ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE CONSTRUCTION AND OPERATION OF A PROPOSED BULK WATER SUPPLY PIPELINE, SALVOKOP,CITY OF TSHWANE METROPOLITAN MUNICIPALITY GAUTENG PROVINCE

SUBMITTED TO: The Department of Forestry, Fisheries and the Environment: Integrated Environmental Authorizations

Environment House 473 Steve Biko Road Arcadia 0001

# **APPLICANT:**



Public works & infrastructure Department: Public Works and Infrastructure REPUBLIC OF SOUTH AFRICA





SPOOR Environmental Services (PTY) Ltd.

t: +27 (0)12 804 1181 f: +27 (0)86 763 5635 e: info@spoorenvironmental.co.za

p: Postnet Suite 448, Private Bag X025, Lynnwood Ridge, 0040, Pretoria,

South Africa

# October 2022

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REPORT TITLE:	EMPr for the Construction and Operation of a Proposed Bulk Water Supply Pipeline, Salvokop, City of Tshwane Metropolitan Municipality
APPLICANT:	Department of Public Works and Infrastructure
CLIENT:	Government Technical Advisory Committee
ENGINEER:	CAPIC SA (PTY) Ltd.
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#### APPLICANT

APPLICANT:	Department of Public Works and Infrastructure
CONTACT PERSON:	Thabane Rachidi
POSTAL ADDRESS:	Private Bag X65, Pretoria, 0001
TELEPHONE:	012 406 1790
ENGINEER:	CAPIC SA (PTY) Ltd.
CONTACT PERSON:	Mr J Doms
POSTAL ADDRESS:	Unit 13, Berkley Office Park, 8 Bauhinia Street, Highveld Techno Park, Centurion, Gauteng

#### **ENVIRONMENTAL ASSESSMENT PRACTITIONER**

CONSULTANT:	SPOOR Environmental Services (Pty) Ltd
CONTACT PERSON:	Mr. JC van Rooyen
POSTAL ADDRESS:	Postnet Suite 448, Private Bag X025, Lynnwood Ridge, 0040
TELEPHONE:	012 804 1181
FAX:	086 763 5635
EMAIL:	jcvr@spoorenvironmental.co.za

# **DECLARATION OF INDEPENDENCE**

I, JC van Rooyen as authorised representative of SPOOR Environmental Services (PTY) Ltd. hereby confirm my independence as an Environmental Assessment Practitioner and declare that neither I nor SPOOR Environmental Services (PTY) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which SPOOR Environmental Services (PTY) Ltd. was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Proposed Construction and Operation of the Bulk Water Supply Pipeline, Salvokop, Coty of Tshwane Metropolitan Municipality.

Signed:

JC van Rooyen

Date:

2022-10-07

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# **EXECUTIVE SUMMARY**

#### Introduction

SPOOR Environmental Services (PTY) Ltd. was appointed by CAPIC SA (PTY) Ltd. on behalf of the Department of Public Works and Infrastructure as the Environmental Assessment Practitioner to manage the Environmental Management process relevant to the construction and operation of a proposed bulk water supply pipeline. The pipeline is required in terms of the routine maintenance as outlines in the Water System Master Plan for this area of the City.

#### Locality

The proposed pipeline site is situated to the Southwest of the Tshwane City Centre on the remainder of portion 406 of the Farm Pretoria Town and Townlands 351 -JR, Gauteng Province. Access to the property is gained via Koch Street which connects to the north of the site.

#### Discussion

The current 700 mm diameter steel pipe from the Salvokop reservoir is approaching the end of its design life and an agreement has been reached between the City of Tshwane Metropolitan Municipality and the Department of Public Works that the existing 700 mm dia pipeline will be decommissioned and replaced by a new 850 mm diameter steel pipeline, which will be sufficient to supply the entire Salvokop reservoir supply zone, i.e. the existing zone and the proposed Salvokop Government Precinct development.

#### **Environmental Impacts Identified**

Anticipated impacts have been identified and described because of the abovementioned processes and the pertinent impacts are summarized in the table below.

#### **Impact Summary**

Potential Impacts	Impact Significance with Mitigation		
Climate, Geology and Soils:			
<ul> <li>Possible scouring and erosion</li> </ul>	Low		
<ul> <li>Possible loss of topsoil</li> </ul>	Low		
<ul> <li>Contaminations</li> </ul>	Low		
Hydrology:			
<ul> <li>Surface water contaminations</li> </ul>	Low		
<ul> <li>Erosion and siltation</li> </ul>	Low		
<ul> <li>Water quality reduction</li> </ul>	Low		
<ul> <li>Infrastructure failure due to erosion damage</li> </ul>	Low		
Fauna and Flora			
<ul> <li>Damage to existing indigenous vegetation</li> </ul>	Low		
<ul> <li>Proliferation of alien vegetation</li> </ul>	Low		
Local Employment:			
<ul> <li>Additional local job opportunities</li> </ul>	High (positive)		
Noise			
<ul> <li>Increase of ambient environmental noise levels.</li> </ul>	Low		

#### EMPr for the Construction and Operation of a Proposed Bulk Water Supply Pipeline Salvokop, City of Tshwane Metropolitan Municipality

Potential Impacts		Impact Significance with Mitigation
*	Possible occupational noise levels	Low
Visual		
*	Negative visual impact related to vegetation removal	Low
*	Final visual outlook of the development.	Low
Air Qua	lity	
*	Potential health impacts on workers and locally sensitive receptors due to dust created by construction.	Low
Traffic S	Safety	
*	Possible impacts include unsafe traffic conditions during the	Low
	arrival and departure of large vehicles.	
Fire		
*	Potential fire hazard	Low
Heritag	e Features	
*	Direct or physical impacts, implying alteration or destruction of	Low
	heritage features within the project boundaries;	
*	Indirect impacts, e.g., restriction of access or visual intrusion	
*	Concerning the broader environment;	
Paleont	cological Features	
*	Direct or physical impacts implying alteration or destruction of	Low
**	nalaeontological resources within the project boundaries	LUW
	paracentological resources within the project boundaries	
*	Negative visual impact related to vegetation removal	LOW
**	רווומו אוגעמו טענוטטג טו נוופ עפאפוטטווופוונ.	LUW

#### **Environmental Management Programme**

Natural areas within the City environment and especially ridges serve as important refuges for urban biodiversity and also contributes significantly to the city environment in terms of socio ecological services such as stormwater management and groundwater recharge, air quality improvement and carbon sequestration. These areas also serve as important tourism areas and contributes especially by means of illuminating the intrinsic value of the natural environment to human existence. For these reasons it is of absolute importance to manage the activities and facilities in these areas in ways that will maintain and enhance the ecological vitality.

Local impacts caused because of the construction and operational phases of the proposed bulk water supply pipeline development are in general not deemed to be significant. This statement is made primarily as a result of the level of existing anthropogenic impacts as well as the low levels of existing environmental sensitivity revealed on the application site. However, the application of the interventions discussed in this document is deemed essential in terms of setting a standard for infrastructure projects in the remaining urban natural environments. Socio-Economically the proposed construction of the infrastructure will contribute to the provision of quality civil infrastructural services for the local precinct which is invaluable in its own right.

The aim of this Environmental Management Programme is to ensure that the planning, assessment, and construction phases of the pipeline development comply with the relevant environmental management

procedures. The Environmental Management Programme furthermore aims to organise and coordinate the proposed environmental management and mitigation measures and to describe these measures in order to prevent, reduce or otherwise manage the potential negative social and environmental impacts and to add to the favourable impacts.

It is believed that the identified impacts can be effectively minimised provided that the mitigation and rehabilitation measures included in section 7 & 9 of this EMPr are strictly adhered to. It is therefore very important that the relevant Managers (the Developer, GDARD, the project Engineers and construction phase & operational phase Managers) of each development stage of this project take cognisance thereof and implement it accordingly.

# DETAILS AND EXPERTISE OF SPOOR ENVIRONMENTAL SERVICES

Name:	JC van Rooyen
Company:	SPOOR Environmental Services (Pty) Ltd
Qualifications:	Pr LA Techno B.L. M.Sc. (Env Soc)
Professional Registration:	SACLAP (20187)

In accordance with Appendix 4 (1) (a) (ii) of Government Notice No. R. 982 of December 2014, this section provides an overview of SPOOR Environmental Service's experience with EMPr's. SPOOR Environmental Services (Pty) Ltd. has been in operation since 2011. The Director, Mr. JC van Rooyen, has been involved in an array of environmental consultation and planning projects in various spheres of the landscape design, development, and environmental management disciplines over the past 20 years. SPOOR Environmental Service's approach towards projects is to strive for sustainable environments that not only reflect artistic and aesthetic quality but also hold diverse ecological and cultural value. The Company can conduct environmental applications and landscape development planning and design for various projects including:

- Environmental Compliance Risk Assessments & Screening
- Scoping & Environmental Impact Assessment Reports,
- Visual Impact Assessments,
- Environmental Management Systems/ Plans,
- Environmental Management Programmes (EMPr),
- Environmental Audits & Monitoring,
- Waste Management Licence Applications,
- Air Emission Licences (AEL's),
- Water Use Licence Applications (WULA),
- Integrated Environmental Management (IEM),
- Tree Removal Permits,
- Environmental Rehabilitation,
- Conservation Planning / Eco-tourism Developments,
- Landscape Design and Development, and
- Landscape/ Environmental Project Management.

# **PROJECT TEAM**

The environmental assessment practitioner working on the project will be:

 Mr. J.C. Van Rooyen (BL., M.Sc. (Env. Soc) (SACLAP) (Principal EAP) Landscape Technologist and Environmental Assessment Practitioner

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# ABBREVIATIONS

СВА	-	Critical Biodiversity Area
CLO	-	Community Liaison Officer
СоТ	-	City of Tshwane Metropolitan Municipality
COIDA	-	Compensation for Occupational Injuries and Diseases Act (No 130 of 1993)
DFFE	-	Department of Forestry, Fisheries & the Environment
DPWI	-	Department of Public Works and Infrastructure
DWS	-	Department of Water and Sanitation
EAP	-	Environmental Assessment Practitioner
ECA	-	Environment Conservation Act
ECO	-	Independent Environmental Control Officer acting on behalf of the Client
EIA	-	Environmental Impact Assessment
ELU	-	Existing Lawful Use
EMPr	-	Environmental Management Programme
ESA	-	Ecological Support Area
EWR	-	Ecological Water Requirement
GDARD	-	Gauteng Department of Agriculture & Rural Development
GTAG	-	Government Technical Centre Advisory
H&S Rep	-	Health and Safety Representative
IEM	-	Integrated Environmental Management
IDP	-	Integrated Development Plan
I&AP	-	Interested and Affected Parties
LLM	-	Lephalale Local Municipality
MAMSL	-	Metres Above Mean Sea Level
NEMA	-	National Environmental Management Act
NEMBA	-	National Environmental Management Biodiversity Act
NEMWA	-	National Environmental Management Waste Act
NFEPA	-	National Freshwater Ecosystems Priority Areas
NHRA	-	National Heritage Resources Act (Act 25 of 1999)
NWA	-	National Water Act (Act 36 of 1998)
OHS	-	Occupational Health and Safety
OHS Act	-	Occupational Health and Safety Act (No 85 of 1993)
PC	-	Principal Contractor
PHRA	-	Provincial Heritage Resources Authority
PM	-	Project Manager
PPE	-	Personal Protective Equipment
QDR	-	Quaternary Drainage Region
QDSG	-	Quarter Degree Square Grid
SABS	-	South African Bureau of Standards
SAHRA -	-	South African Heritage Resources Agency
SANS	-	South African National Standards
SDF	-	Spatial Development Framework
SHE	-	Safety, Health, and Environment
SME	-	Small and Medium Enterprise
SSC	-	Species of Special Concern
WULA	-	Water Use Licence Application

# 1. INTRODUCTION

SPOOR Environmental Services (PTY) Ltd. was appointed by CAPIC SA (PTY) Ltd. on behalf of the Department of Public Works and Infrastructure (DPWI) as the Environmental Assessment Practitioner (EAP) to manage the Environmental Management process relevant to the construction and operation of a proposed bulk water supply pipeline. The pipeline is required in terms of the routine maintenance as outlined in the Water System Master Plan for this area (Salvokop) of the City of Tshwane Metropolitan Municipality (CoT).

# 2. EMPR OBJECTIVES

The aim of the EMPr is to ensure that the design, planning, construction, and operational phases of the pipeline development comply with the relevant environmental legislation, regulations, and guidelines. The EMPr furthermore aims to organise and coordinate the proposed environmental management and mitigation measures and to describe these measures to prevent, reduce or otherwise manage the potential negative social and environmental impacts associated with the pipeline construction and operation and to add to the favourable impacts of the project. In brief, the EMPr therefore aims to ensure that:

- activities arising because of the design, planning and construction on the site of the development is managed in a way that reduces or avoids negative social and environmental impacts and to enhance its positive effects;
- impacted environments are restored per the recommendations of the EMPr;
- ensuring that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts;
- efficient information sharing is maintained, and a clear understanding exists of all the responsibilities of all the relevant stakeholders;
- the necessary precautions are taken against damages and claims that occur because of the implementation of the development in a timeous fashion;
- accurate records are kept of the progress of the development during its various stages as well as of the ongoing monitoring of all its associated social and environmental impacts;
- stakeholders respond to unforeseen events;
- feedback is provided for continual improvement in environmental performance; and
- timeous completion occurs of all the implementation activities on account of generally sound management.

# **3. PROJECT DESCRIPTION**

#### 3.1 Project Overview

The current 700 mm diameter steel pipe from the Salvokop reservoir is approaching the end of its design life and an agreement has been reached between the City of Tshwane Metropolitan Municipality and the Department of Public Works that the existing 700 mm dia pipeline will be decommissioned and replaced by a new 850 mm diameter steel pipeline, which will be sufficient to supply the entire Salvokop reservoir supply zone, i.e. the existing zone and the proposed Salvokop Government Precinct development. The proposed infrastructure includes;

- ± 365m bulk water pipeline of which ±250m falls outside of the existing servitude;
- Pipeline made of 8mm thick continuous welded steel pipe;
- Pipeline buried a minimum of 2m deep and placed on a 150mm sand bedding layer;
- Minimum cover of 1m over pipeline;
- ± 2m wide excavation in a 10m servitude;
- Associated pipeline infrastructure.

#### 3.2 Construction Phase Activities:

- Site Camp establishment including site offices, materials, and equipment storerooms, material laydown areas, construction vehicle parking, sanitary facilities, and the fencing off, of the construction camp etc.;
- Site preparations for the start of construction including setting out of the construction areas by the land surveyor; traffic abatement and other statutory arrangements etc.

#### 3.3 Construction Phase Facilities:

- Security fence around the construction camp;
- Site offices;
- Construction materials storerooms and laydown areas;
- Construction vehicle parking;
- Chemical Toilets;
- Waste collection area.

#### 3.4 Operational Phase:

See Section 3.1

#### 3.5 Locality

The proposed pipeline site is situated to the Southwest of the Tshwane City Centre on the remainder of portion 406 of the Farm Pretoria Town and Townlands 351 -JR, Gauteng Province. Access to the property is gained via Koch Street which connects to the north of the site. See Figure 1.



Figure 1: Locality

# 4. **RECEIVING ENVIRONMENT**

#### 4.1 Bio-Physical Environment

The proposed project site is situated at an average altitude of 1 400 m above mean sea level on the northern border of the Highveld region of the Gauteng Province. The area receives between 400 and 800 mm of rain per annum predominantly during the summer months. Mean monthly temperatures vary from 0 - 2°C in winter (July) to 28-35.5°C during the summer (January). The winters produce typical cold spells with frequent frost, especially in the low-lying areas. Wind direction is mainly from the northwest.

Topographically, the project area lies on a north facing ridge inclusive of a set of prominent hills containing the Langeberge, Weskop, Skanskop and Kwaggasrant hills. The greater area flattens out towards the north until it reached the southern reached of the Magaliesberg ridge system. The geological map (sheet 2528) describes the area as being underlain by shales and quartzites with conglomerates in places reminiscent of the Timeball Hill formation of the Pretoria group of the Transvaal supergroup. This formation which gives rise to shallow red, yellow and /or greyish soils. Significant cutting and filling have also taken place over the years to shape the landscape for the existing reservoirs, pipeline infrastructure and the Freedom Park facilities.



