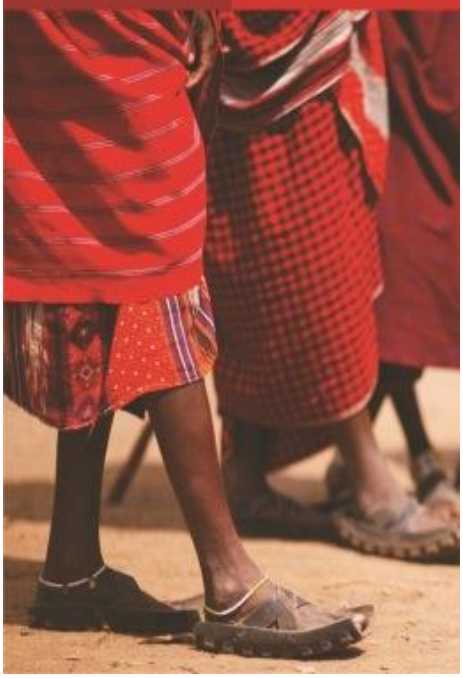

DIGBY WELLS
ENVIRONMENTAL

Environmental Authorisation and Integrated Water Use Licence Applications for the Proposed Water Treatment Plant at the Klipspruit Colliery, Mpumalanga Province

Flora and Fauna Impact Assessment

Project Number:

SOU5014

Prepared for:

South32 SA Coal Holdings (Pty) Ltd

July 2018

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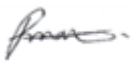
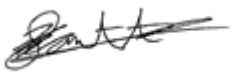
This document has been prepared by Digby Wells Environmental.

Report Type:	**Flora and Fauna Impact Assessment**
Project Name:	**Environmental Authorisation and Integrated Water Use Licence Applications for the Proposed Water Treatment Plant at the Klipspruit Colliery, Mpumalanga Province**
Project Code:	**SOU5014**

Name	Responsibility	Signature	Date
Lusanda Matee	Report Compilation		July 2018
Rudi Greffrath	Report Reviewer		July 2018
Brett Coutts	Report Reviewer		July 2018

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EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) was appointed by South32 SA Coal Holdings (Pty) Ltd (hereafter South32) to undertake and compile a Flora and Fauna impact assessment report as part of an integrated environmental regulatory applications process for authorisations required to install an active Water Treatment Plant (WTP) capable of treating mine affected water at the South32 Klipspruit (KPS) Colliery in Mpumalanga, South Africa Province.

After fieldwork was completed results indicated that the study site can be divided into four main sections: Transformed, Degraded, Natural land as well as Riparian vegetation (wetlands).

The majority of the study area has undergone transformation and/or degradation due to current land use, being mining. These impacts have resulted in disturbance of floral components and caused soil compaction in some areas. However wetlands and associated grasslands form important process and habitat areas, and the remnants of them are regarded as important. Grasslands associated with the project area could also support plant and animal species of special concern (SSC).

During the infield assessment no plant species regarded as SSC, according to the International Union for the Conservation of Nature (IUCN) red data list, provincially protected and none on the national list of Protected Trees were recorded. A total of 13 alien invader plant species (AIP) were recorded on site, of which only 8 were National Environmental Management: Biodiversity Act (NEMBA) listed species while the rest were either weeds or exotic plants. A total of four mammal species were recorded from the site, 57 bird species were recorded, and no reptiles and amphibians were recorded. No faunal SSC were recorded.

The study area was found to be in different states of sensitivity, with the riparian, transformed, and degraded grassland areas designated as low sensitivity respectively and natural grassland being medium sensitivity. It is the opinion of the specialist that the project may go ahead with the following conditions:

- Any surface infrastructure, such as roads and fences, should be located to an area of low sensitivity, this is already the case, except for the riparian/wetland and grassland vegetation types that will still be affected; and
- All mitigation measures prescribed in this document will be adhered to strictly.

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1 Introduction

Digby Wells Environmental (hereafter Digby Wells) was appointed by South32 SA Coal Holdings (Pty) Ltd (hereafter South32) to undertake and compile a Flora and Fauna impact assessment report as part of an integrated environmental regulatory applications process for authorisations required to install an active Water Treatment Plant (WTP) capable of treating mine affected water at the Klipspruit Colliery (KPS) in Mpumalanga Province, South Africa.

As such, in compliance with the Environmental Impact Assessment (EIA) Regulations, dated 2014 (as amended in 2017) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), South32 was required to appoint a qualified Independent Environmental Consultant (IEC) to carry out specialist studies to inform the EIA. This was done to determine the effects that the proposed development will have on the environment and the feasibility of the project (whether or not the project should proceed).

The Flora and Fauna Assessment include the following:

- Assess and detail the potential impacts on both vegetation and fauna on the various sites;
- Outline possible mitigation measures, rehabilitation procedures and/or vegetation removal procedures that would reduce potential impacts; and
- Identify and rate the significance of potential impacts and outline additional management guidelines.

1.1 Project Description

South32 SA Coal Holdings (Pty) Limited (hereafter South32) owns the Klipspruit Colliery (KPS), near Ogies in the Mpumalanga Province (refer to Figure 4-1 for the locality plan). Contaminated water that is being generated at KPS by mining activities exceeds the re-use capacity within the operations, whilst the storage capacity in mined out areas has reached its limits. The result of this is the risk of spillages or discharges to the natural environment. Effective management of this risk is essential to continued operations at KPS ensuring access to coal resources as well as securing and maintaining the requisite environmental licences and authorisations to operate and expand. Water treatment is thus required and South32 proposes to construct a modular Water Treatment Plant (WTP) and ancillary infrastructure to treat mine-affected water (the Project). South32 has appointed Digby Wells Environmental (Digby Wells) as the independent Environmental Assessment Practitioner to undertake the environmental-legal application processes and Specialist studies relevant to this proposed project.

The WTP is to be established within the operational area of the mine in the south-eastern corner of the Mining Right boundary, adjacent to KPS project offices. The proposed WTP will be modular in design and constructed in three phases, starting at a capacity of 2Ml/day, upgradeable to 303Ml/day and then increments of 3.3Ml/day to 10Ml/day. Contaminated water will be abstracted from the Balancing Dam at KPS and pumped to the WTP. After

treatment, clean water that complies with the Resource Water Quality Objectives (RWQO) for the Wilge River catchment is proposed to be discharged into the Saalklapspruit at the northern boundary of the KPS operation adjacent to the N12 national highway.

The treatment process will be based on the use of membrane desalination with brine softening and will consist of the following steps:

- Pre-treatment of the feed water using pH adjustment and disinfection to remove organics from the system that can cause fouling and scaling of the membranes;
- Removal of the dissolved metals by chemical oxidation followed by the removal of precipitates and suspended solids using flocculation and coagulation unit processes;
- Ultrafiltration (UF) will be used to remove fine particles from the feed water to the Reverse Osmosis (RO) unit processes. This is necessary to prevent fouling and scaling of the RO membranes; and
- Product water conditioning is required to ensure the pH meets the discharge requirements.

This process will produce gypsum sludge and brine. The gypsum sludge will be dewatered at the WTP and then loaded onto trucks for off-site disposal at a licenced waste management facility designed for this type of material. The brine will be recycled back into the treatment process until the salinity requires that a portion be depleted from the system. This small volume of brine will be stored in tanks within the proposed WTP footprint from where it will be pumped into road tankers and transported to a third-party waste management site licenced to receive this waste.

The infrastructure layout of the project is depicted in Figure 1-1 and the key infrastructure components of the project scope are as follows:

- A Feed Water Line comprising of a pump station and 1.5km High Density Poly Ethylene (HDPE) pipeline from the Balancing Dam to the WTP site capable of pumping 10Ml/day;
- A return water system from the WTP to the Balancing Dam along the same route as the Feed Water Line for the management of treated water that does not comply with the requirements for release to the catchment;
- A WTP Area with a footprint of approximately 1.5ha for the establishment and operation of a modular WTP with a maximum throughput of 10Ml/day. This includes the development and use of facilities for the storage and handling of hazardous chemicals used in the treatment process;
- A Discharge Line comprising of a 4km HDPE pipeline along the eastern boundary of KPS to transfer the treated water for discharge to the Saalklapspruit. Two pipeline routes are required to accommodate advancing mining and rehabilitation activities along the proposed pipeline servitude, and will be implemented at different stages of the project; and

- A dissipation structure at the proposed discharge point, alongside the N12 National Highway.

Supporting services such as the new powerline and change houses and ablution facilities (connected to KPS's existing sewage line) are also included in the project.

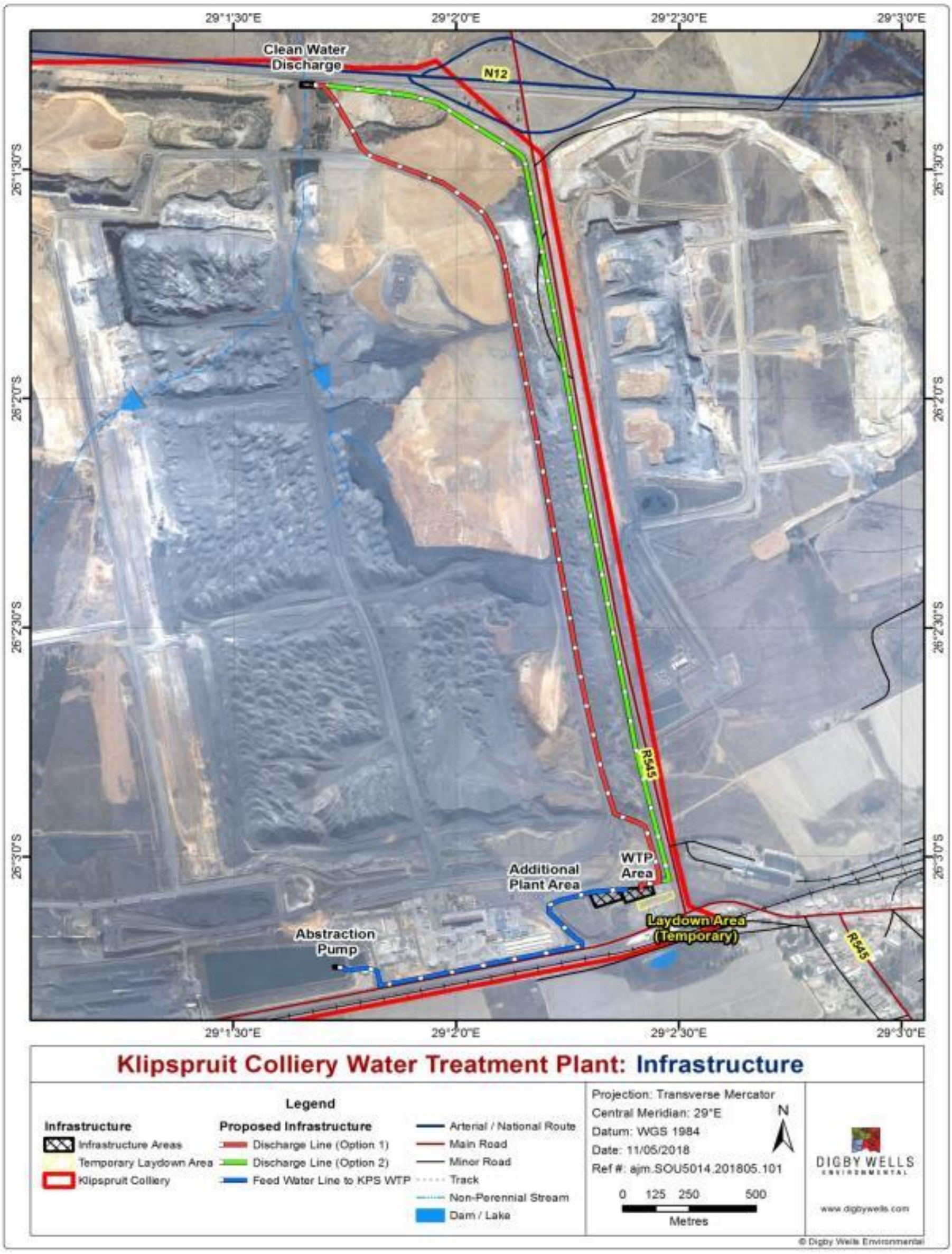

Figure 1-1: Infrastructure Layout Plan

1.2 Terms of Reference

Digby Wells were commissioned by South32 to carry out a Flora and Fauna assessment for the proposed WTP on relevant portions of the farm Klipspruit 3 IS, as well as the related infrastructure, which included water pipelines.

