrass	LC		
POACEAE	<i>Cynodon dactylon</i>	fingers	LC		
POACEAE	<i>Cynodon dactylon</i>	Florida grass	LC		
POACEAE	<i>Cynodon dactylon</i>	Indian couch	LC		
POACEAE	<i>Cynodon dactylon</i>	quick grass	LC		
POACEAE	<i>Cynodon dactylon</i>	running grass	LC		
POACEAE	<i>Cynodon dactylon</i>	Scotch grass	LC		
POACEAE	<i>Cynodon dactylon</i>	star grass	LC		
POACEAE	<i>Cynodon dactylon</i>	twitch grass	LC		
POACEAE	<i>Cynodon dactylon</i>	white quick grass	LC		
POACEAE	<i>Cynodon dactylon</i>	wire grass	LC		
POACEAE	<i>Dactyloctenium giganteum</i>	giant crowfoot	LC		
POACEAE	<i>Digitaria eriantha</i>	common finger grass	LC		
POACEAE	<i>Digitaria eriantha</i>	finger grass	LC		
POACEAE	<i>Digitaria eriantha</i>	Pongola finger grass	LC		
POACEAE	<i>Digitaria eriantha</i>	Smuts finger grass	LC		
POACEAE	<i>Digitaria eriantha</i>	woolly finger grass	LC		
POACEAE	<i>Digitaria ternata</i>	black-seed finger grass	LC		
POACEAE	<i>Digitaria tricholaenoides</i>	purple finger grass	LC		
POACEAE	<i>Echinochloa crus-galli</i>	barnyard grass	LC		
POACEAE	<i>Echinochloa crus-galli</i>	barnyard millet	LC		
POACEAE	<i>Echinochloa crus-galli</i>	cockspur grass	LC		
POACEAE	<i>Echinochloa holubii</i>	Kalahari water grass	LC		
POACEAE	<i>Echinochloa holubii</i>	water grass	LC		
POACEAE	<i>Elionurus muticus</i>	lemon grass	LC		
POACEAE	<i>Elionurus muticus</i>	lemon scented grass	LC		
POACEAE	<i>Elionurus muticus</i>	matrass grass	LC		
POACEAE	<i>Elionurus muticus</i>	silky grass	LC		
POACEAE	<i>Elionurus muticus</i>	Simon grass	LC		
POACEAE	<i>Elionurus muticus</i>	sour grass	LC		



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POACEAE	<i>Elionurus muticus</i>	wine grass	LC		
POACEAE	<i>Elionurus muticus</i>	wire grass	LC		
POACEAE	<i>Enneapogon cenchroides</i>	common nine-awned grass	LC		
POACEAE	<i>Enneapogon cenchroides</i>	fur grass	LC		
POACEAE	<i>Enneapogon cenchroides</i>	furgress	LC		
POACEAE	<i>Enneapogon cenchroides</i>	Sabi grass	LC		
POACEAE	<i>Enneapogon cenchroides</i>	sour grass	LC		
POACEAE	<i>Eragrostis chloromelas</i>	blue love grass	LC		
POACEAE	<i>Eragrostis curvula</i>	african love grass	LC		
POACEAE	<i>Eragrostis curvula</i>	boer love grass	LC		
POACEAE	<i>Eragrostis curvula</i>	Ermelo love grass	LC		
POACEAE	<i>Eragrostis curvula</i>	weeping grass	LC		
POACEAE	<i>Eragrostis curvula</i>	weeping love grass	LC		
POACEAE	<i>Eragrostis curvula</i>	wire grass	LC		
POACEAE	<i>Eragrostis gummiflua</i>	gum grass	LC		
POACEAE	<i>Eragrostis gummiflua</i>	sticky-stem love grass	LC		
POACEAE	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i>	Eastern Province vlei grass	LC		
POACEAE	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i>	land-grass	LC		
POACEAE	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i>	Lehman love grass	LC		
POACEAE	<i>Eragrostis plana</i>	fan love grass	LC		
POACEAE	<i>Eragrostis plana</i>	ox grass	LC		
POACEAE	<i>Eragrostis plana</i>	tough love grass	LC		
POACEAE	<i>Eragrostis planiculmis</i>	broom love grass	LC		
POACEAE	<i>Eragrostis racemosa</i>	Narrow heart love grass	LC		
POACEAE	<i>Eragrostis superba</i>	flat-seed love grass	LC		
POACEAE	<i>Eragrostis superba</i>	heart-seed grass	LC		
POACEAE	<i>Eragrostis superba</i>	heart-seed love grass	LC		
POACEAE	<i>Eragrostis superba</i>	love grass	LC		
POACEAE	<i>Eragrostis superba</i>	Masai love grass	LC		
POACEAE	<i>Eragrostis trichophora</i>	Atherstone's grass	LC		
POACEAE	<i>Eragrostis trichophora</i>	love grass	LC		
POACEAE	<i>Heteropogon contortus</i>	assegai fix	LC		
POACEAE	<i>Heteropogon contortus</i>	common spear grass	LC		
POACEAE	<i>Heteropogon contortus</i>	kusal grass	LC		



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POACEAE	<i>Heteropogon contortus</i>	piercing grass	LC		
POACEAE	<i>Heteropogon contortus</i>	spear grass	LC		
POACEAE	<i>Heteropogon contortus</i>	stick grass	LC		
POACEAE	<i>Heteropogon contortus</i>	tanglehead	LC		
POACEAE	<i>Hyparrhenia dregeana</i>	Drege's deckgrass	LC		
POACEAE	<i>Hyparrhenia dregeana</i>	rooi grass	LC		
POACEAE	<i>Hyparrhenia dregeana</i>	tambuki grass	LC		
POACEAE	<i>Hyparrhenia hirta</i>	blue grass	LC		
POACEAE	<i>Hyparrhenia hirta</i>	Bluegrass	LC		
POACEAE	<i>Hyparrhenia hirta</i>	mofula-tsephe	LC		
POACEAE	<i>Hyparrhenia hirta</i>	thatch grass	LC		
POACEAE	<i>Hyparrhenia quarrei</i>	thatching grass	LC		
POACEAE	<i>Imperata cylindrica</i>	Beady grass	LC		
POACEAE	<i>Imperata cylindrica</i>	bedding grass	LC		
POACEAE	<i>Imperata cylindrica</i>	cotton-wool grass	LC		
POACEAE	<i>Imperata cylindrica</i>	ramsammy grass	LC		
POACEAE	<i>Imperata cylindrica</i>	river grass	LC		
POACEAE	<i>Imperata cylindrica</i>	riverfarm grass	LC		
POACEAE	<i>Imperata cylindrica</i>	silky grass	LC		
POACEAE	<i>Imperata cylindrica</i>	silver spike	LC		
POACEAE	<i>Imperata cylindrica</i>	susenke	LC		
POACEAE	<i>Imperata cylindrica</i>	sword grass	LC		
POACEAE	<i>Koeleria capensis</i>	crested Koeleria	LC		
POACEAE	<i>Koeleria capensis</i>	June grass	LC		
POACEAE	<i>Koeleria capensis</i>	Koeleria grass	LC		
POACEAE	<i>Koeleria capensis</i>	prairie June grass	LC		
POACEAE	<i>Leersia hexandra</i>	cutgrass	LC		
POACEAE	<i>Leersia hexandra</i>	rasp grass	LC		
POACEAE	<i>Leersia hexandra</i>	rice grass	LC		
POACEAE	<i>Leersia hexandra</i>	swamp cut grass	LC		
POACEAE	<i>Leersia hexandra</i>	water cut-grass	LC		
POACEAE	<i>Leersia hexandra</i>	white grass	LC		
POACEAE	<i>Leersia hexandra</i>	wild ricegrass	LC		
POACEAE	<i>Loudetia simplex</i>	russet grass	LC		
POACEAE	<i>Monocymbium cerasiiforme</i>	oat grass	LC		
POACEAE	<i>Monocymbium cerasiiforme</i>	wild oat	LC		



