2020

# ECOLOGICAL IMPACT ASSESSMENT FOR 3KM SEWER LINE UPGRADING- SEBOKENG, GAUTENG PROVINCE


Compiled by: Witness Dube

For NKT Consulting (Pty) Ltd

1/8/2020

| TITLE: | ECOLOGICAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED EVATON 7 & SEBOKENG WASTEWATER PIPELINE UPGRADING AND OPERATION WITHIN EMFULENI MUNICIPAL AREA, GAUTENG PROVINCE |
|---|---|

**ECOLOGICAL IMPACT ASSESSMENT REPORT**


**DOCUMENT AUTHOR**

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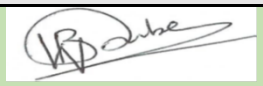
| Signature:  | Position:<br>Ecologist and Environmental Specialist |
|---|---|

**DECLARATION**

I, ***Witness Dube***, as an appointed ecological impact assessment specialist hereby declare that i:

- Act as an independent ecological assessment specialist in this application;
- Am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2017 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- Have and will not have no vested interest in the proposed activity proceeding;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998); the Environmental Impact Assessment Regulations, 2017 and any specific environmental management act;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake our profession in accordance with the Code of Conduct of the Council, as well as any other societies to which we are members;
- Am aware that a false declaration is an offence in terms of regulation 48 of GN No. R326; and
- Based on information provided to me by the project proponent, and in addition to information obtained during this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

**Field of Expertise**

Terrestrial Biodiversity Assessments; Wetland Ecological Assessments, Delineations and Habitat Evaluations.

**ACKNOWLEDGEMENTS**

The authors acknowledge C.V Chabane and Associates (Pty) Ltd for their assistance with project information, and the associated project BID as well as responding to technical queries related to the project.

**GLOSSARY**

In assessing the definitions given below, it may be understood that the definitions as provided in NEMA, NWA and NWRS2 are Primary.

**Ecosystem:** An ecosystem is a working natural system, maintained by internal ecological processes, relationships and interactions between the biotic (plants & animals) and the non-living or abiotic environment (e.g. soil, atmosphere). Ecosystems can operate at different scales, from very small (e.g. a small wetland pan) to large landscapes (e.g. an entire water catchment area);

**Ecosystem Goods and Services:** The goods and benefits people obtain from natural ecosystems. Various different types of ecosystems provide a range of ecosystem goods and services. Aquatic ecosystems such as rivers and wetlands provide goods such as forage for livestock grazing or sedges for craft production and services such as pollutant trapping and flood attenuation. They also provide habitat for a range of aquatic biota;

**Buffer zone:** The strip of vegetation maintained to limit impacts to natural ecosystems from adjoining land use activities;

**Catchment:** A catchment is an area where water is collected by the natural landscape. In a catchment, all rain and run-off water eventually flow to a river, wetland, lake or ocean, or into the groundwater system;

**Conservation:** In relation to a water resource means the efficient use and saving of water, achieved through measures such as water saving devices, water-efficient processes, water demand management and water rationing;

**Regulation:** A rule or directive made and implemented by an authority, which individuals or organizations are obliged to respect and comply with;

**Water Reclamation:** The treatment of water to make it suitable for use by an identified user;
**Biodiversity:** the number and variety of living organisms on earth, the millions of plants, animals, and micro-organisms, the genes they contain, the evolutionary history and potential they encompass, and the ecosystems, ecological processes, and landscapes of which they are integral parts;

**Endemic:** Refers to a plant, animal species or a specific vegetation type which is naturally restricted to a defined region (not to be confused with indigenous). A species of animal may, for

example, be endemic to South Africa in which case it occurs naturally anywhere in the country, or endemic only to a specific geographical area within the country, which means it is restricted to this area and occurs naturally nowhere else in the country;

**Environmental Control Officer (ECO):** Person tasked with monitoring and supervision of the implementation and controlling of environmental issues;

**Terrain Unit Morphological Classes:** areas of the land surface with homogenous form and slope. Terrain may be seen as being made up of all or some of the following units: crest (1), scarp (2), mid-slope (3) foot slopes (4), and valley bottom (5).

**Environmental Impact:** A positive or negative condition that occurs to an environmental component as a result of the activity of a project or facility. This impact can be directly or indirectly caused by the project's different phases (i.e., Construction, Operation, and Decommissioning);

**Land rehabilitation:** Is the process of returning the land in a given area to some degree of its former state, after some process (industry, natural disasters etc.) has resulted in its damage; and

**Watercourse:** Means a river or spring; a natural channel or depression in which water flows regularly or intermittently; a wetland, lake or dam into which or from which water flows; and any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998).

**LIST OF ABBREVIATIONS AND ACRONYMS**

**POSA:** Plants of South Africa, a PRECIS related database hosted by SANBI;

**M&R (2006):** Mucina and Rutherford (2006);

**EMP**: Environmental Management Plan;

**SANBI:** South African National Biodiversity Institute;

**PRECIS:** National Herbarium Pretoria (PRE) Computerised Information System;

**EMPr:** Environmental Management Programme;

**I&AP:** Interested and Affected Party;

**DWS:** Department of Water and Sanitation;

**GIS:** Geographic Information System;

**NEMA:** National Environmental Management Act (Act No. 107 of 1998;

**NEMWA:** National Environmental Management: Waste Act (Act 59 of 2008);

**NWA:** National Water Act (Act No. 36 of 1998);

**VegMap:** Vegetation Map of South Africa, as per Mucina & Rutherford (2006);

**CWB:** Central Weather Bureau;

**CBA:** Critical Biodiversity Area;

**ESA:** Ecological Support Area;

**BAR:** Basic Assessment Report;

**SCC:** Species of Conservation Concern;

**PES:** Present Ecological State;

**GDARD:** Gauteng Department of Agriculture and Rural Development;

**DAFF:** Department of Agriculture, Forestry and Fisheries;

**DEA:** Department of Environmental Affairs;

**SAHRA:** South African Heritage Resources Agency;

**HIA:** Heritage Impact Assessment;

**IDP:** Infrastructural Development Programme;

**NEPAD:** New Partnerships for Africa's Development;

**DEAT:** Department of Environmental Affairs and Tourism;

**POC:** Probability of Occurrence;

**VIS:** Vegetation Index Score

**EXECUTIVE SUMMARY**

This Biodiversity and Ecological Impact Assessment report has been prepared to address requirements of National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA), the Environmental Impact Assessment Regulations, 2017 (specifically in terms of regulation 13 of GN No. R. 326) and any other specific environmental management Act. CV Chabane and Associates was formally appointed by Emfuleni Local Municipality, to provide professional services and construction of the upgrading of existing main outfall sewer on the northern area (gravity sewer main Evaton and Sebokeng north to waste water treatment works). The proposed sewer outfall is approximately 2 940m. NKT Consulting (Pty) Ltd was then appointed by CV Chabane and Associates to conduct this Ecological Impact Assessment study for the proposed construction and operation of a sewer pipeline in eMfuleni Municipality, Gauteng Province.

This ecological impact assessment report also consists of impact management section which will assist significantly on the development of the Environmental Management Programme (EMPr) which is meant to minimise the construction and operational impacts of the development project to natural endowment. The report will also form part of the Basic Assessment Report (BAR). Based on the findings of this ecological assessment, it is the opinion of the ecologists that from a specialist viewpoint after thorough investigation of the study area's ecological composition, the proposed project be considered positively. However, all essential mitigation measures and recommendations presented in this report should be adhered to as to ensure minimum impact on natural systems. The wastewater pipeline upgrading will require a Water Use Licence Application (WULA) as it passes along across sensitive aquatic ecosystems (flood-plain and wetlands) as indicated in the sensitivity map provided in this report.

The major activities will be clearing of vegetation, trenching, laying of pipelines and burying of the pipes. All the mentioned activities above will definitely affect the catchment ecology from construction to operation of the sewer pipeline.

There is a general dominance of grass species of thermeda and kikuyu ones, jacaranda trees, eucalyptus, weeping willow trees characteristic of wet areas or catchments and some grasses typical of a disturbed landscape. This area is a disturbed area with the kind of disturbance being for infrastructural development, (housing development) thus why there is a need to upgrade the sewer systems of the area. A proper ecological management system needs to be exercised in order to ensure that the marked sensitive areas for instance, identified watercourse and its systems (habitat areas) are not affected by this necessary development.

The following conclusions were made by the specialist;

- Civil works should take into consideration the water course flood lines, riparian zone and consideration of possibilities of contaminating the water resource during construction, operation and maintenance;
- Clearing of vegetation should be minimum that is, should only be done on sewer pipeline footprint area;
- No animal nor plant species of concern have been identified from ground survey done;
- Mature flora to be spared as they are deep rooted and allow a buffer zone of approximately 30m from the main line to proliferate on the margins of the sewer pipeline; and
- Recommendations from this report should be adhered to as it forms part of a working technical document that will assist significantly in the production of the Environmental Management Plan.

**Sensitivity analyses**

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated sensitivity unit of the two categories is taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature (**Error! Reference source not found.**).

Table 1: Ecological sensitivity analysis

| Ecological community | Floristic sensitivity | Faunal sensitivity | Ecological sensitivity | Development Go-ahead |
|---|---|---|---|---|
| Farmland | Low | Low | Low | Go |
| Bushveld | Medium | Medium | Medium | Go-But |
| Urban | Low | Low | Low | Go |
| Hills | Medium / High | Medium / High | Medium / High | Go-But |
| Watercourses | Medium | Medium | Medium | Go-But |

There are no 'highly sensitive' or 'no-go' zones within the study site. Although the actual sensitivity rating of watercourses is 'medium', all watercourses, by default, are viewed and approached as sensitive, that is a rating of 'high'

**Priority areas**

The study area is not within any national priority areas and there are no fatal flaws. However, mitigating measures must be implemented especially on wetland areas where the pipeline will be laid and operating

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# 1. INTRODUCTION

CV Chabane and Associates was formally appointed by the Emfuleni Local Municipality in a for the upgrading of existing main outfall sewer on the northern area (gravity sewer main Evaton and Sebokeng north to waste water treatment works). Based on the design the proposed bulk line is approximately 3km. The appointment includes Feasibility study, preliminary design, detail design, preparation of technical report for submission to department of water and sanitations, Preparation of Contract Document, Construction, supervision and project finances administration for the following project: Project No: 11/2020/31

## 1.1. Project Description

Upgrading of main outfall sewer pipeline system from the northern area to the waste water treatment site

## 1.2. Project Location

The project falls within the jurisdiction of Emfuleni Local Municipality, at Sedibeng District Municipality which lies in south west of Gauteng province, South Africa. More-over, the study area is seen to fall approximately 18 km north east of the town of Vanderbijlpark and approximately 14.8 km North West of town of Vereeniging. The proposed main outfall line is a sewer bulk line which collect sewerage around the immediate and nearby area`s to the waste water treatment plant and is located at roughly the following coordinates:

Table 2: Proposed bulk line coordinates, 3km pipeline

| **Position** | **Latitude** | **Longitude** |
|---|---|---|
| **Start of Bulk line** | 26°34'22.35"S | 27°48'56.43"E |
| **End of Bulk line** | 26°33'8.91"S | 27°49'38.61"E |

The following two figures (figures 1 and 2) are representative maps for the two distinctive places where the bulk sewer works will pass through.

