



Muny Consultants

**Basic Assessment Report for the
proposed upgrades of the
KwaThema to Grundlingh WWTW
Bulk Outfall Sewer near Nigel,
Gauteng Province**

Draft Basic Assessment Report

Authority Reference Number:

Provincial Authority GDARD: Gaut: 002/18-19/E0179

Project Number:

TSG 0406

Prepared for:

Tangos Consultants (Pty) Ltd

January 2019



Muny Consultants

This document has been prepared by Muny Consultants.

Report Type:	Draft Basic Assessment Report
Project Name:	Basic Assessment Report for the proposed upgrades of the KwaThema to Grundlingh WWTW Bulk Outfall Sewer near Nigel, Gauteng Province
Project Code:	TSG 0406

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Abbreviations and Acronyms

BAR	Basic Assessment Report
Bgl	Below Ground Level
BID	Background Information Document
CEC	Cation Exchange Capacity
C Plan	Conservation Plan
CRR	Comments and Response Report
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation (previously Department of Water Affairs)
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMM	Ekurhuleni Metropolitan Municipality
EMP	Environmental Management Programme
FEL	Front End Loader
GDARD	Gauteng Department of Agriculture and Rural Development
GN R.	Government Notice Regulation
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IBA	Important Bird Area
IDP	Integrated Development Plan
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
LDV	Light Duty Vehicle
LED	Local Economic Development
LHD	Load-Haul-Dump
MAE	Mean Annual Evaporation
mamsl	Metres above mean sea level
MAP	Mean Annual Precipitation

NEMA	National Environmental Management Act, Act No. 107 of 1998
NEMBA	National Environmental Management: Biodiversity Act, Act No. 10 of 2004
NEMWA	National Environmental Management: Waste Act, Act No. 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Area
NGO	Non-Governmental Organisation
NID	Notice of Intent to Develop
NWA	National Water Act, Act No. 36 of 1998
PES	Present Ecological Status
PHRA-G	Provincial Heritage Resources Agency - Gauteng
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
SSC	Species of Special Concern
TOR	Terms of Reference
WML	Waste Management Licence

Units of Measure

$\mu\text{g}/\text{m}^3$	Micro grams per cubic meter
dBa	Decibels
Ha	Hectare
kV	Kilovolt
km	Kilometres
m	metres
m^2	Square metres
m^3	Cubic metres
mS/m	Millisiemens per Metre
mg/l	Milligrams per litre
mm	Millimetres
mm/a	Millimetres per annum
PPB	Parts Per Billion
PPM	Parts Per Million
Tph	Tonnes Per Hour
Tpm	Tonnes Per Month

Executive Summary

Introduction

The south east sewer system is setup to drain the areas of Marievale, Dunnottar, Sharon Park, a military base and Coca-Cola depot to the Grundlingh Waste Water Treatment Works (hereafter WWTW). This sewer system has various sections where it has been severely vandalised, aged infrastructure and evidence of theft (exposed steel pipes). The Ekurhuleni Metropolitan Municipality have, over the years, carried out major repairs to the aging infrastructure however more sections keep deteriorating thus the need to upgrade the infrastructure with the purpose of meeting current and future developments.

Tangos Consultants was appointed by the City of Ekurhuleni Metropolitan Municipality as the design engineers for the proposed upgrading of the south east sewer system from Kwa-Thema to Grundlingh WWTW sewage outfall (hereafter referred to as the project). Tangos Consultants then appointed Muny Consultants (Pty) Ltd (hereafter Muny Consultants) as their independent Environmental Assessment Practitioner (hereafter EAP) to undertake environmental regulatory processes required for the project.

The proposed upgrades of the sewage pipeline require an Environmental Authorisation (hereafter EA) and a Water Use Licence (hereafter WUL) prior to commencement of construction works. The EA application will be undertaken in line with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA) and the supporting Water Use Licence Application (WULA) in line with the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

Project Applicant

The details of the applicant are detailed in the table below.

Project Applicant:	Ekurhuleni Metropolitan Municipality
Contact Person:	Dikeledi Malatjie
Telephone Number	011 999 3825
Email Address	Dikeledi.Malatji@ekurhuleni.gov.za
Physical Address	Water Services Depot Cnr Vlei Rd & Tenth Rd Crystal Park, Benoni 1515

Environmental Consultants

Contact details for the independent EAP are provided in the table below.

EAP Company Name:	Muny Consultants (Pty) Ltd
EAP:	Mamane Moeketsane
Telephone Number	010 005 5770
Email Address	mamane@munyconsult.com
Physical Address	Maxwell Office Park Building 4 Magwa Crescent Waterfall City 2090

Purpose of this report

The overarching objectives of this Basic Assessment Report (BAR) are to:

- Identify and assess potential environmental impacts associated with the proposed Project; and
- Recommend mitigation and management measures to ensure that the development is undertaken in such a way as to minimise negative impacts.

This report also provides the status quo of the biophysical and socio-economic environment of the project area through specialist studies undertaken. Furthermore, an Environmental Management Programme (EMP) has been developed to mitigate and manage environmental impacts associated with each project activity.

Project Overview

It is anticipated that the south east sewer system will entail the usage of HDPE material. Attributable to the current state of the pipeline, durability and life of infrastructure were main components for the selection of the upgrades material. The design capacity of the pipeline will be 135 l/s. The pipeline diameter will range between 315 mm and 900 mm (0.315 – 0.9 m) and the length is approximately 14 km.

Approach to Public Participation Process

The Public Participation Process (PPP) was developed to ensure compliance with environmental regulatory requirements and to provide Interested and Affected Parties (I&APs) with an opportunity to evaluate the project. During this process stakeholders are able to provide inputs and to receive feedback from the environmental specialists and/or proponent.

A description of the PPP activities undertaken during the basic assessment process are provided in Section 10 of this report. Consultation with I&APs during the basic assessment process was undertaken as follows:

- **Background Information Letter (BIL):** a BIL which included a project description, information about the relevant legislation, the competent authorities and details of the appointed EAP was prepared and distributed on 24 January 2019. The BIL was also accompanied by a Registration and Comment Form for stakeholders to use for formal registration as I&APs or to submit comments. Information regarding the availability of the Draft BAR was also provided, and I&APs were asked to comment.
- **Newspaper advertisement:** newspaper advertisements were placed in the Springs Advertiser and the Star, on 24 January 2019. The Springs Advertiser is a local newspaper that distributes to areas within the east rand. The adverts were published in English and included a brief project description, information about the relevant legislation, the competent authorities, details of the appointed EAP, registration process for I&APs, and information regarding the availability of the Draft BAR for public comment.
- **Site notices:** Site notices were put up at various places on 24 January 2019. The site notices were written in English, Afrikaans and isiZulu. They contained a brief project description, information about the relevant legislation, the competent authorities and details of the EAP, registration process for I&APs and information regarding the availability of the Draft BAR for public comment..

The Draft BAR has been made available for a public comment period of 30 days from Friday, 25 January 2019 to Sunday, 24 February 2019 at the following places:

Venue	Contact Details
Nigel Public Library, Hendrik Verwoerd St, Nigel, 1490	Tel.: (011) 999 9216
Alra Park Public Library, Zebra Ave, Alra Park, Ekurhuleni, 1492	Tel.: (011) 999 9077
Kwa Thema Library, 7019 Nkosi St, Kwa-Thema, Springs, 1575	Tel.: (011) 999 8494
Dunnottar Public Library, 47 Rhodes Ave, Dunnottar, Nigel, 1590	Tel.: (011) 999 9118
Muny Consultants (Pty) Ltd Website	www.munyconsult.com

Summary of the Potential Impact Assessment

A summary of all the potential environmental impacts identified during each phase of the proposed project and the significance of the impacts associated with the biophysical environment, pre-mitigation and post-mitigation, is summarised in the table below.