This specialist study serves to undertake a Flora and Fauna assessment of the study areas. Information generated from this survey has been used to address the impacts that the development will have on this environment, and prescribed suitable mitigation measures. The desktop and field results have been included to interpret the results.

This study addresses the following regulations and regulatory procedures of the Department of Environmental Affairs and Tourism:

- Section 21 of the Environment Conservation Act (Act No. 73, 1989);
- Section 24 of the Constitution – Environment (Act No. 108 of 1996);
- National Environmental Management Biodiversity Act (Act No. 10 of 2004) (NEMBA); and
- Section 5 of the NEMA.

1.3 Aims and Objectives

The overall aim of this specialist study was to undertake a Flora and Fauna Assessment of the local flora and fauna communities associated with the study area and to identify and assess the biodiversity risks and impacts of the proposed WTP. To achieve the overall aim, the following objectives were considered for this specialist study:

- To delineate the various vegetation/habitat types present within the study area and describe their sensitivity;
- To determine if any flora and fauna species or assemblages will be directly impacted upon by the proposed water treatment activities and its associated infrastructure, this includes flora and fauna communities present, the ecological state of these communities, identification of possible Red Data Listed 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 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 Species of Special Concern (SSC) or critical habitat.

To achieve these objectives, the following components were included:

- Results of desktop study, including descriptions of general vegetation types/veld types/habitat associated with faunal component present;

- List with all red data and protected faunal species (Globally, National) and their red data/protected status;
- Species list of the faunal component for each plant community;
- Dominant faunal species for each plant community;
- Exotic species for each plant community;
- Distribution maps of Red Data and protected species recorded;
- Rare or endangered species, as well as all protected plants (if present) for each plant community, including a distribution map of listed red data and protected species recorded;
- A species list for the entire area were compiled for each of the above mentioned;
- A list of endemic species (if present); and
- Mapping of Biodiversity Hotspots and sensitive areas.

2 Details of the Specialist

This Specialist Report has been compiled by the following specialists:

Table 2-1: Details of the Specialist(s) who prepared this Report

Responsibility	**Report Writer**
Full Name of Specialist	Lusanda Matee
Highest Qualification	MSc Biological Sciences
Years of experience in specialist field	0.5
Registration(s):	South African Council for Natural Scientific Professionals: Professional Natural Scientist (Reg. No: 119257)
Responsibility	**Technical Review**
Full Name of Specialist	Rudi Greffrath
Highest Qualification	B-Tech Conservation Management
Years of experience in specialist field	11
Registration(s):	South African Council for Natural Scientific Professionals: Professional Natural Scientist (Reg. No: 400018/17)

2.1 Declaration of the Specialist

I, Rudi Greffrath, as the appointed specialist, hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:

- other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
- am not independent, but another specialist that meets the general requirements set out in Regulation 13 have been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification;
- have disclosed/will disclose, to the applicant, the Department and interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application;
- have ensured/will ensure that information containing all relevant facts in respect of the application was/will be distributed or was/will be made available to interested and affected parties and the public and that participation by interested and affected parties was/will be facilitated in such a manner that all interested and affected parties were/will be provided with a reasonable opportunity to participate and to provide comments.

Signature of the specialist

Rudi Greffrath

Full Name and Surname of the specialist

Digby Wells Environmental

Name of company

25-07-2018

Date

3 Methodology and Scope of Work

3.1 Site visit

Upon the completion of a desktop survey, one comprehensive field assessment was conducted by a suitably qualified Digby Wells specialist on the 5th of April 2018 to assess the status of biodiversity within the proposed WTP project area. As the WTP is to be established in the south-eastern corner of Klipspruit Colliery, close to KPS project offices, within the operational area of Klipspruit Colliery this area was surveyed during the field assessment in addition the pipeline route area inside the mine (Discharge Line Option 1) was surveyed up to the discharge point as well as the route outside the mine up to the relevant discharge point (Discharge Line Option 2) (Figure 4-1).

3.2 Desktop Assessment

Desktop studies of the vegetation (trees, shrubs and forbs as well as exotic and invader species) were completed to gather and assess all available literature and information for the study area. The purpose of a literature survey was to gather and summarize all relevant information regarding the natural vegetation, species diversity, and species composition of the general vegetation (trees, shrubs, and forbs) within the relevant areas. This available information was used to understand the broad environmental setting of the proposed project area. The methods discussed in the sections below were used during the vegetation survey.

3.3 Vegetation Survey

During the infield vegetation assessment, trees, shrubs, grasses, and herbs (forbs) were recorded using the Braun-Blanquette method (Braun-Blanquette, 1964).

3.4 Faunal Survey

One seasonal study of faunal species was conducted concurrently with vegetation surveys. In support of this, a detailed desktop study was also conducted for all faunal species previously recorded on site; this information can be found in the relevant scoping report. All fauna species encountered on site were identified and recorded. The following methods described below were used during the survey and the location of the sampling areas.

3.4.1 Mammals

Small mammals were sampled through opportunistic sightings, tracks and dung, and refuge examination. Large mammals were recorded using scats, tracks and nesting or breeding sites such as burrows and dens. Scats and tracks found during active searches were photographed with a scale and identified. For identification purposes, the field guides used include Mammals of Southern Africa (Smithers, 1983), The Mammals of the Southern African Sub-region (Skinner & Chimimba, 2005), and the Red Data Book of the Mammals of South Africa (Friedman & Daly 2004).

3.4.2 Avifauna

Transect surveys and random point surveys were the principal ornithological field survey techniques used. Transect surveys were planned based on representative sites of different avifauna habitat, such as pans, dams, wetlands, open grassland and road reserves by simply following available roads and paths that transect over these habitat types. Transect procedures involve slow attentive walks along transects during which any bird seen or heard is identified and recorded; this was completed during diurnal surveys only. Species observed during the vegetation surveys and other field trips were also recorded.

The following was recorded:

- All birds encountered or noted during the survey;
- All birds observed by people residing in the study area; and
- A list of rare and endangered species encountered.

Visual identification of birds was used to confirm bird calls where possible. Bird species were confirmed using Robert's birds (2009).

3.4.3 Herpetofauna (Reptiles and Amphibians)

Herpetofauna include reptile and amphibian species. Direct/opportunistic observations were conducted along trails or paths within the project area. Any herpetofauna species seen or heard along such paths or trails within the project area were 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, in fallen logs, rotten tree stumps, in leaf litter, rodent burrows, ponds, old termite mounds, etc. Amphibians and

reptiles observed by people residing in the study area were also recorded. Branch (2001) and Du Preez and Caruthers (2009) were used to confirm identification where necessary.

3.4.4 Macro-Invertebrates

Insects were sampled by means of opportunistic observations during the faunal survey. The available standing grass swards in each survey area were actively searched for using an active trapping method via the use of a sweep net. Identification of sampled macro-invertebrates was done to the lowest taxonomic levels possible using current macroinvertebrate identification keys using the methods of Picker *et al.* (2002), with slight modifications.

3.4.5 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 Listed 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 Listed species (this is especially evident in wetland habitats); and
- Habitat linkage (HL) (corridors) – 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 (unlikely to occur);
- Medium (could possibly occur);
- High (most likely could occur); or
- Recorded (does occur on site).

The IUCN Red Data categories (2017) are used for the status identification of mammals, birds, reptiles, and amphibians globally.

3.5 Sensitive Areas

All sensitive areas, as described by provincial and national legislation, were identified as described in section 5. The locality and extent, as well as species composition of sensitive areas such as the wetlands or pans, streams, rivers and rocky outcrops were conducted in

order to identify and map all such sensitive areas present. Sensitive ecosystems as listed by NEMBA and ratified by the minister in December 2011 were identified and delineated.

3.5.1 Legislation

Red Data Books or RDBs are lists of threatened plants and animals specific to a certain region. They are a vital source of information in guiding conservation decisions. South Africa has produced 5 RDBs dealing with each of the following: birds, land mammals, fish (fresh water and estuarine only), reptiles and amphibians, and butterflies.

The conservation status of a plant or animal species is described by the following terms:

- **Extinct:** a species for which there is a historical record, but which no longer exists in the area under review.
- **Endangered** a species in danger of extinction, and whose survival is unlikely if the factors causing its decline continue.
- **Vulnerable** a species which it is believed will move into the endangered category if the factors causing its decline continue.
- **Rare** a species with small populations, which are not yet vulnerable or endangered, but which are at risk.
- The term **Threatened** is commonly used as a collective description for species which are endangered vulnerable or rare.
- Some species are **Endemic,** i.e. they are restricted to one region and occur nowhere else. A threatened endemic is a conservation priority.

Of special concern were protected plant and animal species. Listed species of flora and fauna are regarded as species of which representation in the wild has declined to such an extent that drastic action is needed to ensure these species' survival. Under anthropogenic pressure, the number of these species has reached levels where preservation management is needed, and conservation management will no longer be effective. The listing of these species under either IUCN or CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), is regarded as a valuable starting point to initiate legally sanctioned management practices to bring these species back to within acceptable numbers.

3.5.1.1 IUCN

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). The IUCN Red List also includes information on plants and animals that are categorized as Extinct or Extinct in the Wild; on

taxa that cannot be evaluated because of insufficient information (i.e., are Data Deficient); and on plants and animals that are either close to meeting the threatened thresholds or that would be threatened were it not for an on-going taxon-specific conservation programme (i.e., are Near Threatened).

Plants and animals that have been evaluated to have a low risk of extinction are classified as Least Concern (IUCN.org) (Figure 3-1).

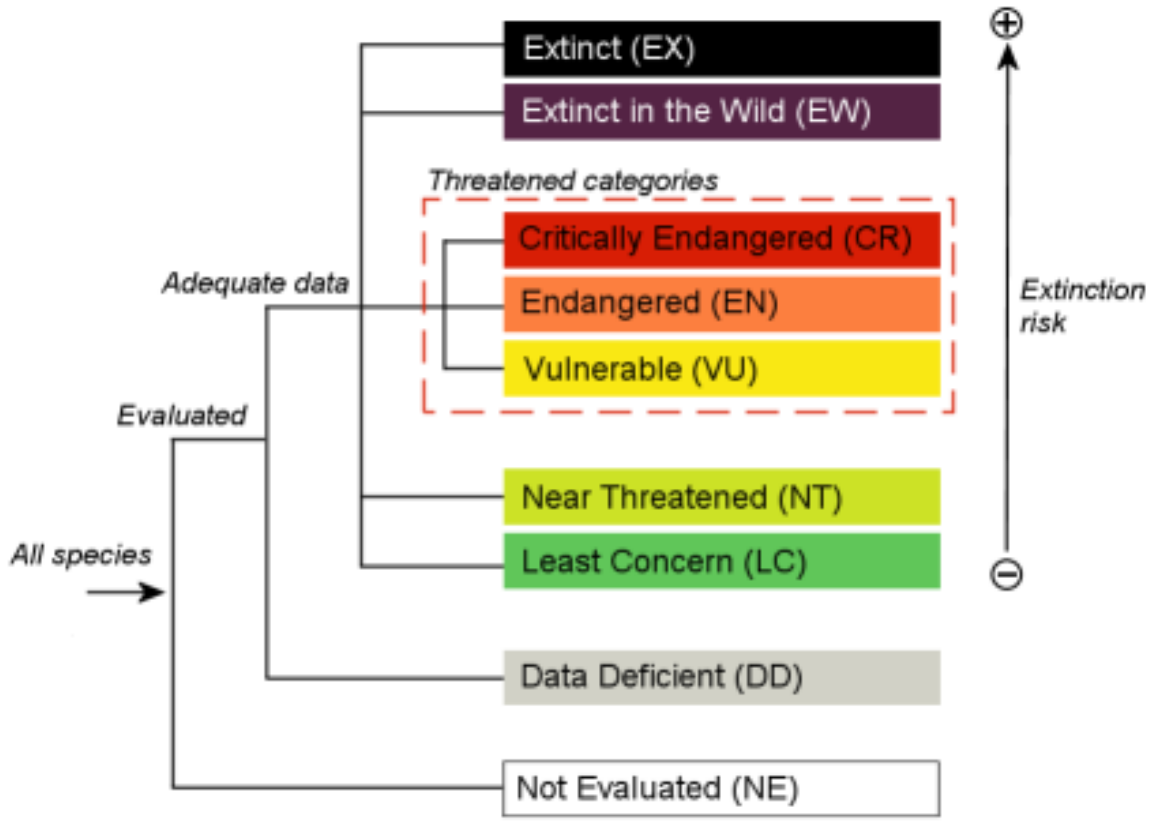

Figure 3-1 : IUCN Categories

3.5.1.2 CITES

CITES Fauna and Flora is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival (CITES.org).

CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-exports and introduction from species covered by the Convention has to be authorised 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 Appendices I, II and III according to the restriction on trade:

- Appendix I: Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
- Appendix II: Species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilisation incompatible with their survival.
- Appendix III: Species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade.

Changes to Appendix III follow a distinct procedure from changes to Appendices I and II, as each Party is entitled to make unilateral amendments to it.

3.6 Impact Assessment Methodology

Impacts and risks have been identified based on a description of the activities to be undertaken. Once impacts have been identified, a numerical environmental significance rating process will be undertaken that utilises the probability of an event occurring and the severity of the impact as factors to determine the significance of a particular environmental impact.

The severity of an impact is determined by taking the spatial extent, the duration, and the severity of the impacts into consideration. The probability of an impact is then determined by the frequency at which the activity takes place or is likely to take place and by how often the type of impact in question has taken place in similar circumstances.

Following the identification and significance ratings of potential impacts, mitigation and management measures will be incorporated into the EMP.

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:

Significance = CONSEQUENCE X PROBABILITY X NATURE

Where

Consequence = intensity + extent + duration

And

Probability = likelihood of an impact occurring

And

Nature = positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 3-2. 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 has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of seven categories (The descriptions of the significance ratings are presented in Table 3-3).

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 3-1: Impact Assessment Parameter Ratings

Rating	Intensity/ Irreplaceability		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.	International 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.	National 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.>65 but <80% probability.

Rating	Intensity/ Irreplaceability		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.	Province/ Region Will affect the enti 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.	Municipal Area 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/ Irreplaceability		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.	Local Local including the site and its immediate surrounding 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.	Limited Limited extending only as far as the development site area.	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/ Irreplaceability		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.	Very limited/Isolated Limited to specific isolated parts of th site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 3-2: Probability/Consequence Matrix

Significance																																						
-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
-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
-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
-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
-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
-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
-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
-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
Consequence																																						

Table 3-3: 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) (-)

4 Existing Environment

4.1 Locality

KPS is situated approximately 27km south west of eMalahleni lies to the south of the N12 highway to Johannesburg and is located approximately 3km east of Ogies in Mpumalanga Province, South Africa. The coordinates of the mine are 26°03'13.0"S 29°02'06.3"E. This mine is found mainly on the farms Klipfontein 3IS, Smaldeel 1IS as well as other surrounding properties (Refer to Figure 4-1).

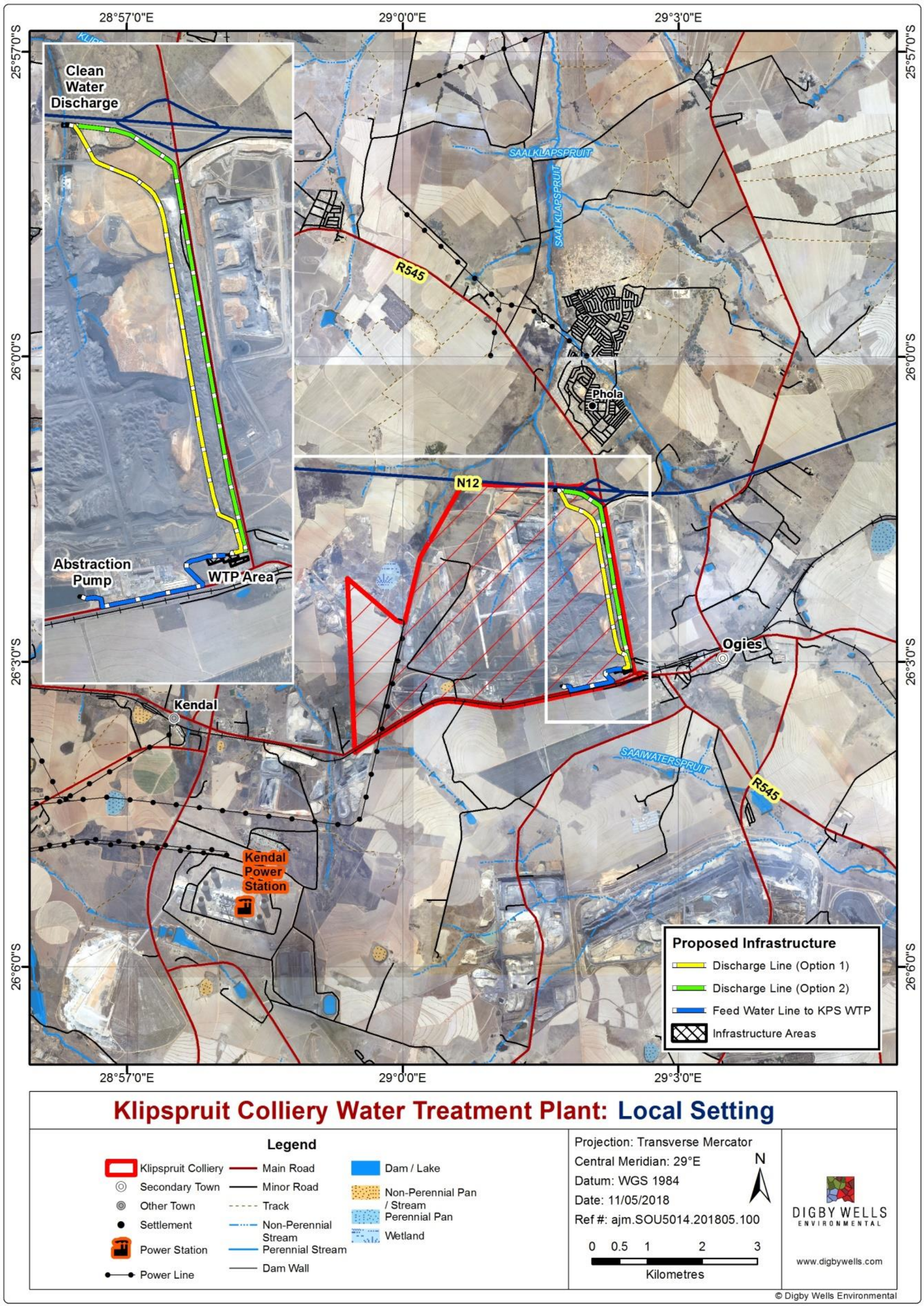

Figure 4-1: Locality Map

4.1.1 Regional Vegetation

The study area is situated within the Grassland Biome of South Africa. According to the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006), the study area falls within the Eastern Highveld Grassland (GM12): This vegetation type occurs in Mpumalanga and the Gauteng provinces on the plains between Belfast in the east and the eastern side of Johannesburg in the west, extending southwards to Bethal, Ermelo, and west of Piet Retief. It occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation can be described as short dense grassland dominated by the usual Highveld grass composition (Aristida, Digitaria, Eragrostis, Themeda, Tristachya, etc.) with small scattered rocky outcrops with wiry, sour grasses and some woody species (*Senegalia caffra*, *Celtis africana*, *Diospyros luciodes subspecies lycioides*, *Parinari capensis*, *Protea caffra*, *Protea welwitschii* and *Englerophytum magalismontanum*). Eastern Highveld Grasslands are considered to be Endangered in South Africa with a conservation target of 24% (Mucina & Rutherford, 2006). Approximately 44% has been transformed by cultivation, plantations, urban sprawl, mining, and building of road and dam infrastructure. Erosion is very low and no serious alien infestation is reported, although species such as *Acacia mearnsii* can become dominant in disturbed places. Important characteristic taxa for the Eastern Highveld Grassland vegetation type are listed in Table 4-1 and the distribution of this vegetation type is shown in Figure 4-2.

Table 4-1: Common and Characteristic Plant Species of Eastern Highveld Grassland Vegetation Type

(Source: Mucina & Rutherford, 2006)

Plant form/Ecological type	Species
Graminoids	*Aristida congesta, A. junciformis subsp. galpinii, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. curvula, E. plana, E. racemosa, E. sclerantha, Heteropogon contortus, Loudetia simplex, Microchloa caffra, Monocymbium ceresiiforme, Setaria sphacelata, Sporobolus africana, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix, T. rehmannii, Alloteropsis semialata subsp. eckloniana, Andropogon appendiculatus, Eragrostis capensis, E. gummiflua,, Harpochloa falx, Panicum natalense, Schizachyrium sanguineum, Setaria nigrirostris,*
Herbs	*Berkheya setifera, Haplocarpha scaposa, Justicia anagalloides, Pelargonium luridum, Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvaalensis subsp. setilobus, Helichrysum aureonitens, H. caespititium, H. rugulosum, Ipomoea crassipes, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata.*

Plant form/Ecological type	Species
Geophytic, Semiparasitic and Aquatic Herbs	*Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypoxis rigidula var.pilosissima, Ledebouria ovatfolia.*
Succulent Herb	*Aloe ecklonis.*
Low Shrubs	*Anthospermum rigidum subsp. pumilum, Stoebe plumose.*

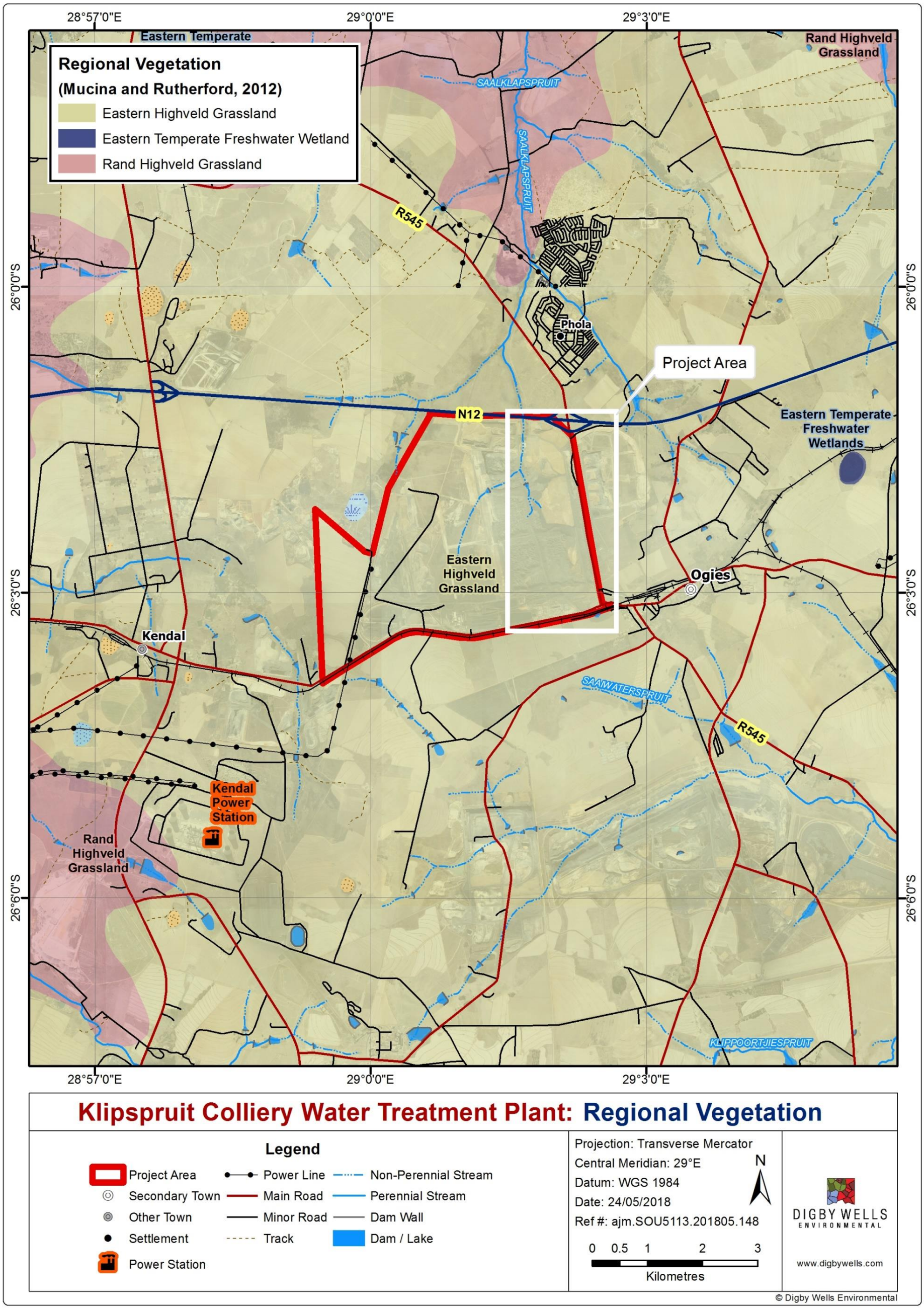

Figure 4-2 : Regional Vegetation Types

4.1.1.1 Species of special concern

According to POSA (2016) eleven species (classified as Vulnerable (VU) or Near Threatened (NT)), and two species (classified as Rare) that might occur within the area of the site that have been recorded by SANBI for the Quarter degree squares (QDS) 2628 BB and 2629 AA. These are listed in Table 4-2 below. The proposed WTP is primarily located in 2629 AA QDS; however 2628 BB is in close proximity to the project area, thus may be affected by the proposed development.