Figure 2: Typical Slope Over the Project Area (Google Corporation, 2022)

In terms of drainage, the area drains to the north to northeast via sheet flow towards the Apies River system. The Apies River eventually drains to the Crocodile and the Limpopo Rivers. The site area falls within the A23D quaternary drainage region (QDR) of the Crocodile-West and Marico Water Management Area (WMA). There are no hydrological features on site.

From a biodiversity point of view, the site is situated within the Sour Mixed Bushveld veld type according to Acocks (1988), and Mixed Bushveld according to Low & Rebelo (1998). Regionally, Mucina & Rutherford (2006)

describes the vegetation unit on the site as the Gauteng Mountain Bushveld unit (SVcb 10). This vegetation unit is found at an altitude of 850-1450m. The Gauteng Mountain Bushveld unit is rated as vulnerable with 79% of the vegetation unit remaining but only in the order of 2.5% formally protected. (Mucina & Rutherford, 2006). The area has been urbanised for some time though and no natural area will be further impacted.

A specialist field survey was conducted in early May 2022 which confirmed that he majority of the project area was significantly impacted by dense Invasive Alien Plant (IAP) growth and the related edge effects from nearby current and historical development activities. No portions of the project area were found to be representative of intact Gauteng Shale Mountain Bushveld vegetation nor CBA area No protected trees or species of special concern (SCC) f were observed; however, it is suspected that these species may occur in certain sections of the less disturbed north and south - eastern portions of the ridge property. (TBC, 2022)

In terms of the local fauna the specialist reported that the presence of mature indigenous trees occurring throughout the area provides ample forage and nesting opportunities for local avifauna (birds), although the degraded state of the herbaceous layer limits this. Several common species were recorded during the field survey, including the Southern Boubou), Tawny-flanked Prinia and the Speckled Mousebird. Mammal and herpetofauna activity were low, despite the extensive rocky ridge microhabitat present. Common Duiker scat was recorded, and common small mammal and reptile species are expected to frequent the ridge. No SCC fauna were recorded, and none are expected to occur within the project area.

#### 4.2 Socio Economic Environment

#### 4.2.1 City of Tshwane Metropolitan Municipality

City of Tshwane Metro Municipality is the largest Metro in the Gauteng Province and is bordered by the Northwest, Limpopo, and Mpumalanga Provinces to the northwest, north, and east respectively. The City of Johannesburg and Ekurhuleni Metro's forms the southern boundaries. The municipality covers an area of approximately 6 368 km<sup>2</sup> and has a population size of 13.2 million people. The Municipality is predominately urban in nature and its main economic sectors include public services, retail, business services, industrial and agriculture to a lesser degree. (http://www.tshwane.gov.za)

The City of Tshwane adopted its Integrated Development Plan (IDP) in 2019 which maps out the delivery agenda of the current term of office of the City for the period 2019/20. As part of the process of seven (7) service delivery regions were established, and the City embarked on a process to develop Regional Spatial Development Plans (RSDPs) which will complement the City-wide IDP. These plans are taking their guidance from the City's IDP but will relate it in more detail at regional level. The proposed bulk water pipeline development that is part of this study is in planning region 3 and ward 80 of the CoT in terms of the (CoT, RSDP, 2019/2).

Region 3 is in the southeast of the city. The region is the host of several national government departments and forms the administrative heart of government. The CBD is the largest job opportunity zone in the CoT. Two of the three Gautrain stations are located within this region, i.e., Hatfield and Pretoria Stations. The region is also the focal point of Tshwane's 'knowledge economy' as it incorporates the bulk of tertiary and research institutions, relative to other regions. (CoT, MSDF, 2012).

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Figure 3: Site Ecological Sensitivity

From a service infrastructure point of view the area is generally well provided for. Rapid development is expanding towards the provincial urban edge. Nonetheless, future development may be subjected to future bulk infrastructure limitations. Unfortunately, further challenges exist in the fact that the CBD has lost its status as the focal point of commercial and office related activity within the metropolitan area. This is largely due to the development of several high order decentralised nodes. This has partially led to a gradual process of urban decay within the CBD and surrounding areas. The demographics, income status and quality of the built environment vary greatly, with the more affluent areas being located east of the CBD and the less affluent areas being located west of the CBD. (CoT, MSDF, 2012).

The proposed pipeline development is deemed positive as it would provide in the bulk water infrastructure requirements aligning the land use with the required zoning in terms of the revised Tshwane Town Planning Scheme of 2014. This will allow the development of the properties to the north to its potential.

# 5. LEGISLATIVE FRAMEWORK

The following section includes the primary list of legislation which is deemed relevant to the development on all levels of government, including the constitutional, national, provincial, and local level. Although the aim was to be as comprehensive as possible the list does not represent a complete legal review as this fall beyond the scope of this project application. The responsibility remains with the Applicant to ensure compliance with the required relevant legislation.

#### 5.1 The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)

The Constitution of the Republic of South Africa is the principal legal source of the Republics' legislative framework, including its environmental law. The Bill of Rights is fundamental to the Constitution of South Africa and in, section 24 of the Act, it is stated that:

Everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Given that environmental management is founded partly on the principles of public participation, Section 195 of the Constitution is of primary relevance. This section states that:

(1) Public administration must be governed by the democratic values and principles enshrined in the constitution, including the following principles: (a) (b) (c) (d) (e) People's needs must be responded to, and the public must be encouraged to participate in policy making. (f) Public administration must be accountable. (g) Transparency must be fostered by providing the public with timely, accessible, and accurate information (Government Gazette, 1996).

#### 5.2 Environment Conservation Act, 1989 (ECA) (Act 73 of 1989)

The primary objective of the ECA is to provide for the effective protection and control of the environment. Subsequent to the promulgation of the Act in 1989, a number of key regulations governing EIA's and identified activities that may be detrimental to the environment have also been promulgated. Section 8 of the Regulations regarding activities identified under section 21(1) of the Environmental Conservation Act (73 of 1989) – General EIA Regulations states that:

After a plan of study for the environmental impact assessment has been accepted, the applicant must submit an environmental impact report to the relevant authority, which must contain; (a) A description of each alternative including particulars on (i) The extent and significance of each identified environmental impact; and (ii) The possibility for mitigation of each identified impact. (b) A comparative assessment of all the alternatives; and (c) Appendices containing descriptions of (i) The environment concerned; (ii) The activities to be undertaken; (iii) The public participation process followed, including a list of interested parties and their comments; (iv) Any media coverage given to the proposed activity; and (v) Any other information included in the accepted plan of study.

### 5.3 National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)

The purpose of the Environmental Impact Assessment Amendment Regulations of 2014 (amended by GN 517 w.e.f. 11 June 2021) is to:

"The purpose of these Regulations is to regulate the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to environmental impact assessment, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto."

The Act provides for the right to an environment that is not harmful to the health and well-being of South African citizens; the equitable distribution of natural resources, sustainable development, environmental protection, and the formulation of environmental management frameworks (Government Gazette, 1998).

#### 5.3.1 Listed Activities Applicable to the Proposed Salvokop Bulk Water Supply Pipeline

The table below provides a summary of the listed activities specified in the EIA Regulations of June 2014 (amended in 2021) and which is applicable to the proposed development.

SPOOR Environmental Services Environmental Services has subsequently been appointed by the Applicant, as the independent Environmental Assessment Practitioner (EAP) to undertake this Environmental Impact Assessment process and to ensure compliance with all the relevant Environmental Legislation, Regulations and Guidelines.

Table 1: Li	sted Activities	in terms of the	June 2014	NFMA FIA F	Regulations
TADIC I. LI	SICU ACTIVITICS	in terms of the	June 2014		Couldtions

Listed Activity in terms of the relevant Basic Assessment Activity(ies) as set out in Listing Notice 3 of the EIA Regulations, 2014 as amended and published in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998)	Describe the portion of the proposed project to which the applicable listed activity relates.
Listing Notice 3: Activity No. 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. c. Gauteng ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans;	A registered servitude exists for the proposed pipeline, but the existing pipeline cannot be decommissioned while the new pipeline is installed. In addition, there is also tourism infrastructure on top of the existing servitude which necessitated an alternative route Approximately 4200m <sup>2</sup> (280m x 10-15m wide= 4200m <sup>2</sup> ) of the pipeline will need to be constructed on a new alignment. The proposed new alignment is included in CBA and ESA areas which necessitates the Application.

#### 5.4 National Environmental Management: Biodiversity Act, 2004 (NEM:BA) (Act 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed. In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations),
- Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity,

Limit further loss of biodiversity and conserve endangered ecosystems.

#### 5.5 National Environmental Management: Air Quality Act, 2004 (NEM: AQA) (Act 39 of 2004)

In regulating air quality in South Africa, The NEM: AQA was introduced to protect the environment by introducing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development whilst promoting justifiable economic and social development. In addition, the act aims to provide national norms and standards for regulating air quality monitoring as well as air quality management and control. The list of activities included in General Notice 248 must be considered for any activities that produces emissions. The following passages of the act bare relevance;

Section 22: No person may without a provisional atmospheric emissions licence conduct an activity;

- (a) listed on the national list anywhere in the Republic; or
- (b) listed on the list applicable in a province anywhere in the province.

#### 5.6 National Environmental Management: Waste Act, 2008 (Act 59 of 2008)

Act no 59 of 2008 provides for the control of waste management activities which have or is likely to have a detrimental effect on the environment. The act aims to;

- Reform the law regulating waste management in order to protect health and the environment by providing reasonable measures to prevent pollution and ecological degradation and for securing ecologically sustainable development,
- To provide for institutional arrangements and planning matters,
- To provide for national norms and standards for regulating the management of waste by all spheres of government,
- To provide for specific waste management measures,
- To provide for the licencing and control of waste management activities,
- To provide for the remediation of contaminated land,
- To provide for a national waste information system,
- To provide for compliance and enforcement, and
- to provide for all matters related to the above aspect.

Importantly the act furthermore includes requirements that stipulate that no person may commence, undertake, or conduct a waste management activity listed in the act unless a licence is issued in respect of that activity.

The proposed activity will not constitute the storage, treating, or processing of any waste. Waste will be disposed of as per **section 2.3.1** above.

#### 5.7 Hazardous Substances Act (Act No. 15 of 1973)

The Hazardous Substances Act (15 of 1973) is regulated by the Department of Health. The Act and its regulations regulate the transportation of defined hazardous

#### 5.8 National Heritage Resources Act, 1999 (NHRA) (Act 25 of 1999)

Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study be undertaken for:

- (a) construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- (b) construction of a bridge or similar structure exceeding 50 m in length; and

(c) any development, or other activity which will change the character of an area of land, or water –

(1) exceeding 10 000 m<sup>2</sup> in extent;

(2) involving three or more existing erven or subdivisions thereof; or

(3) involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or

(d) the costs of which will exceed a sum set in terms of regulations; or

(e) any other category of development provided for in regulations.

# A Phase 1 Cultural Heritage Impact Assessment and a Desktop Study (Phase 1) Paleontological Impact Assessment were completed and submitted on SAHRIS for comment from the Provincial Heritage Resources Authority of Gauteng (PHRA-G).

#### 5.9 Municipal Systems Act, 2000 (Act 32 of 2000)

The Municipal Systems Act form part of a string of other legislation which aims at empowering local government to fulfil its constitutional obligations. As part of this objective the SA government published the Local Government White Paper in 1998, which outline the policy framework for local government structures. In addition, government furthermore published the Municipal Demarcation Act, 1998 (Act 27 of 1998) which allowed for the demarcation of new municipal boundaries, the Municipal Structures Act, 2000 (Act 33 of 2000) which outlines the required structures of a local authority and the Municipal Financial Management Act, 2003 (Act 56 of 2003) which must secure sound and sustainable management of the fiscal and financial affairs of municipalities and municipal entities by establishing norms and standards and other requirements for the lawful financial management of these entities.

The Municipal Systems Act work in unison with these sets of legislation by regulating key municipal organizational, planning, participatory and service delivery systems. In combination these sets of legislation provide a framework for the democratic, accountable, and developmental local government system as envisaged by the Constitution.

#### 5.10 Integrated Environmental Management

The term Integrated Environmental Management (IEM) has been used in South Africa since the 1980's. Documentation on how IEM would assist the EIA process was originally produced in 1992 by the then National Environmental Management Competent Authority. The need has since arisen for more comprehensive inputs in the EIA process, and this paved the way for the development of the Integrated Environmental Management Series in 2002 which consisted of a set of booklets providing more detailed insights in the approach and methodologies associated with EIA. In brief the IEM seeks to achieve the following;

"Integration of environmental considerations across the full lifecycle of the activity: for example, for a project this implies consideration of environmental issues through pre-feasibility, feasibility, planning and design, construction, operation and decommissioning" (DEAT 2002).

#### 5.11 Occupational Health and Safety Act, 1993 (Act 85 of 1993)

The Occupational Health and Safety Act, 1993 (Act 85 of 1993) provides for the health and safety of individuals in the workplace as well as for the health and safety of individuals working near or with of plant and machinery. The Act also protects people, other than persons at work, against hazards to health and safety due to the activities of people at work.

#### 5.12 Sustainable Development

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa (108 of 1996) and given effect by NEMA and the ECA. Section 1(29) of NEMA states that sustainable

development means the integration of social, economic, and environmental factors into the planning, implementation, and decision-making process so as to ensure that development serves present and future generations. Thus, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- That waste is avoided, or where it cannot be altogether avoided, minimised, and re-used or recycled where possible and otherwise disposed of in a responsible manner
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

#### 5.13 Regional Policies

The following Regional strategies were considered;

#### 5.13.1 Gauteng Urban Edge 2010

The study area is located inside the Gauteng Environmental Management Zone (EMZ) Zone 1 (i.e., the urban development zone), and Zone 5 is not applicable to the study area. While the EMZ refers to Zones 2, 3, and 4, the spatial datasets for these zones are not available from egis.environment.gov.za, and therefore the applicable EMZ for the study area could not be determined. The EMZ Zone 1 boundary corresponds to that of the GDARD C-Plan Urban Edge, which indicated that the study area is located inside of the Urban Edge.

In terms of the RSDF policy document, as adopted by the City of Tshwane Metropolitan Municipality, the proposed infrastructure is situated within the latest Urban Development Boundary and the essential services provided thereby can be made readily available for the proposed new developments in the area.

#### 5.13.2 Gauteng Provincial Environmental Management Framework:

The Gauteng Department of Agriculture and Rural Development (GDARD) decided to produce an Environmental Management Framework for the whole of Gauteng (GPEMF). The GPEMF replaces all other EMFs in Gauteng except for the Cradle of Humankind World Heritage Site which is incorporated within the GPEMF. The objective of the GPEMF is to guide sustainable land use management within the Gauteng Province. (GDARD, 2014). The GPEMF, inter alia, serve the following purposes:

- To provide a strategic and overall framework for environmental management in Gauteng;
- Align sustainable development initiatives with the environmental resources, developmental pressures, as well as the growth imperatives of Gauteng;
- Determine geographical areas where certain activities can be excluded from an EIA process; and
- Identify appropriate, inappropriate, and conditionally compatible activities in various Environmental Management Zones in a manner that promotes proactive decision-making.
- The pipeline site is located north of the Urban Development Zone 1 where infill, densification and concentration of development is encouraged.

#### 5.13.3 Tshwane Metropolitan Spatial Development Framework (MSDF) - Administrative Region 3

The site falls within Region 3 of the City of Johannesburg Metropolitan Municipality, Gauteng Province.

The estimated population of the region is 394 000, representing 14 percent of the population of Greater Johannesburg. It is composed of 87 percent black, 11 percent white, 1 percent Indian and 1 percent coloured people, mostly between 17 and 35 years old. The extremely low percentage (less than 5 percent) of children and the elderly highlights the transient nature of the inhabitants of Alex.

As described above, the MSA determines that a municipality must adopt a framework for integrated development in its area in the form of an IDP. A Spatial Development Framework, (SDF) which guides and informs all development in a municipality forms part of the IDP (Section 35 (2)). In addition, the Gauteng Planning and Development Act, 2003 (Act 3 of 2003) determines that municipalities must formulate spatial development frameworks for their areas (Section 31 and 32).