Table 1: Summary of the Key Potential Impacts

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation	Post-Mitigation
Construction	Biodiversity	<ul style="list-style-type: none"> Removal of the natural vegetation Disturbance to animals on site 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Increased soil erosion, increase in silt loads and sedimentation Establishment and spread of declared weeds 	Moderate (-ve)	Negligible (-ve)
Construction and Maintenance		<ul style="list-style-type: none"> Pollution due to oil and fuel spills, erosion, and ablution facilities. 	Moderate (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Pollution due to construction waste 	Minor (-ve)	Negligible (-ve)
Construction	Soil and land capability	<ul style="list-style-type: none"> Soil compaction caused by vehicles and heavy machineries onsite 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Increased soil erosion 	Minor (-ve)	Negligible (-ve)
Construction	Water resources	<ul style="list-style-type: none"> Loss of wetland Features Habitat and Ecological Structure 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Changes to Ecological and Socio-Cultural Services Provision 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Loss of hydrological function and sediment balance 	Moderate (-ve)	Negligible (-ve)
Operational	Water resources	<ul style="list-style-type: none"> Loss of wetland Features Habitat and Ecological Structure 	Negligible (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Changes to Ecological and Socio-Cultural Services Provision 	Negligible (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Loss of hydrological function and sediment balance 	Negligible (-ve)	Negligible (-ve)
Construction	Social	<ul style="list-style-type: none"> Creation of employment opportunities during the construction of the pipeline Enhancement of the local economy 	Negligible (+ve)	Minor (+ve)
Operational		<ul style="list-style-type: none"> Continuation of jobs during the operational phase of the pipeline through maintenance of the pipeline 	Negligible (+ve)	Minor (+ve)
		<ul style="list-style-type: none"> Reduced theft of the steel material for resale as HDPE material will be used for the upgrades 	Minor (+ve)	Minor (+ve)

Conclusion and Recommendation

The impacts identified are expected to be confined to the specific site and the significance of such impacts is greatly reduced through the implementation of mitigation and management measures. The key mitigation and management measures include:

- Only clear vegetation and remove topsoil when and where necessary;
- Berms must be constructed around the periphery of the excavated area and stockpiles to divert stormwater runoff;
- Site clearing and excavation activities to take place during dry winter season
- Undertake an alien invasive monitoring programme. Alien invasive species must be removed as they are identified;
- Prevent any hydrocarbon spills from occurring through ensuring that machines and vehicles are checked daily for oil leaks as well as making use of drip trays where leaks are identified;
- If a spill occurs it is to be cleaned up (Drizit spill kit, Oil or Chemical spill kit) immediately and reported to the appropriate authorities; and

It is noted that no significant impacts or risks associated with the proposed project has been identified and with mitigation measures these impacts are considered manageable. It is therefore recommended that authorisation for the construction and operation of the proposed pipeline be granted.

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Appendix A: EAP's CV

Appendix B: Plans

Appendix C: Public Participation Process

Appendix D: Biodiversity Impact Assessment

Appendix E: Wetland Delineation and Impact Assessment

Appendix F: Heritage Impact Assessment

Appendix G: Paleontological Impact Assessment

Part A: Scope of Assessment and Basic Assessment Report

1 Introduction

The south east sewer system is setup to drain the areas of Marievale, Dunnottar, Sharon Park, a military base and Coca-Cola depot to the Grundlingh Waste Water Treatment Works (hereafter WWTW). This sewer system has various sections where it has been severely vandalised, aged infrastructure and evidence of theft (exposed steel pipes). The Ekurhuleni Metropolitan Municipality have, over the years, carried out major repairs to the aging infrastructure however more sections keep deteriorating thus the need to upgrade the infrastructure with the purpose of meeting current and future developments.

The preliminary engineering design report drafted by Tangos Consultants (Pty) Ltd (hereafter Tangos Consultants) indicates that the City of Ekurhuleni Metropolitan Municipality spends huge sums of money on the operation and maintenance of its sewerage infrastructure at the expense of other competing needs. As a result, the municipality intends to improve the efficiency of sewage drainage and disposal service delivery by implementing measures that would reduce the operational and maintenance costs and improve the efficiency of the whole sewerage out-fall system. It is further stated in the report that the Ekurhuleni Metropolitan Municipality intends to undertake refurbishment and/or upgrade works of the existing sewerage drainage infrastructure aimed at improving their functionality and operation and maintenance, efficiency. Broadly, it is intended that these measures will bring about a balance between efficiency and cost of operation and maintenance of the overall sewerage service delivery system.

Tangos Consultants was appointed by the City of Ekurhuleni Metropolitan Municipality as the design engineers for the proposed upgrading of the south east sewer system from Kwa-Thema to Grundlingh WWTW sewage outfall (hereafter referred to as the project). Tangos Consultants then appointed Muny Consultants (Pty) Ltd (hereafter Muny Consultants) as their independent Environmental Assessment Practitioner (hereafter EAP) to undertake environmental regulatory processes required for the project.

Although detailed engineering designs are still underway, it is anticipated that the south east sewer system draining the areas indicated above will entail the usage of HDPE material. Attributable to the current state of the pipeline, durability and life of infrastructure were main components for the selection of the upgrades material. The design capacity of the pipeline will be 135 l/s. The pipeline diameter will range between 315 mm and 900 mm (0.315 – 0.9 m) and the length is approximately 14 km.

The proposed upgrades of the sewage pipeline require an Environmental Authorisation (hereafter EA) and a Water Use Licence (hereafter WUL) prior to commencement of construction works. The EA application will be undertaken in line with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA) and the supporting Water Use Licence Application (WULA) in line with the National Water Act, 1998 (Act No. 36 of 1998) (NWA)

2 Project Applicant

The City of Ekurhuleni Metropolitan Municipality is applying for EA in accordance with NEMA for Listed Activities triggered under GN R326 of the NEMA EIA Regulations, 2014 (as amended) associated with the upgrading of a sewer pipeline for which purpose this Basic Assessment Report (BAR) has been compiled. Please see the applicant's details in Table 2 below:

Table 2: Details of the Applicant

Project Applicant:	Ekurhuleni Metropolitan Municipality
Contact Person:	Dikeledi Malatjie
Telephone Number	011 999 3825
Email Address	Dikeledi.Malatji@ekurhuleni.gov.za
Physical Address	Water Services Depot Cnr Vlei Rd & Tenth Rd Crystal Park, Benoni 1515

2.1 Details of EAP

Muny Consultants has been appointed by Tangos Consultants as the independent Environmental Assessment Practitioner (EAP) to conduct the Basic Assessment process according to the NEMA and EIA Regulations, 2014 (as amended), as well as the required Public Participation Process (PPP). The details of the EAP undertaking the Basic Assessment process is supplied in Table 3.

Table 3: Details of the EAP

EAP Company Name:	Muny Consultants (Pty) Ltd
EAP:	Mamane Moeketsane
Telephone Number	010 005 5770
Email Address	mamane@munyconsult.com
Physical Address	Maxwell Office Park Building 4 Magwa Crescent Waterfall City 2090

2.2 Expertise of the EAP

2.2.1 The Qualifications of the EAP

Mamane is a Senior Environmental Consultant Muny Consultants. She holds a BSc (Hons) in Environmental and Water Sciences from the University of the Western Cape. Mamane has over five (5) years of relevant experience in the field of Environmental Management. Her key area of expertise lies in undertaking environmental permitting applications and the planning and management thereof. Mamane has a working knowledge of the South African regulatory guidelines and has been involved in various regulatory processes.

2.2.2 Summary of the EAP's Past Experience

During her time at Muny Consultant Mamane has been responsible for the compilation of EIAs, EMPs and Basic Assessment Reports (BARs), as required by South African legislation. Further to this, Mamane has been involved in Performance Assessments, Legal Compliance and Water Use License Audits. She has extensive experience with the ISO 14001 Environmental Management System (EMS) as well as worked as an Environmental Officer on various developments.

Please refer to Mamane Moeketsane's CV attached as Appendix A.

3 Location of the Overall Activity

The farms associated with the pipeline are located south east of Gauteng's capital city, Johannesburg, within the City of Ekurhuleni Metropolitan Municipality. The project area is located 5 km north of the nearest town, Nigel. The predominant land use within the area is residential, industrial and small-scale mining. The farms associated with the proposed upgrades are detailed in Table 4 below.

Table 4: Description of Directly Affected Farms

Farm Name:	<p>The pipeline will be located within the existing servitude which traverses the following Farm Portions:</p> <ul style="list-style-type: none"> ▪ Grootfontein 165 Portion 98 ▪ Varkensfontein 169 Portion 92 ▪ Grootfontein 165 Portion 75 ▪ Varkensfontein 169 Portion 29 ▪ Grootfontein 165 Portion 4 ▪ Grootfontein 165 Portion 29 ▪ Grootfontein 165 Portion 94 ▪ Grootfontein 165 Portion 35 ▪ Grootfontein 165 Portion 44 ▪ Grootfontein 165 Remaining Extent ▪ Varkensfontein 169 Portion 58 ▪ Grootfontein 165 Portion 15
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	<ul style="list-style-type: none"> ▪ Grootfontein 165 Portion 88 ▪ Grootfontein 165 Portion 46 ▪ Grootfontein 165 Portion 76 ▪ Grootfontein 165 Portion 30 ▪ Grootfontein 165 Portion 23 	
Application Area (Ha):	14 ha	
Magisterial District:	Ekurhuleni Metropolitan Municipality	
Distance and direction from nearest town:	Grundlingh WWTW is located approximately 5 km north of the town Nigel, in Gauteng province.	
21 digit Surveyor General Code for each farm portion:	Grootfontein 165 Portion 98	T0IR00000000016500098
	Varkensfontein 169 Portion 92	T0IR00000000016900092
	Grootfontein 165 Portion 75	T0IR00000000016500075
	Varkensfontein 169 Portion 29	T0IR00000000016900029
	Grootfontein 165 Portion 4	T0IR00000000016500004
	Grootfontein 165 Portion 29	T0IR00000000016500029
	Grootfontein 165 Portion 94	T0IR00000000016500094
	Grootfontein 165 Portion 35	T0IR00000000016500035
	Grootfontein 165 Portion 44	T0IR00000000016500044
	Grootfontein 165 Remaining Extent	T0IR00000000016500000
	Varkensfontein 169 Portion 58	T0IR00000000016900058
	Grootfontein 165 Portion 15	T0IR00000000016500015
	Grootfontein 165 Portion 88	T0IR00000000016500088
	Grootfontein 165 Portion 46	T0IR00000000016500046
	Grootfontein 165 Portion 76	T0IR00000000016500076
Grootfontein 165 Portion 30	T0IR00000000016500030	
Grootfontein 165 Portion 23	T0IR00000000016500023	

4 Locality Map

The project is located in the Gauteng province near Nigel town in Ekurhuleni Metropolitan Municipality. The regional and local setting of the project is displayed on Plan 1 and Plan 2 respectively in Appendix B.