Table 4-2: Protected Plant Species

Species	Threat status	SA Endemic
Aloe cooperi Baker subsp. cooperi	LC	No
Aloe reitzii Reynolds var. reitzii	NT	Yes
Brachystelma minor E.A.Bruce	VU	Yes
Brachystelma stellatum E.A.Bruce & R.A.Dyer	Rare	Yes
Crassula setulosa Harv. var. deminuta (Diels) Toelken	NE	Yes
Crassula setulosa Harv. var. setulosa forma setulosa	NE	Yes
Cryptocarya transvaalensis Burtt Davy	LC	No
Dactylis glomerata L.	NE	No
Dianthus zeyheri Sond. subsp. natalensis S.S.Hooper	NE	Yes
Disa alticola H.P.Linder	VU	Yes
Disa zuluensis Rolfe	EN	Yes
Eucomis autumnalis (Mill.) Chitt. subsp. clavata (Baker) Reyneke	NE	No
Eucomis vandermerwei I.Verd.	VU	Yes
Graderia linearifolia Codd	VU	Yes
Habenaria barbertoni Kraenzl. & Schltr.	NT	Yes
Helichrysum aureum (Houtt.) Merr. var. argenteum Hilliard	NE	Yes
Jamesbrittenia macrantha (Codd) Hilliard	NT	Yes
Khadia alticola Chess. & H.E.K.Hartmann	Rare	Yes
Lydenburgia cassinoides N.Robson	NT	Yes
Protea parvula Beard	NT	No
Zantedeschia pentlandii (R.Whyte ex W.Watson) Wittm.	VU	Yes

4.1.2 Flora

The study area was divided into four distinct development zones based on the proposed infrastructure. These were the WTP area, the discharge point inside the mine and the discharge point outside the mine. Distinct vegetation communities were observed within each of these zones.

4.1.2.1 Natural Grassland vegetation habitat

This vegetation (Figure 4-3) unit was found in small pockets mainly in the discharge point area outside the mine. The Grasslands in this unit were characterised by open vegetation cover, made up of predominantly a continuous grassy layer dominated by *Aristida junciformis*. In spite of high level of transformation and degradation of the immediate surroundings the vegetation of this portion of grassland exhibits attributes of Eastern Highveld Grassland i.e. dominant (sometimes moribund) grass sward and diverse herbaceous component typical of natural grassland. This vegetation unit can be considered to be of medium ecological sensitivity.

Figure 4-3: Natural Grassland Habitat Type at the Discharge Point

4.1.2.2 Degraded Grassland

This vegetation type (Figure 4-4) is predominantly found in the discharge point area. Grasslands are vegetation types that are mainly characterised by open vegetation cover, made up of predominantly a continuous grassy layer. The grassland type in the study is degraded grassland characterised by the presence indigenous flora species and a range of dominant species including *Aristida spp*. A number of secondary succession grassland species were also present which are known to occur within disturbed habitats. This vegetation unit can be considered to be of low floristic sensitivity.

Figure 4-4: Degraded Grassland Habitat Type

4.1.2.3 Riparian vegetation

Two wetland systems totalling 211.8ha fall within the 500m buffer of the proposed pipeline routes. These are a large channelled valley bottom wetland that drains north into the Saalklapspruit system, and a hillslope seep which is located in the South East corner of the project area. The wetland habitat unit is dominated by *Typha capensis*, *Paspalum dilatatum* (Dallis Grass), *Juncus effusus* (Common Rush), *Eragrostis gummiflua* (Gum Grass), and *Andropogon eucomus.* It has been moderately to severely modified, modified by mining activities, existing roads, livestock grazing, agricultural activities, and invasion by alien plants (*Acacia mearnsii* (black wattle), *Eucalyptus camaldulensis* (red river gum), *Salix babylonica* (weeping willow)). The ecological sensitivity of this vegetation unit can be considered to be

low as although it is largely transformed it still remains functional and capable of supporting faunal species that will utilise the area for breeding and foraging purposes (Figure 4-4).

Figure 4-5: Riparian Vegetation Habitat Type

4.1.2.4 *Transformed Vegetation Unit*

This vegetation type (Figure 4-6) is found predominantly in the WTP area. It is devoid of natural habitat and characterised by existing disturbances in the form of mining activities (buildings, roads, and mining areas) which has led to transformation of the habitat to one where secondary grassland conditions prevail and alien and invader species abundance is high. This habitat unit has reduced ecological functioning and integrity and it is unlikely that any threatened faunal taxa would persist in these areas, other than potentially just passing

through. The floristic sensitivity of this habitat unit can be considered to be that of low floristic sensitivity.

Figure 4-6: Transformed Vegetation Habit Type on the WTP Footprint

4.1.3 Alien Invasive Plant species

Alien invasive plants can be defined as non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Invasive Species Advisory Committee, 2006). These species generally out-compete native vegetation for space, nutrients, water, and other environmental requirements required for growth. The result of these infestations often include transformation of the native ecosystem in such a manner that compromises the ecological integrity of the ecosystem that could lead to its eventual collapse if not addressed (Van Wilgen *et al*., 1999).

Alien plant species in South Africa have been classified according to 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 Alien Invasive Species Management Programme;
- Category 2: Invasive species controlled by area, and;
- Category 3: Invasive species controlled by activity.

A total of 13 alien invader plant species (AIP's) were recorded on site (Bromilow, 2010) eight of these have been assigned alien invader plant categories according to CARA and NEMBA (Table 4-3).

Table 4-3: AIP's Recorded on Site

Scientific Name	Common Name	NEMBA Status
Acacia mearnsii	Black-wattle	Category 1b
Bidens bipinnata L.	Spanish blackjack	Weed
Cosmos bipinnatus	Cosmos	Category 1b
Conyza albida	Tall fleabane	Weed
Cortaderia selloana	Common pampas grass	Category 1b
Gomphocarpus fruticosus	Milkweed	Exotic
Pennisetum clandestinum	Kikuyu grass	Category 1b
Salix babylonica	Weeping willow	Category 2
Persicaria lapathifolia	Spotted Knotweed	Category 1b
Solunum incanum	Sodom apple	Medicinal weed
Solanum mauritianum	Bugweed	Category 1b
Targetes minuta	Tall Khaki Weed	Weed
Verbena bonariensis	Tall Verbena	Category 1b

4.2 Fauna

4.2.1 Mammals

The project area has a relatively low faunal diversity due to the disturbed nature of the site (Table 4-4). According Skinner and Chimimba, (2005), 82 mammal species may occur in the project, however only three of these were recorded in the project area during the survey.

Table 4-4: Mammal Species Recorded in the Project Area

Common Name	Scientific Name	IUCN 2017	Habitat found in
Highveld Gerbil	*Tatera brantsi*	Least concern	Grassland
Porcupine	*Hystrix africaeaustralis*	Least concern	Grassland
Water mongoose	*Atilax paludinosus*	Least concern	Riparian
Yellow mongoose	*Cynictis penicillata*	Least concern	Grassland

4.2.2 Bats

According to Skinner and Chimimba, (2005), 14 species of the order Chiroptera (Bats) could utilise the study area during nocturnal foraging bouts; however no roosts for any bat species were located in the study plots, however; no bat species were recorded during the field assessment, primarily due to the lack of preferred habitat and the disturbed nature of the project site.

4.2.3 Avifauna

Birds serve as indicators of biological integrity and environmental health. 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. A total of 56 bird species were recorded during the field assessment and these have been listed in Table 4-5.

Table 4-5: Avifauna Species Recorded in the Project Area

Common Names	Scientific Names	IUCN Status	Grassland	Alien trees	Disturbed	Riparian/Wetland
African Hoopoe	*Upupa africana*	NA	#			
African Quailfinch	*Ortygospiza atricollis*	LC				#
African Wattled Lapwing	*Vanellus senegallus*	LC	#		#	
Barn Owl	*Tyto alba*	LC		#		
Black Heron	*Egretta ardesiaca*	LC				#
Black-collared Barbet	*Lybius torquatus*	LC				
Black-headed Heron	*Ardea melanocephala*	LC				#
Black-shouldered Kite	*Elanus caeruleus*	LC	#		#	
Blacksmith Lapwing	*Vanellus armatus*	LC	#		#	
Burchell's Coucal	*Centropus burchellii*	LC		#		
Cape Robin-Chat	*Cossypha caffra*	LC	#	#	#	
Cape Sparrow	*Passer melanurus*	LC	#			
Cape Turtle-Dove	*Streptopelia capicola*	LC	#			
Cape Wagtail	*Motacilla capensis*	LC		#		
Cape White-eye	*Zosterops virens*	LC	#			
Cattle Egret	*Bubulcus ibis*	LC	#		#	
Common Fiscal	*Lanius collaris*	LC	#	#	#	

Common Names	Scientific Names	IUCN Status	Grassland	Alien trees	Disturbed	Riparian/Wetland
Common House-Martin	*Delichon urbicum*	LC	#			
Common Moorhen	*Gallinula chloropus*	LC				
Common Myna	*Acridotheres tristis*	LC	#			
Common Ringed Plover	*Charadrius hiaticula*	LC	#		#	
Crested Barbet	*Trachyphonus vaillantii*	LC				
Crowned Lapwing	*Vanellus coronatus*	LC	#		#	
Dark-capped Bulbul	*Pycnonotus tricolor*	NA	#	#	#	#
Diederick Cuckoo	*Chrysococcyx caprius*	LC				
Egyptian Goose	*Alopochen aegyptiaca*	LC				#
Marsh Owl	*Asio capensis*	LC	#		#	
Hadeda Ibis	*Bostrychia hagedash*	LC	#			
Helmeted Guineafowl	*Numida meleagris*	LC	#		#	
House Sparrow	*Passer domesticus*	LC		#	#	
Laughing Dove	*Streptopelia senegalensis*	LC	#			
Namaqua Dove	*Oena capensis*	LC	#			
Natal Spurfowl	*Pternistis natalensis*	LC	#		#	
Karoo Thrush	*Turdus olivaceus*	LC	#			
Pied Starling	*Spreo bicolor*	LC	#			

Common Names	Scientific Names	IUCN Status	Grassland	Alien trees	Disturbed	Riparian/Wetland
Pin-tailed Whydah	*Vidua macroura*	LC	#			
Purple Heron	*Ardea purpurea*	LC	#			#
Red-billed Teal	*Anas erythrorhyncha*	LC				
Red-capped Lark	*Calandrella cinerea*	LC	#	#	#	
Red-eyed Dove	*Streptopelia semitorquata*	LC	#			
Red-headed Finch	*Amadina erythrocephala*	LC				#
Red-knobbed Coot	*Fulica cristata*	LC				#
Red-winged Starling	*Onychognathus morio*	LC	#	#		
Reed Cormorant	*Phalacrocorax africanus*	LC				#
Rock Dove	*Columba livia*	LC	#			
Speckled Mousebird	*Colius striatus*	LC		#		
Speckled Pigeon	*Columba guinea*	LC	#			
Spotted Thick-knee	*Burhinus capensis*	LC	#	#	#	
Spur-winged Goose	*Plectropterus gambensis*	LC				#
Steppe Buzzard	*Buteo vulpinus*	NA	#		#	
Swainson's Spurfowl	*Pternistis swainsonii*	LC	#		#	
Three-banded Plover	*Charadrius tricollaris*	LC	#		#	
White-breasted Cormorant	*Phalacrocorax lucidus*	NA				#

Common Names	Scientific Names	IUCN Status	Grassland	Alien trees	Disturbed	Riparian/Wetland
White-faced Duck	*Dendrocygna viduata*	LC				#
Yellow Wagtail	*Motacilla flava*	LC			#	#

4.2.4 Important Bird Area

Important Bird Areas (IBAs) are sites that have been identified as globally important for the conservation of avifaunal species. More than 12,000 IBA's have been identified globally. At present, South Africa has 124 IBA's (101 of global-, and 21 of regional importance), covering over 14 million hectares of habitat for our threatened, endemic and congregatory birds. The proposed WTP will not traverse any IBA.