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POACEAE	<i>Monocymbium ceresiiforme</i>	wild oat grass	LC		
POACEAE	<i>Panicum coloratum var. coloratum</i>	small buffalo grass	LC		
POACEAE	<i>Panicum coloratum var. coloratum</i>	white buffalo grass	LC		
POACEAE	<i>Panicum stapfianum</i>	Thompson grass	LC		
POACEAE	<i>Perotis patens</i>	bottlebrush grass	LC		
POACEAE	<i>Perotis patens</i>	purplespike Perotis	LC		
POACEAE	<i>Phragmites australis</i>	Carrizo	LC		
POACEAE	<i>Phragmites australis</i>	Common reed	LC		
POACEAE	<i>Pogonarthria squarrosa</i>	cross grass	LC		
POACEAE	<i>Pogonarthria squarrosa</i>	herringbone grass	LC		
POACEAE	<i>Pogonarthria squarrosa</i>	sickle grass	LC		
POACEAE	<i>Setaria nigrirostris</i>	large seed Setaria	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	common bristle grass	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	golden millet	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	golden Timothy	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	golden timothy grass	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	land grass	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	landgrass	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	old lands grass	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	Rhodesian Timothy grass	LC		
POACEAE	<i>Setaria sphacelata var. sphacelata</i>	South African golden millet grass	LC		
POACEAE	<i>Setaria sphacelata var. torta</i>	small creeping foxtail	LC		
POACEAE	<i>Themeda triandra</i>	angle grass	LC		
POACEAE	<i>Themeda triandra</i>	blue grass	LC		
POACEAE	<i>Themeda triandra</i>	kangaroo grass	LC		
POACEAE	<i>Themeda triandra</i>	red grass	LC		
POACEAE	<i>Themeda triandra</i>	red oat grass	LC		
POACEAE	<i>Themeda triandra</i>	rooi grass	LC		
POACEAE	<i>Trachypogon spicatus</i>	giant spear grass	LC		



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POACEAE	<i>Trachypogon spicatus</i>	grey tussock grass	LC		
POACEAE	<i>Tragus berteronianus</i>	burggrass	LC		
POACEAE	<i>Tragus berteronianus</i>	carrot grass	LC		
POACEAE	<i>Tragus berteronianus</i>	carrot seed grass	LC		
POACEAE	<i>Tragus berteronianus</i>	carrot-seed grass	LC		
POACEAE	<i>Tragus berteronianus</i>	small carrotseed grass	LC		
POACEAE	<i>Tragus berteronianus</i>	spiked carrot-seed grass	LC		
POACEAE	<i>Tragus racemosus</i>	burweed	LC		
POACEAE	<i>Tragus racemosus</i>	carrot grass	LC		
POACEAE	<i>Tragus racemosus</i>	carrot seed grass	LC		
POACEAE	<i>Tragus racemosus</i>	carrotseedgrass	LC		
POACEAE	<i>Tragus racemosus</i>	large carrot-seed grass	LC		
POACEAE	<i>Tragus racemosus</i>	stalked bristle grass	LC		
POACEAE	<i>Tragus racemosus</i>	stalked carrot-seed grass	LC		
POACEAE	<i>Trichoneura grandiglumis</i>	rolling grass	LC		
POACEAE	<i>Trichoneura grandiglumis</i>	tumble weed	LC		
POACEAE	<i>Tristachya leucothrix</i>	hairy trident grass	LC		
POLYGALACEAE	<i>Polygala hottentotta</i>	Small purple broom	LC		
POLYGONACEAE	<i>Rumex lanceolatus</i>	common dock	LC		
POLYGONACEAE	<i>Rumex lanceolatus</i>	smaller dock	LC		
POLYGONACEAE	<i>Rumex lanceolatus</i>	smooth dock	LC		
POLYGONACEAE	<i>Rumex woodii</i>	Paper hearts	LC		
PORTULACACEAE	<i>Portulaca quadrifida</i>	pusley	LC		
PORTULACACEAE	<i>Portulaca quadrifida</i>	wild purslane	LC		
PORTULACACEAE	<i>Talinum arnotii</i>	kalahari butterweed	LC		
POTAMOGETONACEAE	<i>Potamogeton pectinatus</i>	fennel-leaved pondweed	LC		
POTAMOGETONACEAE	<i>Potamogeton pectinatus</i>	sago pondweed	LC		
RHAMNACEAE	<i>Rhamnus prinoides</i>	Camdeboo stinkwood	LC		
RHAMNACEAE	<i>Rhamnus prinoides</i>	Camdeboostinkwood	LC		
RHAMNACEAE	<i>Rhamnus prinoides</i>	dogwood	LC		
RHAMNACEAE	<i>Rhamnus prinoides</i>	glossy-leaf	LC		
RHAMNACEAE	<i>Rhamnus prinoides</i>	redwood	LC		
ROSACEAE	<i>Leucosidea sericea</i>	chechebush	LC		
ROSACEAE	<i>Leucosidea sericea</i>	oldwood	LC		



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ROSACEAE	<i>Leucosidea sericea</i>	ouhout	LC		
ROSACEAE	<i>Leucosidea sericea</i>	troutwood	LC		
RUBIACEAE	<i>Pachystigma pygmaeum</i>	gousiekte bush	LC		
RUBIACEAE	<i>Pachystigma pygmaeum</i>	hairy gousiektebossie	LC		
RUBIACEAE	<i>Pygmaeothamnus zeyheri</i> var. <i>zeyheri</i>	sand apple	LC		
SAPINDACEAE	<i>Pappea capensis</i>	Bushveld cherry	LC		
SAPINDACEAE	<i>Pappea capensis</i>	Indaba tree	LC		
SAPINDACEAE	<i>Pappea capensis</i>	Jacket plum	LC		
SAPINDACEAE	<i>Pappea capensis</i>	judgement tree	LC		
SAPINDACEAE	<i>Pappea capensis</i>	Lobengula's indaba tree	LC		
SAPINDACEAE	<i>Pappea capensis</i>	wild amandel	LC		
SAPINDACEAE	<i>Pappea capensis</i>	wild cherry	LC		
SAPINDACEAE	<i>Pappea capensis</i>	Wild plum	LC		
SCROPHULARIACEAE	<i>Aptosimum indivisum</i>	Karoo violet	LC		
SCROPHULARIACEAE	<i>Aptosimum indivisum</i>	veld violet	LC		
SCROPHULARIACEAE	<i>Aptosimum indivisum</i>	wild violet	LC		
SCROPHULARIACEAE	<i>Aptosimum procumbens</i>	Carpet flower	LC		
SCROPHULARIACEAE	<i>Aptosimum procumbens</i>	Carpet plant	LC		
SCROPHULARIACEAE	<i>Aptosimum procumbens</i>	Karoo carpet flower	LC		
SCROPHULARIACEAE	<i>Aptosimum procumbens</i>	Karoo violet	LC		
SCROPHULARIACEAE	<i>Aptosimum procumbens</i>	Veld violet	LC		
SCROPHULARIACEAE	<i>Aptosimum procumbens</i>	Violet-of-the-Karoo	LC		
SCROPHULARIACEAE	<i>Aptosimum procumbens</i>	Wild violet	LC		
SCROPHULARIACEAE	<i>Jamesbrittenia aurantiaca</i>	Cape saffron	LC		
SOLANACEAE	<i>Solanum panduriforme</i>	apple of Sodom	LC		
SOLANACEAE	<i>Solanum panduriforme</i>	Bitter apple	LC		
SOLANACEAE	<i>Solanum panduriforme</i>	Poison apple	LC		
SOLANACEAE	<i>Solanum supinum</i> var. <i>supinum</i>	Bitter apple	LC		



Family Name	Species Name	Common Name	IUCN	CITES	NEMBA
SOLANACEAE	<i>Solanum supinum</i> var. <i>supinum</i>	Snake berry	LC		
TYPHACEAE	<i>Typha capensis</i>	Bulrush	LC		
TYPHACEAE	<i>Typha capensis</i>	cat's tail	LC		
TYPHACEAE	<i>Typha capensis</i>	common bulrush	LC		
TYPHACEAE	<i>Typha capensis</i>	common cattail	LC		
TYPHACEAE	<i>Typha capensis</i>	Cossack asparagus	LC		
TYPHACEAE	<i>Typha capensis</i>	nail-rod	LC		
TYPHACEAE	<i>Typha capensis</i>	poker plant	LC		
TYPHACEAE	<i>Typha capensis</i>	reed mace	LC		
TYPHACEAE	<i>Typha capensis</i>	reedmace	LC		
VALERIANACEAE	<i>Valeriana capensis</i> var. <i>capensis</i>	Cape valerian	LC		
VERBENACEAE	<i>Lantana rugosa</i>	Bird's beer	LC		
VERBENACEAE	<i>Lantana rugosa</i>	Bird's brandy	LC		
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>	burnut	LC		
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>	common dubbeltjie	LC		
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>	devil's thorn	LC		
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>	puncture vine	LC		
Cichlidae	<i>Pseudocrenilabrus philander</i>	Southern Mouthbrooder	LC		NL
Cyprinidae	<i>Barbus anoplus</i>	Chubbyhead Barb			NL
Cyprinidae	<i>Barbus paludinosus</i>	Straightfin Barb	LC		NL
Cyprinidae	<i>Labeo capensis</i>	Orange River Mudfish			NL