In terms of the above, the proposed bulk water pipeline development falls within the southern sections of Area 3 about the CoT MSDF. The development area is clearly demarcated in terms of its biodiversity category, proposed local nodes and transport corridors, proposed rural community service centres and related urban development requirements. (CoT MSDF)

#### 5.13.4 Gauteng Ridges Policy

The following was taken from the Terrestrial Biodiversity Compliance Statement undertaken by The Biodiversity Company in May 2022 (Appendix 4):

"The quartzite ridges of Gauteng are one of the most important natural assets in this northern province of South Africa. This is because these ridges, and the areas immediately surrounding them, provide habitat for a wide variety of fauna and flora, some of which are Red Listed, rare, or endemic species or, in the case of certain plant species, are found nowhere else in South Africa or around the world.

In order to give practical effect to this policy, the Gauteng Department of Agriculture and Rural Development (GDARD) has classified all ridges in Gauteng into one of four classes, based on the existing extent and percentage of area converted by urban development or disturbed by other human activities. The project area occurs on the 'Class 2' Salvokop ridge, a ridge of which more than 5%, but less than 35%, of its surface area has been converted by urban development activities (**Figure 4**).

According to The Ridges Guideline (GDARD, 2019), only low impact development activities, such as tourism facilities, which comprise of an ecological footprint of 5% or less of the property may be supported. (The ecological footprint includes all areas directly impacted on by a development activity, including all paved surfaces, landscaping, property access and service provision)."

#### 5.13.5 Tshwane Open Space Framework

The CoT has been facing the challenges of sustainable urban development for many years. In 2010, 13 municipalities within the functional area of Pretoria were amalgamated to form the City of Tshwane Metropolitan Municipality (CTMM). This has enlarged the local government's jurisdiction to one of the largest in the world covering 220 000ha. This has necessitated the CoT to develop an integrated Open Space policy framework that applies to its entire area of jurisdiction and that can address the sustainable utilisation and integration of Open Spaces within a context of rapid population growth, urban sprawl, poverty and dwindling financial resources. In order to facilitate the above, a series of open space typologies were developed that would describe a spatial conceptualisation of the open space network. (CoT TOSF, 2005).





Open Space as defined by the Tshwane Open Space Framework (TOSF), adds ecological, social, economic and place making value to any development, and the integration and appropriate response of development to Open Space must at all times be facilitated. Any development within or adjacent to the TOSF network, must be compatible to the functioning, quality, safety requirements and aesthetics of the Open Space in terms of land use, scale, spatial interaction, appearance, and landscaping. Developments must actively contribute to the protection and enhancement of the current and envisioned open space network, without harming the integrity of the open space in any way.

According to the TOSF, open space within a developed area, is referred to as an Urban Environment. This open space becomes Private Open Space, for the exclusive use of the specific community, and is owned and maintained by the representative entity of the development. The Tshwane Open Space Framework provides a holistic Framework within which the sustainable spatial development of the City can be guided and directed. The principles of the TOSF will be taken into account during construction of the proposed bulk water supply pipeline in the planning phases.

#### 5.13.6 Tshwane Integrated Environmental Management Plan

The City of Tshwane Metropolitan Municipality (CTMM) incorporates a diversity of land uses, including residential (rural and urban), agricultural, natural open spaces and industrial and commercial areas within an area of about 2 200 km<sup>2</sup>. The area is rich in natural, cultural, and historical resources but is also faced with a number of problems, such as redressing past inequity and apartheid legacies, the need for housing, pollution by industries and communities, unemployment, and poor service delivery.

The growing needs of the increasing population in Tshwane have resulted in a growing demand for development. The CTMM recognises that, although development must be economically and socially acceptable, it is imperative that the development challenges facing Tshwane be addressed in an environmentally sustainable manner.

The development of the TIEP is a further demonstration of the commitment of the people of Tshwane towards sustainable development and the protection of the environmental resources of the area.

Overarching goals, objectives and policy statements of the TIEP have been identified as:

- Environmental governance
- Spatial development planning
- Economic development
- Social development
- Environmental awareness and education
- Environmental resource management
- Environmental health management

The proposed bulk water supply pipeline will be in line with the above identified goals and the related objectives as set out in TIEP

# 6. ROLES AND RESPONSIBILITIES

In order to ensure that the prescribed mitigation, rehabilitation, and monitoring measures are effectively and efficiently implemented in all the relevant stages of the proposed development, it is important to assign certain responsibilities to the specific managers thereof. The success of the implementation of the aims of this EMPr will not only depend on whether appropriate mitigation and rehabilitation measures have been adequately identified, but also on the level of commitment of all the responsible individuals to implement the recommendations which are proposed in this document.

#### 6.1 Government Departments

As the responsibility for the protection of our natural heritage lies with the relevant Government Departments, they have the power to conduct site inspections to ensure that the development complies with all legislation, regulations, and standards. They may enforce penalties where non-compliance occurs.

#### 6.2 Developer

The party or agent who is the contractual owner of the project during the construction and operational phases and who will be responsible for the long-term maintenance of the proposed infrastructure is the Developer. In the case of the Bulk Water Pipeline Development, the Developer is;

> The Department of Public Works and Infrastructure 256 Madiba Street Pretoria Central 0001 Tel: 012 406 1790 E Mail: Thabane.Rachidi@dpw.gov.za

With relevance to the EMPr the Developer is responsible for:

- appointing an Implementing Agent and/or Project Manager (PM) and that will represent the Applicant and who will liaise competently will all the Services agencies, contractors, the local community, and the other entities involved;
- The Developer must ensure that the conditions of authorization of the relevant environmental authorities are communicated to the professionals involved with the implementation and operational phase management of the pipeline infrastructure and that each are aware of their responsibilities;
- ensuring the implementation of the EMPr (from the initiation of the project to the completion of construction) and all the prescribed rehabilitation measures by the Implementing Agent.

#### 6.3 Implementing Agent

The party or agent who is contractually responsible for the project during the construction phase and who will be responsible for the implementation of the Bulk Water Pipeline Develop is the Implementing Agent. In the case of this project the Implementing Agent is;

> Government Technical Advisory Centre 240 Madiba Street Pretoria Central 0001

Tel: 012 406 5000

With relevance to the EMPr the Implementing Agent is responsible for:

- representing the Developer and to liaise competently will all the relevant Government Departments, Services agencies, the local Community, and the other stakeholders involved;
  - appointing a PM who will ensure the implementation of the EMPr (from the initiation of the project to the completion of construction) and all the prescribed rehabilitation measures by the Project Engineer, Project Manager, or the Principal Contractor (depending on the nature of the professional team).

#### 6.4 Project Engineer and/or Project Manager (PM)

The Project Engineer also fulfils the responsibility of the Project Manager (PM) and generally oversees overall project management of the construction project on behalf of the Developer/Implementing Agent. It is therefore the responsibility of the Developer/Implementing Agent to define the specifics of the appointment of the PM. In the case of this project the Project Engineer/ PM is;

#### CAPIC SA (PTY) Ltd.

Unit 13, Berkley Office Park				
8 Bauhinia Street				
Highveld Techno Park				
Centurion				
0157				
Tel:	012 406 5000			
Email:	johann.doms@capic.co.za			

With relevance to the EMPr the Project Engineer/PM is responsible for:

- the implementation of the EMPr (from the initiation of the project up to start of the operational phase) and all the prescribed mitigation and rehabilitation measures,
  - Compliance to the relevant other environmental management measures (i.e., constant monitoring and maintenance in line with the conditions of the project environmental authorizations and licenses) in terms of the construction phase and associated infrastructure;
  - Assuming the responsibility for all site emergencies and with the authority stop or direct the works.

#### 6.5 Principal Construction Contractor or Principal Contractor (PC)

The Principal Contractor (PC) will be responsible for the implementation of this document during the construction phase of the project. In the case of this project the PC is;

#### King Civil Engineering Contractors (PTY) Ltd.

Portion 152 Rietfontein Beyers Naude Drive Muldersdrift 1747

Tel:	011 957 2325
Email:	ricardoc@kingcivil.co.za

With relevance to the EMPr the PC is responsible for:

- ✤ appointing a construction manager to act as representative for the PC and their staff,
- responding timeously to any complaints and commands issued by the Environmental Control Officer (ECO) or the Community Liaison officer;
- recording any paper trails from the developer/implementing agent, ECO, Community, and the PC,
- rehabilitating the site to conditions acceptable to the directives of the EMPr and the reasonable approval of the ECO,
- compliance to any applicable laws and acts specifically those relevant to the project
- conducting site inspections along with the ECO.
- **PLEASE NOTE:** It is imperative that the EMPr must be included in the principal construction contract documents and the PC must also include the items of the EMPr to be priced in the bill of quantities, for the required provisions to be made towards responsible environmental management.

#### 6.6 Environmental Control Officer (ECO)

The Project Engineer/PM is responsible for employing an Environmental Control Officer (ECO) at the start of the construction phase.

The ECO, on behalf of the implementing agent will be responsible for:

- compiling a monitoring and auditing plan to ensure that the environmental management procedures of the EMPr are implemented and are effective,
- ensuring that the Contractors/Sub-contractors and Employees are aware of their environmental impact;
- conducting compliance audits and developing detailed monthly reports with concerns identified and proposed risk mitigation for the PC to consider and attend to;
- recording and issuing spot-fines for any non-compliance with the requirements of the EMPr,
- producing a photographic record of the site before, during and after construction;
- liaising between the Developer/Implementing Agent and the PC (and the relevant appointed sub-contractors) regarding all environmental concerns; and
- the ECO in association with the relevant parties will also be responsible for assisting in the resolution of conflicts arising due to the proposed infrastructure development.

#### 6.7 The Community Liaison Officer (CLO)

The CLO must preferably consist of an individual representative of the neighbouring Communities and/or other local interest groups. The CLO is appointed by the PC or PM and is responsible for the communication between the neighbours and all the other representatives of the PC/PM management structure for the total duration of the construction phase of the development. The CLO can also function as the community representative during the Operational phase of the development. He/she will therefore be responsible for liaising between the development management, the surrounding landowners, and other affected parties within the community as soon as details become available on how the project will affect them and how it might affect them in the foreseeable future.

#### 6.8 The Local Community

It is important to involve the local communities where this is relevant in terms of impacts that the development may have on their activities or facilities. If possible, a local community member or group should be identified to which pertinent information can be communicated. These parties will also have an open channel through the ECO to communicate any issues to the Applicant.

#### 6.9 In General

All the above-mentioned parties are responsible for appointing representatives that are suitably qualified to perform the necessary tasks appointed to them. These representatives must also be able to interact within a professional team in order to facilitate all the relevant activities needed for the successful implementation of the EMPr and the completion of the proposed Bulk Water Pipeline Infrastructure development.

#### 6.10 Monitoring

Monitoring forms an integral part of the success of an EMPr and must take place on a continual basis. This will ensure that the EMPr is implemented appropriately. Monitoring will also assist in establishing the appropriateness of the mitigating measures and in identifying any other aspects that might need to be included in the EMPr. Where non-compliance did occur, monitoring will assist in determining the effectiveness of the remediation measures implemented and it will assist in identifying any other measures that might be needed. The monitoring programme will be addressed in Chapter 8.

# 7. BIOPHYSICAL, SOCIO-ECONOMIC, AND CULTURAL IMPACTS AND THE ASSOCIATED MITIGATION AND REHABILITATION MEASURES

#### **Table 2: Mitigation & Rehabilitation Measures**

#### **BIOPHYSICAL ENVIRONMENT RISK CATEGORY PROJECT PHASE** ASPECT (With Mitigation) & **RESPONSIBLE PARTY** RELATED MITIGATION AND REHABILITATION MEASURES LOW **ENVIRONMENTAL** MEDIUM PERFORMANCE RISKS HIGH INDICATOR Aspect: **Project Phase:** This EMPr must be made available to all employees, construction Environmental Construction & employees, visitors, and maintenance personnel on the site to ensure Operation Awareness that they are informed of the appropriate environmentally responsible conduct. A copy must therefore be always held at the site offices. **Responsible Parties:** Conduct Environmental Awareness talks to sensitize all visitors and Impacts: Developer, PM, PC, ECO & employees on the site to the relevant site-specific sensitivities. EMPr. Low CLO Sufficient temporary ablution facilities (1 for every 15 people) in the form \*\* of chemical toilets must be provided for all employees during the Sensitive habitat. \*\* Low construction phase of the development. These ablution facilities must be Sensitive species. **Performance Indicators:** (See Vegetation serviced on a regular basis as per the contractor's schedule that provides and Animal Life) Environmentally them. Proper personal Low sensitive and Activities such as littering, informal settlement, loud music and other illmannered behaviour will be regarded as unacceptable, and it will be the conduct. responsible conduct. responsibility of the various contractors and other employers to ensure \*\* Fires. Medium Community Community safety. that employees under their supervision conduct themselves \* Low \*\* appropriately. These actions must be reported to the ECO who will see to safety. the issuing of the relevant fines. See APPENDIX 1.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
<ul> <li>Spread of HIV Aids.</li> <li>Pollution.</li> </ul>			<ul> <li>AIDS awareness talks must be also form part of the Environmental Awareness Talks.</li> <li>This action can be performed at an Environmental Awareness talks at the first appropriate time when the bulk of the contractors and sub- contractors have been appointed.</li> <li>No damage and/or removal of indigenous plant or animal material for cooking or other purposes will be allowed. See APPENDIX 1.</li> </ul>
Aspect:		Project Phase:	
Start of Construction & Related Activities		<ul> <li>Pre-construction &amp; Construction</li> </ul>	<ul> <li>The PM, PC, &amp; CLO must communicate the start of the construction phase to all the relevant local stakeholders at least 6 week before the commencement of construction.</li> </ul>
Impacts:		Responsible Parties:	The PC must, at a relevant staff meeting communicate the dangers of the construction site and stress that the site is specifically out of bounds for
<ul> <li>Communication</li> </ul>	<ul> <li>Medium</li> </ul>	PM, PC, ECO & CLO	staff and children.
<ul> <li>Site clearance for</li> </ul>	✤ Low	Deufenningen in diestenni	Special arrangements must be made for traffic management specifically
the pipeline.	✤ Low	Performance Indicators:	during the construction phase and the PM / PC must ensure that the relevant warnings are communicated to the surrounding landowners
resident soils by		<ul> <li>Public awareness of</li> </ul>	before the commencement of major construction. See The Traffic
construction		start of	Management Plan compiled as part of the EIA.
vehicles.	Andium	construction on	<ul> <li>A complaints register must be maintained on site. (See APPENDIX 5)</li> <li>The whole of the construction site should preferably be forced off during</li> </ul>
contamination by	* Medium	Sile.	construction. The PC must in addition provide suitably visible signage
fuels and other		construction site.	(visible for staff) informing people that the site is under construction and
construction		<ul> <li>Design and</li> </ul>	that no access is allowed for any unauthorised persons. No casual access
materials.		construction of the	may be allowed here.
Security.	Low	construction	
<ul><li>✤ Traffic.</li></ul>	<ul> <li>Medium</li> </ul>	camps.	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
<ul> <li>Access.</li> <li>Occupational Health and Safety.</li> <li>See Appendix 2_Typical Composition of Construction Camp</li> </ul>	<ul> <li>Low</li> <li>Medium</li> </ul>	<ul> <li>Responsible environmental management in and around construction camps.</li> <li>Concurrent management of Occupational Health and Safety aspects.</li> </ul>	<ul> <li>Full documentation (ID, contact details and of next of kin) of all construction personnel must be kept on file at the site office and no unauthorized persons may be allowed on site.</li> <li>The construction phase must be managed by strict management guidelines (EMPr as well as the internal guidelines of the individual contractors), and it will be the responsibility of the relevant contractors to ensure that they themselves and their employees conduct themselves according to the management guidelines laid down.</li> <li>A Maximum width of 8m may be used for the installation of the pipeline development.</li> <li>Vegetation clearance for the erection of construction camps must be avoided and the existing facilities must be used. By no means may this width me cleared in its entirety and especially adult trees must be avoided as far as practically possible.</li> <li>The main site office must be situated at the existing site offices facilities. Temporary water and fuel tanks must also be contained in the camp as well as a workshop area.</li> <li>Adequate water, sanitation and solid waste disposal services must be dumped in an appropriate waste skip at the temporary facility (E.g., cement and chemicals) must be dumped at a licenced waste disposal facility designed for this purpose. A suitable site must be selected for the waste skip site and this site should only contain materials that do not pose any risk in terms of surface or sub surface environmental contamination (e.g., building rubble). This site must also be suitably rehabilitated after completion of the construction activities.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			<ul> <li>Any batching plants must be positioned away from any drainage feature (i.e., Further than 100m away, horizontally from any drainage feature). All runoff from batching areas must be strictly controlled.</li> <li>Cement contaminated water must be collected, stored, and disposed of at a site approved by the ECO. Appropriate measures for overflow from batching plants, e.g., during heavy rains, must be put in place. The batching plant shall be bunded with earth berms, sandbags, or straw bales to prevent runoff escaping from the site.</li> <li>Waste concrete and cement sludge must be scraped off the site of the batching plant daily and removed to an approved landfill site. Concrete shall not be mixed directly on the ground. Plastic liners or mixing trays are to be used.</li> <li>Special attention must be given to any temporary fuel tank and its surrounding area. This area should be appropriately designed, in a watertight bunker which is able to hold 110% of the volume of the tank itself. The area should be monitored on a weekly basis to ensure that no fuel is leaking into the local environment.</li> <li>The drainage valve of the bunded area may not be allowed to drain into the surrounding environment but must be pumped or emptied into containers to be removed by an oil recycling company or other suitable hazardous waste Contractor.</li> <li>Should an accidental puncture of a fuel tank/bowser occur and the bunded area be breached, an appropriate Spills Specialist should be contacted immediately for clean-up operations. The topsoils and sub soils of the site of the spillage must be completely removed and be disposed of at a fittingly licensed facility by the Specialist. The excavation must be filled up to the top with healthy topsoils. This must be performed directly after a spillage and not only at the final rehabilitation of the construction</li> </ul>
ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
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			<ul> <li>camp to ensure no leaching of oils and fuels into the sub soils. See APPENDIX 3 for options.</li> <li>Containment bunkers must always be kept empty to be prepared for any emergency spills.</li> <li>All construction materials must be stored in designated areas that are suitable for the containment of that specific material. (Cement, paints, acidic cleaning agents and bitumen, must be stored in watertight containers within the construction camp). In the event of a spillage the appropriate environmental Spills Specialist must be contacted. The contaminated soils must be removed to a depth at which no sign of the contaminant is visible and replaced with healthy topsoils. See APPENDIX 3 for options.</li> <li>Construction vehicles and equipment must be monitored and maintained on a regular basis (weekly) to ensure that no environmental contamination is brought about by oil, fuel, or hydraulic fluid leakages.</li> <li>All fuel and lubricant oriented areas (for storage and waste) at the construction camp (e.g., diesel tanks, workshop shed, and compressor shed) must be constructed with impervious concrete floors and oil and fuel resistant walls, with watertight sumps at the end of the catchment drains of these areas. Sumps must be pumped into suitable containers and removed by an appropriate Specialist, to a suitably licensed waste disposal facility.</li> <li>On completion of construction the total extent of the construction camp must be dismantled, and full rehabilitation of the site be done.</li> <li>Compacted soils must be loosened to a depth of 300mm and reseeded with seed of locally occurring indigenous grass species. This must occur in all the areas not to be taken up by buildings or paved infrastructure. All soils in areas contaminated with cement dust, small oil and fuel leakages</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			<ul> <li>and other contaminants must be removed to an appropriate depth as per the specific contaminant as prescribed by the ECO. These soils must be replaced with suitably healthy soils (able of harbouring plant and animal life) and be stabilized by contouring the soils according to the local site contours, be reseeded or re planted with soil stabilising grass species.</li> <li>Drivers of construction vehicles must be informed to make use of accepted access roads only and not enter any sensitive areas. (E.g., natural veld areas)</li> <li>A suitably qualified and duly registered Occupational Health and Safety Officer must be appointed to manage the relevant health and safety aspects during the proposed Infrastructure development.</li> <li>Construction employees and staff must be supplied with sufficient protective clothing and other gear (e.g., ear plugs) and must furthermore be trained how to use this gear properly by the Occupational Health and Safety Officer.</li> <li>Also see Recommendations under Geology and Soils.</li> </ul>
Aspect:		Project Phase:	
Cutting and Filling <u>Impacts:</u> Stability of	✤ Low	<ul> <li>Pre-construction</li> <li>Construction</li> <li>Responsible Parties:</li> </ul>	<ul> <li>Specific sites were cut, and fill activities are needed must be inspected by qualified engineers and signed off as stable and safe before construction activities can commence here.</li> <li>Topsoil (top 300mm layer minimum) must be removed, prior to any earthmoving activities and stockpiled separately from subsoil material.</li> </ul>
specific cut and fill sites. ◆ Public Safety.	<ul><li>Low</li><li>Low</li></ul>	PM, PC, ECO & CLO <u>Performance Indicators:</u>	Where these procedures are used during the construction process, rubble associated with the cut operations (natural and not building rubble) must be used during rehabilitation in the fill areas where no structural stability is needed. E.g., in front of the structures. Rubble may