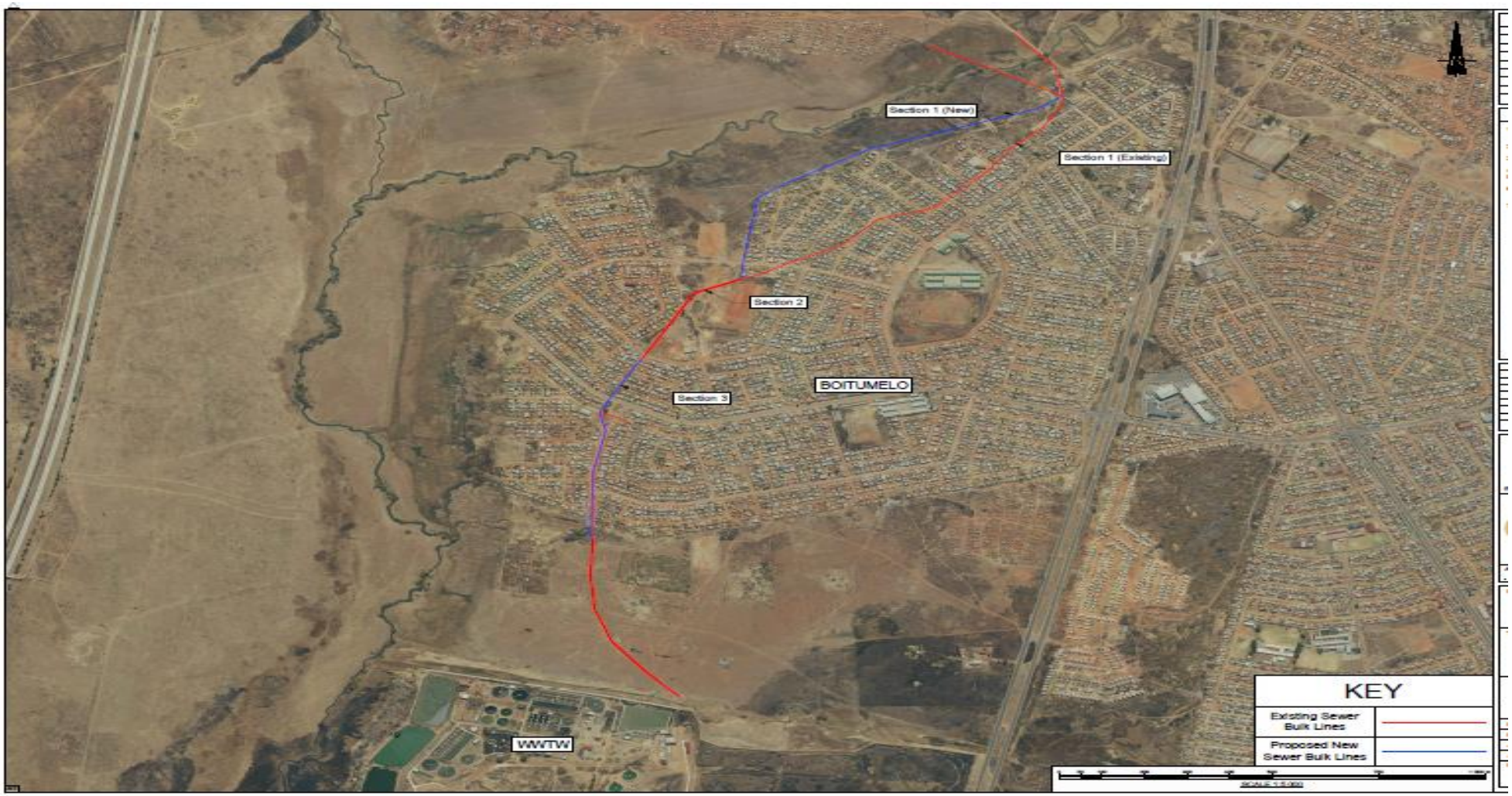


Figure 1: Locality Plan 1

Figure 2: Locality Plan 2-Boitumelo Sewer Pipeline Works

### 1.3. Alternatives

The nature of the existing landscape (Natural Slope and elevation), housing and related infrastructure within the proposed sewer pipeline route construction catchment area leaves the proponent with no alternative option for the route alignment. In addition to the above, the landscape morphology, geology and land ownerships also contributed to fewer options for the construction and operation of the sewer pipeline.

### 1.4. Assumptions and Limitations

- This report considers likely impacts that can arise during the construction, operation and maintenance of the sewer pipeline. However, some unique impacts may arise that must be recorded during monitoring and appropriate corrective actions taken;
- Engineering designs and the specification of rehabilitation structures fall outside of the scope of this general ecological impact assessment report, but consideration will be given on overlaying important sections on final alignments;
- All information contained in this report is based on what the specialist discovered on site as well as what was provided to him by the C.V. Chabane and associates (Pty) Ltd;
- The time lapse between the phases of construction depends on the contactor's work plan; and
- There is limited information on specific availability and behaviour of flora and fauna within this catchment as the assessment was done only within one season (dry winter season). Budgetary constraints and time limitations are some of the issues that might lead to limited assessment of the whole area;

It should be noted that findings, recommendations and conclusions provided in this report are based on the author's best scientific and professional knowledge. No part of this report may be amended or extended without prior written consent of the author. Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or refer to this report. Whenever such recommendations, statements or conclusions form part of the main report to current investigation, this report must be included in its entirety.

# 3. SITE BIO-PHYSICAL DESCRIPTION

## 3.1. Flora and Fauna

The project development area is associated with sparse mature vascular plant eucalyptus trees which are located mainly on the edges of the existing wetland, dry kikuyu grass, the common dry thermeda grass, cypress, pine, weeping willow plants characteristic of wet areas, and jacaranda trees. The typical vegetation is mainly from disturbed landscapes typical again of the township nature. Infrastructural development has influenced significantly vegetation growth around the project area. It must however be known that the service area is a well-built up area with house-hold activities having a bearing on plant growth, survival and maybe regeneration. Due to urbanisation the pipeline path does not affect any protected or endangered vegetation except the wetlands where the Water Use Licence will be applied. The only indigenous plants found within the study area are the acacia trees and the grass plants, but no endangered, threatened and/or protected flora or fauna species due to human inhabitation. It must be known that household pest like rats' favours high concentrated areas.

The figure below shows mature jacaranda and cypress trees found in the area of concern


Figure 3: Mature Jacaranda and Cypress Trees found along the road and within households


Figure 4: Weeping Willow Trees along low-lying areas with wetness

## 3.2. Climate

In Vanderbijlpark, the summers are long, warm, and mostly clear and the winters are short, cold, dry, and clear. Over the course of the year, the temperature typically varies from 33°F to 82°F and is rarely below 27°F or above 88°F. The warm season lasts for 5.2 months, from October 6 to March 14, with an average daily high temperature above 78°F. The hottest day of the year is January 1, with an average high of 82°F and low of 60°F. The cool season lasts for 2.3 months, from May 26 to August 2, with an average daily high temperature below 67°F. The coldest day of the year is June 28, with an average low of 33°F and high of 64°F.

The figure below shows the climatic regions or zones of the republic of South Africa in relation to the study area.

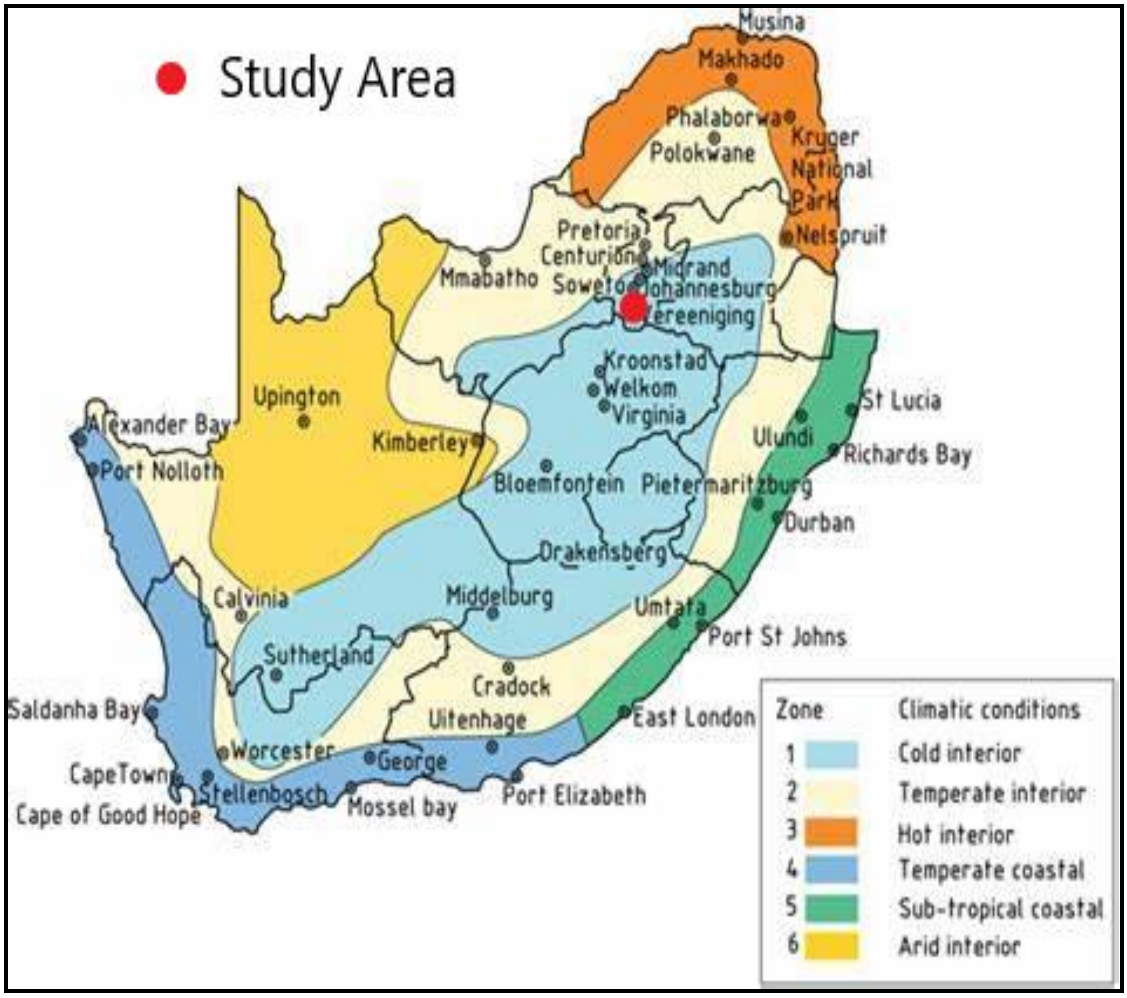


Figure 5: Regional Climatic Zones of The Republic of South Africa

# 4. APPLICABLE LEGISLATION

## 4.1. Local Legislation

An identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of this comprehensive ecological impact assessment report are given in the table below.