Fauna and Flora Assessment Report

Sasol Mining Sigma Colliery Ash Backfilling Project, Sasolburg, Free State Province

SAS5184



DIGBY WELLS
ENVIRONMENTAL

Appendix B: Plant Species List



Scientific Name	Common Name	Ecological Status	Form
<i>Andropogon eucomus</i>	Snowflake grass	Increaser 2 - Subclimax	Grass
<i>Andropogon appendiculatus</i>	Vlei Bluestem	Decreaser - Climax	Grass
<i>Aristida adscensionis</i>	Annual three awn	Pioneer Increase 2	Grass
<i>Aristida congesta barbicolis</i>	Spreading three awn	Pioneer Increase 2	Grass
<i>Aristida congesta congesta</i>	Tassel Tree-awn	Increaser 2 - Pioneer	Grass
<i>Aristida diffusa</i>	Iron Grass	Increaser 3 - Subclimax to climax	Grass
<i>Aristida junceiformis</i>	Ngongoni Three-awn	Invasive	Grass
<i>Aristida stipitata</i>	Long awned grass	Pioneer Subclimax Increaser 2	Grass
<i>Chloris virgata</i>	Feather top chloris	Pioneer increaser 2	Grass
<i>Cynodon dactylon</i>	Couch Grass	Increaser 2 - Pioneer	Grass
<i>Digitaria eriantha</i>	Common Finger Grass	Decreaser - Climax	Grass
<i>Eragrostis chloromelas</i>	(Narrow) Curly Leaf	Increaser 2 - Subclimax to climax	Grass
<i>Eragrostis cilianensis</i>	Stink love grass	Pioneer increaser 2	Grass
<i>Eragrostis curvula</i>	Weeping Love Grass	Increaser 2 - Subclimax to climax	Grass
<i>Eragrostis gummiflua</i>	Gum Grass	Increaser 2 - Subclimax	Grass
<i>Hyparrhenia hirta</i>	Common Thatching Grass	Increaser 1 - Subclimax to climax	Grass
<i>Melinis repens</i>	Natal Red Top	Increaser 2 - Pioneer to subclimax	Grass
<i>Pennisetum clandestinum</i>	Kikuyu Grass	Exotic	Grass
<i>Perotis patens</i>	Cat's Tail	Increaser 2 - Pioneer to subclimax	Grass
<i>Phragmites australis</i>	Common Reed	Decreaser	Grass
<i>Acalypha angustata</i>	Brooms and Brushes	Medicinal	Herb
<i>Acalypha sp.</i>	-	-	Herb
<i>Acanthospermum glabratum</i>	Creeping Starbur	-	Herb
<i>Albuca shawii</i>	Lantern Flower	-	Herb
<i>Amaranthus hybridus</i>	Pigweed	Alien Invasive	Herb
<i>Anthericum cooperii</i>	Coopers Anthericum	-	Herb
<i>Asparagus aethiopicus</i>	-	-	Herb
<i>Asparagus africanus</i>	Bush asparagus	Medicinal	Herb
<i>Babiana hypogea</i>	-	-	Herb
<i>Bidens bipinnata</i>	-	Alien Invasive	Herb
<i>Bidens formosa</i>	Cosmos	Alien Invasive	Herb
<i>Bidens pilosa</i>	Common Black-jack	Alien Invasive	Herb
<i>Blepharis integrifolia var. integrifolia</i>		Medicinal	Herb
<i>Chamaecrista comosa</i>	Trailing dwarf cassia	-	Herb
<i>Chlorophytum fasciculatum</i>	-	-	Herb
<i>Cirsium vulgare</i>	Scotch Thistle	Alien Invasive*	Herb



Scientific Name	Common Name	Ecological Status	Form
<i>Conyza bonariensis</i>	Flax-leaf fleabane	-	Herb
<i>Crassula setulosa</i>	Furry Crassula	-	Herb
<i>Datura stramonium</i>	Common Thorn Apple	Alien Invasive*	Herb
<i>Gomphocarpus fruticosus</i>	Milkweed	-	Herb
<i>Kyllinga alba</i>	White Button Sedge	-	Herb
<i>Cyperus compressus</i>	-	-	Sedge
<i>Cyperus congestus</i>	-	Weed	Sedge
<i>Cyperus denudatus</i>	Winged Sedge	-	Sedge
<i>Gymnospora senegalensis</i>	Red Spike Thorn	Medicinal	Shrub
<i>Eucalyptus camaldulensis</i>	Red River Gum	Alien Invasive**	Tree
<i>Pinus patula</i>	Patula pine	Alien invader	Tree
<i>Celtis africana</i>	White Stinkwood	-	Tree
<i>Opuntia ficus-indica</i>	Sweet Prickly Pear	Alien Invasive*	Tree/Shrub
<i>Opuntia imbricata</i>	Imbricate cactus	Alien Invasive*	Tree/Shrub



Appendix C: List of Expected Mammal Species



Common Name	Scientific Name	IUCN Status (Global)	IUCN Status (National)	NEMBA Status
Cheetah	<i>Acinonyx jubatus</i>	Vulnerable	Vulnerable	Vulnerable
Spiny Mouse	<i>Acomys spinosissimus</i>	Least Concern	Least Concern	Not listed
Impala	<i>Aepyceros melampus</i>	Least Concern	Least Concern	Not listed
Red Veld Rat	<i>Aethomys chrysophilus</i>	Least Concern	Least Concern	Not listed
Tete Veld Rat	<i>Aethomys ineptus</i>	Least Concern	Least Concern	Not listed
Namaqua Rock Mouse	<i>Aethomys namaquensis</i>	Endangered	Least Concern	Not listed
Red Hartebeest	<i>Alcelaphus buselaphus</i>	Least Concern	Least Concern	Not listed
Hottentot's Golden Mole	<i>Amblysomus hottentotus</i>	Not evaluated	Data Deficient	Not listed
Springbuck	<i>Antidorcas marsupialis</i>	Least Concern	Least Concern	Not listed
African Clawless Otter	<i>Aonyx capensis</i>	Least Concern	Least Concern	Protected
South African Hedgehog	<i>Atelerix frontalis</i>	Least Concern	Near Threatened	Protected
Water Mongoose	<i>Atilax paludinosus</i>	Least Concern	Least Concern	Not listed
Yellow Golden Mole	<i>Calcochloris obtusirostris</i>	Least Concern	Vulnerable	Not listed
Side-striped Jackal	<i>Canis adustus</i>	Least Concern	Near Threatened	Not listed
Black-backed Jackal	<i>Canis mesomelas</i>	Least Concern	Least Concern	Not listed
Caracal	<i>Caracal caracal</i>	Least Concern	Least Concern	Not listed
Red Duiker	<i>Cephalophus natalensis</i>	Least Concern	Least Concern	Not listed
White Rhinoceros	<i>Ceratotherium simum</i>	Near Threatened	Least Concern	Protected
Vervet Monkey	<i>Cercopithecus aethiops pygerythrus</i>	Least Concern	Least Concern	Not listed
Stairs's or Mozambique Monkey	<i>Cercopithecus mitis erythrarchus</i>	Least Concern	Least Concern	Not listed
Ansorge's Free-tailed Bat	<i>Chaerephon ansorgei</i>	Least Concern	Least Concern	Not listed
Little Free-tailed Bat	<i>Chaerephon pumila</i>	Least Concern	Least Concern	Not listed
African Civet	<i>Civettictis civetta</i>	Least Concern	Least Concern	Not listed
Percival's Trident Bat	<i>Cloetotis percivali</i>	Near Threatened	Critically Endangered	Not listed
Blue Wildebeest	<i>Connochaetes taurinus taurinus</i>	Least Concern	Least Concern	Not listed
Giant Rat	<i>Cricetomys gambianus</i>	Least Concern	Vulnerable	Vulnerable
Reddish-grey Musk Shrew	<i>Crocidura cyanea</i>	Least Concern	Data Deficient	Not listed
Tiny Musk Shrew	<i>Crocidura fuscomurina</i>	Least Concern	Data Deficient	Not listed
Lesser Red Musk Shrew	<i>Crocidura hirta</i>	Least Concern	Data Deficient	Not listed