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
<ul> <li>Occupational Health and Safety.</li> <li>Rubble removal.</li> <li>Waste Soils.</li> <li>Blasting</li> </ul>	<ul> <li>Low</li> <li>Low</li> <li>Low</li> </ul>	<ul> <li>Environmentally responsible conduct during cutting and/or blasting operations.</li> <li>Occupational health and safety.</li> </ul>	<ul> <li>not be left anywhere on the construction site or be pushed down valleys or drainage ways. Materials and rubble left over must otherwise be reshaped and re-vegetated to resemble the surrounding landscape.</li> <li>Material (only natural) from cutting should be used for the shaping of earth berms or for rehabilitation.</li> <li>Near vertical slopes (1:1 or 1:2) where erosion control measures (e.g., gabions) are not to be placed must be stabilized using hard structures following specifications, preferably with a natural look and facilities for plants to grow in.</li> <li>A reas with a 1:3 – 1:6 slopes must be logged or covered with a biodegradable membrane material (e.g., Kaytech Soil Saver).</li> <li>Secured logs must be placed in continuous lines following the contours and spaced appropriately depending on the steepness (aspect) of the slope.</li> <li>These slopes must be seeded with an indigenous grass mix to reduce soil erosion.</li> <li>A maintenance programme must be developed to ensure sufficient coverage of the grassed areas and to detect and rehabilitate eroded areas timeously.</li> <li>Where the excavation work involves the use of explosives, a method statement must be developed in accordance with the applicable explosive's legislation, i.e., The Explosives Act 2003 (Act 15 of 2003) by an appointed person who is competent in the use of explosives for excavation work and the contractor shall ensure that the procedures therein are followed.</li> <li>Where there is a reasonable possibility of damage to power and telephone lines or any other property, the contractor shall suitably adapt</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			<ul> <li>his method of blasting and the size of charges and shall use adequate protective measures, such as cover blasting, to limit the risk of damage as far as possible. Specific requirements relating to certain services may be included in the Project Specifications.</li> <li>Vibrations caused by blasting operations must be recorded by one or more blasting seismographs of a type as approved by the Engineer and in positions as described by the specialist blasting Consultant.</li> <li>A photographic record shall be kept by the blasting Consultant of all properties that may be affected by the blasting operations.</li> <li>The Engineer shall be given 24 hours' notice by the Contractor before each blasting operation is carried out.</li> </ul>
Aspect:		Project Phase:	
Climate		<ul> <li>Pre-construction</li> <li>Construction</li> <li>Operation</li> </ul>	<ul> <li>Implement a construction/management plan to specify the most appropriate time (preferably May – early September) for any construction activities to commonse and to phase the construction phase</li> </ul>
<u>impacts:</u>		• Operation	to clear only those areas influenced by the next phase of construction.
<ul> <li>High rainfall in</li> <li>24 hours could</li> <li>cause potential</li> </ul>	❖ Low	Responsible Parties: PM, PC, ECO & CLO	<ul> <li>Special attention must be given to the overall storm water design to increase the volume of local storm water absorption, thereby decreasing the volumes and velocities of storm water at the discharge ends of the</li> </ul>
storm water			storm water system.
related impacts e.g., scouring		Performance Indicators:	<ul> <li>Construction and occupational phase storm water management must ensure community safety. Concentrated discharge must be avoided as far</li> </ul>
and erosion.		<ul> <li>Storm water</li> </ul>	as possible and discharged safely.
<ul> <li>Potential water</li> </ul>	✤ Low	management.	<ul> <li>Special attention must also be given to the design of the stormwater</li> </ul>
saturated soil		<ul> <li>Responsible</li> </ul>	structures at the discharge ends of the overflow system so as not to
conditions.		personal conduct	cause erosion damage here.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
<ul> <li>Flooding.</li> <li>Electrical storms.</li> <li>Veld fires.</li> <li>Precautionary measures.</li> </ul>	<ul> <li>Low</li> <li>Low</li> <li>Low</li> <li>Low</li> <li>Low</li> </ul>	of construction staff. ◆ Responsible environmental management practice. ◆ Personal safety	<ul> <li>Employees and staff must be educated on the incidence of lightning and how to work safely under these conditions. This aspect must furthermore be overseen by the site health and safety representative.</li> <li>Ensure that the founding structures of all the infrastructure are constructed during a time of stable sub soil conditions and as per engineer's detail.</li> <li>The PM / PC must compile a list of emergency contacts (SAPS, and CoT EMS Services) who must be contacted during the event of an emergency.</li> <li>Strict safety management rules must accompany the manifest of the pipeline infrastructure development in terms of fire safety. No fires may be allowed outside of designated fireplaces and braai areas. All activities and facilities which has fire related activities must be provided with the appropriate fire distinguishing equipment which must be monitored and serviced by a qualified service operator on a regular basis, according to NHBRC specification.</li> <li>Heavy downpours can create flash floods and the site area is specifically prone to these incidences during the summer months. The PC during construction and the management during the operational phase must create clearly visible on-site awareness to the risk of flash flooding.</li> </ul>
Aspect: Geology and Soils Impacts: ♦ Loss of topsoil – (essential	✤ Low	Project Phase:Pre-constructionConstructionOperationResponsible Parties:	<ul> <li>Topsoil (top 300mm layer minimum) must be removed prior to any earthmoving activities and stockpiled separately from subsoil material and only at the sites of the construction camps and the footprint of the pipeline. The stockpiled topsoil mounds should not exceed 1,5m in height.</li> <li>Topsoil should as far as possible not be stripped while wet.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
<ul> <li>vegetative substrate).</li> <li>Scouring and erosion</li> <li>Compressibility and collapse potential of transported and residual soils between founding depth and bedrock.</li> <li>Site drainage – to reduce risk of subsurface material saturation and consequent differential movement.</li> <li>Perched water conditions on shallow soils.</li> <li>Contaminations</li> </ul>	<ul> <li>Low</li> <li>Low</li> <li>Low</li> <li>Low</li> <li>Medium</li> </ul>	<ul> <li>PM, PC, &amp; ECO</li> <li>Performance Indicators: <ul> <li>Topsoil conservation.</li> <li>Storm water management.</li> <li>Management of accidental contamination and spills.</li> <li>Responsible environmental management practice.</li> </ul> </li> </ul>	<ul> <li>Topsoil stripping should occur in a phased manner and only where construction will follow rapidly to avoid long periods of exposure and only during periods of low precipitation to avoid erosion and subsequent siltation of nearby water bodies.</li> <li>Areas where construction must take place must be clearly demarcated to ensure that only these areas are stripped.</li> <li>Topsoil must be stockpiled as close as possible to the area where it was stripped.</li> <li>Stockpiled topsoil must not be compacted by any vehicle and should be protected against erosion. (E.g., construct a bunded area of sand around the topsoil stockpiles to ensure the containment of the topsoil).</li> <li>Stockpiled topsoil must not be contaminated with oil, diesel, petrol, construction material or rubble or any other foreign matter, which may inhibit its potential to harbour faunal and floral communities after rehabilitation.</li> <li>Stockpiled topsoil must not be used as fill material and should be replaced in the same order as it was stripped and in the same area where it was stripped for the pipeline excavation.</li> <li>Compressibility and collapse potential of the soils and subsurface material of areas where the infrastructure is to be constructed should be investigated by a qualified engineer and construction should then commence according to the engineering Specialist's recommendations)</li> <li>It is recommended that an engineering geologist or geotechnical engineer inspect all foundation areas and trenches prior to construction in order to identify and evaluate any surface or subsurface geological characteristics in variance with that found during the original geotechnical investigations. Any trench or cutting must also be declared or far to were the prevention.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			<ul> <li>Erosion control measures should be implemented to prevent siltation and loss of existing and remaining topsoil on site.</li> <li>In the event of spills from vehicles, the area should be cleaned immediately using a bioremediation product, such as Petro-Clean TM or similar. The absorbent and soil must be placed in a bin and removed from the site by a certified company and disposed of as a hazardous waste at a licensed commercial facility. No Hydrocarbons may escape into the environment. A spill recovery kit must be on site, along with trained personnel. See APPENDIX 3.</li> <li>Vehicle tanks must not be over-filled. Overfill protection devices and shear-off valves must be installed in fuel dispensers and fuel dispensing hoses to prevent fuel spillages in the event of a drive-away during refuelling operations.</li> <li>Staff must be trained to fill vehicles without spilling fuel.</li> <li>A sufficient no. of Spill Kits must supply by a suitably accredited Supplier for the construction phase.</li> <li>Any spill should be cleaned up immediately. Surface contaminations as a result of spillages outside of the dispensing apron area should also be cleared up immediately. Contaminated topsoils and surface water should be disposed of at designated hazardous waste handling facility or be managed by an appropriately qualified Contractor.</li> </ul>
Aspect:		Project Phase:	
Hydrology		<ul><li>Pre-construction</li><li>Construction</li></ul>	<ul> <li>No long-term vegetation clearing of may occur. A construction management plan should be implemented to specify appropriate time for</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
Impacts:	<ul> <li>Low</li> </ul>	<ul> <li>Operation</li> <li><u>Responsible Parties:</u></li> </ul>	<ul> <li>the bulk of the construction activities to commence (preferably May to early September).</li> <li>The whole of the construction site may also not be cleared of vegetation of early Site placement may any only presend for the next place of early set of the second for the next place of early set of the second for the next place of early set of the second for the next place of early set of the second for the next place of early set of the second for the next place of early set of the second for the second</li></ul>
a result of water saturation.		PM, PC, & ECO Performance Indicators:	<ul> <li>at once. Site clearance may only proceed for the next phase of construction as per the construction management plan.</li> <li>Construction work must be performed between the months of April/May to September/October as far as this is reasonably possible. Where this is</li> </ul>
<ul> <li>Site drainage.</li> <li>Scouring and erosion.</li> </ul>	<ul><li>Low</li><li>Low</li></ul>	<ul> <li>Storm water management.</li> </ul>	not possible the PC must prepare a report stating the reasons and additional measures that will be taken to curb storm water related impacts as well as the degradation of water quality.
<ul> <li>Surface water pollution as a result of spillages</li> </ul>	✤ Medium	<ul> <li>Management of accidental contamination and spills.</li> </ul>	<ul> <li>The PC and the Applicant must create awareness of the dangers of the pipeline infrastructure and especially during periods of high precipitation.</li> <li>All such materials, fuels and chemicals must be stored in a specific and secured area to prevent pollution from spillages and leakages. Sufficient</li> </ul>
<ul> <li>Possible</li> <li>groundwater</li> <li>pollution.</li> </ul>	Medium	<ul> <li>Responsible environmental management</li> </ul>	<ul> <li>bunding of fuel storage tanks and chemical storage areas must be provided.</li> <li>Construction vehicles and machines must be maintained properly to</li> </ul>
<ul> <li>Spillages that may occur during refuelling</li> </ul>	❖ Low	practice.	<ul> <li>ensure that oil spillages are kept at a minimum.</li> <li>Spill trays must be provided if refuelling of construction vehicles is done on site. See APPENDIX 3.</li> <li>On site waste disperal and pit latrings must strictly be prohibited during</li> </ul>
<ul> <li>Ponding.</li> </ul>	◆ Low		<ul> <li>Conside waste disposal and pit latimes must strictly be promoted during the construction phase and disposal must be carried out with standard sealed chemical toilets and waste disposal containers. The PC must plan with the CoT's waste section for proper disposal at licenced waste disposal sites of all construction waste.</li> <li>No uncontrolled discharges may be permitted from the construction camp.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			<ul> <li>All spillages from any potential contaminants such as lubricants and hydrocarbon-based fuels must be safely and immediately removed and disposed of at an appropriate site.</li> <li>Surface water draining of contaminated areas containing oil and petrol should be channelled towards a sump which will separate these chemicals and oils.</li> <li>Storm water shall not be allowed to flow through the batching area. Cement sediment shall be removed from time to time and disposed of in a manner as instructed by the RE.</li> <li>Spoil sites may not be used for the disposal of hazardous or toxic waste.</li> <li>Special attention must be given to site drainage details and adequate drainage structures must be designed and constructed to avoid subsurface water saturation and possible structural failure of infrastructure.</li> <li>The use of all materials, fuels and chemicals which could potentially leach into underground water must be controlled and managed according to the relevant legislation.</li> <li>Storm water drainage structures must be designed by qualified engineers and in a way, that disposes of the site storm water in a safe matter, which is not harmful to the surrounding environment in any way.</li> <li>Enough temporary chemical toilets (1 per 15 people) must be installed by the PC for the time of the construction activity.</li> <li>Storm water runoff must be channelled from open areas with retention structures around the construction areas. This must be done without compromising the conditions of the sub soil stability. Storm water outlets discharging stormwater from the surrounding areas during construction must contain energy dissipating structures that will curb erosion.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			<ul> <li>Straw bales should be placed and adequately secured on all downhill locations where erosion may occur to prevent washouts and to retain siltation and topsoil from the site.</li> <li>Vehicle tanks must not be over-filled. Overfill protection devices and shear-off valves must be installed in fuel dispensers and fuel dispensing hoses to prevent product free flow or fuel spillages in the event of a drive-away during refuelling operations.</li> <li>Any spill should be cleaned up immediately. Surface contaminations as a result of spillages should be cleared up immediately.</li> <li>The Developer must develop a routine maintenance and rehabilitation plan or the pipeline infrastructure. The plan must include routine inspections along the entire length of the associated infrastructure according to the industry standard in order to detect any damage or erosion that might occur. Any damage or erosion damage must be reported and repaired immediately.</li> </ul>
Aspect:         Vegetation and         Animal Life         Impacts:         ◆ Removal of vegetation and habitat as a result of	❖ Low	Project Phase:         ◆ Pre-construction         ◆ Construction         ◆ Operation         Pre-construction         ◆ Construction         ◆ Operation         Pre-construction         Pre-construction         ◆ Operation         Pre-construction         Pre-construction	Any significant indigenous plant specimens (e.g., trees of 1,5m high with a trunk thicker than 150mm and vegetation clusters) that will come into harm's way must be transplanted, (if feasible from a transplantable point of view and in a temporary nursery (this can happen at a safe site near the construction laydown area) and be replanted during the rehabilitation or landscaping of the site during the post construction period. Transplanted trees will need to be maintained in a healthy state in order to be used during rehabilitation.