5 Description of the Scope of the Proposed Overall Activity

The National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA) provides the environmental legal framework for South Africa. The listed activities that require environmental authorisation have been outlined in the EIA Regulations 2014 (as amended).

- Regulation GN R. 327 – Listing Notice 1 (as amended): This listing notice provides a list of various activities which require environmental authorisation and must follow the Basic Assessment process as described in Regulation 19 and Regulation 20 of the NEMA EIA Regulations;
- Regulation GN R. 325 – Listing Notice 2 (as amended): This listing notice provides a list of various activities which require environmental authorisation and must follow a full EIA process as described in Regulation 21 to Regulation 24 of the NEMA EIA Regulations; and
- Regulation GN R. 324 – Listing Notice 3 (as amended): This notice provides a list of various environmental activities which have been identified by provincial governmental bodies. The undertaking of such activities within the stipulated provincial boundaries will require environmental authorisation and the Basic Assessment process as described in Regulation 19 and Regulation 20 of the NEMA EIA Regulations.

5.1 Listed and Specified Activities

The proposed project aims to obtain environmental authorisation for the upgrading and operation of a sewer pipeline to be constructed between Kwa-Thema and Grundlingh WWTW in Ekurhuleni Metropolitan Municipality. The following Listed Activities will be triggered in the upgrading and operation of the pipeline as shown in Table 5.

Table 5: Listed and Specified Activities

Listing Notice and Activity	Listed Activity and trigger as per the project description	Aerial extent
GNR 327 (Listing Notice 1): <u>Activity 10</u>	The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: (a) such facilities or infrastructure are for bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area	Pipeline is ~14 000 m and will have a diameter ranging between 315 mm and 900 mm (0.31 – 0.9 m) with a capacity of 135 l/s
GNR 327 (Listing Notice 1): <u>Activity 12</u>	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs: (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	Pipeline is ~14 000 m and will have a diameter ranging between 315 mm and 900 mm (0.31 – 0.9 m)

Listing Notice and Activity	Listed Activity and trigger as per the project description	Aerial extent
GNR 324 (Listing Notice 3): <u>Activity12</u>	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. <u>c. Gauteng</u> i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans; or	Pipeline is ~14 000 m on a 10 m corridor thus an aerial extent of 14 ha.

Based on the above, a Basic Assessment Process is required. No Listed Activities under GNR 325 (Listing Notice 2) are triggered by the proposed upgrades.

5.2 Description of the Activities to be undertaken

5.2.1 Project Overview

The south east sewer system is setup to drain the areas of Marievale, Dunnottar, Sharon Park, a military base and Coca-Cola depot to the Grundlingh WWTW. This sewer system has various sections where it has been severely vandalised, aged infrastructure and evidence of theft (exposed steel pipes). Various sections where the pipeline runs above ground have greatly deteriorated and sewage flows can be seen through the pipes. Further to this, sewer spillages are noticeable on various sections of the pipeline. The Ekurhuleni Metropolitan Municipality have, over the years, carried out major repairs to the aging infrastructure however more sections keep deteriorating thus the need to upgrade the infrastructure with the purpose of meeting current and future developments. Table 6 provides photographic presentation of the current state of the pipeline.

Table 6: Photograph representation of the current state of the pipeline

 <p>Deteriorated pipeline with excessive rust</p>	 <p>Aging infrastructure</p>
 <p>Sewer spillage through manhole</p>	 <p>Repair section on the pipeline</p>

5.2.2 Pipeline upgrades

Though detailed engineering designs are still underway, it is anticipated that the south east sewer system draining the areas of Marievale, Dunnottar, Sharon Park, a military base and Coca-Cola depot to the Grundlingh WWTW will entail the usage of HDPE material. Attributable to the current state of the pipeline, durability and life of infrastructure were main components during the selection of the upgrades material. The design capacity of the pipeline will be 135 l/s. The pipeline diameter will range between 315 mm and 900 mm (0.315 – 0.9 m) and the length is approximately 14 km. A more detailed breakdown of the sewer length and diameter is shown in Table 7.

Table 7: Pipeline diameter and length

Pipe diameter	Length (m)
315 mm (0.315 m)	3 520 m
450 mm (0.45 m)	2 550 m
550 mm (0.55 m)	1 150 m
700 mm (0.7 m)	4 830 m
900 mm (0.9 m)	1 930 m

6 Policy and Legislative Context

This section identifies and describes the legislation, policies and guidelines that are relevant to the project and to which the project must comply before any construction activities may commence. This basic assessment report will be subjected to the requirements of the NEMA and those regulatory and policy instruments discussed in Table 8 below.