Common Name	Scientific Name	IUCN Status (Global)	IUCN Status (National)	NEMBA Status
Maquassie Musk Shrew	<i>Crocidura maquassiensis</i>	Least Concern	Vulnerable	Not listed
Swamp Musk Shrew	<i>Crocidura mariquensis</i>	Least Concern	Data Deficient	Not listed
Lesser Grey-brown Musk Shrew	<i>Crocidura silacea</i>	Least Concern	Data Deficient	Not listed
Spotted Hyaena	<i>Crocuta crocuta</i>	Least Concern	Near Threatened	Protected
Common Molerat	<i>Cryptomys hottentotus</i>	Least Concern	Least Concern	Not listed
Yellow Mongoose	<i>Cynictis penicillata</i>	Least Concern	Least Concern	Not listed
Tsessebe	<i>Damaliscus lunatus lunatus</i>	Least Concern	Endangered	Endangered
Blesbuck	<i>Damaliscus pygargus phillipsi</i>	Least Concern	Least Concern	Not listed
Water Rat	<i>Dasymys incomtus</i>	Least Concern	Near Threatened	Not listed
Grey Climbing Mouse	<i>Dendromus melanotis</i>	Least Concern	Least Concern	Not listed
Brants' Climbing Mouse	<i>Dendromus mesomelas</i>	Least Concern	Least Concern	Not listed
Chestnut Climbing Mouse	<i>Dendromus mystacalis</i>	Least Concern	Least Concern	Not listed
Nyika Climbing Mouse	<i>Dendromus nyikae</i>	Least Concern	Near Threatened	Not listed
Short-tailed Gerbil	<i>Desmodillus auricularis</i>	Least Concern	Least Concern	Not listed
Black Rhino	<i>Diceros bicornis minor</i>	Critically Endangered	Vulnerable	Not listed
Short-snouted Elephant-shrew	<i>Elephantulus brachyrhynchus</i>	Least Concern	Data Deficient	Not listed
Bushveld Elephant-shrew	<i>Elephantulus intufi</i>	Least Concern	Data Deficient	Not listed
Rock Elephant-shrew	<i>Elephantulus myurus</i>	Least Concern	Least Concern	Not listed
Gambian Epauletted Fruit Bat	<i>Epomophorus gambianus crypturus</i>	Least Concern	Data Deficient	Not listed
Wahlberg's Epauletted Fruit Bat	<i>Epomophorus wahlbergi</i>	Least Concern	Least Concern	Not listed
Long-tailed Serotine Bat	<i>Eptesicus hottentotus</i>	Least Concern	Least Concern	Not listed
Burchell's Zebra	<i>Equus burchellii</i>	Least Concern	Least Concern	Not listed
African Wild Cat	<i>Felis silvestris</i>	Least Concern	Least Concern	Not listed
Lesser Bushbaby	<i>Galago moholi</i>	Least Concern	Least Concern	Not listed
Slender Mongoose	<i>Galerella sanguinea</i>	Least Concern	Least Concern	Not listed
Small-spotted Genet	<i>Genetta genetta</i>	Least Concern	Least Concern	Not listed
Large-spotted Genet	<i>Genetta tigrina</i>	Least Concern	Least Concern	Not listed
Hairy-footed Gerbil	<i>Gerbillurus paeba</i>	Least Concern	Least Concern	Not listed
Giraffe	<i>Giraffa camelopardalis</i>	Least Concern	Least Concern	Not listed



Common Name	Scientific Name	IUCN Status (Global)	IUCN Status (National)	NEMBA Status
Butterfly Bat	<i>Glauconycteris variegatus</i>	Least Concern	Near Threatened	Not listed
Mozambique Woodland Mouse	<i>Grammomys cometes</i>	Least Concern	Data Deficient	Not listed
Woodland Mouse	<i>Grammomys dolichurus</i>	Least Concern	Data Deficient	Not listed
Woodland Dormouse	<i>Graphiurus murinus</i>	Least Concern	Least Concern	Not listed
Rock Dormouse	<i>Graphiurus platyops</i>	Least Concern	Data Deficient	Not listed
Dwarf Mongoose	<i>Helogale parvula</i>	Least Concern	Least Concern	Not listed
Large Grey Mongoose	<i>Herpestes ichneumon</i>	Least Concern	Least Concern	Not listed
Yellow-spotted Hyrax	<i>Heterohyrax brucei</i>	Least Concern	Least Concern	Not listed
Hippopotamus	<i>Hippopotamus amphibius</i>	Least Concern	Least Concern	Not listed
Sundevall's Leaf-nosed Bat	<i>Hipposideros caffer</i>	Least Concern	Data Deficient	Not listed
Roan Antelope	<i>Hippotragus equinus</i>	Least Concern	Vulnerable	Vulnerable
Sable Antelope	<i>Hippotragus niger niger</i>	Least Concern	Vulnerable	Not listed
Brown Hyaena	<i>Hyaena brunnea</i>	Near Threatened	Near Threatened	Protected
Cape Porcupine	<i>Hystrix africaeaustralis</i>	Least Concern	Least Concern	Not listed
White-tailed Mongoose	<i>Ichneumia albicauda</i>	Least Concern	Least Concern	Not listed
Striped Polecat	<i>Ictonyx striatus</i>	Least Concern	Least Concern	Not listed
Damara Woolly Bat	<i>Kerivoula argentata</i>	Least Concern	Endangered	Not listed
Lesser Woolly Bat	<i>Kerivoula lanosa</i>	Least Concern	Near Threatened	Not listed
Waterbuck	<i>Kobus ellipsiprymnus ellipsiprymnus</i>	Least Concern	Least Concern	Not listed
Botswana Long-eared Bat	<i>Laephotis botswanae</i>	Near Threatened	Vulnerable	Not listed
Single-striped Mouse	<i>Lemniscomys rosalia</i>	Least Concern	Data Deficient	Not listed
Cape Hare	<i>Lepus capensis</i>	Least Concern	Least Concern	Not listed
Scrub Hare	<i>Lepus saxatilis</i>	Least Concern	Least Concern	Not listed
African Elephant	<i>Loxodonta africana</i>	Endangered	Least Concern	Protected
Spotted-necked Otter	<i>Lutra maculicollis</i>	Vulnerable	Near Threatened	Protected
African Wild Dog	<i>Lycaon pictus</i>	Vulnerable	Endangered	Endangered
Pangolin	<i>Manis temminckii</i>	Near Threatened	Vulnerable	Vulnerable
Multimammate Mouse	<i>Mastomys coucha</i>	Least Concern	Least Concern	Not listed
Natal Multimammate Mouse	<i>Mastomys natalensis</i>	Least Concern	Least Concern	Not listed
Honey Badger	<i>Mellivora capensis</i>	Least Concern	Near Threatened	Not listed
Lesser Long-fingered Bat	<i>Miniopterus fraterculus</i>	Near Threatened	Near Threatened	Not listed