Table 3: Legislation Useful for the Study Area

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| Constitution of the Republic of South Africa (Act No 108 of 1996) | ➢ Chapter 2 – Bill of Rights.<br>➢ Section 24 – environmental rights. | Government of South Africa | ➢ Obligation to ensure that the proposed development will not result in pollution and ecological degradation; and<br>➢ Obligation to ensure that the proposed development is ecologically sustainable, while demonstrating economic and social development. The proposed project can be considered as a sustainable development that will prevent pollution and ecological degradation whilst promoting justifiable economic and social development. |

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| National Environmental Management Act (Act No 107 of 1998) | ➢ Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment); and<br>➢ Section 28 – Duty of care and remediation of environmental damage. Environmental management principles. | Department of Environmental Affairs (DEA) | ➢ The EIA Regulations, 2014 as amended, were published on 07 April 2017 in terms of the NEMA and came into effect on 07 April 2017;<br>➢ In terms of these EIA Regulations, the following listed activities within Government Notice 327,325 and 324 (of 07 April 2017) are triggered by the proposed development, thereby requiring environmental authorisation from the GDARD;<br>➢ GN. No. 327, List Notice 1: Activities 12, 19, 24 & 56;<br>➢ GN No. 325, Listing Notice 2: Activity 27;<br>➢ GN No. 324, Listing Notice 3: Activities 4, 14 & 18. |

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| National Water Act, 1998 (Act No. 36 of 1998) | Chapter 3 – Protection of water resources.<br>➢ Section 19 – Prevention and remedying effects of pollution;<br>➢ Section 20 – Control of emergency incidents;<br>➢ Section 21 – Water Uses under Section 21 of the Act must be licensed, unless such water use falls into one of the categories listed in Section 22 of the Act or falls under the general authorisation (and then registration of the water use is required);<br>➢ Non-consumptive water uses may include impeding or diverting of flow in a water course – Section | Department of Water and Sanitation (DWS) | A water use license (WUL) is required to be obtained for the construction of crossing links for the pipeline in terms of Section 21 (c) and (i) of the Act. |

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| | 21(c); and altering of bed, banks or characteristics of a watercourse – Section 21(i). | | |
| National Environmental Management:<br>Air Quality Act, 2004 (Act No. 39 of 2004) | Air Quality Management:<br>➢ Section 32 – dust control; and<br>➢ Section 34 – noise control.<br>The Act provides for the protection of air quality in South Africa. Amongst others, no person may without a provisional atmospheric emission license, or an atmospheric license conduct an activity that is listed in the Act. The Act also makes provision for ambient air quality standards related to criteria air pollutants in SA. | Gauteng Department of Agriculture and Rural Development (**GDARD)** | ➢ The proposed projects do not require an air emission license but will be required to ensure that air quality is not deteriorated to the levels beyond these standards and where associated health impacts can occur. |

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| National Forests Act (Act No. 84 of 1998) | Section 15 – authorisation required for impacts to protected trees. | Department of Agriculture, Forestry and Fisheries (DAFF) | The ecological survey will be conducted to determine any protected plant species on the subject properties. |
| Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983) | ➢ Control measures for erosion; and<br>➢ Control measures for alien and invasive plant species. | Department of Agriculture, Forestry and Fisheries (DAFF) | This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of agricultural authorities will be required if the project requires the draining of wetlands, marshes or water sponges on land outside urban areas.<br>Measures will be included in the EMPr to curb the spread of declared weeds and to prevent soil erosion. |

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) | Management and conservation of the country's biodiversity. Protection of species and ecosystems. | **DEA** | Under this Act, a permit would be required for any activity that is of a nature that may negatively impact on the survival of a listed protected species. An ecological study will be undertaken as part of the S & EIR Process. |
| National Environmental Management Waste Act (Act 59 of 2008) | The objects of this Act are to protect health, well-being and the environment by providing reasonable measures for:<br>➢ Minimising the consumption of natural resources;<br>➢ Avoiding and minimising the generation of waste;<br>➢ Reducing, re-using, recycling and recovering waste;<br>➢ Treating and safely disposing of waste as a last resort;<br>➢ Preventing pollution and ecological degradation. | **DEA** | There are no activities associated with the proposed project that requires a Waste Management License Application. A Waste licence could be required in the event that more than $100m^3$ of general waste or more than $80m^2$ of hazardous waste is to be stored on site at any one time. The volumes of waste generated during construction and operation of the facility are not expected to be larger enough to require a waste license. |

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| National Heritage Resources Act No 25 of 1999 (Act No 25 of 1999 as amended) | ➢ Securing ecologically sustainable development while promoting justifiable economic and social development -Section 35- protection of heritage resources. | South African Heritage Resources Agency (SAHRA) | A permit may be required should identify cultural/heritage sites onsite be required to be disturbed or destroyed as a result of the proposed development. A HIA has been undertaken as part of the Scoping & Environmental Impact Reporting Process to identify potential heritage sites. |
| **GUIDELINES**<br>Each province develops own guidelines which should be in line with the national goals or strategies, thus localising the national goals and or plans. The main ones are highlighted below and are inclusive of the main GDARD biodiversity assessment requirements and these guidelines have played a major role in the production of this report and are referenced. | | | |
| Sedibeng Integrated Development Plan 2011/16 | The aim of the IDP is to provide a 'coherent plan' for the improvement of quality of life for people living in eMfuleni Municipality. The IDP specifically seeks to align the priorities of the municipality with the national and provincial | **SIDP** | The eMfuleni IDP indicates a commitment by the City of Vanderbiljpark to the eight Millennium Development Goals and as such, the integration of principles of sustainable development into policies and programmes. In addition, the City of Vanderbiljpark is a |

| Legislation | Applicable Requirements | Administering Authority | How the Proposed Activity Complies with and Responds to the Legislation and Policy Context, Plans, Guidelines and Frameworks |
|---|---|---|---|
| | priorities, policies and strategies. | | signatory to Agenda 21 (which was adopted at the United Nations Conference on Environment and Development in 1992). Under this agreement, the City of Vanderbiljpark is further obligated to incorporate Local Agenda 21 into all of its developmental activities. |
| Gauteng Conservation Plan Version 3.3 (C-Plan 3.3) | ➢ Serve as the primary decision support tool for the biodiversity component of the Environmental Impact Assessment (EIA) process; and<br>➢ Inform protected area expansion and biodiversity stewardship programmes in the province. | **GDARD** | Serve as a basis for development of Bioregional Plans in municipalities within the province. |

## 4.2. International Agreements & Policies

The international community has agreed to treat and attend to environmental and water management with one voice. Regional and individual nations have developed their own policies and legislation in line with international agreements, policies as well as protocols. This is meant to save the biodiversity, ecosystem and environment at large. The list below is international agreements and policies:

- Convention Concerning the Protection of World Cultural and Natural Heritage (1972);
- Agenda 21 regarding sustainable development at global and national levels (1992);
- United Nations Framework Convention on Climate Change (1994);
- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (1975)-Ramsar;
- Convention on the Conservation of Migratory Species of Wild Animals (1983), - Bonn;
- Convention on Biological Diversity including eco-systems and genetic resources (1992);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975); and
- Copenhagen Accord on climate change (2009).

## 4.3. Regional Agreements

The following lists of agreements are from the sub-tropical and continental as in the African way of co-operating:

- Action Plan of the Environmental Initiative of NEPAD for sustainable development in Africa (2003); and
- African Convention on the Conservation of Nature and Natural Resources (1969).

# 5. PRACTICAL ASSESSMENT APPROACH

## 5.1. Desktop Assessment

A literature review was conducted regarding the main vegetation types and fauna of the general region and of the specific study area. The primary guidelines used were those of Mucina & Rutherford (eds) (2006), Low & Rebelo (1996) and Acocks (1988). Background data regarding soils, geology, climate and general ecology were also consulted. These are useful in determining what species of fauna and flora can be expected or possibly present within the different habitats of the study area.

Lists of plant species for the relevant 1:50 000 base map grid references within which the proposed project is situated, were obtained from the South Africa National Biodiversity Institute's (SANBI) database. The lists represent all plant species that have been identified and recorded within the designated grid coordinates. The main aim was to initially determine if any protected species or Red Data species were known to occur in the study area or in the immediate vicinity of the study area.

Red data and protected species listed by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as well as in other authoritative publications were consulted and taken into account. Alien invasive species and their different Categories (1, 2 & 3) as listed by the Conservation of Agricultural Resources Act (Act No. 43 of 1983) and the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) were also consulted.

## 5.2. Field surveys

Digital photographs and GPS reference points of importance were recorded during field investigations and used throughout the specialist report. Also, during field surveys or investigations, cognisance was taken of the following environmental features and attributes:

- Biophysical environment;
- Regional and site-specific vegetation;
- Habitats ideal for potential red data fauna species;
- Sensitive floral habitats;
- Red data fauna and flora species;
- Protected fauna and flora species; and
- Watercourses and water bodies

## 5.3. Floristic Sensitivity

The methodology used to estimate the floristic sensitivity is aimed at highlighting floristically significant attributes and is based on subjective assessments of floristic attributes. Floristic sensitivity is determined across the spectrum of communities that characterize the study area. Phytosociological attributes (species diversity, presence of exotic species, etc.) and physical characteristics (human impacts, size, fragmentation, etc.) are important in assessing the floristic sensitivity of the various communities.

Criteria employed in assessing the floristic sensitivity vary in different areas, depending on location, type of habitat, size, etc. The following factors were considered significant in determining floristic sensitivity:

- Habitat availability, status and suitability for the presence of Red Data species;
- Landscape and/or habitat sensitivity;
- Current floristic status;
- Floristic diversity; and
- Ecological fragmentation or performance.

Floristic Sensitivity Values are expressed as a percentage of the maximum possible value and placed in a particular class or level as shown in the table below.

Table 4: Floristic Sensitivity Values Table

| **Classification** | **Percentage Index Values (%)** |
|---|---|
| High | 80-100 |
| Medium -High | 60-80 |
| Medium | 40-60 |
| Low - Medium | 20-40 |
| Low | 0-20 |

**High Sensitivity Index Values** indicate areas that are considered pristine, unaffected by human influences or generally managed in an ecological sustainable manner. Nature reserves or even well managed game farms typify these areas.

**Low Sensitivity Index Values** indicate areas of poor ecological status or importance in terms of floristic attributes, including areas that have been negatively affected by human impacts or poor management.

Each vegetation unit is subjectively rated on a scale of 1 to 10 (Sensitivity Values) in terms of the influence that the particular Sensitivity Criterion has on the floristic status of the plant community. Separate Values are multiplied with the respective Criteria Weighting, which emphasizes the importance or triviality that the individual Sensitivity Criteria have on the status of each community.