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
construction activity. ❖ Alien invasive plant species management.	✤ Low	<ul> <li>Protection of indigenous vegetation.</li> <li>Relocation of sensitive species on site.</li> <li>Management of alien invasive species.</li> <li>Environmental Awareness Training.</li> </ul>	<ul> <li>Only indigenous vegetation must be planted during the operational phase to increase the biodiversity of the site and effort should be given to retain the natural character of the site as far as possible.</li> <li>Any small game or other bird, reptile or amphibian specie that becomes trapped in the trenches or in any construction related activity may not be harmed and must be placed in a suitable container. The relevant CoT Department or closest SPCA must then be contacted to come and remove the animal. This CoT Department or SPCA will then bear the responsibility to relocate the specie to a suitable habitat.</li> <li>Proliferation of alien and invasive species is expected within disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the proposed Infrastructure project. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, must be controlled.</li> <li>Removal of the alien and weed species encountered on site must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998).</li> <li>Removal of species should take place throughout the construction and rehabilitation/ maintenance phases.</li> <li>Avoid the use of herbicides approved by the Department of Water and Sanitation (DWS) may be used and care should be taken with the choice of herbicide to ensure no additional impacts on the receiving biodiversity.</li> <li>All removed plant material must be covered with a sail, that is tied down during transportation by road to prevent any blow-off from the vehicle.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
			<ul> <li>Alien invasive species management over the longer term must include the following measures:         <ul> <li>Identify priority species to control in consultation with relevant stakeholders;</li> <li>Develop protocols for the removal of all alien species that show recruitment;</li> <li>Rehabilitate disturbed areas to pre-disturbance conditions, invasive grass species must not be utilised during rehabilitation activities;</li> <li>Keep grass height (of indigenous grass species) as tall as possible as this enables it to effectively out-compete weeds and tolerate greater disease/ pest pressure so reducing the number of herbicides needed. Taller grass also uses water more efficiently than shorter grass and protects the soil from moisture loss and erosion (USEPA. 2006);</li> <li>Re-assessment and monitoring of the area to determine success of the action and any follow-up measures required; and</li> </ul> </li> </ul>
<u>Aspect</u> Waste Management <u>Impacts:</u>	✤ Low	<ul> <li>Project Phase:</li> <li>◆ Construction</li> <li>◆ Operation</li> <li>Responsible Parties:</li> <li>PM, PC, &amp; ECO</li> </ul>	<ul> <li>All construction related areas and roads should be cleared of any construction waste and should be swept clean as to avoid the waste from entering the storm water systems.</li> <li>All solid waste must be removed and transported to an approved registered landfill site on a weekly basis.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES	
<ul> <li>Waste Management Plan.</li> <li>Recycling.</li> <li>Storage.</li> <li>Cleaning.</li> <li>Disposal.</li> <li>Waste Removal.</li> <li>Record Keeping.</li> </ul>	<ul> <li>Low</li> <li>Low</li> <li>Low</li> <li>Low</li> <li>Low</li> <li>Low</li> <li>Low</li> </ul>	<ul> <li>Performance Indicators:</li> <li>Construction Waste Management Plan.</li> <li>Closure and Rehabilitation of construction site and construction site camps on completion of construction phase.</li> <li>Waste re-use, recycling and disposal record keeping.</li> <li>Hazardous waste</li> </ul>	<ul> <li>On completion of works, the contractor shall clear away and remove from the site all construction paint, surplus material, foundations, plumbing and other fixtures of every kind. Areas thus cleared shall be graded and scarified to restore the ground as near as possible to its original profile.</li> <li>Waste must be recycled.</li> <li>All hazardous waste including used oils and fuels and wash water containing hydrocarbons must be managed in accordance with its hazardous substance category. Hazardous wastes must be taken away the nearest hazardous waste handling facility on managed by an appropriate hazardous wastes Contractor.</li> </ul>	
Aspect Fuel Management Impacts: ♦ Storage. ♦ Re-Fuelling.	<ul> <li>♦ Medium</li> <li>♦ Medium</li> <li>♦ Low</li> </ul>	<ul> <li>Project Phase:</li> <li>Construction</li> <li>Operation</li> <li>Responsible Parties:</li> <li>PM, PC, &amp; ECO</li> <li>Performance Indicators:</li> </ul>	<ul> <li>Re-fuelling must take place in the designated area with sufficient surface sealing such as a concrete liner to prevent spillage and soil contamination. See APPENDIX 1 &amp; APPENDIX 3.</li> <li>Drip trays (min 100mm deep) must be placed under all vehicles awaiting maintenance, suspected of having a mechanical problem that can lead to a significant leakage, that is decommissioned and awaiting removal or that will remain or the parking area for more than one week.</li> </ul>	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES	
<ul> <li>Drip trays and Spill Kits.</li> <li>Notification.</li> <li>Rehabilitation.</li> </ul>	<ul> <li>❖ Medium</li> <li>❖ Low</li> </ul>	<ul> <li>Management of fuel related areas.</li> <li>Spill management.</li> </ul>	<ul> <li>Spill kits must be available in all vehicles that transport hydrocarbons for dispensing to other vehicles on the site. The dispensing devices (pump heads) must be compatible with the vehicles to which they are dispensing. In addition, the dispensing devices must be fitted with the necessary valves/ apparatus that will ensure that the nozzles do not drip fuel after pumping has stopped. See APPENDIX 3.</li> <li>The whole of the site where vehicles are operated must undergo routine weekly inspections for any spillages, and these areas must be rehabilitated accordingly.</li> <li>Applicable provincial and local government departments, local municipalities and adjacent landowners must be notified within 24 hour of a major spillage.</li> <li>In the event of spills from vehicles, the area should be cleaned immediately using a bioremediation product, such as Petro-Clean TM. The absorbent and soil must be placed in a bin and removed from the site by a certified company and disposed of as a hazardous waste at a licensed commercial facility. No Hydrocarbons may escape into the environment. A spill recovery kit must be on site, along with trained personnel. See APPENDIX 3.</li> </ul>	
Aspect:		Project Phase:		
Vehicle Maintenance Impacts:		<ul> <li>Construction</li> <li>Operation</li> <li>Responsible Parties:</li> </ul>	Vehicle maintenance may only be performed if in a sealed off area with an oil impenetrable floor. In the case that the PC cannot supply such a facility on site, all vehicles and machinery must be services and maintained off site. Vehicle maintenance yards and secured storage areas	
Design	<ul><li>✤ Medium</li><li>✤ Low</li></ul>	PM, PC, & ECO	will be established as far as is practicable, further than 100m horizontally from and water course and buffer areas as determined by the storm	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES	
<ul> <li>Maintenance area</li> <li>Equipment</li> <li>Machinery</li> </ul>	<ul> <li>✤ Low</li> <li>✤ Low</li> </ul>	<ul> <li>Performance Indicators:</li> <li>♣ Sustainable vehicle management for optimal use.</li> </ul>	<ul> <li>water management plan. The maintenance yard should be indicated of the layout plan of the site.</li> <li>The maintenance of vehicles and equipment used for any purpose during any phase must take place only in the maintenance yard.</li> <li>Any breakdown other than that in the maintenance area of the site requires the presence of a spill treatment team and equipment. This team must prevent and mitigate any spills that occur in this situation.</li> <li>Equipment used in the construction phase must be adequately maintained in order not to spill oil, diesel, fuel, or hydraulic fluid during operations.</li> <li>Machinery or equipment used on the site must not constitute a polluti hazard in respect of the above substances. The PM / PC or ECO shall order such equipment to be repaired or withdrawn from use if he or sh considers the equipment or machinery to be polluting and irreparable.</li> </ul>	
Aspect: General Rehabilitation Measures Impacts: ♦ Relevant phases of the activity ♦ Contamination	<ul> <li>❖ Low</li> <li>❖ Medium</li> </ul>	<ul> <li>Project Phase:</li> <li>Construction</li> <li>Operation</li> </ul> Responsible Parties: PM, PC, ECO & CLO Performance Indicators:	<ul> <li>Rehabilitation should be implemented concurrently during construction and should aim to prevent erosion and aid the return of natural, endemic, and indigenous vegetation cover.</li> <li>After construction activities are complete, the construction sites offices, facilities and laydown areas must be taken down and full rehabilitation of the construction site be done. Compacted soils must be loosened to a depth of 300mm re-compacted lightly (via turf roller) and reseeded with seed of locally occurring indigenous ground covering species.</li> <li>All soils contaminated with cement dust, small oil and fuel leakages and other contaminants must be removed to an appropriate depth as per the specific contaminant and as prescribed by the ECO and be taken to an</li> </ul>	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES	
<ul> <li>Rehabilitation measures</li> <li>Excess spoil material</li> </ul>	❖ Low	<ul> <li>Removal and rehabilitation of construction camps.</li> <li>Rehabilitation of contaminated areas.</li> <li>Establishment of sufficient vegetation layer on all barren soil areas.</li> </ul>	<ul> <li>(able of harbouring plant and animal life) and be stabilized by contouring the soils according to the local site landform.</li> <li>Site roads used during construction must also be reshaped according to the prevailing landform, scarified, fertilized, and re-seeded and revegetated with indigenous grasses and vegetation.</li> <li>After construction, the PC must ensure that the site is clean, and void of any soils, construction rubble or any other construction related materials.</li> <li>All barren sections of the finished construction area around the development must be wetted and stabilized to form a good medium for planting. These areas must then be reseeded with indigenous species.</li> <li>Construction materials and litter. The ECO and the PC must organize a final site inspection to see if this measure is in place before the site is signed off as finished.</li> <li>The excess spoil material left over from the pipeline construction must be used to rehabilitate the pipeline route. The area must be reshaped to resemble the surrounding landform and revegetated with the recommended Gauteng Grass Mix. See Section 8.7</li> <li>Cognisance must be taken of all the mitigation and rehabilitation measures in the site specific EMPr and must be read in conjunction with this rehabilitation plan.</li> </ul>	
Aspect: Visual Environment		Project Phase: Pre-construction	<ul> <li>Negative impacts related to the construction phase of the development will</li> </ul>	
Impacts:		<ul><li>Construction</li><li>Operation</li></ul>	only last for the duration of the construction phase of the development and will thus not be permanent. The PC and subcontractors must see to the	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
<ul> <li>Construction related activities.</li> <li>Final visual outlook of the development.</li> </ul>	<ul> <li>✤ Low</li> <li>♣ Low</li> </ul>	<ul> <li>Responsible Parties:</li> <li>PM, PC, ECO &amp; CLO</li> <li>Performance Indicators: <ul> <li>Maintenance of construction camps and site during construction phase.</li> <li>Screening of negative visual aspects of the proposed Infrastructure Development with vegetation.</li> <li>Downlighting.</li> </ul> </li> </ul>	<ul> <li>overall tidiness of the construction area and that construction vehicles, materials and personnel stay within the construction camps after hours, over weekends and on public holidays. For the relevant proposed fines see APPENDIX 1.</li> <li>Indigenous vegetation must be used to screen negative visual aspects of structures. Screening must however not be obtrusive to the natural character of the site.</li> <li>Screening vegetation and landscaping must be planted to ensure that it is applied in a way that compliments the vegetation of the region.</li> <li>Existing vegetation should be retained as far as possible at the construction site and the temporary construction camp structures to act as visual screens/absorbers and dust collectors.</li> <li>No painting or marking of natural features shall be allowed. Marking for surveying and other purposes shall only be with pegs and beacons.</li> <li>Additional locally indigenous landscaping should also be implemented in key areas to screen negative visual aspects.</li> <li>Topographic shaping should be implemented - final profile of rehabilitated areas is formed to emulate natural contours of the area. Cuttings and fill areas to be rehabilitated to emulate occurrence of natural rocky outcrops in the area both in colour and shape.</li> <li>Rehabilitate/restore exposed areas as soon as possible after construction activities are complete.</li> <li>Dust suppression techniques should be in place at all times during the construction phase.</li> </ul>