Common Name	Scientific Name	IUCN Status (Global)	IUCN Status (National)	NEMBA Status
Schreibers' Long-fingered Bat	<i>Miniopterus schreibersii</i>	Near Threatened	Near Threatened	Not listed
Angolan Free-tailed Bat	<i>Mops condylurus</i>	Least Concern	Least Concern	Not listed
Midas Free-tailed Bat	<i>Mops midas</i>	Least Concern	Least Concern	Not listed
Banded Mongoose	<i>Mungos mungo</i>	Least Concern	Least Concern	Not listed
Desert Pygmy Mouse	<i>Mus indutus</i>	Least Concern	Least Concern	Not listed
Pygmy Mouse	<i>Mus minutoides</i>	Least Concern	Least Concern	Not listed
Thomas' Pygmy Mouse	<i>Mus neavei</i>	Least Concern	Data Deficient	Not listed
Dark-footed Forest Shrew	<i>Myosorex cafer</i>	Least Concern	Data Deficient	Not listed
Forest Shrew	<i>Myosorex varius</i>	Least Concern	Data Deficient	Not listed
Rufous Hairy Bat	<i>Myotis bocagei</i>	Least Concern	Data Deficient	Not listed
Temminck's Hairy Bat	<i>Myotis tricolor</i>	Not Evaluated	Near Threatened	Not listed
Welwitsch's Hairy Bat	<i>Myotis welwitschii</i>	Least Concern	Near Threatened	Not listed
Gunning's Golden Mole	<i>Neamblysomus gunningi</i>	Vulnerable	Endangered	Endangered
Juliana's Golden Mole	<i>Neamblysomus julianae</i>	Critically Endangered	Vulnerable	Vulnerable
Cape Serotine Bat	<i>Neoromicia capensis</i>	Least Concern	Least Concern	Not listed
Banana Bat	<i>Neoromicia nanus</i>	Least Concern	Least Concern	Not listed
Aloe Bat	<i>Neoromicia zuluensis</i>	Near Threatened	Least Concern	Not listed
Common Slit-faced Bat	<i>Nycteris thebaica</i>	Least Concern	Least Concern	Not listed
Wood's Slit-faced Bat	<i>Nycteris woodi</i>	Near Threatened	Near Threatened	Not listed
Schlieffen's Bat	<i>Nycticeinops schlieffeni</i>	Near Threatened	Least Concern	Not listed
Klipspringer	<i>Oreotragus oreotragus</i>	Least Concern	Least Concern	Not listed
Antbear	<i>Orycteropus afer</i>	Least Concern	Least Concern	Not listed
Gemsbuck	<i>Oryx gazella</i>	Least Concern	Least Concern	Not listed
Bat-eared Fox	<i>Otocyon megalotis</i>	Least Concern	Least Concern	Not listed
Thick-tailed Bushbaby	<i>Otolemur crassicaudatus</i>	Least Concern	Least Concern	Not listed
Angoni Vlei Rat	<i>Otomys angoniensis</i>	Least Concern	Least Concern	Not listed
Vlei Rat	<i>Otomys irroratus</i>	Least Concern	Least Concern	Not listed
Laminate Vlei Rat	<i>Otomys laminatus</i>	Least Concern	Least Concern	Not listed
Leopard	<i>Panthera pardus</i>	Least Concern	Least Concern	Vulnerable
Chacma Baboon	<i>Papio ursinus</i>	Least Concern	Least Concern	Not listed
Selous' Mongoose	<i>Paracynictis selousi</i>	Least Concern	Data Deficient	Not listed
Tree Squirrel	<i>Paraxerus cepapi</i>	Least Concern	Least Concern	Not listed



Common Name	Scientific Name	IUCN Status (Global)	IUCN Status (National)	NEMBA Status
Springhare	<i>Pedetes capensis</i>	Vulnerable	Least Concern	Not listed
Grey Rhebok	<i>Pelea capreolus</i>	Least Concern	Least Concern	Not listed
Four-toed Elephant-shrew	<i>Petrodromus tetradactylus</i>	Least Concern	Endangered	Endangered
Warthog	<i>Phacochoerus africanus</i>	Least Concern	Least Concern	Not listed
Anchieta's Pipistrelle	<i>Pipistrellus anchietae</i>	Vulnerable	Near Threatened	Not listed
Kuhl's Pipistrelle	<i>Pipistrellus hesperidus</i>	Least Concern	Least Concern	Not listed
Rusty Bat	<i>Pipistrellus rusticus</i>	Least Concern	Near Threatened	Not listed
African Weasel	<i>Poecilogale albinucha</i>	Least Concern	Data Deficient	Not listed
Bushpig	<i>Potamochoerus porcus koiropotamus</i>	Least Concern	Least Concern	Not listed
Rock Dassie	<i>Procavia capensis</i>	Least Concern	Least Concern	Not listed
Jameson's Red Rock Rabbit	<i>Pronolagus randensis</i>	Least Concern	Least Concern	Not listed
Hewitt's Red Rock Rabbit	<i>Pronolagus saundersiae</i>	Least Concern	Least Concern	Not listed
Aardwolf	<i>Proteles cristatus</i>	Least Concern	Least Concern	Not listed
Steenbuck	<i>Raphicerus campestris</i>	Least Concern	Least Concern	Not listed
Sharp's Grysback	<i>Raphicerus sharpei</i>	Least Concern	Near Threatened	Protected
Common Reedbuck	<i>Redunca arundinum</i>	Least Concern	Least Concern	Protected
Mountain Reedbuck	<i>Redunca fulvorufula</i>	Least Concern	Least Concern	Not listed
Striped Mouse	<i>Rhodomys pumilio</i>	Least Concern	Least Concern	Not listed
Peak-saddle Horseshoe Bat	<i>Rhinolophus blasii</i>	Least Concern	Vulnerable	Not listed
Geoffroy's Horseshoe Bat	<i>Rhinolophus clivosus</i>	Least Concern	Near Threatened	Not listed
Darling's Horseshoe Bat	<i>Rhinolophus darlingi</i>	Least Concern	Near Threatened	Not listed
Rüppell's Horseshoe Bat	<i>Rhinolophus fumigatus</i>	Least Concern	Near Threatened	Not listed
Hildebrandt's Horseshoe Bat	<i>Rhinolophus hildebrandtii</i>	Least Concern	Near Threatened	Not listed
Lander's Horseshoe Bat	<i>Rhinolophus landeri</i>	Least Concern	Near Threatened	Not listed
Bushveld Horseshoe Bat	<i>Rhinolophus simulator</i>	Least Concern	Least Concern	Not listed
Swinny's Horseshoe Bat	<i>Rhinolophus swinnyi</i>	Least Concern	Endangered	Not listed
Meller's Mongoose	<i>Rhynchogale melleri</i>	Least Concern	Data Deficient	Not listed
Egyptian Fruit Bat	<i>Rousettus aegyptiacus</i>	Least Concern	Least Concern	Not listed



Common Name	Scientific Name	IUCN Status (Global)	IUCN Status (National)	NEMBA Status
Pouched Mouse	<i>Saccostomus campestris</i>	Least Concern	Least Concern	Not listed
Flat-headed Free-tailed Bat	<i>Sauromys petrophilus</i>	Least Concern	Least Concern	Not listed
Yellow House Bat	<i>Scotophilus dinganii</i>	Least Concern	Least Concern	Not listed
Lesser Yellow House Bat	<i>Scotophilus viridis</i>	Least Concern	Least Concern	Not listed
Krebs's Fat Mouse	<i>Steatomys krebsii</i>	Least Concern	Least Concern	Not listed
Fat Mouse	<i>Steatomys pratensis</i>	Near Threatened	Least Concern	Not listed
Least Dwarf Shrew	<i>Suncus infinitesimus</i>	Least Concern	Data Deficient	Not listed
Greater Dwarf Shrew	<i>Suncus lixus</i>	Least Concern	Data Deficient	Not listed
Lesser Dwarf Shrew	<i>Suncus varilla</i>	Least Concern	Data Deficient	Not listed
Common Duiker	<i>Sylvicapra grimmia</i>	Least Concern	Least Concern	Not listed
Buffalo	<i>Syncerus caffer</i>	Least Concern	Least Concern	Not listed
Egyptian Free-tailed Bat	<i>Tadarida aegyptiaca</i>	Least Concern	Least Concern	Not listed
Mauritian Tomb Bat	<i>Taphozous mauritianus</i>	Least Concern	Least Concern	Not listed
Highveld Gerbil	<i>Tatera brantsii</i>	Least Concern	Least Concern	Not listed
Bushveld Gerbil	<i>Tatera leucogaster</i>	Least Concern	Data Deficient	Not listed
Common Eland	<i>Taurotragus oryx</i>	Least Concern	Least Concern	Not listed
Tree Rat	<i>Thallomys paedulus</i>	Least Concern	Least Concern	Not listed
Greater Cane Rat	<i>Thryonomys swinderianus</i>	Least Concern	Least Concern	Not listed
Nyala	<i>Tragelaphus angasii</i>	Least Concern	Least Concern	Not listed
Bushbuck	<i>Tragelaphus scriptus</i>	Least Concern	Least Concern	Not listed
Kudu	<i>Tragelaphus strepsiceros</i>	Least Concern	Least Concern	Not listed
Cape Fox	<i>Vulpes chama</i>	Least Concern	Least Concern	Protected