## 5.4. GO, NO - GO Criteria

The sensitivity analyses are also expressed in terms of whether the "Go Ahead" has or has not been given for development in a specific area or ecological unit, with regards to the ecological sensitivity along with mitigating measures. The criteria are directly linked to all the other analyses used in the study and can be expressed as follows:

- GO: Areas of low sensitivity-These would typically be areas where the veld has been totally or mostly transformed;
- GO-SLOW: Areas of medium/low sensitivity-These would typically be areas where large portions of the veld has been transformed and/or is highly infested with alien vegetation and lacks any real faunal component. Few mitigating measures are typically needed, but it is still always wise to approach these areas properly and slowly;
- GO-BUT: Areas of medium sensitivity and medium/high sensitivity-These are areas that are sensitive and should generally be avoided if possible. But, with the correct implementation of mitigating and management measures can be entered if need be.; and
- NO-GO: Areas of high sensitivity-These are areas of high sensitivity and should be avoided at all cost. In these areas mitigating measures are typically futile in limiting impacts.

It should be noted that "The Precautionary Principle" is applied throughout this investigation.

## 5.5. Floral Assessment – Species of Conservation Concern

Baseline data for the quarter degree grids in which the study area is situated were obtained from the SANBI database and was compared to the Interim Red Data List of South African Plant Species (Threatened Species Programme, 2004) to compile a list of Floral Species of Conservation Concern (which include all Red Data flora species) that could potentially occur within the study area.

A snapshot investigation of an area presents limitations in terms of locating and identifying Red Data floral species. Therefore, particular emphasis is placed on the identification of habitats

deemed suitable for the potential presence of Red Data species by associating available habitat to known habitat types of Red Data floral species. The verification of the presence or absence of these species from the study area is not perceived as part of this investigation as a result of project limitations.

## 5.6. Gauteng Provincial Conservation Plan

Conservation planning was started in Gauteng in the year 2000 and the aim was to revise C-Plan at least every 5 years. C-Plan Version 1 was produced in 2001 and was followed by version 2 in 2005. Version 2 was refined in 2007 and was named Version 2.1. The small size of the province made it feasible to conduct an extensive biodiversity survey, named Biodiversity-GAP, which aimed to provide the information on spatial occurrence of biodiversity necessary for rigorous conservation planning. C-Plan 3 represents priority areas for biodiversity conservation in the Gauteng province. C-Plan 3 is based on the systematic conservation protocol developed by Margules & Pressey (2000) and is based on the principles of complementarity, efficiency, defensibility and flexibility, irreplaceability, retention, persistence and accountability. Systematic conservation planning is an iterative process. Knowledge of the distribution of biodiversity, the status of species, approaches for dealing with aspects such as climate change, methods of data analysis, and the nature of threats to biodiversity within a planning region are constantly changing, especially in the Gauteng province which is developing at an extremely rapid rate. This requires that the conservation plan be treated as a living document with periodic review and updates. The products have been the basis of the decision support process to the EIA process in the department, and together with a standardized set of decision-making guidelines have allowed for consistent, scientifically justified and defensible recommendations on development applications submitted to GDARD

Information from the Provincial Conservation Plan was also used in the assessment criterion for the ecological impact assessment of the study area and of special concern is the CBA or ESA data from the main plan as shown in the figure below. In addition to the above guide, a sensitivity map which is part of this report is also developed using the Critical Biodiversity Area (CBA). With the list of expected vegetation and animal species in mind, it becomes very easy to search within habitats, some of which have high chances of being found within the study area. Incorporation of the findings and expected findings are however done in table 8. Construction and operation of the sewer pipeline should be guided by the findings as well as recommendations from this report.

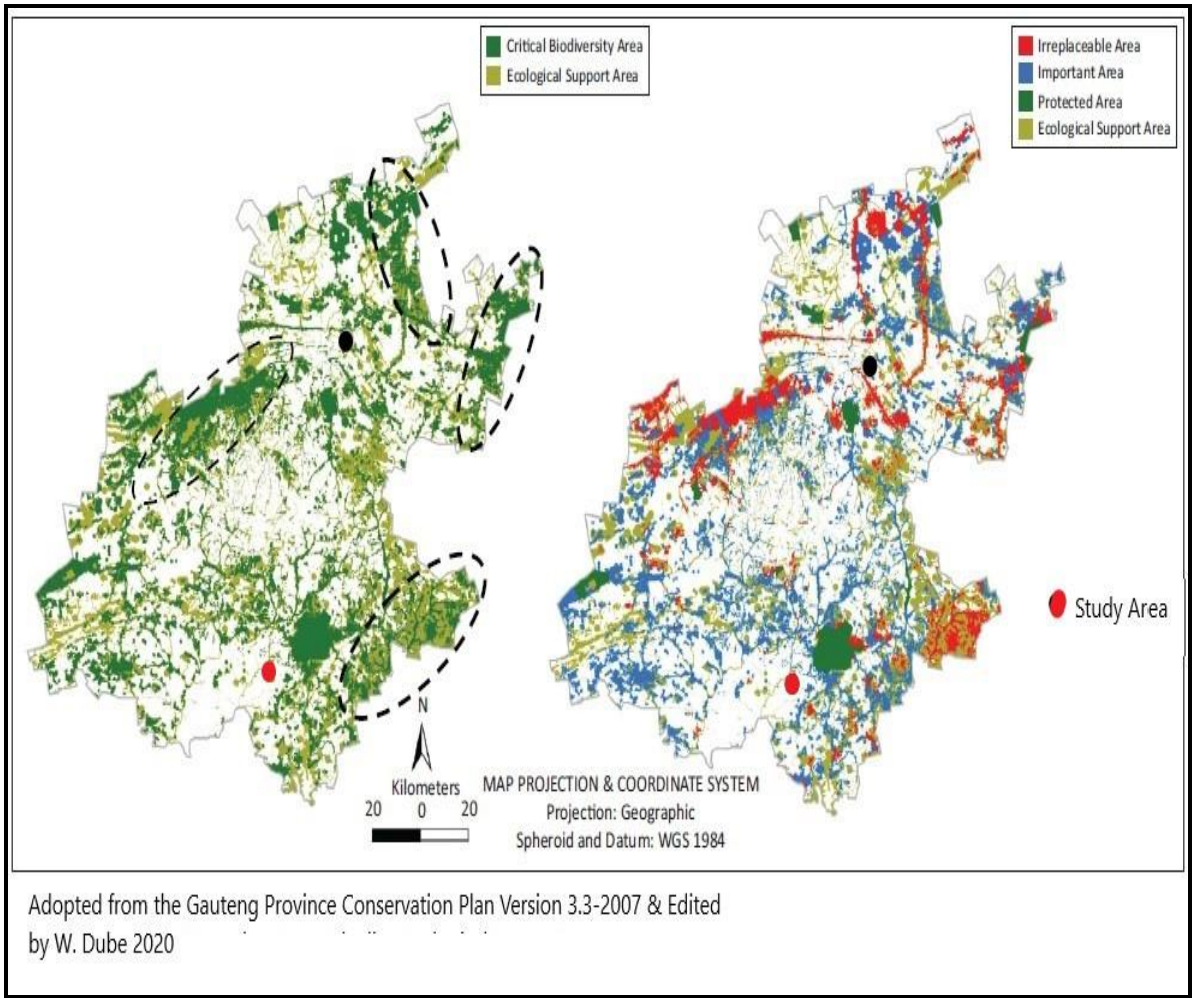


Figure 6: Gauteng Provincial Conservation Plan

## 5.7. Faunal Sensitivity

Determining the full faunal component of a study area during a short time scale of a few field trips can be highly limiting. Therefore, the different habitats within the study area and nearby surrounding areas were scrutinized for attributes that are deemed to be suitable for high diversity of fauna, as well as for Red Data species. Special consideration was given to habitats of pristine condition and high sensitivity. Areas of faunal sensitivity were calculated by considering the following parameters:

- ***Habitat status*** – the status or ecological condition of the habitat. A high level of habitat degradation will often reduce the likelihood of the presence of Red Data species;
- ***Habitat linkage*** – Movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to surrounding habitats and adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area; and

- ***Potential presence of Red Data species*** – Areas that exhibit habitat characteristics suitable for the potential presence of Red Data species are considered sensitive.

The same rating scale and indices that are used for the floral sensitivities are used for the faunal sensitivities.

## 5.8. Faunal Assessment – Species of Conservation Concern

Literature was reviewed and relevant experts contacted to determine which faunal species of conservation concern (which include all Red Data species) are present, or likely to be present, in the study area. A snapshot investigation of an area presents limitations in terms of locating and identifying Red Data fauna species. Particular emphasis was therefore placed on the identification of habitat deemed suitable for the potential presence of Red Data fauna species by associating available habitat to known habitat types of Red Data species. The verification of the presence or absence of these species from the study area is not perceived as part of this investigation as a result of project limitations.

## 5.9. Fauna Red Data Sensitivity Index Score (RDSIS)

Field investigations limited to a few days can seldom, if ever be comprehensive in terms of identifying all faunal species, let alone Red Data Listed (RDL) Species and/or priority species. Included is the reality that many faunal species are highly mobile and might be moving in and out of an area, which makes observing these species sometimes incidental and fortunate, depending largely on time and chance. Added to this are the species that are primarily nocturnal in nature.

For the above reasons, the Red Data Sensitivity Index Scoring (RDSIS) method for fauna is widely used by specialists involved in Environmental Impact Assessment (EIAs), specialist studies, etc. The RDSIS methodology provides a calculated indication for the potential of certain red data or priority species occurring in the study area. The index is based on historical data, present presence of ideal habitat and food sources, general extrapolations on the land-uses of the region and the specialist's knowledge and experience.

## 5.10. Probability of Occurrence (POC)

Known distribution range (D), habitat suitability of the site (H) and availability of food sources (F) on site is determined for each of the species. Each of these variables is expressed a percentage (where 100% is a perfect score). The average of these scores provides a POC score for each species.

The POC is calculated as follows:

POC = (D+H+F) / 3

The POC value is then categorized as follows:

- 0-20% = Low;

- 21-40% = Low / Medium;
- 41-60% = Medium;
- 60-80% = Medium/High; and
- 81-100%= High

## 5.11. Total Species Score (TSS)

Species with a POC score of more than 60% (Medium/High) are considered when applying the RDSIS. A weighting factor is assigned to the different IUCN categories providing species with a higher conservation status, a higher score. This weighting factor is then multiplied with the POC to calculate the total species score (TSS) for each species. The weighting assigned to each category rating is shown in the table below.

Table 5: Total Species Score for Fauna

| Status Category | Abbreviation | Weighting |
|---|---|---|
| Data deficient | DD | 0,2 |
| Rare | RA | 0,5 |
| Near Threatened | NT | 0,7 |
| Vulnerable | VU | 1,2 |
| Endangered | EN | 1,7 |
| Critically Endangered | CR | 2,0 |

The TSS is calculated as follows:

TSS = (IUCN weighting x POC) where POC is > 60%.

## 5.12. Average Total Species & Average Threatened Taxa Score

The average of the Total Species (TSS) potentially occurring on the site is calculated. The average of all the Threatened Taxa (TT) (Near threatened, Vulnerable, Endangered and Critically Endangered) TSS scores are also calculated. The average of these two scores (Av.TSS and Av.TT) is then calculated in order to add more weight to threatened taxa with POC higher than 60%.