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES	
			No construction rubble, construction material, refuse, litter, or any oth material not found naturally in the surroundings should be allowed at a time to be lying around on the construction site.	
<ul> <li>Aspect:</li> <li>Noise:</li> <li>Impacts:</li> <li>◆ Possible noise pollution occurring as a result of construction and operation activities.</li> <li>◆ Occupational Health and Safety</li> </ul>	<ul><li>✤ Low</li><li>♣ Low</li></ul>	<ul> <li>Project Phase:</li> <li>Construction</li> <li>Operation</li> <li>Responsible Parties:</li> <li>PM, PC, ECO &amp; CLO</li> <li>Performance Indicators:</li> <li>Notification of surrounding landowner's preconstruction commencement.</li> <li>Maintenance of construction and maintenance equipment.</li> </ul>	<ul> <li>The surrounding landowners must be notified of the commencement of construction activities well in advance of the actual start of the activities (At least 4 weeks).</li> <li>Noisy activities related to the construction phase of the development (e.g., vehicles, compressors, employees) must be kept to the necessary minimum. Construction activities must also be restricted to between 08:00 in the mornings and 05:30 in the evening and not on any weekend or public holidays. This must be monitored by the ECO and fines must be levied for non-compliance. (See APPENDIX 1).</li> <li>All employees, construction employees and maintenance personnel must be instructed to be sensitive towards the surrounding landowners. This action can be performed via an Environmental Awareness Workshop at the first appropriate time when the bulk of the contractors and subcontractors have been appointed. (See APPENDIX 1)</li> <li>Activities such as loud music and other ill-mannered behaviour must not be allowed. This behaviour will be regarded as unacceptable, and it will be the responsibility of the various contractors and other employers to ensure that employees under their supervision conduct themselves appropriately. These actions must be reported to the ECO who will see to the issuing of the relevant fines. (See APPENDIX 1)</li> </ul>	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES	
		<ul> <li>Proper personal conduct by all construction staff.</li> <li>Compliance with occupational health and safety regulations.</li> </ul>	<ul> <li>Construction vehicles and equipment must be regularly serviced to avoid the noise that these machines may make if in disrepair.</li> <li>Construction employees and staff must be supplied with sufficient protective clothing and other gear (e.g., ear plugs) and must furthermore be trained how to use this gear properly by the Occupational Health and Safety Officer.</li> <li>The contractor shall give the Engineer 24 hours' notice before any blasting operation is carried out.</li> <li>The Developer via the PM / PC must inform surrounding landowners, the local community, and any other registered I&amp;AP at least 24 hours prior to blasting operations for them to make the necessary arrangement.</li> </ul>	
<ul> <li><u>Aspect:</u></li> <li>Air Quality:</li> <li><u>Impacts:</u></li> <li>❖ Increased dust pollution could occur during construction activities.</li> <li>❖ Generation of dust on site dirt roads.</li> </ul>	<ul><li>✤ Low</li><li>♣ Low</li></ul>	Project Phase:         ◆ Pre-construction;         ◆ Construction and         ◆ Operation         Responsible Parties:         PC & ECO         Performance Indicators:         ◆ Sufficient dust suppression regimes during	<ul> <li>Dust suppression must be performed according to the seasonal change and according to the prevailing site-specific circumstances via a dust suppression truck on the site roads, other construction areas and the parking areas.</li> <li>Vegetation and landscaping of the larger development environment wi help improve air quality over the long term and must therefore be planted wherever disturbed as far as possible.</li> <li>Site roads and parking areas must furthermore be maintained to remai in a good condition (e.g., roads must be kept from widening to keep the exposed area (area influenced by winds) as small as possible.</li> <li>Construction vehicles must maintain low speeds on all site roads (10 – 3 km\h) to reduce dust dispersal during construction.</li> </ul>	

ASPECT & RELATED ENVIRONMENTAL RISKS	RISK CATEGORY (With Mitigation) LOW MEDIUM HIGH	PROJECT PHASE RESPONSIBLE PARTY PERFORMANCE INDICATOR	MITIGATION AND REHABILITATION MEASURES
<ul> <li>Occupational Health and Safety</li> </ul>	◆ Low	<ul> <li>construction and operation.</li> <li>Speed control on gravel roads during construction and operation.</li> </ul>	The health and safety manager must ensure that employees are supplied with the correct safety wear and equipment (e.g., dust masks) and that they are informed as to their appropriate use.
Aspect: Archaeological Findings: Impacts: ◆ Possible archaeological findings.	❖ Low	Project Phase:         ◆       Pre-construction         ◆       Construction         ◆       Operation         Responsible Parties:         PM, PC, ECO & CLO         Performance Indicators:         ◆         Environmental Awareness	<ul> <li>Employees, contractors, and construction employees should be informed to report any unusual finds during the construction phase, to the ECO in order to implement the correct procedures according to the South African Heritage Resources Act to conserve these finds appropriately.</li> <li>This impact must be brought forward during the environmental awareness workshops.</li> </ul>

# 8. MONITORING & AUDITING

# 8.1 Purpose

The purpose of the monitoring is to ensure that the mitigating measures that are being implemented during the pre-construction, construction and operational phases are having the affect as desired. It is also done to ensure that the impacts are within the predicted levels as identified in the EMPr. The monitoring programme will further aid in detecting any cumulative or secondary impacts that may arise or any extreme deviations from the baseline conditions.

Monitoring during the construction phase must be done by the EO daily. The monitoring will culminate into a weekly compliance report. The EO will be responsible for the day-to-day environmental compliance together with the PM and PC. A monthly meeting must be held with the PM, and the PC where the main findings will be communicated, and any remedial actions be suggested.

The Developer's ECO will undertake independent verification audits on a monthly basis and prepare a detailed compliance report with findings and proposed risk mitigation for the PC's consideration and attention.

For the purposes of the operational phase the Developer must develop a routine monitoring and maintenance plan. This plan must be developed according to the industry standard and must describe clear procedures for aspects such as fuel management.

# 8.2 Methodology

The monitoring methodology followed is the one proposed by Department of Water Affairs and Forestry (DWAF) in their Environmental Best Practice Monitoring Report (2005) for the Construction Phase of activities. The compliance will be measured against the baseline conditions which were determined during the Scoping and Environmental Impact Reports.

The different aspects of the construction phase will be scored as follow:

3 - best practice / full compliance
2 - satisfactory (> 50% compliance)
1 - unsatisfactory (< 50% compliance)</li>
0 - nothing in place
n/a - not applicable

The percentage compliance is calculated for each aspect. This is used to calculate the current risk exposure. At the end of each monitoring session a monitoring report will be compiled consisting of a summary of all aspects and recommendations will be made as how to improve on the different aspects. The following section contains the monitoring form that will be used during monitoring as adapted from the DWAF Best Practice Monitoring Report (2005) for this specific project. The contents of the report should include the aspects recorded below. All reports to be controlled by the PM and contained within a file on site.

There are three different monitoring reports that will need to be completed at different timeframes to ensure compliance with the EMPr. The specifics of each report are discussed below.

# 8.2.1 Weekly Monitoring Report

This report will:

- comprise a checklist of environmental parameters;
- to be monitored and the results of the monitoring;
- record the Contractor's compliance or non-compliance with the specifications;
- record any community complaints that have been raised; (See Appendix 6).
- record all formal and informal discussions relating to environmental matters that have been made on site;
- propose measures to be implemented to address issues which have arisen on site.

This report shall be distributed to the Project Manager on a weekly basis.

### 8.2.2 Monthly Monitoring Report

The report will:

- report on the results of the Monitoring Programme;
- record the Contractor's compliance or non-compliance with specifications and actions required;
- report on the performance of the PC regarding implementation of recommendations for mitigation of issues which arose on site;
- comment on areas where the PC is performing well;
- propose measures to be implemented to address issues which have arisen on site;
- propose revisions to the monitoring strategies, if required.

This report shall be completed by the final week of every month and will be distributed to the PM.

# 8.2.3 Non-Compliance Report

This report will detail any serious infringement of the environmental requirements of the Contract. It will also propose mitigation measures. It will note any non-conformances to the conditions of the EMPr. This report must be submitted with 24 hours of the incident and shall be distributed to the PM, and PC. (See Appendix 4)

# 8.3 Monitoring Scorecards

The EO shall be responsible for using the monitoring scorecards in order to effectively monitor the mitigation measures that have been proposed in the EMPr. Table 2 shall be used to monitor all the conditions of the EMPr. All the conditions on the EMPr are to be filled onto the scorecards by the EO. The relevant scorecards are to be used during the different phases of per-construction and construction in order to assist with compilation of the monitoring reports.

# 8.4 Environmental Training

The purpose of an environmental awareness-training program is to ensure that each employee, construction worker and maintenance crew knows his/her responsibilities regarding the EMPr and the environment in general. Everyone will receive instructions regarding appropriate and inappropriate activities during construction on site. An environmental awareness-training program must be organized as part of the induction training to ensure that each employee knows his/her responsibilities regarding the EMPr and the environment in general. All training must be documented, and attendance registers taken as proof of training. (See Appendix 6).

	Fulfilment of EMPr Mitigation and Rehabilitation Measures						
ASPECT	DESCRIPTION	SCORE	NOTES / ACTION				
	TOTAL SCORE						
	AS AVERAGE						
	AS PERCENTAGE						

Table 3: Fulfilment of the EMPr Mitigation & Rehabilitation Measures

# 9. BULK WATER PIPELINE LANDSCAPE REHABILITATION PLAN

# 9.1 Introduction

It is unavoidable that the receiving environment of developments will be affected during the construction and the operational phases of a project. In instances where the proposed project is included or crosses sensitive ecological landscapes, the challenge lies in implementing the project within the allotted time and budgetary frameworks and in a manner that will enable sustained and productive ecological functioning at the project site. The purpose of this section is to provide a process for the rehabilitation of the pipeline construction footprint and to implement the proposed rehabilitation measures to obtain the productive ecological functioning as discussed above as well as the associated practical and aesthetic benefits.

# 9.2 Anticipated Landscape Level Impacts

In terms of the Bulk Water Supply Pipeline Development, the project would require the clearance of mature mountain bushveld vegetation at a width of between 8 -10m and over 365m. See Section 3. The anticipated impacts related to civil engineering construction process and the operational phase has been detailed in section 7 of this report. On a landscape level the primary impacts associated with the proposed pipeline project include the following:

Antio	ipated Impacts	Project Phase	
Geol	ogy and Soils:		
* * * * *	Disturbance of top 2-2,5m layer geological strata Disturbance of top 2-2,5m layer soil horizons Incorrect removal and stockpiling of topsoils removed during the pipeline excavations Incorrect replacement of topsoils during rehabilitation Increase in erosion susceptibility of the pipeline route Possible damage to infrastructure due to post construction settlement of the backfill	<ul> <li>Construction and operational</li> <li>Construction and operational</li> <li>Construction and operational</li> <li>Construction</li> <li>Construction and operational</li> <li>Operational</li> </ul>	
Hydr	ology:		
* *	Formation of unsightly erosion gullies Decrease in water quality because of silt laden stormwater drainage	<ul> <li>Operational</li> <li>Construction and operational</li> </ul>	
Flora	:		
* * *	Loss of mature trees Loss of base layer vegetation cover with associated increase in risk of erosion Proliferation in alien invasive vegetation	<ul> <li>Operational</li> <li>Construction and operational</li> <li>Construction and operational</li> </ul>	
Faun	a:		
	Habitat loss     Construction and operational		
Visua	al Impacts:		
*	<ul> <li>Negative visual impact related to vegetation removal</li> </ul>	<ul> <li>Construction and operational</li> <li>Operational</li> </ul>	

# **Table 4: Anticipated Landscape Level Impacts**

Anticip	pated Impacts	Project Phase
*	Possible negative visual impact related to poor monitoring	
	and maintenance of the installed infrastructure	

### 9.3 Methodology

The rehabilitation measures included are intended to guide the reinstatement of the natural Salvokop mountain habitat of the local ecological systems as much as possible, to ensure continuing performance of the natural systems. Apart from the apparent mitigation required, these rehabilitation measures will also protect the pipeline infrastructure and that of the Freedom Park facilities.

A site-specific terrestrial ecological assessment was commissioned to examine the receiving environment of the pipeline and to present mitigatory ecological rehabilitation measures for the anticipated impacts. The rehabilitation measures presented in this Landscape rehabilitation plan are presented in unison with the recommendations of the ecological assessment as well as the prescribed mitigation and rehabilitation measures in Section 7 of this report, to present site-specific specifications for the planning, implementation, monitoring and maintenance phases of the pipeline development.

A priority rating is included to provide direction in terms of important and less important measures to be implemented. This should be used by the Developer and their Agents to guide planning and budgeting during the various stages of the pipeline development project. The priority rating submits the following:

- Environmental aspects with a "High" priority rating must be budgeted for and dually implemented.
- Environmental aspects with a *"Medium"* priority rating must be implemented but can be moved to a later stage to allow for budgeting for the High priority items.
- Environmental Aspects with a "Low" priority rating will enhance the site environmental features but will not substantially jeopardise the long-term ecological functioning of the local environment if not implemented.

#### 9.4 Pipeline Rehabilitation Phases

#### 9.4.1 Pre-Construction Phase Rehabilitation Planning

Planning and design will form the basis of the rehabilitation measures during the pre-construction phase. The design Engineers and pipeline Contractor must use this phase to familiarize themselves with the identified site sensitivities and mitigation recommendations illuminated in the Specialist reports to be able to adapt their designs and construction methodology accordingly.

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
Environmental Awareness	Design Engineers and Contractors must be inducted on the project EMPr and this Landscape Rehabilitation Guideline document to be aware of the identified site sensitivities and the recommended site mitigation and rehabilitation measures.	✤ High

#### Table 5: Planning Phase Mitigation and Rehabilitation Measures

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
Site Planning	<ul> <li>A photographic record must be taken of the pipeline route at 50m intervals as well as areas where the pipeline crosses existing infrastructure. This is to record the preconstruction visual outlook of the pipeline for use during rehabilitation.</li> <li>The construction footprint area of must remain as small as possible during construction and not exceed 10m in with.</li> <li>Primary material laydown areas are to remain outside of the pipeline construction footprint at the existing laydown areas for the reservoir construction project.</li> <li>A Planting plan must be developed by a qualified botanist or landscape architect in order to plan the placement of the trees, shrubs, and other local landscape elements in natural plant communities during the rehabilitation phase. This will enhance the ecological restoration of the ridge area and reduce the visual impact of the construction process.</li> </ul>	<ul> <li>High</li> <li>High</li> <li>High</li> <li>High</li> <li>High</li> </ul>
Infrastructure Design	<ul> <li>Pipeline infrastructure must be designed to follow the existing natural slope as far as possible (not to exceed a 1:4 gradient) to increase slope stability and prevent erosion.</li> <li>Where required, stormwater detention structures should be designed across the width of the rehabilitated excavation, to prevent erosion along the excavation. This can be achieved via packed rock mounds/berms, packed perpendicular across the slope at 5 -10m intervals depending on the slope.</li> </ul>	<ul><li>✤ High</li><li>♦ High</li></ul>
Long-Term Strategic and Financial Planning	<ul> <li>Financial provision must be made for the appointment of a suitably qualified Environmental Control Officer (ECO), to monitor the implementation of the site-specific mitigation and rehabilitation measures. Upon finalisation of the construction and implementation of the site-specific rehabilitation measures, the ECO must sign off on the execution of these activities.</li> <li>It is highly recommended that financial provision be made for the appointment of a suitably qualified ECO to monitor the long-term rehabilitation of the pipeline, to ensure the efficient and effective implementation of this rehabilitation plan.</li> </ul>	<ul> <li>✤ High</li> <li>♠ Medium</li> </ul>

### 9.4.2 Construction Phase Rehabilitation

As far as practically feasible the construction phase rehabilitation must be implemented concurrently with the progress of the pipeline infrastructure.