Appendix D: List of Expected Bird Species



English Family	Scientific	National	Endemic
Apalis Bar-throated	<i>Apalis thoracica</i>		
Avocet Pied	<i>Recurvirostra avosetta</i>		
Barbet Acacia Pied	<i>Tricholaema leucomelas</i>		
Barbet Black-collared	<i>Lybius torquatus</i>		
Barbet Crested	<i>Trachyphonus vaillantii</i>		
Batis Chinspot	<i>Batis molitor</i>		
Bee-eater European	<i>Merops apiaster</i>		
Bee-eater White-fronted	<i>Merops bullockoides</i>		
Bishop Southern Red	<i>Euplectes orix</i>		
Bishop Yellow	<i>Euplectes capensis</i>		
Bishop Yellow-crowned	<i>Euplectes afer</i>		
Bittern Eurasian	<i>Botaurus stellaris</i>	CR	
Bittern Little	<i>Ixobrychus minutus</i>		
Bokmakierie Bokmakierie	<i>Telophorus zeylonus</i>		
Brubru	<i>Nilaus afer</i>		
Bulbul African Red-eyed	<i>Pycnonotus nigricans</i>		
Bulbul Dark-capped	<i>Pycnonotus tricolor</i>		
Bunting Cape	<i>Emberiza capensis</i>		
Bunting Cinnamon-breasted	<i>Emberiza tahapisi</i>		
Bunting Golden-breasted	<i>Emberiza flaviventris</i>		
Bunting Lark-like	<i>Emberiza impetuani</i>		
Buttonquail Kurrichane	<i>Turnix sylvaticus</i>		
Buzzard European Honey-	<i>Pernis apivorus</i>		
Buzzard Jackal	<i>Buteo rufofuscus</i>		
Buzzard Steppe	<i>Buteo buteo</i>		
Canary Black-throated	<i>Crithagra atrogularis</i>		
Canary Cape	<i>Serinus canicollis</i>		
Canary Yellow	<i>Crithagra flaviventris</i>		
Canary Yellow-fronted	<i>Crithagra mozambica</i>		
Chat Ant-eating	<i>Myrmecocichla formicivora</i>		
Chat Familiar	<i>Cercomela familiaris</i>		
Chat Mocking Cliff-	<i>Thamnolaea cinnamomeiventris</i>		
Cisticola Cloud	<i>Cisticola textrix</i>		
Cisticola Desert	<i>Cisticola aridulus</i>		
Cisticola Lazy	<i>Cisticola aberrans</i>		
Cisticola Levaillant's	<i>Cisticola tinniens</i>		



English Family	Scientific	National	Endemic
Cisticola Rattling	<i>Cisticola chiniana</i>		
Cisticola Wailing	<i>Cisticola lais</i>		
Cisticola Wing-snapping	<i>Cisticola ayresii</i>		
Cisticola Zitting	<i>Cisticola juncidis</i>		
Coot Red-knobbed	<i>Fulica cristata</i>		
Cormorant Reed	<i>Microcarbo africanus</i>		
Cormorant White-breasted	<i>Phalacrocorax lucidus</i>		
Coucal Burchell's	<i>Centropus burchellii</i>		
Cursorer Double-banded	<i>Rhinoptilus africanus</i>		
Cursorer Temminck's	<i>Cursorius temminckii</i>		
Crake African	<i>Crex egregia</i>		
Crake Baillon's	<i>Porzana pusilla</i>		
Crake Black	<i>Amauromis flavirostra</i>		
Crake Corn	<i>Crex crex</i>	VU	
Crake Spotted	<i>Porzana porzana</i>		
Crane Blue	<i>Anthropoides paradiseus</i>	VU	
Crane Grey Crowned	<i>Balearica regulorum</i>	VU	
Crombec Long-billed	<i>Sylvietta rufescens</i>		
Crow Cape	<i>Corvus capensis</i>		
Crow Pied	<i>Corvus albus</i>		
Cuckoo African	<i>Cuculus gularis</i>		
Cuckoo Common	<i>Cuculus canorus</i>		
Cuckoo Diderick	<i>Chrysococcyx caprius</i>		
Cuckoo Great Spotted	<i>Clamator glandarius</i>		
Cuckoo Jacobin	<i>Clamator jacobinus</i>		
Cuckoo Klaas's	<i>Chrysococcyx klaas</i>		
Cuckoo Red-chested	<i>Cuculus solitarius</i>		
Darter African	<i>Anhinga rufa</i>		
Dove Cape Turtle-	<i>Streptopelia capicola</i>		
Dove Laughing	<i>Spilopelia senegalensis</i>		
Dove Namaqua	<i>Oena capensis</i>		
Dove Red-eyed	<i>Streptopelia semitorquata</i>		
Dove Rock	<i>Columba livia</i>		
Drongo Fork-tailed	<i>Dicrurus adsimilis</i>		
Duck African Black	<i>Anas sparsa</i>		
Duck Comb	<i>Sarkidiornis melanotos</i>		



English Family	Scientific	National	Endemic
Duck Fulvous	<i>Dendrocygna bicolor</i>		
Duck Maccoa	<i>Oxyura maccoa</i>	LC	
Duck White-backed	<i>Thalassornis leuconotus</i>		
Duck White-faced	<i>Dendrocygna viduata</i>		
Duck Yellow-billed	<i>Anas undulata</i>		
Eagle African Fish-	<i>Haliaeetus vocifer</i>		
Eagle Booted	<i>Hieraaetus pennatus</i>		
Eagle Long-crested	<i>Lophaetus occipitalis</i>		
Eagle Martial	<i>Polemaetus bellicosus</i>	VU	
Eagle Verreauxs'	<i>Aquila verreauxii</i>		
Egret Cattle	<i>Bubulcus ibis</i>		
Egret Great	<i>Ardea alba</i>		
Egret Little	<i>Egretta garzetta</i>		
Egret Yellow-billed	<i>Egretta intermedia</i>		
Eremomela Yellow-bellied	<i>Eremomela icteropygialis</i>		
Falcon Amur	<i>Falco amurensis</i>		
Falcon Lanner	<i>Falco biarmicus</i>	NT	
Falcon Red-footed	<i>Falco vespertinus</i>		
Finch Cuckoo	<i>Anomalospiza imberbis</i>		
Finch Red-headed	<i>Amadina erythrocephala</i>		
Finch Scaly-feathered	<i>Sporopipes squamifrons</i>		
Firefinch African	<i>Lagonosticta rubricata</i>		
Firefinch Jameson's	<i>Lagonosticta rhodopareia</i>		
Firefinch Red-billed	<i>Lagonosticta senegala</i>		
Fiscal Common	<i>Lanius collaris</i>		
Flamingo Greater	<i>Phoenicopterus roseus</i>	NT	
Flamingo Lesser	<i>Phoeniconaias minor</i>	NT	
Flufftail Red-chested	<i>Sarothrura rufa</i>		
Flycatcher African Paradise-	<i>Terpsiphone viridis</i>		
Flycatcher Fairy	<i>Stenostira scita</i>		
Flycatcher Fiscal	<i>Sigelus silens</i>		
Flycatcher Marico	<i>Bradornis mariquensis</i>		
Flycatcher Spotted	<i>Muscicapa striata</i>		
Francolin Coqui	<i>Peliperdix coqui</i>		
Francolin Grey-winged	<i>Scleroptila africana</i>		
Francolin Orange River	<i>Scleroptila levaillantoides</i>		



English Family	Scientific	National	Endemic
Francolin Red-winged	<i>Scleroptila levaillantii</i>		
Go-away-bird Grey	<i>Corythaixoides concolor</i>		
Godwit Black-tailed	<i>Limosa limosa</i>	LC	
Goose Egyptian	<i>Alopochen aegyptiaca</i>		
Goose Spur-winged	<i>Plectropterus gambensis</i>		
Grassbird Cape	<i>Sphenoecus afer</i>		
Grebe Black-necked	<i>Podiceps nigricollis</i>		
Grebe Great Crested	<i>Podiceps cristatus</i>		
Grebe Little	<i>Tachybaptus ruficollis</i>		
Greenshank Common	<i>Tringa nebularia</i>		
Guineafowl Helmeted	<i>Numida meleagris</i>		
Gull Grey-headed	<i>Chroicocephalus cirrocephalus</i>		
Hamerkop	<i>Scopus umbretta</i>		
Harrier African Marsh-	<i>Circus ranivorus</i>	VU	
Harrier Black	<i>Circus maurus</i>	NT	
Harrier Montagu's	<i>Circus pygargus</i>		
Harrier Pallid	<i>Circus macrourus</i>	NT	
Hawk African Harrier-	<i>Polyboroides typus</i>		
Heron Black	<i>Egretta ardesiaca</i>		
Heron Black-crowned Night-	<i>Nycticorax nycticorax</i>		
Heron Black-headed	<i>Ardea melanocephala</i>		
Heron Goliath	<i>Ardea goliath</i>		
Heron Green-backed	<i>Butorides striata</i>		
Heron Grey	<i>Ardea cinerea</i>		
Heron Purple	<i>Ardea purpurea</i>		
Heron Squacco	<i>Ardeola ralloides</i>		
Heron White-backed Night-	<i>Gorsachius leuconotus</i>	VU	
Hobby Eurasian	<i>Falco subbuteo</i>		
Honeybird Brown-backed	<i>Prodotiscus regulus</i>		
Honeyguide Greater	<i>Indicator indicator</i>		
Honeyguide Lesser	<i>Indicator minor</i>		
Hoopoe African	<i>Upupa africana</i>		
Ibis African Sacred	<i>Threskiornis aethiopicus</i>		
Ibis Glossy	<i>Plegadis falcinellus</i>		
Ibis Hadedda	<i>Bostrychia hagedash</i>		
Indigobird Dusky	<i>Vidua funerea</i>		