4.2.5 Herpetofauna

The persistence and metapopulation structure of many herpetofauna species is dependent on aquatic environments and terrestrial biotic corridors as well as broadly defined habitat types, in particular; terrestrial, arboreal (tree-living), rupiculous (rock-dwelling), and wetland associated vegetation cover. Basal cover was poor in many places and would not provide adequate cover for herpetofauna species during the dry season. No reptiles were encountered during the wet season field survey. This is primarily due to paucity of habitat diversity in the project area.

4.2.6 Invertebrates

Insect biodiversity accounts for a large proportion of all biodiversity on the planet, over 57% of the estimated 1.82 million organism species currently described on earth are classified as insects. Insects are important biological resources that are crucial for the ecosystems in which they exist. They perform a number of important functions such as aerating the soil, pollinating plants, and controlling of insect and plant pests. No invertebrates were recorded during the infield assessment.

5 Sensitivity of the Site and No Go Areas

In terms of ecological sensitivity, the following features are assessed to determine how sensitive the habitat identified within the site is:

- Presence or absence of Red Data Listed or protected plant and animal species;
- Presence or absence of exceptional species diversity;
- Extent of intact habitat in good ecological condition in the absence of disturbance; and
- Presence or absence of important ecosystems such as IBA's, Protected Areas, and areas demarcated for future protected area status (NPAES) and wetlands.

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 ecological functioning. Further to this, details of the field investigation are used to determine the site-specific sensitivity.

5.1 Protected Areas

South Africa is a highly diverse country and the third most biodiverse country after Brazil and Indonesia. Developments within areas adjacent to or within protected areas could have far-ranging detrimental consequences as far as impacts on these areas are concerned. The proposed WTP does not traverse any protected areas.

5.2 Mpumalanga Biodiversity Sector Plan

There are two biodiversity management plans for Mpumalanga Province, the earlier version is called the Mpumalanga Biodiversity Conservation Plan (MBCP) and the more recent version is called the Mpumalanga Biodiversity Sector Plan (MBSP), developed in 2013. The MBSP is a spatial biodiversity tool based on scientifically determined and quantified biodiversity objectives, and forms part of the national biodiversity planning. The main purpose of the MBSP is to contribute to sustainable development in Mpumalanga. MBSP classifies the natural vegetation of the Province according to the following categories (As described further in Table 5-1):

- Protected Areas;
- Critical Biodiversity Areas;
- Other Natural Areas;
- Ecological Support Area; and
- Modified.

Table 5-1: Summary of the Different Categories occurring within the Mpumalanga Terrestrial CBA Map

Map Category	Description	Sub-Category	Description
Protected Areas	Areas that are formally protected by law and recognised in terms of the Protected Areas Act, including contract protected areas declared through the biodiversity stewardship programme.	National Parks & Nature Reserves	Includes formally proclaimed National Parks, Nature Reserves, Special Nature Reserves, and Forest Nature Reserves.
		Protected Environments: Natural	Includes Protected Environments, declared in terms of Protected Areas Act (Act 57 of 2003, as amended).
		Protected Environments: Modified	Heavily modified areas in formally proclaimed Protected Environments.
Critical Biodiversity Areas (CBAs)	All areas required to meet biodiversity pattern and process targets; Critically Endangered ecosystems, critically linkages (corridor pinch-points) to maintain connectivity; CBAs are areas of high biodiversity value that must be maintained in a natural state.	CBA: Irreplaceable	This category includes: (1) Areas required to meet targets and with irreplaceable values of more than 80%; (2) Critical linkages or pinch- points in the landscape that must remain natural; (3) Critically Endangered Ecosystems.
		CBA: Optimal	The CBA Optimal Areas (previously called 'important and necessary' in the MBCP) are the areas optimally located to meet both the various biodiversity targets and other criteria defined in the analysis. Although these areas are not 'irreplaceable' they are the most efficient land configuration to meet all biodiversity targets and design criteria.
Ecological Support Areas (ESA)	Areas that are not essential for meeting targets but play important role in supporting the functioning of CBAs and that deliver services.	ESA: Landscape Corridor	The best option to support landscape-scale ecological processes, especially allowing for adaptation to the impacts of climate change

Map Category	Description	Sub-Category	Description
	Important ecological services	ESA: Local Corridor	Finer-scale alternative pathways that build resilience into the corridor network by ensuring connectivity between climate change focal areas, reducing reliance on single landscape-scale corridors.
		ESA: Species Specific	Areas required for the persistence of particular species. Although these may be production landscapes, a change in land-use may result in loss of this species from the area. (Only one species-specific ESA was included in the analysis – an over-wintering site for blue cranes).
		ESA: Protected Areas Buffers	Areas surrounding protected areas that moderate the impacts of undesirable land-uses that may affect the ecological functioning or tourism potential of Pas. Buffer distances vary according to reserve status: National Parks – 10km; Nature Reserves – 5km and Protected Environments – 1km buffer.
Other Natural Areas (ONA) Areas that have not been identified as a priority in the current systematic biodiversity plant but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.			
Moderately or Heavily Modified Areas	Areas in which significant or complete loss of natural habitat and ecological function has taken place due to activities such as ploughing, hardening of surfaces, open-cast mining, and cultivation and so on.	Heavily Modified	All areas currently modified to such an extent that any valuable biodiversity and ecological functions have been lost.
		Moderately Modified: lands Old	All areas currently modified to such an extent that any valuable biodiversity and ecological functions have been lost.

5.2.1 Land Management Objectives of Areas Classified as CBA 1

Maintain in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process:

- Ecosystems and species fully or largely intact and undisturbed;
- These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met; and
- These are biodiversity features that are at, or beyond, their limits of acceptable change.

5.2.2 Land Management Objectives of Areas Classified as CBA 2

Maintain in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process:

- Ecosystems and species fully or largely intact and undisturbed;
- Areas with intermediate irreplaceability or some flexibility in terms of meeting biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve biodiversity targets, although loss of these sites would require alternative sites to be added to the portfolio of CBAs; and
- These are biodiversity features that are approaching but have not passed their limits of acceptable change.

The matrix of recommended land use zones and associated activities in relation to the CBA Map categories (adopted from Mpumalanga Tourism and Parks Agency (MPTA, 2014), indicates that Environmental Conservation, Environmental Management Overlay Zones, Game Farming and Livestock production, are the only acceptable land use zoning activities permitted in CBA 1 and 2. Ecological support areas 1 fall in the same category but add that Low Impact Tourism/Recreational and Accommodation is also permitted.

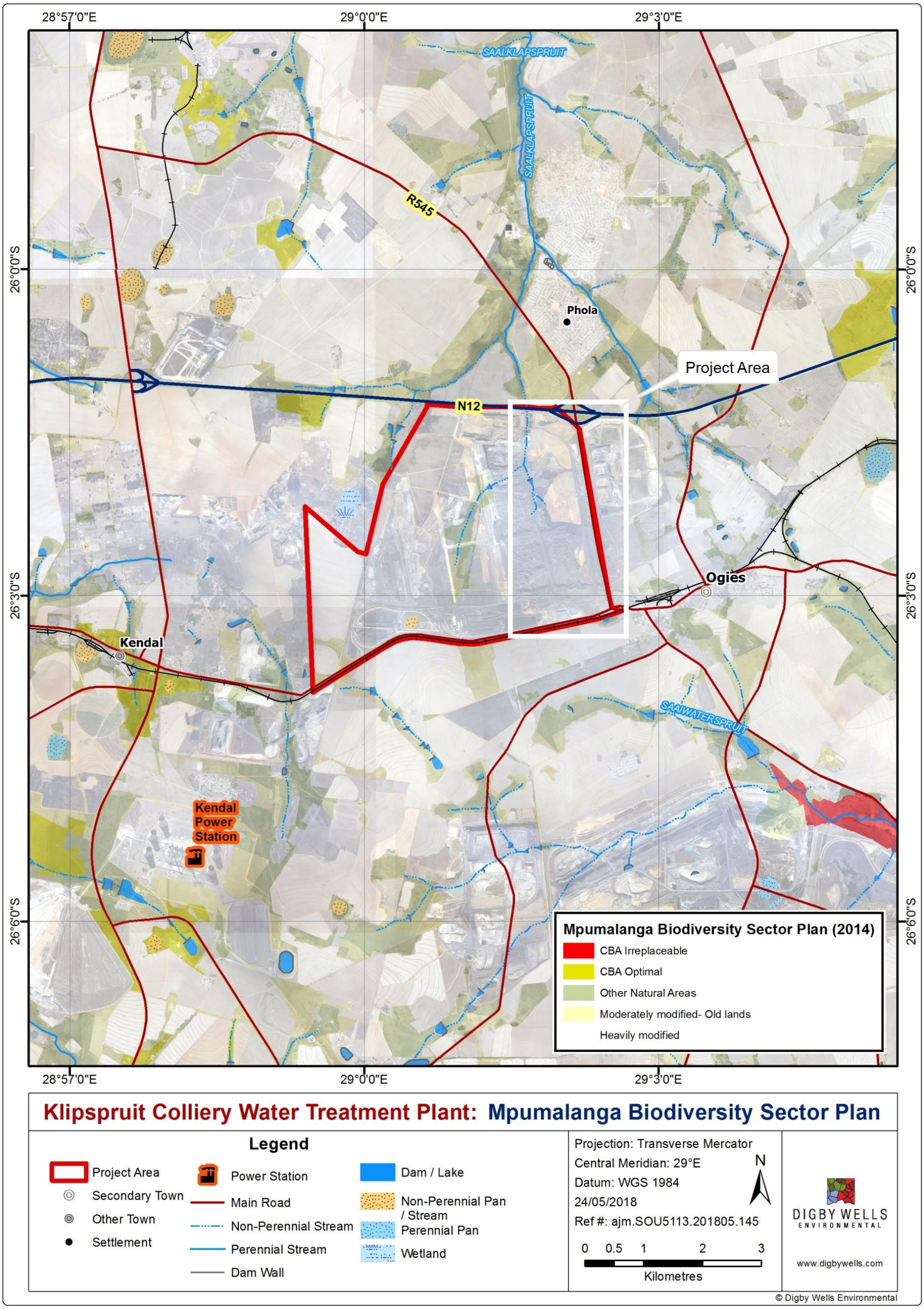

Figure 5-1: Critical Biodiversity Areas. (Mpumalanga Biodiversity Sector Plan)

6 Assumptions, Limitations and Gaps in Knowledge

Whilst every effort is made to cover as much of the site as possible, representative sampling is done and it is possible that some plant and animal species that are present on site were not recorded during the field investigations, due to seasonality. In the event that a possible biological occurrence has noteworthy ecological implications a more intensive field survey is recommended, this is however not envisaged. In light of the above mentioned, sufficient background information is available to suggest that it is highly unlikely that an intensive survey will augment this site visit and will add significantly to the data base, and the additional costs are unlikely to warrant the effort.