The average is calculated as follows:

Average = (Av.TSS [TSS / Tot.Species] + Av.TT [TT TTS / No. of species]) / 2

## 5.13. Red Data Sensitivity Index Score (RDSIS)

The average score obtained above and the sum of the percentage of species with a POC of >60% of the total number of Red Data Listed species listed for the area is then calculated. The average of these two scores, expressed as a percentage, gives the RDSIS for the area investigated.

The RDSIS is calculated as follows:

RDSIS = (Average + [Spp. with POC >60% / Total No. of Spp*100]) / 2; and is simplified below.

Table 6: The RDSIS Category Ratings

| RDSIS Score | Category Rating |
|---|---|
| 0 – 20% | LOW |
| 21 – 40% | LOW / MEDIUM |
| 41 – 60% | MEDIUM |
| 61 – 80% | MEDIUM / HIGH |
| 81 – 100% | HIGH |

## 5.14. Biodiversity Impact Assessment

The impact assessment takes into account the nature, scale and duration of the effects on the natural environment and whether such effects are positive (beneficial) or negative (detrimental).

A rating/point system is applied to the potential impact on the affected environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue, the following criteria are used and points awarded as shown:

- Extent: National - 4; Regional – 3; Local – 2; Site – 1;
- Duration: Permanent – 4; Long term – 3; Medium term – 2; Short term – 1;
- Intensity: Very high – 4; High – 3; Moderate – 2; Low – 1; and
- Probability of Occurrence: Definite – 4; Highly probable – 3; Possible – 2; Impossible – 1.

## 5.15. Criteria for the classification of an impact

### 5.15.1. Nature

A brief description of the environmental aspect being impacted upon by a particular action or activity is presented.

### 5.15.2. Extent (Scale)

Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required.

This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.

- Site: Within the construction site;
- Local: Within a radius of 2 km of the construction site;
- Regional: Provincial (and parts of neighboring provinces); and
- National: The whole of South Africa

### 5.15.3. Duration

Indicates what the lifetime of the impact will be.

- Short-term: The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase;
- Medium-term: The impact will last for the period of the construction phase, where after it will be entirely negated;
- Long-term: The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter; and
- Permanent: The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

### 5.15.4. Intensity

Describes whether an impact is destructive or benign.

- Low: Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected;
- Medium: Effected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way;
- High: Natural, cultural and social functions and processes are altered to extent that they temporarily cease; and
- Very high: Natural, cultural and social functions and processes are altered to extent that they permanently cease.

### 5.15.5. Probability

Probability is the description of the likelihood of an impact actually occurring.

- Improbable: Likelihood of the impact materializing is very low;
- Possible: The impact may occur;
- Highly probable: Most likely that the impact will occur; and
- Definite: Impact will certainly occur.

### 5.15.6. Significance

Significance is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both the physical extent and the time scale and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact. Using the scoring from the previous section, the significance of impacts is rated as follows:

- Low impact: 4-7 points. No permanent impact of significance. Mitigating measures are feasible and are readily instituted as part of a standing design, construction or operating procedure;
- Medium impact: 8-10 points. Mitigation is possible with additional design and construction inputs;
- High impact: 11-13 points. The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment; and
- Very high impact: 14-16 points. The design of the site may be affected. Intensive remediation as needed during construction and/or operational phases. Any activity, which results in a "very high impact", is likely to be a fatal flaw.

### 5.15.7. Status

Status gives an indication of the perceived effect of the impact on the area.

- Positive (+): Beneficial impact;
- Negative (-): Harmful or adverse impact; and
- Neutral Impact (0): Neither beneficial nor adverse.

It is important to note that the status of an impact is assigned based on the *status quo.* That is, should the project not proceed, thus not all negative impacts are equally significant. The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented.

## 5.16. Sensitivity Mapping & Assessment

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different vegetation and habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern as highlighted in the information supplied by sections mentioned earlier in the chapter. The

ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- ***Low*****:** Units with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. This category is reserved specifically for areas where the natural vegetation has already been transformed, usually for intensive agricultural purposes such as cropping. Most types of development can proceed within these areas with little ecological impact;
- ***Medium***: Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken;
- ***High:*** Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas is highly undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately; and
- ***Very High*****:** Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially **''no-go''** areas from a developmental perspective and should be avoided at all costs. Usually represented in "red".

Under normal circumstances, a map is then created to represent the area's sensitivity to any type of development and will be shown in the chapter that follows.

# 6. ECOLOGICAL ASSESSMENT FINDINGS

## 6.1. Floral Species

No red data listed (RDL) (Critically endangered, endangered or vulnerable) floral species were observed during field investigations. The table below shows the kind of plants observed as well as those expected to be seen, during the walk through the investigation site and note that some of the plants observed are classified as alien or invasive plant species and are therefore categorized accordingly.

Table 7: Plant Species Observed and Expected on Site

| Scientific Name | Common Name | Conservation Status | Observed/Not | Recommendation (EIA guidelines) |
|---|---|---|---|---|
| *Salix babylonica* | Weeping willow | Not threatened | Observed | These plants or trees are normally |

| Scientific Name | Common Name | Conservation Status | Observed/Not | Recommendation (EIA guidelines) |
|---|---|---|---|---|
| | | | | found on waterways and classifies as invasive. |
| *Jacaranda mimosofolia* | Jacaranda | Vulnerable | Observed | Avoid mature trees on encountering then close to trenching area. If unavoidable, seek permit to move the plants |
| *Cupressus sempervirens* | Cypress | Not threatened | Observed | Avoid mature ones |
| *Hyparrhenia filipendula* | Fine thatching grass | Least concern | Observed | Scrap plant material with top soil to be stockpiled separately for rehabilitation. |
| *Pennesetum clandestinum* | Kikuyu grass | Invasive and not threatened | Observed | Remove on encountering |
| | Syngeria | | Observed | Cut and remove on encountering. |
| *Acacia mellifera* | Black thorn | Least concern | Observed | Scattered and medium aged. Cut or clear on encountering them. |
| *Pinus pinaster* | Pine | Least concern | Observed | Very few in the areas where the sewer line will be laid. If encountered, should be removed. |

## 6.2. Conservation status

The status of all veld-types in the greater study area is least threatened (LT) but considered sensitive and vulnerable especially on sections where the pipelines is expected to pass or run on the flood zones of the wetland or watercourse. Infrastructural development of the area also contributes towards less vegetation coverage of the whole study area, thus housing and related services. (www.bgis.sanbi.org/LUDS). The table below gives a basic description of the status categories. The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or protected. The main purpose for the listing of threatened ecosystems is an attempt to reduce the rate of ecosystem and species destruction and habitat loss, leading to extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI). The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process. This includes the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011) (SANBI).

Table 8: Ecosystem Status: Simplified explanation of categories used

| **Status** | **Percentage Transformed (%)** | **Effect on Ecosystem** |
|---|---|---|
| Least Threatened (LT) | 0-20% (<20% loss) | No significant disruption of ecosystem functions |
| Vulnerable (VU) | 20-40% (>20% loss) | Can result in some ecosystem functions being altered |
| Endangered (EN) | 40-60% (>40% loss) | Partial loss of ecosystem functions |
| Critically Endangered (CR) | >60% or BT Index for that specific veldtype | Species loss. Remaining habitat is less than is required to represent 75% of species diversity |

***Source:*** *South African National Spatial Biodiversity Assessment Technical Report. Volume 1: Terrestrial Component. 2004. SANBI. Mucina & Rutherford (eds) (2010).*

Note: BT stands for the Biodiversity Threshold and is an index value that differs for each veld-type. In other words, because the composition, recovery rate, etc. differs for each veld-type there will be a different threshold (in this case percentage transformed) at which species

become extinct and ecosystems breakdown. That is, at which point the veldtype is critically endangered.

The major plant species identified during field investigations are listed in the photographs that follow. During field investigations no red data listed (RDL) species where observed. A final and comprehensive walkdown will be required prior to commencement with sewer pipeline construction activities to conduct a search and rescue operation. A tree permit application will also be required closer to the time.


Figure 7: Syringa Plant Species


Figure 8: Mature Eucalyptus Tree


Figure 9: Dry Thatch Grass on disturbed ground


Figure 10: Grazing Cattle and Mature Weeping Willow Trees

## 6.3. Alien plants identified in the Study Area

The Department of Environmental Affairs defines invasive alien plants as plant species that are exotic, non-indigenous or non-native to an ecosystem. Due to the lack of natural enemies and the resistance to local diseases, these plants tend to spread aggressively, which then threatens biodiversity, reduce water availability and increase the risk and intensity of wildfires. The Alien and Invasive Species Regulations of the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) regulates all invasive organisms in South Africa and categorizes invasive plant species into four different categories: Category 1a & 1b, Category 2 and Category 3. These categories of IAP's need to be controlled or removed from areas where they may cause harm to the environment or where they are prohibited. In South Africa there is a total of 383 invasive plant species that must be controlled and these species are listed in the NEMBA Alien and Invasive Species list of 2016.

A few alien invasive plant species common to the area and province are present in the study area. The alien plant species encountered in the study area are recorded, along with their category rating, in the table below. It must be known that these alien species identified were dry as it was during the dry cold season when the investigation was done.

Although there are invasive alien species present there are not many areas of significant encroachment or serious infestation. Most invasive species are within disturbed areas and around dwellings and other structures. A specific invasive species monitoring and management programme should be designed and followed to enable the management of these plants especially during construction and operation of the sewer pipeline. The presence of settlements or household also contribute towards propagation of most invasive plant species within the study area catchment.

Table 9: Alien Plant Species Identified at the Study Area

| **Botanical Name** | **Common Name** | **Category** |
|---|---|---|
| *Bidens pilosa* | Blackjacks | - |
| *Melia azedarach* | Syringa | 1b |
| *Eucalyptus cladocalyx* | Sugar gum | 1b |
| *Tagetes erecta* | Mexican marigold | 1b |
| *Pennisetum clandestium* | Kikuyu grass | 1b |

## 6.4. Fauna

During field investigations only a few birds were observed, the white stork, quilea birds and the ibis. It must be known that mammals like the cows, rats or rodents were also seen on site. The table below indicates the animals seen on site and those expected to be seen.