#### Table 6: Construction Phase Mitigation and Rehabilitation Measures

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
Site Clearing	<ul> <li>Areas which are to be cleared of vegetation must remain as small as possible, to reduce erosion and the risk of the proliferation of alien vegetation.</li> <li>The area required for the excavation (maximum of must be clearly demarcated with construction netting and this demarcated with be been been been been been been been</li></ul>	<ul><li>✤ High</li><li>♦ High</li></ul>
	<ul> <li>Mature indigenous trees (Trunk width of 150mm and a hight of over 1,5m) must be rescued from the excavation area (where practically possible) and stored in a temporary nursery at a suitable site at the construction laydown area. Transplanted trees will need to be maintained in a healthy state in order to be used during the rehabilitation phase. Alternatively, the trees will need to be replaced at a decent size and sourced from a commercial resource.</li> </ul>	❖ Low
	<ul> <li>All indigenous material (Trees and shrubs) removed from the area to be excavated should be mulched. The mulch can be used as a soil stabilizer and moisture retainer during the post rehabilitation maintenance phase.</li> <li>No unnecessary removal or scarring of indigenous vegetation</li> </ul>	✤ High ♣ High
	<ul> <li>must be allowed.</li> <li>No unnecessary construction vehicles or equipment must be allowed at the construction area. The necessary construction personal must access the excavations on foot to reduce trampling.</li> </ul>	✤ High
	<ul> <li>All natural loose stone and rock material found in the area to fall under the excavation must be collected and stored for use in the rehabilitation, post the installation of the pipeline.</li> <li>The stripping of the top 300mm of topsoils and the correct stockniling of these soils are critical to the rehabilitation.</li> </ul>	<ul><li>✤ High</li><li>♣ High</li></ul>
Soil Management	<ul> <li>stockpring of these sons are entited to the reflabilitation process and quick vegetation establishment. See EMPr under Geology and Soils for associated topsoil stripping and management methodology.</li> <li>All temporary soil stockpiles must be levelled to tie in with the natural surrounds and revegetated with indigenous</li> </ul>	✤ High
	<ul> <li>Vegetation as soon as possible.</li> <li>Unused excavated soil should be removed from site to a registered landfill.</li> </ul>	✤ Medium
	Construction must preferably proceed from the top of the slope to the bottom and rehabilitation must follow concurrently to allow vegetation to establish and to restrict stormwater velocities and subsequent erosion.	✤ Medium
Construction	During excavation, trenches should only be excavated for the shortest practical distance (50- 100m) and trenches backfilled as soon as the pipes have been laid in any given section to restrict erosion.	✤ High
		🏼 High

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
	<ul> <li>Excavators should be used instead of bulldozers in areas sensitive to erosion (e.g., steep areas and unstable soils).</li> <li>Excavated trenches must be protected against erosion via cut-off drains directing stormwater into sufficiently vegetated surroundings.</li> <li>Following the installation of the pipeline, it must be ensured that the excavation is re-profiled to ensure natural drainage patterns and habitat connectivity is maintained, to reduce the risk of upstream ponding / downstream scouring, and to reduce risk of erosion.</li> </ul>	❖ High ❖ High
Vegetation Management	All disturbed areas (Contractors' yard, laydown area, extended areas where invasive vegetation has been removed, temporary access roads and areas where temporary berms or other erosion controls have been removed) and where construction has been finalized must be re-vegetated with indigenous floral species to the degree where at least 80% coverage is achieved. A list of suitable vegetation and general specifications are provided in the EMPr Section 7 – Vegetation and Animal Life as well as Section 8.5 below.	✤ High
Alien Vegetation Management	<ul> <li>Concurrent alien vegetation control is deemed a crucial component of restoration of the natural vegetation.</li> <li>Removal of alien vegetation within pipeline servitude must be undertaken manually, to prevent further disturbances to the area.</li> <li>Avoid the use of herbicides as far as possible. Should herbicides be deemed necessary, only herbicides approved by the Department of Water and Sanitation (DWS) may be used to ensure no additional impacts on the indigenous fauna and floral species.</li> </ul>	<ul> <li>✤ High</li> <li>✤ High</li> <li>✤ High</li> </ul>
	<ul> <li>All removed plant material must be covered with a sail, that is tied down during transportation by road to prevent any blow-off from the vehicle.</li> <li>Alien vegetation must be disposed of at a designated waste disposal site.</li> </ul>	<ul><li>✤ High</li><li>✤ High</li></ul>

# 9.4.3 Operational Phase: Short – Medium Term Rehabilitation

Post construction rehabilitation measures required as part of the early operation phase of the new infrastructure will include that which is described in Table 5.

#### Table 7: Operational Phase: Short – Medium Term Mitigation and Rehabilitation Measures

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
Infrastructure Monitoring &	<ul> <li>Regular inspections must be conducted to detect and pro- actively manage potential infrastructure failure. Water leaking from the pipeline itself can be a cause of settling and infrastructure failure.</li> </ul>	✤ High
Maintenance	<ul> <li>Routine maintenance must be performed along the pipeline in accordance with a fixed maintenance programme to detect potential faulty infrastructure.</li> </ul>	↔ High
	The rehabilitated pipeline excavation and associated services areas must be inspected monthly and after every storm event directly post construction to ensure that no erosion has occurred. This must be repeated until soils around the construction area have settled and at least 80% vegetation cover has been achieved	♦ High
Soil	<ul> <li>Where storm related damage has occurred, this must be</li> </ul>	✤ High
Management	repaired immediately.	A Madium
	All temporary site roads and barren soil areas which underwent re-vegetation as part of the site rehabilitation must be inspected monthly up to the stage where at least 80% vegetation cover has been achieved. Areas where sufficient coverage has not been achieved must be revegetated as discussed in Section 8.5 below.	♣ Medium
Vegetation	Vegetation establishment on disturbed areas (Contractors' yard, laydown area, large patches where invasive vegetation has been removed, temporary access roads and areas where temporary berms or other erosion controls have been removed) and where revegetation has taken place as part of the rehabilitation process, must be monitored monthly.	♦ High
Management	<ul> <li>Areas where sufficient coverage has not been achieved must be revegetated with indigenous floral species to the degree where at least 80% coverage is achieved. See Section 5.6 below.</li> </ul>	✤ Medium
Alien	Concurrent alien vegetation establishment monitoring, and control is deemed a crucial component of restoration of the natural vegetation. This will necessitate the development of an alien vegetation management plan by a suitably qualified specialist in order to identify the priority species to control	✤ High
Vegetation	and species-specific control methods.	<b></b>
Management	<ul> <li>Removal of alien vegetation within pipeline servitude must be undertaken manually, to prevent further disturbances to the area.</li> </ul>	<ul> <li>₩ High</li> </ul>
	<ul> <li>Avoid the use of herbicides as far as possible. Should herbicides be deemed necessary, only herbicides approved by the Department of Water and Sanitation (DWS) may be</li> </ul>	✤ High

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
	<ul> <li>used to ensure no additional impacts on the indigenous fauna and floral species.</li> <li>All removed plant material must be covered with a sail, that is tied down during transportation by road to prevent any blow-off from the vehicle.</li> <li>See Appendix D of Appendix 2 for further details pertaining to the management of alien vegetation.</li> </ul>	<ul><li>✤ High</li><li>♦ High</li></ul>
Monitoring	<ul> <li>Fixed monitoring and maintenance programmes must be developed and implemented to detect potential issues, and pro-actively manage such issues. Aspects which require monitoring include the following:         <ul> <li>Vegetation establishment</li> <li>Erosion;</li> <li>Incidences of alien vegetation establishment.</li> </ul> </li> </ul>	✤ High
	<ul> <li>Infrastructure to be monitored includes:         <ul> <li>The bulk water pipeline must be regularly inspected, and pressure tested to detect any leaks. Leaks must be repaired within 24 hours of being detected;</li> <li>Gabions and any other erosion control mechanisms.</li> </ul> </li> </ul>	✤ High

# 9.4.4 Operational Phase: Long Term Rehabilitation Planning and Management

The introduction to this report described the Salvokop ridge environment as a valuable resource for the natural and human components of area in the light of the negative impacts of improper construction and maintenance management and the positive impact that this resource can have for the local communities if managed responsibly. Long-term planning and management must include provision for ongoing rehabilitation and maintenance of the pipeline servitude as required.

<b>Table 8: Operational Phase:</b>	Long-Term	Mitigation and	Rehabilitation	Measures
		0		

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
Infrastructure Monitoring & Maintenance	<ul> <li>Routine monitoring and maintenance must be performed along the pipeline in accordance with a fixed monitoring and maintenance programme to detect and repair potential faulty infrastructure.</li> </ul>	✤ High
Soil Management	Constant monitoring must be done on the incidence of stormwater damage and resultant erosion, and this must be rehabilitated on discovery	✤ Medium

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
Vegetation Management	<ul> <li>Vegetation establishment on disturbed areas (Contractors' yard, laydown area, large patches where invasive vegetation has been removed, temporary access roads and areas where temporary berms or other erosion controls have been removed) and where revegetation has taken place as part of the rehabilitation process, must be monitored quarterly. When 80% coverage is achieved, monitoring can be performed annually.</li> <li>Areas where sufficient coverage has not been achieved must be revegetated with indigenous floral species to the degree where at least 80% coverage is achieved. See Section 8.5 below.</li> </ul>	<ul><li>✤ Medium</li><li>♣ Medium</li></ul>
	Alien vegetation needs to be cleared on an ongoing basis along the length of the servitude and immediate surroundings to ensure these species do not outcompete re-established indigenous vegetation.	✤ High
	The Freedom Park Management should develop a long-term alien vegetation removal plan with protocols for the removal of all alien species that show recruitment.	✤ High
	The relevant section of the CoT and the Freedom Park Management should liaise with surrounding stakeholders to develop a plan to control surrounding nodes of alien invasive seed producing vegetation This can be a source of employment	✤ High
Alien Vegetation	<ul> <li>Identify priority species to control in consultation with relevant stakeholders (CoT, DWS, DEFE etc.)</li> </ul>	✤ High
Management	<ul> <li>Rehabilitate any disturbed areas (because of future developments) to pre-disturbance conditions and along the guidelines in this report.</li> </ul>	✤ High
	<ul> <li>Keep grass height (of indigenous grass species) as tall as possible as this enables it to effectively out-compete weeds and tolerate greater disease/ pest pressure so reducing the extent of herbicides needed. Taller grass also uses water more efficiently than shorter grass and protects the soil from moisture loss and erosion (USEPA. 2006);</li> </ul>	↔ High
	<ul> <li>Conduct concurrent re-assessment and monitoring of the area to determine success of the alien vegetation clearing operation and any follow-up measures required.</li> </ul>	↔ High
Monitoring	<ul> <li>Fixed long-term monitoring and maintenance programmes must be developed and implemented on a concurrent basis to detect potential issues, and pro-actively manage such issues. Aspects which require monitoring include the following:         <ul> <li>Vegetation establishment</li> <li>Erosion;</li> </ul> </li> </ul>	↔ High

Environmental Aspect	Recommended Mitigation and Rehabilitation Measures	Priority
	<ul> <li>Incidences of alien vegetation establishment.</li> <li>As for the medium-term mitigation and rehabilitation measures, infrastructure to be monitored includes:         <ul> <li>The bulk water pipeline that must be regularly inspected and pressure tested to detect any leaks. Leaks must be repaired within 24 hours of being detected;</li> <li>Gabions and any other erosion control mechanisms.</li> </ul> </li> </ul>	<b>∻</b> High

# 9.5 Landscape Rehabilitation Specifications

### 9.5.1 Rehabilitation Along Pipeline

As a point of departure, it is taken that the excavation has been backfilled at the required layer thickness and compaction rates and that the stockpiles topsoils have been replaced as discussed in the section above. The following measures should now be implemented:

- Clear all construction spoil material, wastes, rubble, and debris from the entire construction area;
- All excavations not situated in solid material (i.e., in rock material) and which include disturbed erodible material, should be re-shaped to a stable natural uniform landform along the entire length of the disturbed area;
- Grade both the upslope and downslope areas of excavations to form a natural flowing landform;
- Fill all depressions and uneven areas to form an even landform over the entire excavation area;
- All shaped areas should be ripped or scarified by hand or mechanically along the contours to form a proper bond between subsoil and topsoil;
- A Planting plan must be developed by a qualified botanist or landscape architect in order to plan the placement of the trees, shrubs, and other local landscape elements in natural plant communities during the rehabilitation phase. This will enhance the ecological restoration of the ridge area and reduce the visual impact of the construction process;
- Concentrated surface run-off on a long slope must be avoided. Stormwater discharge in these areas must be released in a controlled manner at regular intervals according to the specific slope.

# 9.6 Soil Preparation

# Soil Preparation for Embankments/Ridge Areas

- Where topsoils have been lost, topsoil should be sourced from a reputable commercial source and inspected by a suitable Specialist before delivered to site;
- Topsoils to a depth of 300 mm must be spread evenly over the entire excavated area and shaped to resemble the surrounding topography;
- Topsoil shall be free of detrimental salts and other impurities, weeds, construction rubble or similar objects no larger than 75 mm in any dimension, also brush, roots and other objectionable vegetal matter, litter, or any other foreign material unsuitable or harmful to plant growth;
- Topsoil shall not be extremely acid or alkaline. The pH shall be in the range of 6-7;

- Apply 4:3:4 (36) or 2:3:2 (22) at a rate of 60gm/m<sup>2</sup> over the whole area to be established and ripped into the topsoil;
- For slopes steeper than a gradient of 9-15%, additional biodegradable erosion containment in the form of biomats (BioJute<sup>®</sup>, Bio Mac<sup>®</sup>, etc.) should be installed to assist in re-vegetation of the slope. In addition, loose rock collected pre the excavation can also be placed across the excavated area and along the contour at intervals of 10m apart, in the steep areas;
- No storm water discharge structures may be allowed to discharge concentrated storm water on top of, or near the rehabilitated construction areas.

# Soil Preparation for other Bare Areas (Site roads not to be used post construction and the construction camps and laydown areas itself)

- Compacted areas must be ripped in two directions and at 90°, to a minimum depth of 150 mm and with the final direction of ripping to be along the contour;
- Topsoils to a depth of 300 mm must be spread evenly over the entire excavated area and shaped to resemble the surrounding landform;
- Topsoil shall be free of detrimental salts and other impurities, weeds, construction rubble or similar objects no larger than 75 mm in any dimension, also brush, roots and other objectionable vegetal matter, litter, or any other foreign material unsuitable or harmful to plant growth;
- Topsoil shall not be extremely acid or alkaline. The pH shall be in the range of 6-7;
- Apply 4:3:4 (36) or 2:3:2 (22) at a rate of 60gm/m<sup>2</sup> over the whole area to be established and ripped into the topsoil;
- No storm water discharge structures may be allowed to discharge concentrated storm water on top of, or near the rehabilitated construction areas.

# 9.7 Re-vegetation

# Establishment of the Grass Cover

- The entire construction area must be hand seeded with a seed mix and rate per hectare as provided below;
- The areas to be seeded shall unless wet be thoroughly watered before seeding to ensure that soil will be uniformly wet over a depth of at least 150 mm when seeding takes place;
- To ensure even distribution sowing must be done in two passes over the area and at 90°;
- The seed application must be done directly onto the rough un-raked ripped surface;
- The entire seeded area must be thoroughly wetted down after seeding to fix the seed to the soil surface ad to prevent undue drying out;
- Ensure that the area is not traversed by any vehicle or unnecessarily by foot for a period of at least two months after the re-vegetation has been done.
- The proposed seed mix for areas along the pipeline route and as follows:
- Aristida adscensionis @ 5% of grass mix
- Aristida congesta @ 5% of grass mix
- Chloris gayana @ 5% of grass mix
- Cynodon dactylon @ 15% of grass mix
- Digitaria eriantha
   @ 5% of grass mix
- Eragrostis curvula @ 5% of grass mix
- Fingerhuthia Africana @ 5% of grass mix
- Heteropogon contortus @ 5% of grass mix
- Loudetia simplex
   @ 5% of grass mix

- Schizachyrium sanguineum @ 5% of grass mix
- Schmidtia pappophoroides @ 5% of grass mix
- Setaria sphacelata
  Stipagrostis uniplumis
- Stipugi Ostis unipiunis
   Theorem de taise de
- Themeda trianda
- Tragus berteronianus
- o Thricholaena monachne
- Urochloa oligotricha @ 10% of grass mix

@ 5% of grass mix

- Only good quality fresh seed shall be used;
- Seed can be obtained from Diverse Ecological Solutions (PTY) Ltd or similar supplier;
- ✤ Tel: 012 545 4069
- Email: ivan@ecologicalsolutions.co.za

#### Shrub Planting:

The ecological screening identified numerous shrubs that are prevalent on the area. The shrub layer forms vegetative communities along with the grass and tree layers and are an important part of the local vegetation group. The following shrubs are recommended for the rehabilitation phase:

- *Ehretria regida* (Puzzle Bush)
- Euclea crispa (Blue Guarri)
- Gymnosporia buxifolia (Spike Thorn)
- Vanguera infausta (African Medlar)

#### Shrubs should be planted in the following manner:

- Prepare a 0.5 m x 0.5 m x 0.5 m hole for each shrub to be planted;
- Prepare a soil mixture of 25 gms 2:3:2 (22) fertilizer, 25 gms Superphosphate, 1 part per volume well decomposed compost, 25 gms bonemeal and 4 parts per volume of the soil removed from each planting hole;
- Backfill each shrub hole with the soil mixture to the level that the whole of the shrub's root ball will be covered when placed in the hole;
- Compact the backfilled soil lightly before placing the shrub in the hole;
- Place each shrub in the hole and replace the remainder of the soil mixture around the root ball;
- Compact the backfilled soil slightly around the shubs to ensure that they stand firmly in position;
- Where required, fix shrubs to a suitable timber stake to stabilize it after planting,
- Create a soil berm 20 mm high and 1 m diameter around each shrub for watering purposes.