7 Project Activities

The activities assessed for the fauna and flora impact assessment are listed in Table 7-1. This section includes an impact assessment for activities associated with the proposed pipeline for the conveyance of treated water.

Table 7-1: Project Activities

Activity	Phase of Project
Site clearing, soil disturbance, crossing of wetland and river areas, increased vehicular movement, stockpiling of topsoils, storage and dumping of building materials associated with the development and construction of the various proposed activities.	Construction phase
Operational and maintenance activities associated with the WTP and associated infrastructure	Operational phase
Decommissioning of infrastructure and rehabilitation of impacted land.	Decommissioning, closure and rehabilitation phase

7.1 Construction Phase

7.1.1 Activity: Site Clearance

The WTP will necessitate the clearance of vegetation for construction of infrastructure, and the pipeline routes will also require vegetation clearance to facilitate the placing of the pipeline. Activities include site clearing, soil disturbance, topsoil stockpiling, storage and dumping of building materials. Both route options for the pipelines have been considered in this impact assessment. Both options for the pipeline route traverse impacted habitat and vegetation types. Option 1 is within the mine boundary and Option 2 is on the road reserve outside the mine area. From a fauna and flora perspective, the impact of site clearance will have a minimal impact to these areas, if mitigation measures are followed.

7.1.1.1 Impact Description

7.1.1.1.1 Vegetation and Habitat Destruction

The construction of the pipeline infrastructure and WTP will take place in a large area which will affect the current habitat and vegetation types present. There are four main types of habitat found on site, grassland areas (of which two differentiations were encountered, natural and degraded) and riparian. Construction will constitute the complete removal of vegetation on the footprint of both the pipeline and plant infrastructure. This will remove the remaining habitat that the existing vegetation types currently provided.

The activities that have been rated as having the most significant impacts are the construction of the pipelines and WTP that will occur in the degraded grassland areas and riparian area, with the pipelines being in transformed areas and a road reserve. Discharge of treated water will occur into natural grassland; however, the impact is not regarded as negative, as apart from the water quantity increasing, no other impacts are expected.

The partial degradation of habitat for animal life has already taken place within the general environment due to current land use practices this includes mining (and associated impacts) and uncontrolled grazing, outside the mine property.

No protected plant species were encountered on the footprint of the treatment plant or the pipeline routes; the vegetation within the KPS where the pipelines are planned has no natural vegetation remaining due to opencast mining activities, and the impacts that occur in a road reserve.

With the clearing of vegetation on WTP footprint, open areas will occur. Here limited indigenous vegetation will be replaced by fast growing alien and weed vegetation. This impact can be greatly reduced with the correct implementation of an alien vegetation management plan. This AIP's management plan must focus on the treatment plant and pipelines.

7.1.1.1.2 Alien Plant Species Invasion

As detailed in section 4.1.3, alien plant species degrade the natural state of a habitat. Species that may establish are listed in Table 4-3. Natural grassland encountered at the discharge point is moderately affected by alien invasive plant species and the introduction of additional species will result in a negative impact.

The risk of alien plant species spreading can be managed through regular monitoring and removal of alien plants as seedlings/juveniles before they reach seed-bearing maturity.

7.1.1.1.3 Disturbance to Fauna due to Noise and increased Vehicular Movement on Site

The remaining fauna on site may be scared away due to increased activity associated with construction activities. In addition, breeding species within proximity of the activities may be

disturbed. The remaining natural grassland areas and riparian areas are regarded as possible areas where species could find refuge.

7.1.1.2 Management Objectives

Management objectives will be to prevent the loss of important/protected landscapes, species of plants and animals (such as those with Red Data Status, National, and Provincial). This is achieved by avoiding destruction of areas where these species are located. In the case of plants, if it is not possible to avoid the destruction of these areas then relocation permits are required. The sensitive landscapes on site include all wetland and riparian areas, and although this study did not encounter protected species, the likelihood of them occurring is still moderate.

The destruction of the vegetative cover must be limited within the final pipeline corridor. This can be achieved by restricting the removal and disturbance of vegetation to those areas absolutely essential for the infrastructure placements; however, this area is already disturbed.

The ecosystem present must be preserved; this includes areas not directly affected by project activities, and can be achieved by limiting project activities to areas where they are essential. Of importance for this is the wetland and riparian areas.

Rehabilitation plans must be initiated during construction to minimise disturbed areas. Habitat/vegetation degradation must be prevented through the implementation of an alien invasive plant management strategy.

The objective of alien plant management is to ensure that no additional alien plant species are established as a result of disturbance from rehabilitation activities. Further to this, existing alien plant stands should be removed and controlled.

The objective of managing noise and general disturbance on site is to reduce the impact on faunal communities, particularly breeding individuals.

7.1.1.3 Management Actions and Targets

Red Data Status plants located in areas of development (if encountered) should be marked prior to construction of any infrastructure and the necessary permits for relocations of these protected species must be obtained from the Mpumalanga Parks Board. Relocation of Red Data species must be to a designated safe place to avoid destruction, and stipulations made by Mpumalanga Parks Board must be followed. A nursery should be developed on site for this purpose. No protected plant species can be disturbed without authorisation.

Vehicular movement should be restricted to existing roads and no vehicles should access the site at night as this will curb the impact on night dwelling animal species.

An alien plant management strategy must be implemented whereby a qualified vegetation ecologist will monitor the disturbed areas biannually for two to four years for alien plants. Monitoring should preferably take place between November and March. All alien plant species should be identified, demarcated, and removed. Such a strategy will entail the

identification of areas where such infestation occurs and what the extent of it is. Thereafter, specific eradication measures can be prescribed for species present. The alien invasive plant strategy must reduce the number of these plant species that occur in the project area. This can be measured against the number of plants that were identified in this and previous studies. Current mapped alien invasive plant infestations must therefore be removed with the aim of complete eradication thereof.

Illegal waste dumping, including building waste and rubble, should be prohibited. Such illegal dumping sites are prone to alien vegetation recruitment. The environmental officer must ensure that after each building site is rehabilitated, there are no rubble piles remaining.

Training should be given to onsite staff on which plants and animals have Red Data status and how they may be identified. Thereafter the Environmental Officer must initiate the Red Data management plan. The incidence of plant or animal Red Data removal or death must be quantified and records kept, as this will ensure that management actions are adapted or they are not successful.

Destruction of vegetation should be limited to the areas essential for the development; specifically the pipeline routes. Once construction is finalised, the Environmental Officer must ensure the construction areas are rehabilitated. Areas of erosion must be marked and attended to before the following wet season starts.

Rehabilitation of disturbed areas should take place within a week of construction. All bare patches of soil should be vegetated, preferably with pioneer species which will colonise open and disturbed areas relatively quickly, and prevent erosion and alien vegetation establishing.

Community awareness should be implemented by South32's Community Liaison Officer to create awareness of biodiversity and preservation of natural habitats.

7.1.1.4 Impact Ratings

The impact of construction of infrastructure on vegetation and fauna habitat associated with the site is rated in table Table 7-2, Table 7-3 and Table 7-4 respectively.

Table 7-2: Potential Impacts due to Construction of Infrastructure

Activity and Interaction: Construction of infrastructure require vegetation clearing			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Direct loss of floral species/vegetation types and biodiversity			
Prior to mitigation/ management			
Duration	Beyond Project Life (3)	Total loss of floral species/vegetation will occur.	Minor (negative) – 56
Extent	Local (2)	Removal of vegetation could occur without planning, thereby affecting the development site area.	

Activity and Interaction: Construction of infrastructure require vegetation clearing			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity x type of impact	Moderate(-3)	The pipeline footprint covers natural areas; disturbed grassland and mine rehabilitated areas.	
Probability	Definite (7)	It is likely that total destruction of vegetation types will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Limit degradation and destruction of natural environment to designated pipeline project areas by keeping the footprint of the disturbed areas to the minimum and within designated areas only, preferably the already disturbed areas. Re-vegetate open areas to limit erosion, which will also aid in water infiltration and flood attenuation. ▪ Avoid sensitive landscapes such as riparian areas, and wetland areas that were encountered on site, as mentioned previously, Manage nationally restricted alien invasive plant species by ensuring the removal of vegetation during construction and operation are controlled so that no open areas occur.			
Post- mitigation			
Duration	Permanent (2)	Short Term, mitigation measures prescribed will ensure this.	Negligible (negative) – 24
Extent	Limited (2)	If contractors adhere to mitigation such as to limit the footprint of disturbance to only essential areas.	
Intensity x type of impact	Minor (-2)	Dependent on sensitivity of the specific site.	
Probability	Probable (4)	This impact will occur	
Nature	Negative		

Table 7-3: Loss of Species of Special Concern

Activity and Interaction (Construction of infrastructure (Pipelines) require vegetation clearing)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Potential loss of species of special concern (protected species)			
Prior to mitigation/ management			
Duration	Beyond Project Life (3)	Loss floral species/vegetation will occur within the footprints of infrastructure, with no management.	Moderate (negative) – 56

Activity and Interaction (Construction of infrastructure (Pipelines) require vegetation clearing)			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Local (2)	Species/habitat loss will only occur within the project site.	
Intensity x type of impact	Moderate(-3)	Sensitive species could be present in natural areas and riparian areas.	
Probability	Definite (7)	It is likely that destruction of protected species will occur without management measures.	
Nature	Negative		
Mitigation/ Management actions			
▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the disturbed areas to the minimum and within designated areas only. Re-vegetate open areas to limit erosion, which will also aid in water infiltration and flood attenuation. ▪ Avoid sensitive landscapes such as riparian and wetland areas that were encountered on site. ▪ Applications for permits for removal of certain plants, where required by provincial authorities. If plants of SSC are to be removed, they should be either translocated to a similar habitat to the donor site or relocated to a nursery.			
Post management			
Duration	Medium term (3)	With vegetation management including rehabilitation, vegetation can recover.	Negligible (negative) – 24
Extent	Limited (2)	If contractors adhere to mitigation such as to limit the footprint of disturbance to only essential areas.	
Intensity x type of impact	Moderate - negative (-3)	Dependent on sensitivity of the specific site.	
Probability	Unlikely (3)	It is unlikely that compaction will have an effect after rehabilitation	
Nature	Negative		

Table 7-4: Alien Vegetation Establishment

Activity and Interaction (Construction of infrastructure (Pipelines) require vegetation clearing)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Alien vegetation establishment			
Prior to mitigation/ management			

Activity and Interaction (Construction of infrastructure (Pipelines) require vegetation clearing)			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Beyond Project Life (6)	Alien vegetation will colonise any area that is available (open areas), with no mitigation this problem will persist and spread.	Minor (negative) – 56
Extent	Municipal area (4)	Such an infestation can easily spread to the entire municipal area, and infest water sources.	
Intensity x type of impact	Serious Loss (-4)	Serious loss of sensitive habitats and species due to alien vegetation colonisation.	
Probability	Likely (5)	It is unlikely that without mitigation measures, alien vegetation will establish	
Nature	Negative		
Mitigation/ Management actions			
▪ Manage nationally restricted alien invasive plant species by ensuring the removal of vegetation during construction and operation are controlled so that no open areas occur. ▪ If alien vegetation is encountered, remove these plants, in the correct way and timeously. Alien plants should be removed as seedlings before they reach seed-bearing age. Alien plants can establish on a site after removal for up to two to five years, therefore appropriate monitoring must take place.			
Post management			
Duration	Short term (2)	Alien vegetation colonisation will be eradicated through Management Plan.	Negligible (negative) – 18
Extent	Limited (2)	An infestation will not be allowed to spread.	
Intensity x type of impact	Minor (-2)	Only limited areas will experience this for a short duration.	
Probability	Unlikely (3)	It is unlikely that alien vegetation will establish if mitigation is adhered to.	
Nature	Negative		

7.2 Operational Phase

Activity: Operation of the pipeline and WTP. The activities of these treatment systems (as listed in section 1.1) during the operational phase will not lead to direct impacts to Flora and Fauna.