English Family	Scientific	National	Endemic
Indigobird Purple	<i>Vidua purpurascens</i>		
Indigobird Village	<i>Vidua chalybeata</i>		
Jacana African	<i>Actophilornis africanus</i>	NT	
Kestrel Greater	<i>Falco rupicoloides</i>		
Kestrel Lesser	<i>Falco naumanni</i>	VU	
Kestrel Rock	<i>Falco rupicolus</i>		
Kingfisher Brown-hooded	<i>Halcyon albiventris</i>		
Kingfisher Giant	<i>Megaceryle maxima</i>		
Kingfisher Half-collared	<i>Alcedo semitorquata</i>	NT	
Kingfisher Malachite	<i>Alcedo cristata</i>		
Kingfisher Pied	<i>Ceryle rudis</i>		
Kite Black	<i>Milvus migrans</i>		
Kite Black-shouldered	<i>Elanus caeruleus</i>		
Kite Yellow-billed	<i>Milvus parasitus</i>		
Korhaan Blue	<i>Eupodotis caerulescens</i>	NT	Yes
Korhaan Northern Black	<i>Afrotis afraoides</i>		
Lapwing African Wattled	<i>Vanellus senegallus</i>		
Lapwing Blacksmith	<i>Vanellus armatus</i>		
Lapwing Crowned	<i>Vanellus coronatus</i>		
Lark Eastern Clapper	<i>Mirafra fasciolata</i>		
Lark Eastern Long-billed	<i>Certhilauda semitorquata</i>		
Lark Melodious	<i>Mirafra cheniana</i>	NT	
Lark Pink-billed	<i>Spizocorys conirostris</i>		
Lark Red-capped	<i>Calandrella cinerea</i>		
Lark Rufous-naped	<i>Mirafra africana</i>		
Lark Sabota	<i>Calendulauda sabota</i>		
Lark Spike-heeled	<i>Chersomanes albofasciata</i>		
Longclaw Cape	<i>Macronyx capensis</i>		
Mallard	<i>Anas platyrhynchos</i>		
Mannikin Bronze	<i>Lonchura cucullata</i>		
Martin Banded	<i>Riparia cincta</i>		
Martin Brown-throated	<i>Riparia paludicola</i>		
Martin Common House-	<i>Delichon urbicum</i>		
Martin Rock	<i>Ptyonoprogne fuligula</i>		
Martin Sand	<i>Riparia riparia</i>		
Moorhen Common	<i>Gallinula chloropus</i>		



English Family	Scientific	National	Endemic
Mousebird Red-faced	<i>Urocolius indicus</i>		
Mousebird Speckled	<i>Colius striatus</i>		
Mousebird White-backed	<i>Colius colius</i>		
Myna Common	<i>Acridotheres tristis</i>		
Neddicky	<i>Cisticola fulvicapilla</i>		
Nightjar European	<i>Caprimulgus europaeus</i>		
Nightjar Fiery-necked	<i>Caprimulgus pectoralis</i>		
Nightjar Freckled	<i>Caprimulgus tristigma</i>		
Nightjar Rufous-cheeked	<i>Caprimulgus rufigena</i>		
Oriole Eurasian Golden	<i>Oriolus oriolus</i>		
Osprey	<i>Pandion haliaetus</i>		
Ostrich Common	<i>Struthio camelus</i>		
Owl African Grass-	<i>Tyto capensis</i>	VU	
Owl Barn	<i>Tyto alba</i>		
Owl Cape Eagle-	<i>Bubo capensis</i>		
Owl Marsh	<i>Asio capensis</i>		
Owl Southern White-faced Scops-	<i>Ptilopsis granti</i>		
Owl Spotted Eagle-	<i>Bubo africanus</i>		
Owl Verreaux's Eagle-	<i>Bubo lacteus</i>		
Parakeet Rose-ringed	<i>Psittacula krameri</i>		
Pelican Great White	<i>Pelecanus onocrotalus</i>		
Pelican Pink-backed	<i>Pelecanus rufescens</i>		
Petronia Yellow-throated	<i>Gymnoris superciliaris</i>		
Pigeon African Olive-	<i>Columba arquatrix</i>		
Pigeon Speckled	<i>Columba guinea</i>		
Pipit African	<i>Anthus cinnamomeus</i>		
Pipit Buffy	<i>Anthus vaalensis</i>		
Pipit Long-billed	<i>Anthus similis</i>		
Pipit Plain-backed	<i>Anthus leucophrys</i>		
Pipit Striped	<i>Anthus lineiventris</i>		
Plover Caspian	<i>Charadrius asiaticus</i>		
Plover Chestnut-banded	<i>Charadrius pallidus</i>	NT	
Plover Common Ringed	<i>Charadrius hiaticula</i>		
Plover Kittlitz's	<i>Charadrius pecuarius</i>		
Plover Three-banded	<i>Charadrius tricollaris</i>		
Pochard Southern	<i>Netta erythrophthalma</i>		



English Family	Scientific	National	Endemic
Pratincole Black-winged	<i>Glareola nordmanni</i>	NT	
Prinia Black-chested	<i>Prinia flavicans</i>		
Prinia Tawny-flanked	<i>Prinia subflava</i>		
Pytilia Green-winged	<i>Pytilia melba</i>		
Quail Common	<i>Coturnix coturnix</i>		
Quail Harlequin	<i>Coturnix delegorguei</i>		
Quailfinch African	<i>Ortygospiza fuscocrissa</i>		
Quelea Red-billed	<i>Quelea quelea</i>		
Rail African	<i>Rallus caerulescens</i>		
Robin Kalahari Scrub-	<i>Erythropygia paena</i>		
Robin-Chat Cape	<i>Cossypha caffra</i>		
Roller European	<i>Coracias garrulus</i>	LC	
Ruff	<i>Philomachus pugnax</i>		
Sandpiper Common	<i>Actitis hypoleucos</i>		
Sandpiper Curlew	<i>Calidris ferruginea</i>		
Sandpiper Marsh	<i>Tringa stagnatilis</i>		
Sandpiper Wood	<i>Tringa glareola</i>		
Scimitarbill Common	<i>Rhinopomastus cyanomelas</i>		
Secretarybird Secretarybird	<i>Sagittarius serpentarius</i>	NT	
Seedeater Streaky-headed	<i>Crithagra gularis</i>		
Shelduck South African	<i>Tadorna cana</i>		
Shoveler Cape	<i>Anas smithii</i>		
Shrike Lesser Grey	<i>Lanius minor</i>		
Shrike Magpie	<i>Urolestes melanoleucus</i>		
Shrike Red-backed	<i>Lanius collurio</i>		
Snipe African	<i>Gallinago nigripennis</i>		
Snipe Greater Painted-	<i>Rostratula benghalensis</i>	NT	
Sparrow Cape	<i>Passer melanurus</i>		
Sparrow House	<i>Passer domesticus</i>		
Sparrow Southern Grey-headed	<i>Passer diffusus</i>		
Sparrowhawk Black	<i>Accipiter melanoleucus</i>		
Sparrowlark Chestnut-backed	<i>Eremopterix leucotis</i>		
Spoonbill African	<i>Platalea alba</i>		
Spurfowl Natal	<i>Pternistis natalensis</i>		
Spurfowl Swainson's	<i>Pternistis swainsonii</i>		
Starling Cape Glossy	<i>Lamprotornis nitens</i>		