Table 8: Policy and Legislative Context

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p><u>Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)</u> Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that –</p> <ul style="list-style-type: none"> 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 	<p>Tangos Consultants has appointed Muny Consultants as the independent EAP to undertake a BA process to determine the potential impacts associated with the project on people and their environment. Mitigation measures and monitoring plans have been recommended and compiled in an Environmental Management Programme to ensure that any potential impacts are managed to an acceptable level to support the rights as enshrined in the Constitution.</p>	<p>A BA application to upgrade the pipeline was submitted to the Gauteng Department of Agriculture and Rural Development (GDARD) detailing the activities that will be undertaken as part of the Project. Subsequently, a BA Process has been undertaken which includes the compilation of a BA report where the impacts associated with the activities being undertaken have been determined. The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process.</p>
<p><u>National Environmental Management Act, 1998 (Act No. 107 of 1998)</u> The NEMA, as amended was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: <i>The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.</i> The EIA Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. These regulations have subsequently been amended in April 2017 published GN R.326. Together with these EIA Regulations, the Minister also published GN R.327 (Listing Notice No. 1 which requires a basic assessment process), GN R.325 (Listing Notice No. 2 which requires an EIA process) and GN R.324 (Listing Notice No. 3 which requires a basic assessment process) in terms of sections 24(2) and 24D of NEMA, as amended.</p>	<p>Environmental authorisation for the upgrading and operation of the sewer pipeline is required for listed activities in terms of the EIA Regulations (2014) (as amended) of the NEMA. The listed activities are listed in Table 5. No activities identified in Listing Notice 2 apply to the proposed upgrades, and therefore a BA Process is being followed in applying for authorisation.</p>	<p>This BA report has been compiled in accordance with the requirements of the NEMA EIA Regulations, 2014 (as amended), with the environmental management objective to protect ecologically sensitive areas.</p>
<p><u>National Water Act, 1998 (Act No. 36 of 1998) (NWA)</u> The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has the overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. As such Section 21 of the NWA lists water uses that may require authorisation through the undertaking of a Water Use Licence Application (WULA). In this regard, it is anticipated that the following water uses will be applied for:</p> <ul style="list-style-type: none"> (i) Section 21(c): <i>impeding or diverting the flow of water in a watercourse; and</i> (ii) Section 21 (i): <i>altering the bed, banks, course or characteristics of a watercourse.</i> 	<p>The Construction of infrastructure within 100 meters of a River or within 500 meters of a wetland requires a license under Section 40 of the NWA. The pipeline will be constructed across various watercourses, therefore a WUL will be applied for in terms of Section 21 (c) and (i) in accordance with the NWA.</p>	<p>A WULA will be submitted to the DWS for the triggered water uses under Section 21 of the NWA. The WUL will be undertaken concurrently with this BA processes.</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p><u>National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)</u> The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources be managed and conserved by a Resource Authority, either nationally, by the South African Heritage Resources Agency (SAHRA) or by the relevant provincial Agency. In this case, the Provincial Heritage Resources Authority Gauteng (PHRA-G) is responsible for the identification, conservation and management of heritage resources throughout the province.</p>	<p>A Heritage Impact Assessment Report (HIA) was completed as part of the proposed project to determine the impact the pipeline may have on any heritage resources located in the area. Further to this, a paleontological sensitivity analysis was undertaken as part of the HIA. The HIA will be submitted to the Gauteng Provincial Heritage Resources Authority (PHRA-G) and the South African Heritage Resources Authority (SAHRA).</p>	<p>No heritage/archaeological resources associated with the project site have been identified within the footprint of the pipeline.</p>
<p><u>National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)</u> NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates to the protection of species and ecosystems that require national protection and considers the management of alien and invasive species. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance:</p> <ul style="list-style-type: none"> ▪ Alien and Invasive Species Lists, 2014 published (GN R.599 in GG 37886 of 1 August 2014) ; ▪ National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations (GN R.152 in GG 29657 of 23 February 2007) and <p>National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R.1002, 9 December 2011).</p>	<p>As part of this project, a Biodiversity Impact Assessment was undertaken to determine the status of the environment and to determine any potential ecological sensitivity to be avoided and/or mitigated. No applications have been submitted in terms of NEM:BA for the project as no protected species were identified along the pipeline route</p>	<p>The Biodiversity Impact Assessment details the pipeline area and have determined the ecological importance of the area. The findings of the biodiversity assessment, in the form of the impacts and the proposed mitigation measures for the project are included herein.</p>
<p><u>National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)</u> On 29 November 2013, the list of waste management activities published under GN R.718 of 3 July 2009 (GN R718) was repealed and replaced with a new list of waste management activities under GN R.921 of 29 November 2013 . Included in the new list are activities listed under Category A, B and C. These activities include inter alia the following:</p> <ul style="list-style-type: none"> ▪ Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA Regulations supporting an application for a Waste Management Licence (WML); ▪ Category B describes waste management activities requiring an EIA process to be conducted in accordance with the EIA Regulations supporting a WML application; and ▪ Category C describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. These activities include the storage of general waste at a facility with a capacity to store in excess of 100 m³ and storage of hazardous waste in excess of 80 m³. <p>The Waste Classification and Management Regulations published under GN R 634 of November 2013 require that all wastes be classified according to SANS10234 and managed according to its classification. The National Norms and Standards for the Assessment of Waste for Landfill Disposal were published under GN R635 on 23 August 2013 and prescribe the requirements for the assessment of waste prior to disposal to landfill in terms of Regulation 8(1)(a) of the Waste Classification and Management Regulations.</p> <p>The National Norms and Standards for the Disposal of Waste to Landfill were published under GN R 636 of 23 August 2013 and determine the requirements for the disposal of waste to landfill as contemplated in Regulation 8(1)(b) and (c) of the Waste Classification and Management Regulations.</p>	<p>The construction of the pipeline does not trigger any waste related activities therefore no waste management licence is required.</p> <p>General construction waste that will be generated by the pipeline construction is expected to be limited and will be disposed of by the construction contractor at a licensed</p>	<p>Waste management mitigation measures have been identified and will be implemented to ensure no impact to the environment occurs. All waste, both general and hazardous, will be managed in accordance with the NEM:WA and relevant waste regulations.</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p><u>Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA)</u> CARA aims to provide for the conservation of the natural agricultural resources of the country through the maintenance of the production potential of land, by combatting and preventing erosion and the weakening of water sources. In addition, this Act aims to protect vegetation, while combatting weeds and invader plants</p>	<p>Mitigation measures have been included for the potential impacts on soils and land capability.</p>	<p>Section 12 of the CARA details the maintenance of soil conservation in which every land user will be responsible for the maintenance and conservation of soil. The mitigation measures recommended as part of this Basic Assessment Report aim to prevent the compaction, erosion and degradation of the soil resources.</p> <p>The project will not result in the loss of agricultural land.</p>

6.1.1 Further Relevant National Legislation

This section of the report further describes other various national regulations which may need to be adhered to in relation to the project, these include:

- **The Hazardous Substances Act, 1973 (Act No. 15 of 1973)**, which relates to the transport, handling and storage of fuels and other hazardous materials to and from the project site and the measures which need to be put in place to avoid or mitigate any significant risks;
- **The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)**, relating to the health and safety of the employees during construction and operation activities and ensuring a safe working environment for all, including the provision of the Personal Protective Equipment (PPE);
- **The National Road Traffic Act, 1996 (Act No 93 of 1996)**, regarding the transport of materials and product from the project site and ensuring safe transport through adherence with traffic rules (i.e. speed limits, weight and height restrictions, access arrangements to the project site etc.);
- **Employment Equity Act, 1998 (Act No. 55 of 1998) and Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997)**, these acts require an equal opportunity, fair and transparent recruitment process as well as fair compensation and working conditions for all employees.
- **Skills Development Act (Act No. 97 of 1998) as amended**, makes provision for training and skills transfer to all employees.

7 Need and Desirability of the Proposed Activity

The sewerage system draining the areas of Marievale, Dunnottar, Sharon Park, a military base and Coca-Cola depot is in dire need of infrastructure upgrade. Currently, the infrastructure has greatly deteriorated due to aging (Figure 1) and vandalism (Figure 2). The vandalism of the infrastructure is mainly perpetuated by the illegal mining activities (Figure 3). The illegal miners have, in some sections of the pipeline, removed the covers of the manhole and dug out furrows to divert the waste water to areas where they are mining (Figure 4). As a consequence of the vandalism and aging infrastructure sewer spillages are noticeable in various sections of the pipeline (Figure 5). The damages noticeable on the sewer pipeline result in waste water flowing through to the nearby water courses / drainage line and thereby negatively impacting on the ecological value of the area.

The preliminary engineering design report indicates that the City of Ekurhuleni Metropolitan Municipality spends huge sums of money on the operation and maintenance of its sewerage infrastructure at the expense of other competing needs. As a result, the municipality intends to improve the efficiency of sewage drainage and disposal service delivery by implementing measures that would reduce the operational and maintenance costs and improve the efficiency of the whole sewerage out-fall system. It is further stated that the Ekurhuleni

Metropolitan Municipality intends to undertake refurbishment and/or upgrade works of the existing sewerage drainage infrastructure aimed at improving their functionality and operation and maintenance, efficiency. Broadly, it is intended that these measures will bring about a balance between efficiency and cost of operation and maintenance of the overall sewerage service delivery system.



Figure 1: Aging infrastructure



Figure 2: Vandalism of the sewerage



Figure 3: Illegal mining undertaken along the pipeline route



Figure 4: Furrows to divert waste water



Figure 5: Sewage spillage from the pipeline

8 Motivation of the Overall Preferred Site, Activities and Technology Alternative

This application for environmental authorisation is for the upgrading of an existing sewer pipeline, draining various areas in the south east of Johannesburg to the Grundlingh WWTW. The upgrades will follow the existing pipeline route and within the same servitude and as such, the alternatives that have been considered for the project were technological. The preliminary design report recommends the usage of HDPE material for the upgrades. This is due to the flexibility of the material, thereby allowing it to be transported in rolls and used in trenchless installations where it can be pulled through the existing pipe to replace it. HDPE material is lightweight, resistant to cracking, easy to handle, easy to joint and resistant to corrosion. It is not damaged by direct sunlight and can be used in above-ground applications. The material is said to be supplied in long lengths and as such fewer joints will be required, thus minimising the possibility of sewer leaks through joint sections.

9 Full Description of the Process Followed to reach the Preferred Alternatives within the Site

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives aid in identifying the most appropriate method of developing the project, considering route alternatives, technological alternatives, rehabilitation alternatives, as well as the No-Go alternative. Alternatives also aid in determining the activity with the least environmental impact.

9.1 Design Material Alternatives

As mentioned in Section 8, the upgrades are for an existing sewer pipeline and only material and the No-Go alternatives were considered as part of this assessment. These are discussed below.

9.1.1 Un-plasticized Poly Vinyl Chloride (uPVC)

The uPVC material is lightweight, easy to handle and resistant to corrosion however this material should not be exposed to direct sunlight for long periods as it results in deterioration of the material i.e. weakening and discolouration. Considering that durability of the infrastructure was a top requirement for the proposed upgrades, uPVC material was regarded as unsuitable for use in sewer systems where pipelines are installed above ground.

9.1.2 High Density Polyethylene (HDPE)

The preliminary design report recommends the usage of HDPE material for the upgrades. This is due to the flexibility of the material, thereby allowing it to be transported in rolls and used in trenchless installations where it can be pulled through the existing pipe to replace it. HDPE material is lightweight, resistant to cracking, easy to handle, easy to joint and resistant to corrosion. It is not damaged by direct sunlight and can be used in above-ground applications. The material is said to be supplied in long lengths and as such fewer joints will be required, thus minimising the possibility of sewer leaks through joint sections.