7.3 Closure Phase

The decommissioning phase will involve the removal of the WTP and pipeline infrastructure and rehabilitation of their impacted footprints.

7.3.1 Activity: Rehabilitation

During this phase the infrastructure of the WTP will be removed and the areas disturbed will be rehabilitated. This entails the removal of building rubble, the grading and levelling of the areas, thereafter the spreading of topsoil which will be seeded by indigenous and fast growing grass species.

7.3.1.1 Impact Description

7.3.1.2 Rehabilitation

Impacts include compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas.

Removal of vegetation and disturbance of soils in the vicinity of the decommissioning footprint is likely to give rise to an increased potential for encroachment by alien invasive vegetation species, further altering the natural vegetation encountered in the vicinity of the decommissioning footprint.

7.3.2 Management objectives

The objective for this phase will be to maximise the success of the rehabilitation that will happen after infrastructure is removed, and to furthermore reduce any impacts that may occur during this phase.

7.3.3 Management Action and Targets

Decommissioning of the WTP and pipeline infrastructure will be predominantly a rehabilitation activity of footprint areas. In order for this to be a positive impact the removal of the infrastructure must be completed so as to not harm or negatively impact surrounding vegetation. Furthermore the rehabilitation must be conducted in such a manner to achieve aims for the process. These aims will be to ensure the footprint areas are vegetated and that erosion through runoff and wind does not occur. Efforts will be maximised if rehabilitation is completed before the first rains fall so as to make use of the rainfall to assist in plant recruitment.

7.3.3.1 Impact Rating

Activity and Interaction: Rehabilitation of infrastructure footprint areas			
Dimension	**Rating**	**Motivation**	**Significance**

Activity and Interaction: Rehabilitation of infrastructure footprint areas			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Restoration of vegetation and habitat types.			
Duration	Short term (2)	If rehabilitation is not completed effectively it will accomplish the aim of avoiding erosion.	18 "Small Positive"
Extent	Very Limited (1)	Only certain parts of the site will have revegetated cover.	
Intensity	Moderate (3)	The effectiveness of the rehab will determine the intensity	
Probability	Unlikely (3)	It's unlikely that the rehabilitation will be effective	
Nature	Positive		
Impact Description: Rehabilitation of infrastructure footprint areas			
Duration	Permanent (7)	If rehabilitation is completed successfully this impact will be permanent	84 "Moderate positive"
Extent	Local (3)	The general area beyond the project site will be positively impacted on.	
Intensity	Positive (4)	Vegetation will be restored.	
Probability	Almost certain (6)	With correct implementation this impact has a high probability of occurring	
Nature	Positive		

8 Cumulative Impacts

The only construction and subsequent removal of vegetation that will occur is within the footprint of the pipeline and WTP, with negligible (after mitigation) impacts occurring from

these activities. Construction and subsequent removal of vegetation pose the greatest cumulative impacts to the general area.

When determining the impacts of a development such as this, one needs to consider cumulative impacts. Cumulative impacts take into account impacts of current land use and land use change in the broader area. Ideally, all development should take place within a predefined Strategic Environmental Assessment which defines no-go and conservation areas as well as allowing for development such as housing, roads, agriculture and mining. In the absence of such a strategic plan, one can look at the surrounding activity and land use and determine to a certain extent, the overall impacts in the region with the addition of the proposed WTP

There are currently several mines surrounding KPS, all of which are coal mines with associated impacts on biodiversity as a whole. These mining areas are directly adjacent to KPS and together these all have a high cumulative impact on the area as a whole. The construction of the WTP on site can be seen to have no discernible negative impact after mitigation measures are implemented, due to the impacted nature of the project area.

The opportunity exists for KPS to contribute to conservation in the region. Conservation of as much of the natural land in the area, and the creation of corridors linking other natural areas, would aid in conservation of ecosystems, flora and fauna. If this is achieved (permanently, not just over the life of the mine), then the mine itself will have a possible positive impact.

9 Mitigation and Management Measures

Below in Table 9-1 a description of the mitigation and management options for the environmental impacts anticipated during the construction, operational and decommissioning and closure phases are provided.

Table 9-1: Impacts and Mitigation

Activities	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
WTP					
Construction of pipelines, MWTP around natural areas	Pre-construction and construction		▪ Red Data Status plants located in areas of development should be marked prior to construction and the necessary permits for relocations of protected species must be obtained from the relevant government department. The relocation strategy must be approved by relevant authorities prior to relocation to a safe place to avoid destruction. A nursery should be developed on site for this purpose; ▪ Illegal waste dumping should be prohibited; ▪ Training should be given to onsite staff on which plants have Red Data Status and how to identify them; ▪ Destruction of vegetation should be limited to the areas essential for the development ▪ All bare patches of soil should be vegetated, preferably with pioneer species which will colonise open and disturbed areas relatively quickly; ▪ Community awareness should be implemented as part of the stakeholder engagement procedure to create awareness of biodiversity and preservation of natural habitats; and ▪ Rehabilitation of disturbed areas should take place as soon as possible.	▪ South African National Biodiversity Institute (SANBI) Red List of South African plants version 2012.1 ▪ National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) listed species; and ▪ National Forests Act, 1998 (Act No. 84 of 1998) Protected Trees.	Continually, specifically construction
Rehabilitation, removal of infrastructure	Decommissioning		▪ Re-vegetation with indigenous fast growing grass species as soon as possible. ▪ Avoid steep slopes during contouring. ▪ Make use of the already implemented AIP management plan.	▪ National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) listed species	Continually, specifically decommissioning

10 Monitoring Requirements

The Flora and Fauna monitoring program should be initiated pre-construction and continue through construction, and conducted annually thereafter during the growing season (December to March) as close to the same time of year as possible. Should the monitoring results indicate the additional presence of Red Data species, or threatened species. This may necessitate the need to undergo monitoring for that particular species more frequently, especially during the breeding season and birthing season for that species.

Monitoring will include sites in undisturbed vegetation areas which will act as control plots. Plots within the disturbed infrastructure areas will have baseline data and then be monitored during the rehabilitation phase. The same plots will be monitored with each survey so as to ensure collected data is comparable and trends are identified.

Where rehabilitation is conducted, additional plots will be included to monitor the efficacy of the re-vegetation.

Aspects that will be monitored in the annual surveys will include species richness, vegetation composition i.e. proportion grasses, forbs and woody species, canopy height, cover percentage, presence of Red Data or protected species, and presence of alien invasive species.

10.1 Flora

10.1.1 Vegetation Cover Monitoring

The vegetation cover established on the disturbed areas needs to be monitored annually for the first two years after rehabilitation has been carried out, to ensure that the rehabilitation work has been successful in terms of stabilising the newly formed surfaces (preventing air and water erosion from affecting those surfaces), and that the newly established vegetation cover is trending towards convergence with the original vegetation cover found on the areas prior to disturbance (and on adjacent undisturbed areas) (Dawson, 2007).

Vegetation cover of rehabilitated areas should be assessed during the summer growing season; at least a month after rain has fallen so that there has been an opportunity for fresh plant growth to have occurred. It is recommended that this should be done annually for the first two years. Thereafter, visual spot-checking with photographic recording by an experienced field botanist/rehabilitation practitioner every three years will suffice, depending on results found. Remote sensing information and aerial photos will also be used to determine impacts and management plans.

The environmental indicators which will demonstrate whether the rehabilitation in disturbed areas has been successful, include:

- Increasing similarity between rehabilitated and undisturbed areas in terms of species composition and vegetation structure;

- Increasing species diversity of desired (local) species in rehabilitation cover over time;
- Reduction in presence of weed species over time;
- Increase in woody plant growth, and achievement of reproductive status and production of reproductive propagules (seed);
- Ability of the rehabilitation species populations to reproduce, indicated by the presence of seedlings of the rehabilitation species once the original generation has reached sexual maturity ("population recruitment");
- Increase in vegetation basal cover and biomass; and
- Increase in soil organic matter.

In the event that the vegetation cover remains static, or should deteriorate; additional seeding, with locally harvested species, and possibly fertilisation would be required as a mitigation measure.

10.1.2 Alien Vegetation Monitoring

An Alien Invasive Plant Management Plan has been compiled for the mine. All key aspects of this plan remain the same and KPS will follow and adapt, as necessary, the Alien Invasive Plant Management Plan in order to identify, prevent, treat, and monitor invasive plants throughout the Project during construction, operation, and decommissioning stages of the WTP Project area.

Species likely to be problematic include those identified during the field assessment; namely *Acacia mearnsii, Cosmos bipinnatus Cortaderia selloana*, *Salix babylonica Persicaria lapathifolia*, *Solanum incanum*, *Solanum mauritianum* and *Targetes minuta* amongst others

10.2 Fauna

Fauna monitoring will be closely linked to the flora monitoring programme to enable solid scientific conclusions and comparisons; also, the strong ecological link between vegetation and animals can only be measured if monitoring is similar (e.g. in terms of monitoring points) for both disciplines.

To successfully monitor faunal and floral biodiversity, a solid baseline (prior to construction) will be established through the first round of monitoring. This needs to be supplemented with regular repeats to compile a reasonable comparison between the pre-construction faunal communities present and faunal communities found in the same areas during various stages of construction and operation of the proposed project.

10.2.1 Mammals

Small mammals will be surveyed using Opportunistic and deliberate mammal sampling. Tracks and ecological indicators will be used to assess the presence of larger free-roaming

mammals – frequencies of such observations will be used for quantitative comparisons. The nesting sites, burrows, and possible home ranges of these species will be recorded, marked, monitored, and actively avoided.

10.2.2 Birds

If the client is already busy with bird monitoring program, this program will have to be expanded to include the WTP project area, if not the following monitoring must be implemented. Line transects will be used to compile quantitative lists of birds present in the areas surveyed; both sounds and visual observations will be used. Nesting sites of threatened birds will be marked and the area preserved with an adequate buffer zone. The authorities will be informed of any sites found and the client will abide by their recommendations. It is recommended that the more detailed avifaunal monitoring is conducted in the breeding season between October and January.

Surveys for terrestrial birds must be conducted in summer, but only once the vegetation layer has recovered sufficiently from winter fires to allow for assessment of available habitat.

For species associated with wetlands, the assessment must follow good summer rains i.e. standing water must be present and the vegetation must have recovered sufficiently from winter fires to allow for assessment of available habitat.

11 Public Consultation

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. Comments received by stakeholders will be included in this section once finalised.

12 Conclusion and Recommendations

The Klipspruit area was found to be under pressure from current land use, being mining, and agriculture including maize and cattle farming, adjacent to the mine. These impacts were responsible for the removal of much of the natural vegetation and habitat present prior to mine commencing. It was found that the habitat related to natural areas in and adjacent to the project area 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 form important process and habitat areas for fauna. Grasslands on site could also support some SSC. These areas are of conservation importance and the opportunity exists for South32 to conserve some biodiversity corridors maintaining ecosystem functionality and potentially having a positive impact on biodiversity.

It is the opinion of the specialist that the project may go ahead with the following conditions:

- Any surface infrastructure, such as roads and fences, should be located to an area of low sensitivity. This is already the case for the existing mine infrastructure, except for the riparian/wetland and grassland vegetation types that might be affected by construction of the WTP and pipeline;
- All mitigation measures prescribed in this document will be adhered to strictly.

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Appendix A: Specialist CV

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Tertiary Education

- 2005-2006: B-tech Degree in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).
- 2001- 2004: National Diploma in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).

Professional Registration

South African Council for Natural Scientific Professions, *Professional Natural Scientist* in the field of practice *Conservation Science,* registration number is *400018/17*;

- IAIA, International Association for Impact assessments;
- Botanical Society of South Africa;
- The Land Rehabilitation Society of Southern Africa, LARSA (Membership No. 0085);
- Birdlife International;
- Endangered Wildlife Trust (EWT);
- Grassland Society of Southern Africa.

Employment

- 2006 – Present: Digby Wells Environmental, Johannesburg, South Africa.
- 2002 - 2003: Shamwari Game Reserve, Eastern Cape, South Africa.
- 2001: Kop-Kop Geotechnical instrumentation specialists, Johannesburg, South Africa.