English Family	Scientific	National	Endemic
Starling Pied	<i>Lamprotornis bicolor</i>		
Starling Red-winged	<i>Onychognathus morio</i>		
Starling Violet-backed	<i>Cinnyricinclus leucogaster</i>		
Starling Wattled	<i>Creatophora cinerea</i>		
Stilt Black-winged	<i>Himantopus himantopus</i>		
Stint Little	<i>Calidris minuta</i>		
Stonechat African	<i>Saxicola torquatus</i>		
Stork Abdim's	<i>Ciconia abdimii</i>		
Stork Black	<i>Ciconia nigra</i>	NT	
Stork Marabou	<i>Leptoptilos crumeniferus</i>	NT	
Stork White	<i>Ciconia ciconia</i>		
Stork Yellow-billed	<i>Mycteria ibis</i>	NT	
Sunbird Amethyst	<i>Chalcomitra amethystina</i>		
Sunbird Greater Double-collared	<i>Cinnyris afer</i>		
Sunbird Malachite	<i>Nectarinia famosa</i>		
Sunbird White-bellied	<i>Cinnyris talatala</i>		
Swallow Barn	<i>Hirundo rustica</i>		
Swallow Greater Striped	<i>Cecropis cucullata</i>		
Swallow Pearl-breasted	<i>Hirundo dimidiata</i>		
Swallow Red-breasted	<i>Cecropis semirufa</i>		
Swallow South African Cliff-	<i>Petrochelidon spilodera</i>		
Swallow White-throated	<i>Hirundo albigularis</i>		
Swamphen African Purple	<i>Porphyrio madagascariensis</i>		
Swift African Black	<i>Apus barbatus</i>		
Swift African Palm-	<i>Cypsiurus parvus</i>		
Swift Alpine	<i>Tachymarptis melba</i>		
Swift Common	<i>Apus apus</i>		
Swift Horus	<i>Apus horus</i>		
Swift Little	<i>Apus affinis</i>		
Swift White-rumped	<i>Apus caffer</i>		
Tchagra Brown-crowned	<i>Tchagra australis</i>		
Teal Cape	<i>Anas capensis</i>		
Teal Hottentot	<i>Anas hottentota</i>		
Teal Red-billed	<i>Anas erythrorhyncha</i>		
Tern Caspian	<i>Hydroprogne caspia</i>	NT	
Tern Whiskered	<i>Chlidonias hybrida</i>		



English Family	Scientific	National	Endemic
Tern White-winged	<i>Chlidonias leucopterus</i>		
Thick-knee Spotted	<i>Burhinus capensis</i>		
Thrush Cape Rock-	<i>Monticola rupestris</i>		
Thrush Groundscraper	<i>Psophocichla litsitsirupa</i>		
Thrush Karoo	<i>Turdus smithii</i>		
Thrush Sentinel Rock-	<i>Monticola explorator</i>		
Tit Ashy	<i>Parus cinerascens</i>		
Tit-Babbler Chestnut-vented	<i>Sylvia subcaerulea</i>		
Vulture Cape	<i>Gyps coprotheres</i>	VU	
Wagtail African Pied	<i>Motacilla aguimp</i>		
Wagtail Cape	<i>Motacilla capensis</i>		
Wagtail Yellow	<i>Motacilla flava</i>		
Warbler African Reed-	<i>Acrocephalus baeticatus</i>		
Warbler Garden	<i>Sylvia borin</i>		
Warbler Great Reed-	<i>Acrocephalus arundinaceus</i>		
Warbler Icterine	<i>Hippolais icterina</i>		
Warbler Lesser Swamp-	<i>Acrocephalus gracilirostris</i>		
Warbler Little Rush-	<i>Bradypterus baboecala</i>		
Warbler Marsh	<i>Acrocephalus palustris</i>		
Warbler Sedge	<i>Acrocephalus schoenobaenus</i>		
Warbler Willow	<i>Phylloscopus trochilus</i>		
Waxbill Black-faced	<i>Estrilda erythronotos</i>		
Waxbill Blue	<i>Uraeginthus angolensis</i>		
Waxbill Common	<i>Estrilda astrild</i>		
Waxbill Orange-breasted	<i>Amandava subflava</i>		
Waxbill Violet-eared	<i>Uraeginthus granatinus</i>		
Weaver Cape	<i>Ploceus capensis</i>		
Weaver Southern Masked-	<i>Ploceus velatus</i>		
Weaver Thick-billed	<i>Amblyospiza albifrons</i>		
Weaver Village	<i>Ploceus cucullatus</i>		
Weaver White-browed Sparrow-	<i>Plocepasser mahali</i>		
Wheatear Capped	<i>Oenanthe pileata</i>		
Wheatear Mountain	<i>Oenanthe monticola</i>		
White-eye Cape	<i>Zosterops capensis</i>		
Whitethroat Common	<i>Sylvia communis</i>		
Whydah Long-tailed Paradise-	<i>Vidua paradisaea</i>		



English Family	Scientific	National	Endemic
Whydah Pin-tailed	<i>Vidua macroura</i>		
Whydah Shaft-tailed	<i>Vidua regia</i>		
Widowbird Long-tailed	<i>Euplectes progne</i>		
Widowbird Red-collared	<i>Euplectes ardens</i>		
Widowbird White-winged	<i>Euplectes albonotatus</i>		
Wood-Hoopoe Green	<i>Phoeniculus purpureus</i>		
Woodpecker Cardinal	<i>Dendropicos fuscescens</i>		
Woodpecker Ground	<i>Geocolaptes olivaceus</i>		
Wryneck Red-throated	<i>Jynx ruficollis</i>		



Appendix E: List of Expected Reptile Species



Genus	Species	Common name	Red list category	Atlas region endemic
<i>Agama</i>	<i>aculeata distanti</i>	Distant's Ground Agama	NE	1
<i>Agama</i>	<i>atra</i>	Southern Rock Agama	NE	0
<i>Aparallactus</i>	<i>capensis</i>	Black-headed Centipede-eater	NE	0
<i>Homoroselaps</i>	<i>lacteus</i>	Spotted Harlequin Snake	NE	1
<i>Boaedon</i>	<i>capensis</i>	Brown House Snake	NE	0
<i>Crotaphopeltis</i>	<i>hotamboeia</i>	Red-lipped Snake	NE	0
<i>Dasyplepis</i>	<i>scabra</i>	Rhombic Egg-eater	NE	0
<i>Lamprophis</i>	<i>aurora</i>	Aurora House Snake	NE	1
<i>Lycodonomorphus</i>	<i>rufulus</i>	Brown Water Snake	NE	0
<i>Psammophis</i>	<i>crucifer</i>	Cross-marked Grass Snake	NE	0
<i>Psammophylax</i>	<i>rhombeatus rhombeatus</i>	Spotted Grass Snake	NE	0
<i>Hemachatus</i>	<i>haemachatus</i>	Rinkhals	NE	0
<i>Lygodactylus</i>	<i>capensis capensis</i>	Common Dwarf Gecko	NE	0
<i>Pachydactylus</i>	<i>capensis</i>	Cape Gecko	NE	0
<i>Nucras</i>	<i>holubi</i>	Holub's Sandveld Lizard	NE	0
<i>Pelomedusa</i>	<i>subrufa</i>	Marsh Terrapin	NE	0
<i>Acontias</i>	<i>gracilicauda</i>	Thin-tailed Legless Skink	NE	1
<i>Trachylepis</i>	<i>capensis</i>	Cape Skink	NE	0
<i>Trachylepis</i>	<i>punctatissima</i>	Speckled Rock Skink	NE	0
<i>Afrotyphlops</i>	<i>bibronii</i>	Bibron's Blind Snake	NE	0



Appendix F: List of Expected Amphibian Species



Scientific Name	Common Name	IUCN Status
<i>Afrana angolensis</i>	Common River Frog	
<i>Afrivalus aureus</i>	Golden Leaf-Folding Frog	Rare
<i>Breviceps adspersus</i>	Bushveld Rain Frog	
<i>Bufo fenoulheti</i>	Northern Pygmy Toad	
<i>Bufo garmani</i>	Olive Toad	
<i>Bufo gutturalis</i>	Guttural Toad	
<i>Cacosternum boettgeri</i>	Common Caco	
<i>Hyperolius pickersgilli</i>	Pickersgill's Reed Frog	Rare
<i>Kassina senegalensis</i>	Bubbling Kassina	
<i>Phrynobatrachus mababiensis</i>	Dwarf Puddle Frog	
<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	
<i>Phrynomantis bifasciatus</i>	Banded Rubber Frog	
<i>Ptychadena anchietae</i>	Plain Grass frog	
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	Endangered
<i>Schismaderma carens</i>	Red Toad	
<i>Tomopterna cryptotis</i>	Tremolo Sand Frog	
<i>Xenopus laevis</i>	Common Platanna	