9.1.3 Ductile Iron (DI)

The use of DI pipes was studied and considered as the material is resistant to corrosion however this material was not preferred as it is regarded as heavy and difficult to handle. Another disadvantage to the usage of DI pipes was the increased possibility of theft (for resale at a scrap metal) as evident with the existing pipeline.

9.1.4 Steel

Steel pipes have been used in pipeline construction since the 20th century and continue to be used today. This material is preferred due to its strength however, it is highly corrosive.

9.2 No-Go Option

Should a No-Go option be selected the pipeline will not be constructed therefore all negative and positive impacts associated with the pipeline will not be realised. Additionally, it should also be considered that if the pipeline is not upgraded, the need and desirability outlined in Section 7 above will not to be realised. Therefore, it is the opinion of the EAP that the No-Go alternative should not be considered.

10 Details of the Public Participation Process Followed

A Public Participation Process (PPP) is undertaken in terms of the regulatory requirements set out in Regulation 39 and 44 of the EIA Regulations, 2014 (as amended) and as required in terms of Chapter 5 of NEMA. The PPP enables stakeholders to partake and submit comments, suggestions or issues of concern. Stakeholder comments will be incorporated where possible by the project team and specialists. The important elements relating to the PPP that are required by the Regulations are the following:

- Formal project announcement;
- Identification and Registration of Interested and Affected Party(s) (I&APs);
- Public comment period for the draft BAR; and
- Announcement of the Decision (granting or not granting of the EA by GDARD)

The activities undertaken during each phase are described below. All PPP documentation which has been distributed to I&APs has been incorporated within Appendix C.

10.1 Formal Project Announcement

As part of the announcement phase, details of the proposed upgrades together with availability of the Draft BAR were provided to stakeholders. Below are the key activities undertaken for the PPP Announcement Phase.

10.1.1 Identification of Stakeholders

Stakeholders interested in or affected by the proposed project were identified by means of the methods indicated below:

- A desktop search of property owners and owner's details as well as adjacent property owners;
- Responses on the distribution of the Background Information Letter, site notices or newspaper advertisement placed; and
- Consultation with landowners to identify other potential I&APs.

Stakeholders for the proposed project were grouped into the following categories:

- **Government:** National, Provincial, District and Local authorities;

-
- **Landowners and occupants:** Directly affected, adjacent or indirectly affected landowners and occupants;
 - **Parastatals:** Such as Transnet, SANRAL and Eskom;
 - **Non-Governmental Organisations (NGOs):** Environmental and social organisations; and
 - **Business:** Small and medium enterprises, mining and industrial companies.

A stakeholder database was compiled and will be updated throughout the Basic Assessment process (see Appendix C 1).

10.1.2 Public Participation Media

Considering the legislative requirements and good practice, the following methods have been implemented to make project information available to stakeholders.

- **Background Information Document (BID):** a BID which included a project description, information about the relevant legislation, the competent authorities and details of the appointed EAP was prepared and distributed on 24 January 2019. The BID was also accompanied by a Registration and Comment Form for stakeholders to use for formal registration as I&APs or to submit comments. Information regarding the availability of the Draft BAR was also provided, and I&APs were asked to comment. The BID has been included in Appendix C 2.
- **Newspaper advertisement:** newspaper advertisements were placed in the Springs Advertiser and the Star, on 24 January 2019. The Springs Advertiser is a local newspaper that distributes to areas within the east rand. The adverts were published in English and included a brief project description, information about the relevant legislation, the competent authorities, details of the appointed EAP, registration process for I&APs, and information regarding the availability of the Draft BAR for public comment. Evidence of the placement of the newspaper is included in Appendix C 3.
- **Site notices:** Site notices were put up at various places on 24 January 2019. The site notices were written in English, Afrikaans and isiZulu. They contained a brief project description, information about the relevant legislation, the competent authorities and details of the EAP, registration process for I&APs and information regarding the availability of the Draft BAR for public comment.

The Draft BAR has been made available for a public comment period of 30 days from Friday, 25 January 2019 to Sunday, 24 February 2019 at the following places:

Venue	Contact Details
Nigel Public Library, Hendrik Verwoerd St, Nigel, 1490	Tel.: (011) 999 9216
Alra Park Public Library, Zebra Ave, Alra Park, Ekurhuleni, 1492	Tel.: (011) 999 9077
Kwa Thema Library, 7019 Nkosi St, Kwa-Thema, Springs, 1575	Tel.: (011) 999 8494
Dunnottar Public Library, 47 Rhodes Ave, Dunnottar, Nigel, 1590	Tel.: (011) 999 9118
Muny Consultants (Pty) Ltd Website	www.munyconsult.com

Comments received from I&APs regarding the project during this period will be incorporated into the Final BAR.

10.1.3 Public Participation Activities undertaken

Table 9 below provides a summary of the PPP activities undertaken thus far, together with referencing materials included as annexures in Appendix C.

Table 9: Public Participation Activities

Activity	Details	Reference in Report
Identification of stakeholders	Stakeholder database was developed which represents various sectors of society, including directly affected and adjacent landowners, in and around the proposed project area.	Appendix C 1: Stakeholder Database
Distribution of BID	A BID with registration and comment form was emailed and posted to stakeholders on 24 January 2019	Appendix C 2: BID with registration and comment sheet
Placing of newspaper advertisement	Newspaper advertisements were placed in the Springs Advertiser and the Star on 24 January 2019.	Appendix C 3: Advertisement
Announcement of the Draft BAR availability	Announcement of availability of the Draft BAR was emailed and posted to stakeholders together with the formal project announcement on 24 January 2019. Copies of the Draft BAR were available to stakeholders at the Nigel, Alra Park, KwaThema, and Dunnottar Public Libraries, as well as on the Muny Consultants website: www.munyconsult.com (under Published Documents)	Appendix C 2: BID Appendix C 3: Advert

10.2 Decision Making

Once the competent authority has made a decision regarding the proposed project, results thereof, together with information about the regulated appeals procedure, will be

communicated to stakeholders as prescribed under the NEMA legislation. Notification to stakeholders will be done by means of a letter via email and post.

11 The Environmental Attributes associated with the Alternative

A summary of the baseline environment in the proposed project area is provided in the sections below. It should be noted that the following specialist studies have been undertaken for the proposed project:

- Biodiversity Impact Assessment (Appendix D);
- Wetland Delineation and Impact Assessment (Appendix E);
- Heritage Impact Assessment (Appendix F); and
- Paleontological Impact Assessment (Appendix G)

11.1 Climate

11.1.1 Rainfall

The highest average of rainfall (mm) was recorded during the summer and spring months, while the lowest rainfall average occurred during the winter and autumn months. Intense thunderstorms can be experienced in the late afternoons, periodically with hail. Frequent lightning strikes 6 – 8 lightning flashes per square kilometre per year (Botha, 2012) occur within the region.

11.1.2 Temperatures

In summer (November to February) the study area experience daily average temperatures ranged between ~ 20 °C and ~ 18 °C, while winter temperatures range between ~13°C and ~ 15°C. The relative humidity is lowest during the winter and highest in summer and spring.

11.1.3 Wind Direction and Speed

The predominant wind direction within the study area is mainly from the north and north western region. Secondary winds are noted from the south western and north eastern region. The highest frequency of wind speeds lies between 2.1 – 3.6 m/s and 3.6 – 5.7 m/s which occurred for 33 % of the time respectively.

11.2 Vegetation

The proposed project is located within the Tsakane Clay Grassland (Gm 9) which is part of the Grassland Biome (refer to Plan 3 in Appendix B). The Tsakane Clay Grassland occurs on flat to gently undulating plains with low hills. The presence of *Hyparrhenia hirta* and *Eragrostis chloromelas* indicates past disturbances in this veld type. The veld type is considered Endangered and only 1.5% of the 24% target is currently under conservation (Mucina &

Rutherford, 2006). The sections below provide a summary of the site assessment. Please refer to Appendix D for the detailed results of the biodiversity assessment.

11.2.1 Vegetation Communities

Five (5) vegetation communities were identified during the site assessment (Figure 6). These were recognised based on physiognomy, moisture regime, and species composition and disturbance characteristics. The vegetation communities are listed below:

- Eucalyptus woodland,
- Mined area,
- Natural grassland,
- Ridge, and
- Vegetation associated with watercourses.