Table 10: Faunal Species Found and Expected from the Site

| **Biological Name** | **Common Name** | **Red Data Status** | **Habitat Type** | **Habitat Restrictions** |
|---|---|---|---|---|
| **Mammals** | | | | |
| *Bos taurus* | Cattle | Least concern | Free range | No restrictions within this area |
| *Rattus rodentia* | Rats | Least concern | Dumbing area and households | No restrictions |
| Avifauna | | | | |
| *Bubulcus ibis* | Cattle egret | Least concern | Swampy cattle grazing areas | Migratory and no restrictions |
| *Plegadis* | Ibis | Least concern | Swampy areas | Migratory |

| | | | | |
|---|---|---|---|---|
| *falcinellus* | | | with organic waste. | |

## 6.5. Sensitivity Mapping

The sensitivity mapping system is used to mark areas which are perceived to be sensitive around or in the vicinity of the project development area. These zones which are deemed sensitive should be avoided when project implementation and operation occur, or some precautionary measures need to be partaken in order to minimise the impacts of the project development (Construction and operation). Some of the mitigation measures are therefore highlighted in this report as well as the EMPr. Some of the areas to be avoided or treated with care are watercourses, wetlands, riparian belts and buffer zones as they are deemed sensitive. These are areas with sensitive species (biodiversity), sensitive habitats and their disturbance can destabilise natural ecological recovery patterns. The following is the sensitivity map for the sewer pipeline in Sebokeng. From the given sensitivity map below, there is a small portion where the pipeline seems to be within the watercourse flood line zone which is classified as highly sensitive as shown on the map legend. This area was also identified during the site visit This area should therefore be handled and treated with caution. It is advised that a Water Use Licence (WUL) should be applied with DWS to seek authority to use the area for the sewer pipeline. The WUL conditions in the authorisation will serve as a guide towards use of the area. The sensitivity map therefore acts as a guide during construction, operation and maintenance of the sewerage pipeline so as to achieve sustainable cooperation of natural and human impact on the environment.

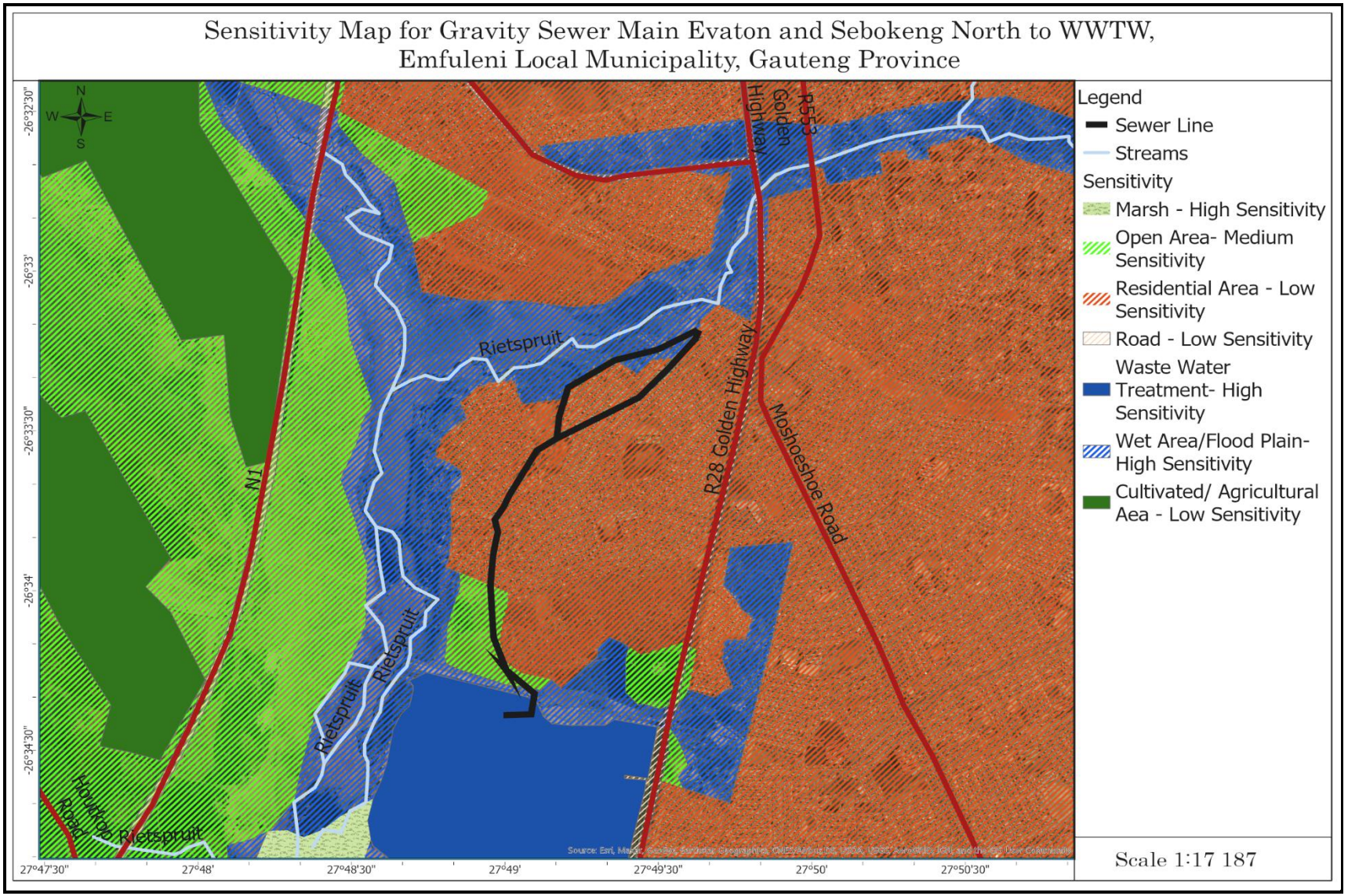


Figure 11: Sebokeng Waste Water Pipeline Catchment Area Sensitivity Map

# 7. IMPACT ASSESSMENT

The aim of this section is to identify the potential ecological impacts that are likely to arise as a result of the proposed construction and operation of Sebokeng sewerage pipeline. The major impacts affect the main two phases of development (Construction and operation) though they should be noted during the planning stage.

## 7.1. Impact Assessment Methodology

The impact assessment was done according to the following methodology:

- Direction of an impact may be positive, neutral or negative with respect to the particular impact (e.g., a habitat gain for a key species would be classed as positive, whereas a habitat loss would be considered negative);
- The magnitude and outline the rationale used. Appropriate, widely recognised standards are used as a measure of the level of impact;
- Magnitude is a measure of the degree of change in a measurement or analysis (e.g., the area of pasture, is therefore, classified as none/negligible, low, moderate or high. The categorization of the impact magnitude may be based on a set of criteria (e.g. health risk levels, ecological concepts and/or professional judgment) pertinent to each of the discipline areas and key questions analysed;
- Duration refers to the length of time over which an environmental impact may occur i.e. transient (less than 1 year), short-term (0 to 5 years), medium term (5 to 15 years), long-term (greater than 15 years with impact ceasing after closure of the project) or permanent;
- Scale/Geographic extent refers to the area that could be affected by the impact and is classified as site, local, regional, national, or international;
- Probability of occurrence is a description of the probability of the impact actually occurring as improbable (less than 5% chance), low probability (5% to 40% chance), medium probability (40 % to 60 % chance), highly probable (most likely, 60% to 90% chance) or definite (impact will definitely occur); and
- Impact significance was rated by the specialist using the scoring system shown in the table below.

Table 11: Model Scoring System for Assessment of Significance

| **Magnitude** | **Scale** | **Duration** | **Probability** |
|---|---|---|---|
| 10-Very high | 5-International | 5-Permanent | 5-Definite |

| Magnitude | Scale | Duration | Probability |
|---|---|---|---|
| 8- High | 4-National | 4-Long-term (impact ceases after closure of activity) | 4-Highly probable |
| 6-Moderate | 3-Regional | 3-Moderate (5 to 15years) | 3-Medium probability |
| 4-Low | 2-Local | 2-Short-term (0 to 5 years) | 2-Low probability |
| 2-Minor | 1-Site only | 1-Transient | 1-Improbable |
| 0-None | | | 0-None |
| **Maximum SP is 100 points**<br>**SP> 75 High Environmental Significance**<br>**SP 30 to 75 Moderate Environmental Significance**<br>**SP< 30 Low Environmental Significance** | | | |

After ranking these factors for each impact, the significance of the two aspects, occurrence and severity were assessed using the following formula:

**SP (Significance Points) = (Magnitude + Duration + Scale) x Probability**

The maximum value is 100 significance points (SP). The potential environmental impacts were then rated as of High (SP >75), Moderate (SP 30 – 75) or Low (SP <30) significance, both with and without mitigation measures on the following basis:

Table 12: Significance Points Table

| | | |
|---|---|---|
| SP> 75 | Indicates high environmental Significance | Where it would influence the decision regardless of any possible mitigation. An impact which could influence the decision about whether or not to proceed with the project. |
| SP 30 to 75 | Indicate moderate environmental significance | Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged. |
| SP< 30 | Indicate Low Environmental Significance | Where it will not have an influence on the decision. Impacts with little real effect and which should not have an influence on or require |

| | | |
|---|---|---|
| | | modification of the project design or alternative mitigation. |
| + | Positive | An impact that is likely to result in positive consequences / effects. |

## 7.2. Impacts Rating Matrix

The Impact rating matrix for the project is shown below. Please refer to the table above for the Impact Rating Matrix scoring system.

## 7.3. Cumulative Environmental Impacts

Cumulative environmental impacts, can be defined as changes to the environment caused by the combined impact of past, present and future human activities and natural processes. Cumulative impacts to the environment are the result of multiple activities whose individual direct impacts may be relatively minor but in combination with others result are significant environmental effects. The multiple impacts of different activities may have an additive, synergistic or antagonistic effect on one another and with natural processes. Cumulative impacts can be difficult to predict and manage due to inadequate environmental baseline data, complex ecological processes, and the large scale at which human development occurs. Many human activities result in direct and indirect impacts that collectively impact the environment. The impacts of activities in combination with natural processes can result in cascading responses in ecosystems that can become unpredictable. The construction and operation of the sewer pipeline also contribute significantly to the cumulative environmental impacts as highlighted in the table below. The major impacts being leakage incidences contributing to pollution of the ground and surface water resources, encroachment of invasive plant species, scavenger animals being attracted to leak areas.