#### Tree Planting:

The northern ridge of Salvokop is strewn with several adult indigenous trees typical of the vegetation type of the area. The following trees are recommended for the rehabilitation phase:

- Celtis africana (White Stinkwood)
- Combretum molle (Velvet Bushwillow
- Pappea capensis (Jacket Plum)
- Peltophorum africanum (Weeping Willow)
- Searsia lancea (Karee)
- Searsia leptodictya (Mountain Karee)
- Senegalia caffra (Hook Thorn)
- Vachellia robusta; (Splendid Thorn)

#### Trees should be planted in the following manner:

- Prepare a 1 m x 1 m x 1 m hole for each tree to be planted;
- Prepare a soil mixture of 50 gms 2:3:2 (22) fertilizer, 50 gms Superphosphate, 2 parts per volume well decomposed compost, 50 gms bonemeal and 8 parts per volume of the soil removed from each tree hole;

- Backfill each tree hole with the soil mixture to the level that the whole of the tree's root ball will be covered when placed in the hole;
- Compact the backfilled soil lightly before placing the tree in the hole;
- Place each tree in the hole and replace the remainder of the soil mixture around the root ball;
- Compact the backfilled soil slightly around the trees to ensure that they stand firmly in position;
- Fix each tree to a suitable timber stake to stabilize it after planting,
- Create a soil berm 20 mm high and 1 m diameter around each tree for watering purposes;
- Water each tree thoroughly after planting.

### 9.8 Watering Programme

- The total re-vegetated area must be watered on a bi-weekly basis for the first three months after which watering can be reduced to once a month during the first year. Watering can be terminated on verification of vegetation establishment;
- All trees and shrubs must be watered on a weekly basis for the first three months upon which watering can be reduced to once a month during the first year after being planted. Watering can be terminated on verification of vegetation establishment;
- Watering must be adapted in terms of the rainfall pattern;
- Do not over irrigate the re-vegetated areas (especially barren patches) as the exposed surface may erode due to early exposure to surface drainage and flooding.

### 9.9 Site Monitoring and Maintenance

- Site monitoring must be done by the relevant Contractor on a monthly basis and for a period of one year after the rehabilitation has been completed;
- The Contractor shall be solely responsible for establishing an acceptable vegetation cover and for the cost of replanting where acceptable cover is not obtained;
- Any signs of erosion or failing of the excavation or the surrounding rehabilitated areas must be reported to the Developer and must be repaired straightaway;
- Maintenance of the vegetation cover will include reseeding of grass on embankments and other bare areas to ensure at least 80% coverage;
- There shall be no bare patches of more than 500mm x 500mm maximum dimension;
- Weeds and other alien vegetation must be removed as part of the monthly monitoring of the rehabilitated area for at least one year after completion of the rehabilitation activities and on an ongoing basis as part of responsible environmental management by the Developer;
- The alien vegetation control program needs to be implemented in accordance with the recommendations of the EMPr.

#### PLEASE NOTE:

The recommendations made in this report are made in the light of achieving a state of reduced visual impact, protection of the newly installed infrastructure and sustained ecological functioning of the general site environment after construction and during the operational phase of the proposed bulk water pipeline construction. Recommendations made in terms of any civil infrastructural component of the proposed construction and associated infrastructure must first be studied by the design Engineer and certified before implementation.

Concurrent maintenance of the natural areas associated with the pipeline infrastructure will be imperative in order to achieve the sustained ecological functioning of the receiving environment and the structural integrity of the proposed new infrastructure.
#### 10. CONCLUSION

Natural areas within the City environment and especially ridges serve as important refuges for urban biodiversity and also contributes significantly to the city environment in terms of socio ecological services such as stormwater management and groundwater recharge, air quality improvement and carbon sequestration. These areas also serve as important tourism areas and contributes especially by means of illuminating the intrinsic value of the natural environment to human existence. For these reasons it is of absolute importance to manage the activities and facilities in these areas in ways that will maintain and enhance the ecological vitality.

Local impacts caused because of the construction and operational phases of the proposed bulk water supply pipeline development are in general not deemed to be significant. This statement is made primarily as a result of the level of existing anthropogenic impacts as well as the low levels of existing environmental sensitivity revealed on the application site. However, the application of the interventions discussed in this document is deemed essential in terms of setting a standard for infrastructure projects in the remaining urban natural environments. Socio-Economically the proposed construction of the infrastructure will contribute to the provision of quality civil infrastructural services for the local precinct which is invaluable in its own right.

It is believed that the identified impacts can be effectively minimised provided that the mitigation and rehabilitation measures included in section 7 & 9 of this EMPr are strictly adhered to. It is therefore very important that the relevant Managers (the Developer, GDARD, the project Engineers and construction phase & operational phase Managers) of each development stage of this project take cognisance thereof and implement it accordingly.

#### **11. EMPR UPDATES**

The EMPr will be updated as new aspects are identified and mitigating measures for these aspects are proposed.

#### Table 9: EMPr Updates

ASPECT / IMPACT	MITIGATING MEASURES	DATE	RESPONSIBLE PERSON
	· · · · · · · · · · · · · · · · · · ·		

After an update, the site and project team are to be updated to ensure continual implementation of the EMPr occurs. Low risk updates can be conducted as part of ongoing environmental awareness on the site. High risk updates are to be communicated as soon as possible.

#### **12. REFERENCES**

#### **12.1** Published Sources

- Acocks, J. P. H., 1975. Veld Types of South Africa. Memoirs of the Botanical Survey of South Africa, No
  40. Pretoria: Botanical Research Institute.
- DEAT. 2004. Environmental Management Plans, Integrated Environmental Management, Information Series 12. Pretoria: Department of Environmental Affairs and Tourism (DEAT).
- ENPAT, 1998. Van Riet, Claasen, van Rensburg, Du Plessis, Environmental Potential Atlas of South Africa.
- Kruger, A. C., 2002. Climate of South Africa: Surface Winds (WS43), Pretoria: South African Weather Service.
- Kruger, A. C., 2002. Climate of South Africa: Climate Regions (WS45), Pretoria: South African Weather Service
- Mucina, L. & Rutherford, M. C. (eds.) 2006. The Vegetation of South Africa, Lesotho, and Swaziland. Strelizia 19. Pretoria: South African National Biodiversity Institute.
- Shultze, R. E., 1997. South African Atlas of AgroHydrology and Climatology, Pietermaritzburg: Department of Agricultural Engineering, University of Natal.

#### 12.2 Unpublished Resources

- Schrenck, M., & Husted, A., 2022. Terrestrial Biodiversity Compliance Statement for the Proposed Freedom Park Bulk Water Pipeline Project, Salvokop, Pretoria, Gauteng Province.
- Van Schalkwyk, J. A., 2022. Phase 1 Cultural Heritage Impact Assessment: Proposed Freedom Park Bulk Water Pipeline Project, City of Tshwane Gauteng Province

## Proposed Penalties and Fines Associated with Various Acts of

Non-compliance and Miss-Conduct

# PROPOSED PENALTIES AND FINES FOR NON-COMPLIANCE OR MISCONDUCT

This EMPr forms part of the contract agreement between the Client and the PC and the Construction Manager. As such, non-compliance with conditions of the EMPr will amount to a breach of contract. Penalties will be issued directly to the PC/Construction Manager by the EO in the event of non-compliance to the EMPr specifications. The issuing of a penalty will be preceded by a verbal warning by the EO, as well as strict instruction in at least one monthly EO report to rectify the situation. The EO and PC/Construction Manager will communicate with regards to realistic timeframes for possible rectification of the contravention, and possible consequences of continued non-compliance to the EMPr.

Penalties incurred do not preclude prosecution under any other law. Cost of rehabilitation and/or repair of environmental resources that were harmed by the actions of the PC/ Construction Manager if such actions were in contravention of the specifications of the EMPr will be borne by the PC/ Construction Manager himself. Penalties may be issued over and above such costs. The repair or rehabilitation of any environmental damage caused by non-compliance with the EMPr cannot be claimed in the Contract Bill, nor can any extension of time be claimed for such works. Penalty amounts shall be deducted from Certificate payments made to the Contractor.

The following categories of non-compliance are an indication of the severity of the contravention, and the fine or penalty amounts listed in table 1 may be adjusted depending on the seriousness of the infringement.

Category One:Acts of non-compliance that are unsightly, a nuisance or disruptive to adjacent<br/>landowners, existing communities or persons passing through the area.Category Two:Acts of non-compliance that cause minor environmental impact or localised<br/>disturbance.Category Three:Acts of non-compliance that affect significant environmental impact extending<br/>beyond point source.Category Four:Acts of non-compliance that result in major environmental impact affecting large<br/>areas, site character, protected species, or conservation areas.

All the contraventions mentioned in table 1 as well as any other contravention to the EMPr specifications should be measured in terms of one of these 4 categories of non-compliance and penalties or fines should be adjusted accordingly.

Misconduct					
DESCRIPTION OF NON-COMPLIANCE TO EMPr SPECIFICATION	SPOT FINES AND PENALTIES THAT COULD BE INCURRED				
Any person, vehicle, plant, or other activity related to the contractor's operations that spill over into a "no-go" or sensitive area	R 4 000				
Any vehicle driving in excess of specified speed limits	R 1 000				
Vehicles being driven, plant or construction materials being stored outside of demarcated areas within the construction site. Unauthorised persons on site.	R 2 000				
Persistent, un-repaired oil/fuel leaks from machinery/vehicles. Spillages of oil/fuel at the re- fuelling site. Spillage of hazardous (e.g., Cement, Asphalt, Chemicals) materials on site. Burying of soils containing these spillages.	R 5 000				
Litter on site or dumping/ burying of rubble or waste outside designated location/s. Inadequate provision of waste disposal facilities on site	R 2 000				
Illegal Fires on site	R 5 000				
Eating / cooking food outside of designated areas. Inadequate site ablution facilities or failure to make use of the site ablution facilities.	R 1 000				
Excessive noise and / or dust as a result of site activities	R 2 000				
Contractor's operations causing a public nuisance as a result of contravention of EMPr specifications.	R 2 000				
Activities in contravention of EMPr that cause water waste or pollution	R 5 000				
Poaching/ setting of snares or traps.	R 5 000				
Damage to cultural Sites	Up to R 100 000				

## 

Erosion as a result of non-compliance – penalty shall be equivalent to the cost of rehabilitation plus 20%

#### DESCRIPTION OF NON-COMPLIANCE TO EMPr SPECIFICATION

#### SPOT FINES AND PENALTIES THAT COULD BE INCURRED

Severe oil spills - penalty shall be equivalent to the cost of clean-up operations plus 20%

Damage to indigenous vegetation or sensitive environments - penalty shall be equivalent to the cost of rehabilitation plus 20%

Penalties for removing or damaging trees that are to be retained

Girth of Trunk am above ground level	Replacement value per tree
0 – 15 mm	R 100
16 – 30 mm	R 200
31 – 50 mm	R 500
51 – 75 mm	R 1 000
76 – 100 mm	R 2 500
101 – 150 mm	R 5 000
151 – 300 mm	R 10 000
Larger than 300 mm	R 15 000 – R 100 000

# <u>PLEASE NOTE:</u> For any repeat offenders the fine will be DOUBLED, and a third offence could result in permanent suspension.

The following acts and legislation, amongst others, apply and will be enforced and monitored by the ECO;

- Environmental Conservation Act, (Act 73 of 1989)
- National Environmental Management Act, (Act 107 of 1998)
- National Environmental Management: Biodiversity Act, (Act 10 of 2004)
- Water Act, 1998, (Act 36 of 1998)
- National Parks Act, (Act 57 of 1976)
- Lake Areas Development Act, (Act 139 of 1975)
- Mountain Catchment Areas Act, (Act 63 of 1970)
- Forest Act, (Act 122 of 1984)
- Conservation of Agricultural Resources Act, (Act 43 of 1983)
- ✤ All Provincial ordinances and regulations as applicable

## Typical Composition of a Construction Camp



## **Spill Management Contractors List**

	SPILL AND POLLUTION RES	LL AND POLLUTION RESPONSE COMPANIES						
	Company	Product Description	Operating District	Website	Email address	Contact details		
	24 Hour Spill Response Association	Oil and hazardous materials spills, Truck roll-overs/transfers, derailments, acid spills, biohazard containment and cleanup, ship leaks, fuel spills, industrial plant emergencies, air quality monitoring, clean up and remediation including facility and equipment decontamination, soil excavation and disposal, sludge processing, cleaning services, waste management ensuring safe disposal and safe disposal certificates, contingency planning, asbestos removal, offshore vessel services and support, pollution control, maintenance and service, consumable sales	railments, acid spills, biohazard emergencies, air quality monitoring, intamination, soil excavation and ent ensuring safe disposal and safe ffshore vessel services and support,		info@24hourspillresponse.co.za	t: 0800 00 5817		
	Oil Spill Control	Range of absorbent materials for oil and other hydrocarbon based products, chemicals and other liquids, spill kits, oily water separators, oil skimmers, pumps, oil containment booms, training service, spill response service, site inspection service, providing guidance on safety, environment and ISO regulations		http://oilspillcontrol.co.za/		t (sales): 021 531 5335 t: 082 774 8964 t: 082 455 7832		
riders	Oil-Gone Agency cc Enretech	Bioremediation, spill clean-ups, spill kits, environmental remediation technology	Eastern Cape	http://www.oilgone.co.za/ http://www.enretech.co.za		t: 084 580 0327		
Services Prov	Procon Environmental Technologies	Environmental Products and Technologies, specializing in systems that minimize the impact of contamination on the environment and surrounding areas, prevention and treatment of oil pollution in soil and water	Centurion Witbank http://www.pro-enviro.co.za/		procon@pro-enviro.co.za	t: 013 697 4617/4634 f: 013 697 4618 t: 012 667 5389 f: 012 667 5389		
	ROSE Foundation (Recycling Oil Saves the Environment)	None-profit organisation - collect used oil	Burgersfort, Cape Town, Durban, Johannesburg, Middelburg, Nelspruit, Pietermaritzburg, Port Elizabeth, Pretoria, Richards Bay, Rustenberg, Weenen	http://www.rosefoundation.o rg.za/	usedoil@iafrica.com	t: 021 448 7492 c: 082 378 8556 f: 086 652 7384		
	Spill Tech	Spill response 24/7, absorbent products, spill kits, asbestos disposal service, hazmat, high pressure cleaning, waste management, marine response, bioremediation, clean up after fires and floods.	National	http://www.spilltech.co.za/	info@spilltech.co.za	t: 0861 000 366		
	HazClean	24h spillage response, skill kits, equipment, absorbent products	National	http://www.hazclean.co.za/	ian@hazclean.co.za	t: 0080 00 5817		
	IFRT Spill Response	24h spillage response, industrial cleaning, skill kits, equipment, absorbent products, training	Vereeniging	http://www.ifrt.co.za/		t: 016 428 2207 t: 083 284 1879 t: 083 284 1880		
Products	Absorbetech Environmental (former name SupaZorb Sales)	Absorbetech, a hydrocarbon absorbent, which is used to clean up spillages in factories, on water and capped or uncapped outdoor surfaces. The main benefit of using this product however, is the bio- remedial capacity it possesses. This means, the cleaning of such spillages utilizing a natural process through which a blend of bacteria and fungi break down, or degrade, a wide variety of hydrocarbons. In addition we offer a number of related products.	Durban Cape Town Johannesburg	http://absorbetech.yellowpag es.co.za/	info@absorbetech.com	t: 031 914 3939 t: 031 700 8617 t: 021 531 9999 t: 011 708 1494		
	Bio-systems SA	Products for the bioremediation of oil-contaminated soils, the bioaugmentation of urban, agricultural and rural effluent streams and the re-use of grey water.		www.biosystemssa.co.za	info@biosystemssa.co.za	t: 021 786 2972 f: 086 726 5445		
	Earthwize Envirionmental SA (PTY) Ltd.	Oil and chemical absorbent products	National	http://www.spillsorb.co.za/	gus@enviroshore.co.za	t: 012 568 1043		

## **Environmental Incident Register Template**

#### **Environmental Incident Register Template**

Environmental Incident Register							
Environmental Incident		al Incident	Mitigation Measures	Incident Closure			
Date and Time	Reported by	Description of Incident	Description of Mitigation Action Person		Date	Responsible Person	

## **Environmental Complaints Register Template**

#### Environmental Complaints Register Template

Nature of Complaint	Date and Time	Contact Details	Response and Investigation Undertaken	Actions Taken (and by whom)	Formal Response Date

#### **Environmental Training Register Template**

#### **Environmental Training Register Template**

Environmental Training Register							
Site:		Trainer:	Signiture:				
Date	Training Aspe	ct (Theme)		Attende	e Name	Signiture	