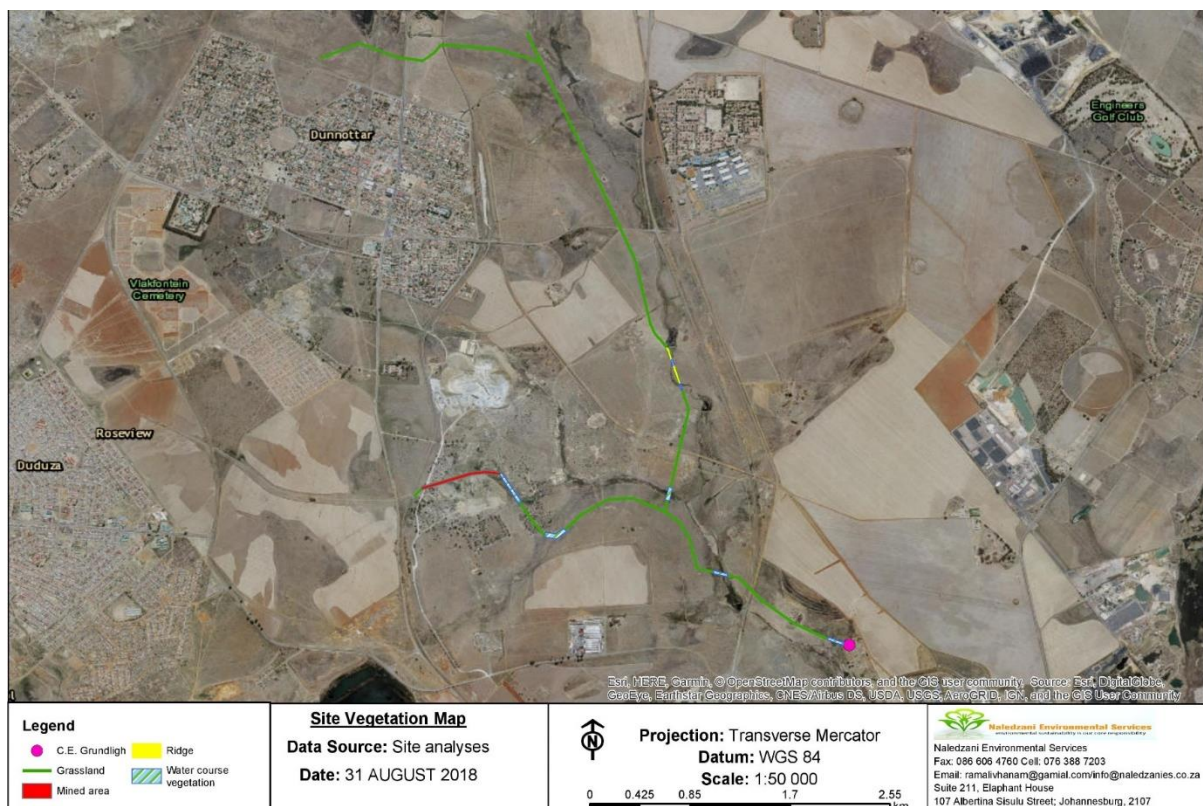


Figure 6: Site Vegetation Communities

11.2.2 Alien Invasive Plants

Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that all these transformers be eradicated and controlled by means of an eradication and monitoring programme. Some invader plants may also

degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

According to the published Alien and Invasive Species regulations in terms of section 97(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) four (4) categories of problem plants are identified as:

- **Category 1a:** These plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned.
- **Category 1b:** These plants are widespread invasive species controlled by a management programme.
- **Category 2:** These plants are invasive species controlled by area. Can be grown under permit conditions in demarcated areas. All breeding, growing, moving, and selling are banned without a permit.
- **Category 3:** These plants are ornamental and other species that are permitted on a property but may no longer be planted or sold.

Numerous alien plant species were recorded in the study area at the time of the survey; most notably the extensive invasions by species such as *Argemone Mexicana* and *Datura stramonium* have the potential to form dense stands. Table 10 lists the alien species as well as the applicable NEM:BA categories for each species recorded during the survey.

Table 10: Alien species recorded in the study area

Scientific name	Common name	NEMBA Category
<i>Argemone Mexicana</i>	Mexican prickly poppy	1b
<i>Agave sisalana</i>	Sisal	2
<i>Datura Stramonium</i>	Downy thorn apple	1b
<i>Eucalyptus globulus</i>	Tasmanian blue gum	3
<i>Opuntia ficus-indica</i>	Prickly pear	1b
<i>Acacia mearnsii</i>	Black wattle	1b
<i>Sesbania punica</i>	Red sesbania	1b
<i>Cortaderia selloana</i>	Pampas grass	1b
<i>Eucalyptus globulus</i>	Tasmanian bluegum	
<i>Campuloclinium macrocephalum</i>	Pompom	1b
<i>Melia azedarach</i>	Syringa	1b anywhere but 3 in urban areas

11.2.3 Medicinal Plants

The demand for medicinal plants is increasing while the frequently used species and the communal land that it is harvested from are on the decline. With an increase in the country's population and the high rate of infectious diseases, this will put an even higher strain on the already scarce natural medicinal resources (Emery *et al.*, 2002). Areas of high biodiversity

are thus important for the conservation and sustainable use of these resources and should be protected.

Table 11: Medicinal plants recorded in the study areas.

Scientific name	Common name	Conservation Status
<i>Opuntia ficus-indica</i>	Prickly pear	Invader

11.2.4 Description of Critical Biodiversity Areas in the Gauteng Province

Critical Biodiversity Areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI, 2007). These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision-making tools.

The primary purpose of CBA's is to inform land-use planning and the land-use guidelines attached to CBA's aim to promote sustainable development by avoiding loss or degradation of important natural habitat and landscapes in these areas and the landscape as a whole. CBA's can also be used to inform protected area expansion and development plans. The use of CBA's in this assessment follows the definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- **“Critical biodiversity areas (CBAs)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses”.
- **“Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.”

The guideline for bioregional plans defines three basic CBA categories based on three high-level land management objectives.

Table 12: A framework for linking spatial planning categories (CBAs) to land-use planning and decision-making guidelines based on a set of high-level land biodiversity management objectives

CBA category	Land Management Objective
PA & CBA 1	<p>Natural landscapes:</p> <ul style="list-style-type: none"> ▪ Ecosystems and species fully intact and undisturbed ▪ These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost, then targets will not be met. ▪ These are landscapes that are at or past their limits of acceptable change.
CBA 2	<p>Near-natural landscapes:</p> <ul style="list-style-type: none"> ▪ Ecosystems and species largely intact and undisturbed. ▪ Areas with intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising our ability to achieve targets. ▪ These are landscapes that are approaching but have not passed their limits of acceptable change.
Ecological Support Areas (ESA)	<p>Functional landscapes:</p> <ul style="list-style-type: none"> ▪ Ecosystems moderately to significantly disturbed but still able to maintain basic functionality. ▪ Individual species or other biodiversity indicators may be severely disturbed or reduced. ▪ These are areas with low irreplaceability with respect to biodiversity pattern targets only.
Other Natural Areas (ONA) and Transformed	<p>Production landscapes: manage land to optimize sustainable utilization of natural resources.</p>