Table 13: Cumulative Impacts of the Sewer Pipeline

| **Project Phase** | **Potential Impact and/or Aspect** | **Significance rating of Impact before Mitigation** | **Mitigation** | **Significance rating after mitigation** |
|---|---|---|---|---|
| Operation | ➢ Compaction of the service routes and choking of drain points from litter | Extent: Local (2)<br>Duration: Medium-term (2) | ➢ Service routes to be maintained | Extent: Site (1)<br>Duration: Medium-term (2)<br>Intensity: Low (1) |

| | | | | |
|---|---|---|---|---|
| | and debris;<br>➢ Poor maintenance of the pipeline leading to heavy leakages and blockages of the natural systems;<br>➢ Unattended leakages leading to invasive plant encroachment and attraction of scavenger animals;<br>➢ Potential of disease spreading due to poor pipeline leak repair and maintenance; and<br>➢ Pollution of surface and ground water resources (organic pollution) | Intensity: Moderate (2)<br>Probability: Possible (2)<br>Significance: Medium (8) | seasonally;<br>➢ Ensure ripped areas are not chocked with debris, litter etc;<br>➢ Plant erosion abating plants on drain ways; and<br>➢ Ensure reported leaks and blockages are attended to as quickly as possible. | Probability: Possible (2)<br>Significance: Low (6) |

Table 14: Sebokeng 3km Waste Water Pipeline Impact Matrix

| **Project Development Phase** | **Potential Impact and/or Aspect** | **Significance rating of Impact before Mitigation** | **Mitigation** | **Significance rating after mitigation** |
|---|---|---|---|---|
| Construction | ➢ Irresponsible construction practices could lead to the pollution of the small stream water way (existing water course thus where the pipeline begin) from hydrocarbon contamination, construction debris, surface water pollution from petrochemicals leakages, cement dust and litter material);<br>➢ Poor storm-water management in the construction area, and in the context of soil | **Extent:** Local (2)<br>**Duration:** Medium-term (2)<br>**Intensity:** Moderate (2)<br>**Probability:** Possible (2)<br>**Significance:** Medium (8) | ➢ Construction to be guided by the EMPr and the mitigation measures stipulated in this report;<br>➢ Construction to be monitored by an ECO according to the stipulations of the EMPr;<br>➢ No batching or chemical / fuel storage areas to be located within 50m of the area of ecologically sensitive areas like the boundaries of the stream (1:100 years flood line); | **Extent:** Site (1)<br>**Duration:** Medium-term (2)<br>**Intensity:** Low (1)<br>**Probability:** Possible (2)<br>**Significance:** Low (6) |

| Project Development Phase | Potential Impact and/or Aspect | Significance rating of Impact before Mitigation | Mitigation | Significance rating after mitigation |
|---|---|---|---|---|
| | stockpiles could lead to the siltation and/or pollution of the area of residual hydromorphic soils or of the sensitive riparian corridor as well as sediments being washed into the natural water-way drainage system;<br>➢ The movement of machinery within the area could cause compaction or physical disturbance of these soils; and<br>➢ Temporary (illegal) construction access to the active water-flow zones and buffer area (riparian corridor) to abstract | | ➢ All waste from the construction site to be deposited into marked and protected areas like skip bins for construction debris, wooden or organic waste bins etc;<br>➢ Construction-phase storm-water controls to be implemented along the stretch of the construction zones adjacent to the area and around all stockpiles; and<br>➢ No temporary construction accesses to be constructed into the flood plain (1:100-year | |

| Project Development Phase | Potential Impact and/or Aspect | Significance rating of Impact before Mitigation | Mitigation | Significance rating after mitigation |
|---|---|---|---|---|
| | water could cause hydrological and morphological impacts (erosion, channel morphology changes, undercutting of riparian areas, etc.) and degrade the resource quality. | | flood line) of the existing water courses, unless authorised by the Department of Water and Sanitation (DWS); and<br>➢ No machinery should enter the sensitive zones without authorisation. | |
| Operation Phase | ➢ Poor servicing of the operating pipeline can result in contamination of soil within the surrounds of the ecological belt for the pipeline and its drain-ways, (from service vehicles and road users);<br>➢ Poor maintenance of service roads can | **Extent:** Local (2)<br>**Duration:** Medium term (2)<br>**Intensity:** High (3)<br>**Probability:** Possible (2)<br>**Significance:** Medium (9) | ➢ Ensure that service routes are draining and authorisation for use to be obtained from relevant authorities. Minimise activity on sensitive portions of the riverine, if it happens, the ECO | **Extent:** Local (2)<br>**Duration:** Medium term (2)<br>**Intensity:** Low (1)<br>**Probability:** Possible (2)<br>**Significance:** Medium (7) |

| Project Development Phase | Potential Impact and/or Aspect | Significance rating of Impact before Mitigation | Mitigation | Significance rating after mitigation |
|---|---|---|---|---|
| | accelerate erosion and siltation of the riverbed;<br>➢ Waste management from service crew can choke the riverine water systems as well attracting scavenging animals like birds, rats and dogs to the campsites as well as to the waterway itself;<br>➢ Increased possibilities of having uncontrolled sprouting of invasive plant species. | | should assist on how best to rehabilitate the affected areas;<br>➢ Ensure that service routes and existing operational route are having silt trapping mechanisms on their sides;<br>➢ Clean-up the area where servicing would have taken place to ensure that no waste is left even litter; and<br>➢ Frequently monitor the water quality from the pipeline catchment on a | |

| Project Development Phase | Potential Impact and/or Aspect | Significance rating of Impact before Mitigation | Mitigation | Significance rating after mitigation |
|---|---|---|---|---|
| | | | seasonal basis and ensure that the riverine buffer zone is maintained. | |

## 7.4. Ecological Management Plan

The Sebokeng Waste water pipeline construction and operation if properly managed will have almost insignificant impacts to the existing ecosystem especially during operation. In most cases, ecological management plans are designed for once off projects and with the existence of a stream, within the project catchments, it would be advisable to develop an ecological monitoring schedule and/or system to frequently check and advice on the condition of the ecologically sensitive parts within the peripheries of the project for instance water quality of the water-way and drainage system. The area requires development of an active ecological buffer zone which should be managed with an active invasive species eradication, monitoring and management plan. This ecological management guideline will assist in setting up a proper management system for the project. As highlighted above, a couple of issues require addressing for instance, waste management issues, handling of hydrocarbons, management of organic waste leaks from the operating pipeline, storm-water management systems, invasive species management etc. Use of mechanical and biological removal of invasive species will be recommended but monitoring of the later (biological) should be ensured as this might result in abnormal population skewing of certain animal species within an ecosystem. The area's rehabilitation plan is discussed properly in the subsection that follows.

## 7.5. Rehabilitation Plan

As for rehabilitation, this activity should not wait until operational stage for the sewer pipeline project but should continue as a concurrent activity from construction stage right through to operation. This stage is mainly meant to ensure that as the construction process will be taking place, there will be minimum impacts on the environment till the operation stage. After each stage of construction, the affected area should therefore be cleared of rubble and if heavily compacted, it must be ripped and a seed-mix is broadcast on top to allow regeneration (secondary succession).

The area should also drain to minimise stagnation of water during construction as well as operation. The above sensitivity map will assist significantly when trying to identify the zones which should not be impacted by both construction and operational activities.

In real terms, all affected areas within project development site should be rehabilitated to suit the original state before development thus to blend the new environment with the old and surrounding environs. The project budget under most cases includes the rehabilitation planning and costs. This report defines rehabilitation as the reinstatement of the temporarily disturbed areas affected by project development and in this case "construction or construction related activities" to a state that resemble the conditions prior to the disturbances. The ECO will also

assist in identifying other areas that might require rehabilitation and include them during the process so as to ensure that all the footprints (external) caused by the project are addressed. These additional points will definitely affect budget and should be expected, therefore when planning for every development, the rehabilitation related costs should be flexible.

It is highly recommended that rehabilitation around the construction footprint takes place immediately after disturbances in order to limit detrimental effects resulting from for example, rainfall events after removal or clearing of the existing material especially storm-water drainage towards the existing stream and/or road drainage systems, that's where this rehabilitation plan will assist to a greater extent. They are supposed to blend well with the existing ecological buffer of the area as proposed in the above chapters or sub-sections. It is therefore imperative that rehabilitation of disturbed areas takes places after each construction phase. This will minimise costs and time at the end.

The final stage of rehabilitation requires that local and/or indigenous plant species be planted to enable the area to naturally recover (natural succession) as well as blending with the already existing natural vegetation for the area. Sloping areas will be terraced or benched and top-soil covered (at least 30cm) to assist in encouraging natural growth of plants, a local agricultural expert will be consulted to assist in the determination of what plant species seed-mix should be applied. Proper care and maintenance should therefore be done with independent supervision from the ECO. Monitoring of the rehabilitation process from each phase should be emphasised and the ECO should assist with the blending mechanisms as promulgated in this report. The following table below lists the rehabilitation measures that should be undertaken when monitoring post-construction with corrective actions. Please note that each impact is followed by the corrective measure which in this instance is the rehabilitation and the time frames will act as a guide, which can be altered depending on the on-site activities.

Table 15: Impact Related Rehabilitation Plan Table for the Sebokeng Sewer Pipeline

| Impact | Rehabilitation Measures | Time Frame |
|---|---|---|
| ***Compacted Surfaces (batching areas, pipeline backfilled trench areas, stockpile areas)*** | ➢ Clear the affected area of waste materials (debris, litter etc), please note that the material should be disposed of properly, put top soil that would have been cleared at the beginning;<br>➢ The top soil filled area should be ripped in a way to allow plant regeneration, an indigenous seed-mix should be broadcast on top of the ripped top soil;<br>➢ Do not permit vehicular or pedestrian access into natural areas or into seasonally wet areas during and immediately after rainy periods, until such a time that the soil has dried out (DAWF, 2005); and<br>➢ All cement contaminated soil should be removed from site for safe disposal so as to minimise the panning of the affected soil. | ➢ Immediately after backfilling of trenches; and<br>➢ As and when monitoring indicates degradation of the footprint area for the sewer pipeline. |
| ***Accelerated Erosion and Slope attenuation on construction site and service routes*** | ➢ Minimise uncontrolled slope attenuation and heavy erosion by construction of storm-water control berms, gabion rock blocks as velocity dissipaters and installing culverts to spread the flowing surface run-off especially on the service road route-sides. | ➢ Seasonally and as soon as signs of erosion are noticeable from the area |
| ***Pollutants release during service and*** | ➢ In case of emergencies or unforeseen events, the problem must be remediated immediately and any spillage into any watercourse be | ➢ Immediately after a construction phase; |

| Impact | Rehabilitation Measures | Time Frame |
|---|---|---|
| ***construction:*** (*construction activity can expose hydrocarbons to the watercourse area and vegetation through machinery leaks, biogeochemical reactions of bedrock resulting in disturbed sensitive environs)* | reported to the Department of Water Affairs. In addition, the soil must be stabilised (import additional topsoil if necessary) and re-vegetate as soon as possible. Re-vegetation should include seeds from the adjacent grassland and any rescued protected plants and/or plants of conservation concern that might have been impacted upon by the emergency / unforeseen event; and<br>➢ Remove all project-related material / support equipment immediately on completion of any of the construction phases. Drip trays and spill kits to be part of the soil contamination amelioration and should be on site all the time. | ➢ Anytime during operational phase of the project, especially when maintenance activities might have resulted in pollution. |
| ***Invasive and alien species spreading:*** | ➢ Appoint a specialist in invasive species control, eradication, management and monitoring and identified invasive species should be removed prior to construction related soil disturbances. This will prevent seed spreading into disturbed soils or to downstream areas;<br>➢ Mechanical removal is the most preferred control mechanism using machinery depending on how congested the area is and this should be a continuous programme, biological eradication mechanisms will also | ➢ Immediately after vegetation clearing, project commissioning and during progression of the project; and<br>➢ Should be an on-going process. |

| Impact | Rehabilitation Measures | Time Frame |
|---|---|---|
| | work but this require an ecological specialist for population blooming management; and<br>➢ A register of the methods used, dates undertaken, as well as herbicides (if used) and dosage used must be kept and available on site. The register must also include incidents of poisoning or spillage. | |

# 8. CONCLUSIONS AND RECOMMENDATIONS

Momentary disparities to the richness and distribution of faunal and floral species may befall during the construction phase but should be insignificant with many species re-occupying the area when construction activities have ceased especially during natural succession. Rehabilitation and mitigation measures should be, as far as possible be done concurrently throughout the duration of the project (project lifecycle), thus resulting in minimal effort to apply final rehabilitation approaches. Any monitoring programs as suggested in the EIA/EMPr must be adhered to, both during the construction and operational stages. The following are the recommendations from the ecological perspective;

- A buffer zone should also be created to allow ecological rejuvenation naturally in cases of pipe leakages etc. Poor or no maintenance of the pipeline can significantly affect the ecological buffer zones along the sides of the pipeline as well as the pipeline catchment system. Therefore, it is advisable to allow a 30m buffer zone especially around the waterway edges and monitor the water quality for organic pollutants (surface and ground water reserves) in accordance with National Water Act of 1998;
- The same buffering technique can also be implemented along the pipeline so as to monitor the possible impacts of the pipeline footprint to the catchment. It will also be easy to observe changes;
- A Water Use Licence is recommended for the pipeline waterway floodline passing, this will be done with the Department of Water and Sanitation (DWS);
- From the ecological perspective, the proposal is to proceed with construction and operation of the project but highlighted impact monitoring schedule, from the Environmental Management Plan/or programme (EMPr) should be followed extensively. The ecological management and rehabilitation from this report should however be followed as well to assist in the sustainable project development for the area of concern;
- An invasive species monitoring plan should prepared to assist in the control of such species;
- The construction personnel and community should refrain from dumping waste including allowing litter to fly and land onto the road and its buffer area; and
- A qualified and competitive Environmental Control Officer (ECO) should be employed to assist in ensuring that all is done in accordance with the conditions set in the Environmental Authorisation and approved WUL during construction and operation.