Experience

Rudolph's current role is that of a terrestrial ecologist, with specific reference to Flora and Fauna. In this capacity he is responsible for the planning and completion of terrestrial ecological studies, in the context of standalone reports, EIA reports and ESIA reports used for environmental authorisations or are focused specialist studies which meet local and international standards.

Rudolph has extensive experience in the application and adherence to the International Finance Corporation Performance standards, specifically performance standard 6. In this field he has worked with mining companies across Africa to ensure their compliance to IFC PS6. In this regard he has gained experience in applying the No Net Loss and Net Positive Impact approaches for Biodiversity in a mining business context. He has experience in applying the Equator Principles and World Bank criteria, specifically Criteria 7.

In support of this, Rudolph is responsible for off set design after a mitigation hierarchy is applied; in this regard he compiles Biodiversity Land Management Programs where various specialist studies are collated into a working document for clients in order to aid in pre or post mining management and achieving the No Net Loss and Net Positive Impacts.

Further to this he is also involved in rehabilitation design studies which entail the planning, implementation and monitoring of vegetative rehabilitation in designated areas on mines. He is responsible for the planning of post mine land use and the various methods utilised to achieve this.

Rudolph also fulfils the role of project manager here he manages national and international projects across Africa, specifically west, central and southern Africa, managing a multi-disciplinary team of specialists.

Rudolph is also involved in the acquisition of regulatory permits for clients; this includes the planning of relocation strategies for protected and endangered plant species in areas where mines are to be established. This involves the planning and execution of data gathering surveys, thereafter he manages the process involving relevant provincial and National authorities in order to obtain the specific permit that allows for a development to continue.

Information pertaining to the technical expertise of Rudi includes the following:

- Environmental Impact Assessments (EIAs), Basic Assessments and Environmental Management Plans (EMPs) for environmental authorisations in terms of the South African National Environmental Management Act (NEMA), 1998 (Act 107 of 1998);

Environmental pre-feasibility studies for gold tailings reclamation and iron ore mining projects:

- International Finance Corporation (IFC) related projects across central and west Africa, applying performance standards and Equator Principles on the Environmental Health and Safety Guidelines set down by the IFC;
- Environmental and Social Impact Assessments (ESIA) for Environmental Authorisation;
- Environmental off-Set studies, determining off-set liability, applying the Mitigation hierarchy and best practice in the form of IFCPS6 and BBOP.
- Large Mammal Monitoring Projects;
- Biodiversity Assessments including Mammalia, Avifauna, Herpetofauna and Arthropoda;

- Environmental Impact Assessments (EIA) based Impacts to the terrestrial Ecological environment;
- Biodiversity Action Plan, design and Implementation;
- Biodiversity and Land Management Programs;
- Protected plant species management strategies planning and implementation;
- Monitoring of rehabilitation success by means of vegetation establishment;
- Rehabilitation planning;
- Environmental auditing of rehabilitated areas;
- Project management of ecological specialist studies;
- Planning and design of Rehabilitation off-set strategies.

Training

- Measurements of Biodiversity at the University of the Free State, led by Prof. M. T. Seaman. September 2008.
- IFC performance standards implementation training, Lee-Ann Joubert, January 2013.
- Bird Identification course led by Ettiene Marais November 2009.
- Introduction to VEGRAI and Eco-classification led by Dr. James Mackenzie December 2009 and January 2018.
- Dangerous snake handling and snake bite treatment with Mike Perry 2011, 2015.
- Rehabilitation of Mine impacted areas, with Fritz van Oudshoorn, Dr Wayne Truter and Gustav le Roux 2011.
- First aid Level 2, School of Emergency and Critical care, Netcare, 2013
- First aid Level 2, National First Aid Academy, 2017.

Projects

The following project list is indicative of Rudolph's experience, providing insight into the various projects, roles and locations he has worked in.

Project	Location	Client	Main project features	Positions held	Activities performed
Tongon Off-set project	Ivory Coast	Randgold Resources Limited	Applying IFC, BBOP and other best practice guidelines in designing an Off-set project for the residual Impact of the Tongon Gold Mine	Project Lead Technical Specialist	
Annual Large Mammal Monitoring in the Niokola Koba National Park.	Senegal	DPN Direction des Parcs Nationaux du Sénégal	Applying Aerial, Ground and vehicle, monitoring techniques in the National Park.	Aerial game counter, project specialist.	Training of field staff, recording of data in the vehicle and aerial surveys, Report reviews
Mmamabula Energy Project (MEP).	Botswana	CIC energy	Construction of a railway, opencast mine, wellfield, conveyors, addits, housing.	Technical Specialist Ecologist	IFC level specialist studies, Flora and Fauna surveys for the project features, including impact assessments, management plans. Alien eradication plans.
Orlight Solar PV Power Project	South Africa	Orlight SA	Environmental Impact Assessment (EIA) process for five proposed Solar Photovoltaic (PV) Power Plants	Technical Specialist Ecologist	EIA Terrestrial Biodiversity studies, IFC level specialist studies

Project	Location	Client	Main project features	Positions held	Activities performed
Twenty Nine Capitol	South Africa	CSIR	Photovoltaic Power stations	Technical Specialist Ecologist	EIA Terrestrial Biodiversity studies, in support of the EIA report, IFC level specialist studies
Tongan Biodiversity Land Management Plan	Ivory Coast	Randgold Resources Limited	Design, compilation and implementation of the BLMP	Technical Specialist Ecologist, Project Manager	Flora and Fauna surveys for the BLMP, compilation of BLMP. Alien eradication plans. IFC level specialist studies
Kibali Gold mine	DRC Congo	Randgold Resources Limited	Gold mine infrastructure	Technical Specialist Ecologist	Technical specialist, Flora and Fauna , for the Kibali ESIA. IFC level specialist studies
Kibali Gold mine	DRC Congo	Randgold Resources Limited	ESIA Update	Technical Specialist Ecologist	Technical specialist, Flora and Fauna , for the Kibali ESIA. IFC level specialist studies
Nzoro Hydroelectric station	DRC Congo	Randgold Resources Limited	Hydroelectric plant	Technical Specialist Ecologist	Technical specialist, Flora and Fauna , for the Nzoro ESIA. IFC level specialist studies.
Loulo Biodiversity Land Management Plan	Mali	Randgold Resources Limited	Design, compilation and implementation of the BLMP	Technical Specialist Ecologist, Project Manager	Flora and Fauna surveys for the project features, compilation of BLMP.

Project	Location	Client	Main project features	Positions held	Activities performed
Koidu Diamond Mine	Sierra Leone	Koidu Resources	Construction of new open pit	Technical Specialist Ecologist	Technical specialist, Flora and Fauna , for the Koidu ESIA. IFC level specialist studies, terrestrial ecology management plans
Resource Generation	South Africa	Temo Coal	Coal mine/Railway Line	Technical Specialist Ecologist	Flora and Fauna surveys, Protected plant species management plans, Permitting and Rehabilitation design.
Impunzi Rehabilitation monitoring	South Africa	Glencore	Monitoring of rehabilitation success and suggested management measures	Technical Specialist Flora specialist, Project manager	Vegetation surveys, rehabilitation monitoring. Alien eradication plan.

Publications

- Biodiversity Action Plans for faunal habitat maintenance and expansion in mining. Poster presented at the 48th Annual Grassland Society of Southern Africa (GSSA) conference.
- Limpopo Province South Africa – the Biodiversity perspective Paper presentation, presented at the Limpopo Minerals Conference and Trade show, hosted by the fossil fuel foundation and LEDET, 2015/11/11.

CURRICULUM VITAE

Mr. Lusanda Patrick Matee

Assistant Ecologist (Consultant): Flora and Fauna

Biophysical Department

Digby Wells Environmental

Education

- 2012 :BSc. Biological Sciences

  University of KwaZulu-Natal

  Research Project: “Mapping the distribution of selected Southern African bat species”

- 2013 : BSc. (Honours) Biological Sciences (Zoology)

  University of KwaZulu-Natal

  Research Project: “Sleeping patterns in selected South African avian species: Ring-necked Parakeets (*Psittacula krameri*), and Red-winged Starling (*Onychognathus morio*)”

- 2016: MSc by Research Biological Sciences

  University of KwaZulu-Natal

  Research Project: “Lichen photobiology in relation to climate change: Protection in Peltigeralean lichens against excess ultraviolet (UV) radiation using induced melanins and the effects of UV on melanin synthesizing enzymes”

  Master of Science (Masters by Research in Biological Sciences (Botany) SANCOOP Project, collaboration with Norwegian University of Life Sciences Department of Ecology and Natural Resource Management

Language Skills

- English: 1st Language
- isiXhosa: Home language
- isiNdebele: Conversational and written command
- isiZulu : Conversational and written command

Employment

- November 2017-Present: Assistant Ecologist (Consultant)
- June 2017- November 2017: Digby Wells Environmental Biophysical Intern (Ecology intern: Flora and Fauna)

- 2011-2016 : Laboratory demonstrator & Teaching Assistant University of KwaZulu-Natal
- 2012-2013: DNA Bar-coding Research Intern at the South African National Biodiversity institute (SANBI)

Experience

Lusanda Matee is Assistant Ecologist (Consultant) in the Biophysical department. He has Working knowledge of environmental planning processes, policies, regulatory frameworks, and legislation. He is also competent in Compilation of environmental reports in accordance with relevant environmental legislative requirements. His role in the company is assisting with projects related to Flora and Fauna.

Project Experience

Year	Client	Project	Responsibility	Location
2017	Sibanye Gold	Long Term Rehabilitation and Closure Strategy for the Cooke Operations	Update of Rehab and Closure Plan	South Africa
2017	Mutsho Power Company (Pty) Ltd	Proposed Mutsho Power Project Wetland Baseline Scoping Report	Wetland Scoping Report Compilation	South Africa
2017	Randgold Resources	Kibali BLMP Audit	Assisting with Report Compilation	DRC
2017	Randgold Resources	Environmental and Social Impact Assessment for the Massawa and Sofia Gold Project, Senegal	Assisting with the Baseline Report Compilation	Senegal
2017	Exxaro	BAR : Environmental Authorisation in Support of the Rehabilitation and Closure of Tshikondeni Coal Mine	Assisting with BAR Compilation and Submission	South Africa
2017	Exxaro	Exxaro Grootegeluk Coal Mine Exploration Drilling Sites Protected Tree Assessment	Protected Tree Infield Assessment	South Africa
2017	Exxaro	Exxaro Matla Biomonitoring	River biomonitoring	South Africa
2018	Rustenburg Platinum Mines Limited	Closure Environmental Management Plan for Prospecting Right on Farm Cyferkruil	Baseline Compilation	South Africa

Year	Client	Project	Responsibility	Location
2018	Rustenburg Platinum Mines Limited	Closure Environmental Management Plan for Prospecting Right on the Farm Waagfontein 89 JQ	Baseline Compilation	South Africa
2018	Rustenburg Platinum Mines Limited	Closure Environmental Management Plan for Prospecting Right on the Farm Zandspruit 168 JP	Baseline Compilation	South Africa
2018	Exxaro	Alien Invasive Vegetation Assessment and Management Plan for the Matla Colliery	Alien Invasive Vegetation Infield Assessment and Compilation of Management Plan	South Africa
2018	Sasol Mining	Alien Invasive Vegetation Assessment and Management Plan for the Sigma: Mooikraal Colliery	Alien Invasive Vegetation Infield Assessment and Compilation of Management Plan	South Africa
2018	Anker Coal and Mineral Holdings SA (Pty) Ltd.	Alien Invasive Vegetation Assessment and Management Plan for the Elandsfontein Colliery	Alien Invasive Vegetation Infield Assessment and Compilation of Management Plan	South Africa

Professional Bodies and Memberships

- South African Council for Natural Scientific Professions, *Cand.Sci.Nat* in the field of practice Biological Science, registration number is 119257
- Golden Key International Honour Society
- Zoological Society of Southern Africa

Publications

- Matee, L. P., Beckett, R. P., Solhaug, K. A., & Minibayeva, F. V. (2016). Characterization and role of tyrosinases in the lichen *Lobaria pulmonaria* (L.) Hoffm. The Lichenologist, 48(4), 311-322.