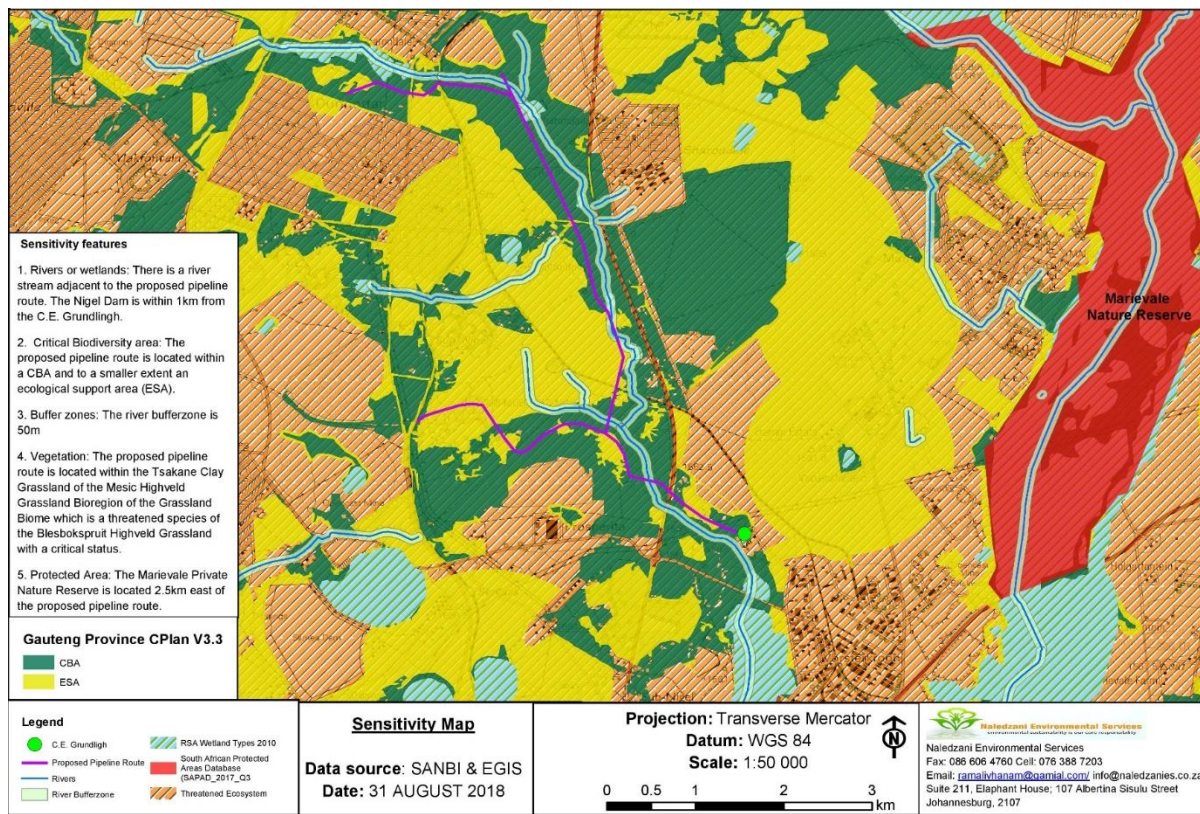


Figure 7: Study area in relation to the Gauteng Conservation Plan

11.2.5 Avi-Fauna

Desktop assessment (SABAP 2) showed that a total of 205 bird species have been confirmed within the QDGC. Many avifaunal species are adaptable as they are habitat generalists and can therefore accommodate a certain degree of habitat degradation and transformation (Harrison *et al.*, 1997). Other species are extremely habitat specific and have to rely on certain habitat units for breeding, hunting or foraging and roosting. It is the survival of these species that become threatened as they cannot adapt to changes to the habitat. Habitat-specific species are sensitive to environmental change, with destruction of habitat being the leading cause of species decline worldwide (Barnes, 2000).

It is widely accepted that vegetation structure, rather than the actual plant species, influences bird species' distribution and abundance (Harrison *et al.*, 1997). Therefore, the vegetation description used in the Bird Atlas does not focus on lists of plant species, but rather on factors which are relevant to bird distribution. A list of birds on the QDGC is attached as appendix D.

11.3 Hydrology

The sections below provide a summary of the findings as per the Wetland Delineation and Assessment study. Please refer to Appendix E for the detailed findings.

11.3.1 Eco Region and Quaternary Catchment

The water resources of South Africa have been divided into quaternary catchments, which are regarded as the principle water management units in the country. A quaternary catchment is a fourth order catchment in a hierarchical classification system in which the primary catchment is the major unit's.

The study area located within farms Grootfontein 165 and Vakernsfontein 169 falls within the Tsakane Clay Grassland. This database was used as reference for the catchment of concern in order to define the EIS. The project area lies entirely within quaternary catchment C21E (Plan 11 Appendix B). The results of the assessment are summarised in the Table 13 below.

Table 13: Quaternary Catchment Summary

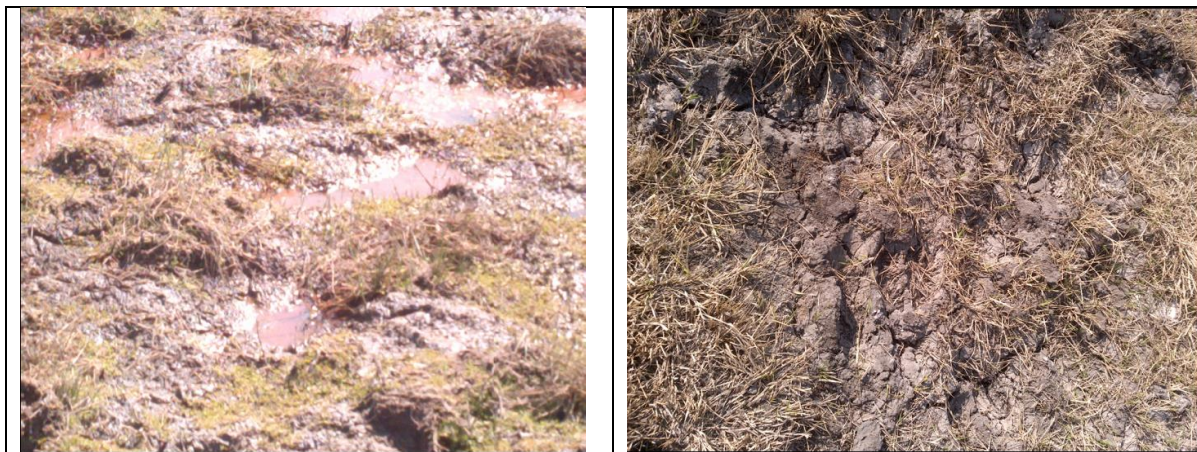
Quaternary Catchment	River Name	Ecological Sensitivity	Confidence
C21E	Blesbokspruit	High	High

11.3.2 Soil Wetness and Soil Form Indicator

According to DWAF (2005), the permanent zone of a wetland will always have either Champagne, Katspruit, Willowbrook or Rensburg soil forms present, as defined by the Soil Classification Working Group (1991). The seasonal and temporary zones of the wetlands will have one or more of the following soil forms present (signs of wetness incorporated at the form level): Kroonstad, Longlands, Wasbank, Lamotte, Estcourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu, Montagu. Alternatively, the seasonal and temporary zones will have one or more of the following soil forms present (signs of wetness incorporated at the family level): Inhoek, T sitsikamma, Houwhoek, Molopo, Kimberley, Jonkersberg, Groenkop, Etosha, Addo, Brandvlei, Glenrosa, Dundee (DWAF, 2005). Table 14 presents the saturated soils that were used as wetland indicators on the study site.

Table 14: Photographic Representation of Saturated Soils





According to the DWAF (2005), soil wetness indicators (i.e. identification of redoximorphic features) are the most important indicator of wetland occurrence due to the fact that soil wetness indicators (redoximorphic features) remain in wetland soils, even if they are degraded or desiccated. It is important to note that redoximorphic features were present in the delineated wetland within the upper 500mm of the soil profile. The presence or absence of redoximorphic features within the upper 500mm of the soil profile alone is sufficient to identify the soil as being hydric (a wetland soil), or non-hydric (non-wetland soil) (Collins, 2005).

11.3.3 Wetland Vegetation Indicator

According to DWAF (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act, Act 36 of 1998. Using vegetation as a primary wetland indicator however, requires undisturbed conditions (DWAF, 2005) This indicator was used to delineate the wetland as the site under investigation had minimum disturbances. A cautionary approach was taken as vegetation alone cannot be used to delineate a wetland, as several species, while common in wetlands, can occur extensively outside of wetlands. When examining plants within the wetland, a distinction between hydrophilic (vegetation adapted to life in saturated conditions) and upland species was kept in mind. The site showed a typically well-defined 'wetness' gradient that was found to occur along the river channel.

Moist grasslands delineated in this wetland were classified as vegetation that typically grew in permanently to temporary saturated soils and was dominated by grass and / or sedge species. The moist grasslands were characterized as areas where permanent water was observed or where the soils supported plant species with an affinity to grow in permanent, temporary or seasonally saturated conditions. Table 15 presents vegetation associated with the wetland as river channel.

Table 15: Photographic Representation of hydrophilic vegetation

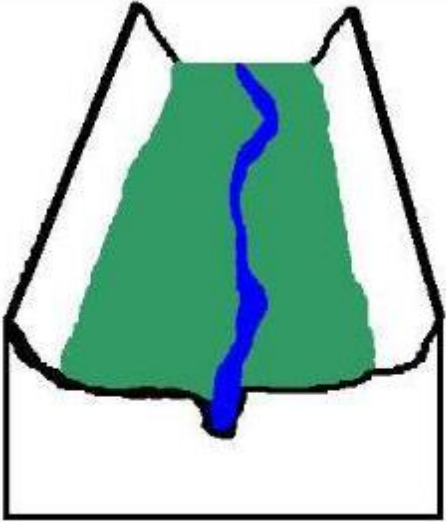


11.3.4 Wetland Delineation

The riparian zone and associated wetland features were delineated according to the guidelines advocated by DWA (2005). Further to this, the delineation as presented in this report is regarded as a best estimate of the boundary of the riparian zone and temporary zone of wetlands based on the site conditions present at the time of assessment.

Two hydro-geomorphic (HGM) type and a river floodplain was delineated. The majority of the wetlands associated with the watercourse system can be defined as a channelled valley bottom wetland due to the presence of a stream and the location of the HGM. The identified wetland systems are described in Table 16 below. Please refer to Plan 7 in Appendix D for the NFEPA wetlands.