# 9. REFERENCES


- DEAT (2009) Guideline Regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans (Government Gazette No.32006, 16 March 2009);
- DEAT (2008) The National Protected Area Expansion Strategy 2008-2012: A framework for Implementation. South African National Biodiversity Institute, National Department of Environmental Affairs and Tourism;
- Ball, I.R., H.P. Possingham, and M. Watts. 2009. Marxan and relatives: Software for spatial conservation prioritisation. Chapter 14: Pages 185-195 in Spatial conservation prioritisation;
- https://www.invasives.org.za/legislation/item/250-sugar-gum-eucalyptus-cladocalyx;
- Kleynhans, C.J. (1999): A procedure for the determination of the determination of the ecological reserve for the purpose of the national water balance model for South African Rivers. Institute for Water Quality Studies Department of Water Affairs and Forestry, Pretoria;
- Aves identification book by Harrison et al (1997a & b);
- Mamalian Identification book by Stuart & Stuart (1993);
- Amphibian identification book, Caruthes 2001;
- Cowden C, and Kotze D (2009) WET-Rehab Evaluate: Guidelines for monitoring and evaluating wetland rehabilitation projects. WRC Report No.TT 342/09;
- Driver, A., Sink, K.J., Nell, J.L., Holness, S., van Niekerk, L., Daniels, F. Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. (2012) National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. SANBI & DEA, Pretoria;
- Department of Water Affairs and Forestry, (2005): Environmental Best Practice Specifications: Construction for Construction Sites, Infrastructure Upgrades and Maintenance Works. Version 3;
- Mucina L. & Rutherford, M.C. (Eds) (2006). The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria; and
- GDARD guidelines for specialist assessments.

# 10. APPENDIX: SHORT CV OF THE AUTHOR

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**PROFILE OF WITNESS DUBE**

## OVERVIEW

**Career Objective:**
A mature professional man who is an extremely enthusiastic Environmental Scientist with exceptional skills in environmental management, water resource management, monitoring for compliance, ecological and wetland specialist assessment professional as well as quality management to sectors inclusive of the mining, construction, municipal, natural resources management, provincial governance right through to consultancy at regional and national level.

**Key Skills and Qualifications:**

- Excellent analytical skills and communication skills for environmental reporting, report writing as well as incident investigation;
- Regulatory compliance monitoring skills and environmental risk assessment to construction projects as well as mining;
- Have facilitation and training skills in development of strategy, planning and assessment of project impact;
- Strategic planning in resources optimisation, loss prevention, quality evaluation and/or auditing;
- Up to date knowledge on how to implement the integrated Environmental Management Systems (EMS) as well as for Integrated Water Resources Management (IWRM);
- Hands on experience in basic assessments, environmental impact assessment, ecological impact and biodiversity assessment using local and international guidelines;
- Excellent mining catchment environmental and water use licence application, auditing and monitoring for compliance, land restoration and rehabilitation.
- Registered scientist (SACNASP) who operates within statutory regulations in executing the natural scientist duties; and
- Working knowledge of local legislation and application to operational activities, thus National Environmental Management Act (NEMA), Water Act of 1998, Waste Management Act, MPRDA.

## ACQUIRED SKILLS / ABILITIES

- Strategic Planning;
- Quality Evaluation on process activities and final product;
- Environmental monitoring for compliance;
- Waste Management (solid and liquid);
- Environmental Risk Assessment
- Report Writing
- Project Management
- Computer Literate

## EDUCATION DETAILS

| | | | |
|---|---|---|---|
| **Highest Grade** | Advanced Level (Metric Equivalent) | **Institution** | St Faith's High-Zimbabwe |
| **Year Passed** | 1996 | | |

| | | | |
|---|---|---|---|
| **Qualification** | Bachelor of science Honours degree in Environmental Science and Health | **Institution** | National University of Science and Technology, (NUST), |
| **Year Passed** | 2005 | | |
| **Qualification** | Water and air pollution management certificate | **Institution** | Standards Association of Zimbabwe. |
| **Year Passed** | 2005 | | |
| **Qualification** | NQF 6-Total Quality Management | **Institution** | University of South Africa (UNISA) |
| **Year Passed** | 2015 | | |

## ADDITIONAL COURSES / CERTIFICATES

- Registered with SACNASP
- Affiliate member of the International Association of Impact Assessment (IAIAsa)
- Excellent passes in Advanced Level Sciences
- Certificate in Water Quality Monitoring: CEM-NWU

## COMPUTER LITERACY

- Ms Word
- Ms Excel
- Ms Power Point
- Email
- Computerised environmental science and health management.

**CAREER DETAILS**

| Name of Employer | **Vierfontein Colliery (Pty) Ltd** |
|---|---|
| **Designation / Title** | **Environmental Officer** |
| **Period of Employment** | **2018– Current** |

- Pollution Monitoring, Control and Management around the mine Catchment;
- Environmental monitoring for compliance with regulatory standards as well as in accordance with Environmental Authorization (EA) conditions from the Department of Environmental Affairs (DEA), Department of Water and Sanitation (DWS) and Department of Mineral Resources (DMR);
- Compiling the Mine Environmental Performance Assessment, environmental liability and financial provisions for submission to regulatory authorities;
- Direct involvement in internal Water Use Licence (WUL) auditing and Environmental Inspection of the natural resources within the mine catchment;
- Water resources management through sampling, quality monitoring as well as assessment using the DWS guidelines as well as the conditions stipulated in the WUL;
- Mine Solid and liquid waste management using approved waste management techniques from EMPR and statutory guidelines;
- Developing mine environmental risk assessments, rehabilitation plans and closure plans for the mine; and
- Active involvement in the mining project management, administration and reporting.

| Name of Employer | **Kimopax (Pty) Ltd** |
|---|---|
| **Designation / Title** | **Senior Environmental Scientist** |
| **Period of Employment** | **2014 – 2018** |

- Assisting coal mining companies in the development of Integrated Waste Water Management Plan (IWWMP) for the application of water use licences as well as updating them;
- Compiling and reviewing EMPRs, IWULA and practical involvement in the wetland and ecological assessment of proposed project areas;
- Direct involvement in environmental control officer duties to the Transnet Leeufontein and Bosmanskop sub-stations construction in Mpumalanga;
- Environmental auditing to monitor compliance with EMPr and related regulations for the coal mines as well as Transnet capital projects;
- Pollution control and management at mining companies;
- Environmental monitoring for compliance with regulatory standards as well as in accordance with Environmental Authorization (EA) conditions from the DEA and DMR;
- Compiling mines environmental performance assessment, environmental liability and financial provisions for submission to DMR;
- Compilation and involvement in the application for water use licence with DWS as well as active involvement in mine water use licence external and internal auditing;
- Water resources management through sampling, quality monitoring as well as

assessment using the DWS guidelines as well as the conditions stipulated in the WUL;
- Developing mine environmental risk assessments, rehabilitation plans and closure plans for the coal mines within Mpumalanga province;
- Active involvement in the Basic assessment studies reports, Scoping and Environmental Impact Assessments for mining, municipal and tourism industries;
- Active involvement in project management, administration, reporting and development of Environmental management Programme (EMPr), and
- Active representation to mines environmental and water related official audits.

| Name of Employer | **Dumicol Consulting** |
|---|---|
| **Designation / Title** | **Environmental Consultant** |
| **Period of Employment** | **2010 – 2014** |

- Conducting baseline ecological and biodiversity assessment for a number of projects ranging from mining, water and tourism.
- Assisting mines in the development of effective and working guidelines for their SHEQ as well as initiating the implementation.
- In depth involvement in wetland vegetation, hydrological assessment and delineation for development projects in the national parks, game reserves municipal catchments
- Mining environment catchment pollution assessment, analysis and control including waste management techniques, treatment and environmentally friendly disposal mechanisms.
- Environmental inspection, monitoring and auditing for compliance with appropriate legislative requirements of construction sites of well-known companies.
- Basic Assessment Report Compilation, Environmental Impact Assessment and Environmental Management Plans and report analysis.
- Identification of mining impacts on the catchment's environs and ensuring sustainable utilization of natural resources within the catchment.
- Designing site specific and user-friendly disaster management plans for specific operations.
- Mine air quality management and ventilation audits for compliance with specific regulations.
- Developing and updating natural resources inventory for bio-geophysical mapping using GIS
- Contaminated natural resources sampling, assessment, analysis and designing of rehabilitation strategies.
- Assisting the mining giants in the developing a working mine closure plan and program as well as updating the existing ones.
- Designing and implementation of Environmental Management Systems (EMS) in accordance with local and international standards.

| Name of Employer | **Sanparks –Kruger National Park** |
|---|---|
| **Designation / Title** | **Environmental Control Officer** |

| Period of Employment | 2007 – 2009 |
|---|---|

- Site inspection and monitoring for compliance with relevant statutory instruments as well as Environmental Authorisation conditions from DEA on all construction projects for the Park;
- Practical involvement in accident investigation, risk assessment and training of the contractors' representatives on environmental management, rehabilitation of affected areas;
- Active involvement in developing site-specific environmental risk assessment, rehabilitation and management plan for active projects;
- Technical advisory strategist for environmental policy making;
- Direct involvement in monthly environmental audit using the park's environmental management plan as well as making follow-ups on non-conforming issues;
- Ecological assessment of Kruger wetlands and river catchments to ensure there is controlled natural disturbance;
- Scientific research on grass and vascular plant species natural regeneration in the middle section of the park where degradation is rampant;
- Ensuring that activities on construction sites comply with legislation of relevance to the environment as well as the Park's by laws;
- Involvement in the design, facilitation and implementation of the park's environmental management system using principles of the ISO 14001; and
- Involvement in the environmental education and awareness of social projects designed to link the community conservation principles with the national policies.