Table 16: Identified wetland system and description

 <p style="text-align: center;">Valley Bottom with a Channel</p>	<p>Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterised by the net loss of sediment. Water inputs from the main channel (when channel banks overspill) and from adjacent slopes.</p>
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11.4 Cultural Heritage

In southern Africa archaeology is divided into the Stone Age, Iron Age and the Historical Period. During these periods diverse groups of people settled on the southern African landscape. Several archaeological sites have been identified in the Gauteng Province.

11.4.1 Stone Age

The Stone Age is divided into three periods. The Early Stone Age (ESA) (2 million to 250 000 years ago), the Middle Stone Age (MSA) (250 000 – 22 000 years ago) and the Later Stone Age (LSA) (25 000 to 200 years ago). The ESA is comprised of the Oldowan stone tool complex (2 and 1.7-1.5 million years ago), and the Acheulean stone tool complex (1.7-1.5 million years ago and 250-200 thousand years ago) (Klein 2000; Mitchell 2002). The ESA is comprised of the Oldowan stone tool complex and is characterized by small flakes, flaked cobbles and percussive tools (Klein 2000; Mitchell 2002; Diez-Martín *et al.*, 2015; De La Torre 2016). Several ESA sites have been researched and recorded in the Cradle of Humankind near Johannesburg. Oldowan stone tools have been found at Swartkrans (Sutton 2012), Sterkfontein (Kuman & Field 2009; Reynolds & Kibii 2011), Malapa (Berger *et al.*, 2010), and Kromdraai (Kuman & Field 1997). Several hominin fossil species have also been excavated at these sites (Reynolds & Kibii 2011). The Acheulean stone tool complex included large hand axes and cleavers (1.7-1.5 million years ago and 250-200 thousand years ago) (Klein 2000; Mitchell 2002; Diez-Martín *et al.*, 2015; De La Torre 2016). At the Gladysvale Cave located 5 kilometres north-northwest of Nigel, a hand axe dating to the Acheulean stone tool complex was found by Hall *et al.*, (2006). Other ESA sites have been identified to the west of Pretoria near the Magaliesriver as well as in the region of the Magaliesberg mountains (Van Vollenhoven 2006). The transition from the Early to Middle Stone Age includes a change in

technology from large stone tools to smaller blades and flakes. The MSA stone tool assemblage include blades, flakes, scrapers and pointed tools that could have been hafted and used as spears or arrowheads and is associated with anatomically modern humans (Wadley, 2007).

11.4.2 Iron Age

The Iron Age, according to Huffman (2007) can be divided into the Early Iron Age (EIA) (AD 200 – 900); the Middle Iron Age (MIA) (AD 900 – 1300); and the Late Iron Age (LIA) (AD 1300 – 1840). The Iron Age is characterized by farming communities who domesticated animals, produced various ceramic vessels, smelted iron for weapons and manufactured tools.

The EIA communities throughout eastern and southern Africa share a similar Iron Age culture called the Chifumbaze complex (Phillipson 1994; Huffman 2007). The Chifumbaze complex contains evidence of the first farmers who cultivated crops, herded domestic animals, used iron, and who made pots (Phillipson 1994). It can furthermore be divided into the Kalundu and Urewe Traditions (Huffman 2007). The Kalundu Tradition is also referred to as the western stream, while the Urewe Tradition is known as the eastern stream (Huffman 2007). The Kalundu Tradition can be found in southern Africa where the makers of these pots lived on wetter and more arable land (Mitchell 2013). The Urewe Tradition ceramic assemblage can be found in the eastern parts of south-central and south eastern Africa (Mitchell 2013). The Nkope and Kwale branches form part of the Urewe tradition (Phillipson 1994; Mitchell 2002; Huffman 2007).

Mzonjani Facies (AD 450-750) of Kwale branches form the Urewe tradition have been found in the areas surrounding Pretoria and Johannesburg as well as the region between Musina and Nelspruit (Evers 1975, 1977; Huffman 2007). In 1997, Mzonjani ceramics were found on the farm Derdepoort, north of Pretoria and in the Magaliesberg (Nienaber *et al.*, 1997; Van Vollenhoven 2006). Ceramics of the Mzonjani Facies have also been located around Richards bay in KwaZulu-Natal (Maggs 1980; Huffman 2007).

During the climatic conditions in southern and eastern Africa, Moloko people migrated from east Africa to southern Africa (Boeyens 2003). Moloko type ceramics of the Sotho-Tswana people, replaced earlier Eiland ceramics (AD 1000 – 1300), in the Limpopo Province as well as in Botswana (Evers 1983; Klapwijk & Evers 1987; Boeyens 2003). This take over indicates the movements of Sotho-Tswana people to South Africa during the second millennium AD (Boeyens 2003; Badenhorst 2010). Icon (AD 1300 - 1500) a ceramic phase of the Moloko ceramics first appeared in Phalaborwa (Evers & Van der Merwe 1987; Mitchell 2002; Huffman 2007). This indicates that the Sotho-Tswana people originated from east Africa as indicated from tracing the Moloko ceramics back to the EIA of the Urewe Tradition (Hanish 1979; Huffman 1989; Jacobson *et al.*, 1991; Lane 1996; Boeyens 2003; Taylor *et al.*, 2003; Huffman 2007).

The Sotho-Tswana people can be divided into four clusters; the Fokeng, the Hurutshe, the Kgatla and the Rolong (Huffman 2002, 2007). However, Huffman later identified that ceramics of the Fokeng do not form part of the Sotho-Tswana tradition, and that the Fokeng were Nguni

speakers (Sadr & Rodier, 2012). Their first migration of Sotho-Tswana people to the Waterberg dates to AD 1350 (Taylor *et al.*, 2003). It is argued that these people moved to southern Africa due to drought in eastern Africa (Taylor *et al.*, 2003). These Sotho-Tswana speaking people migrated north-westwards until they settled in the Limpopo Province (Taylor *et al.*, 2003). The second migration of Sotho-Tswana people was in AD 1350-1450 and is associated with the migration of the Kweana-Hurutshe (Huffman 2002; Boeyens 2003; Taylor *et al.*, 2003). The Hurutshe cluster (includes the Kwena, Ngwato, Ngwaketse and Tawana) are the descendants of those who claim lineage from Malope and his father Masilo (who originated from the Lowa waterhole in Botswana) who lived at Rathateng near Marico and Crocodile confluence in AD 1440 and 1560 (Huffman 2002, 2007). The oral traditions of the Hurutshe indicates that they settled in the Marico region of the North West Province during the 15th century AD (Boeyens 2003). The Hurutshe exiled the Rolong from the Mosega area south of Zeerust (Huffman 2002). The Rolong, a third cluster of the Sotho Tswana arrived in southern Africa between AD 1200 and 1350 and includes the Tlhaping groups (Boeyens 2003; Huffman 2002). The Rolong settled in the region between the Magaliesberg to the Vaal (Huffman 2002; Giliomee & Mbenga 2007; Huffman 2007). According to White (1977) the region north of Klerksdorp contains numerous Iron Age sites related to the Rolong capital of Thabeng.

The Fokeng cluster (Bafokeng) found at Ntsuanatsatsi Hill in the Free State Province, formed out of the Kwena (of the Hurutshe cluster) who migrated southeast across the Vaal in AD 1550 and 1650 (Huffman 2002, 2007). The Fokeng and Kwena settlements and associated material culture have been recorded at sites across the Vaal River into Balfour (in Mpumalanga Province), Klipriviersberg (jn Gauteng Province) and Vredefort (in the Free State Province) (Van Schalkwyk & Pelsler 1999; Tomose 2018).

Ceramics of the Ntsuanatsatsi facies (AD 1450 to 1650) of the Blackburn Branch and Urewe Tradition, have been found near Johannesburg and along the Vaal River in the Free State Province. (Mason 1986; Dreyer 1992; Huffman 2007). The Ntsuanatsatsi facies is closely related to the oral histories of the Early Fokeng and represent the movement of Nguni-speaking people out of Kwazulu-Natal into the interior of South Africa. The Uitkomst facies (AD 1650 – 1820) of the same branch is seen as the successors to the Ntsuanatsatsi facies and contains elements of both Nguni (Ntsuanatsatsi facies) and Sotho-Tswana speakers (Olifantspoort facies) pottery styles (Huffman, 2007). This represents contact between these two groups. Ceramics of the Uitkomst facies have been found throughout the Gauteng Province around Johannesburg and Pretoria as well as in the north-eastern regions of the North West Province (Huffman 2007).

The Olifantspoort facies (AD 1500-1700) of the Moloko Branch has been found around the Potchefstroom, Rustenburg and Pretoria regions (Mason 1986; Mitchell 2002; Huffman 2007). Mason (1973, 1974) has also found pottery similar to the Olifantspoort facies on the slopes of Platberg, near Klerksdorp. Olifantspoort pottery is characterised by “multiple bands of fine stamping and narrow incision separated by colour” (Huffman 2007). Ceramics of the Olifantspoort facies have been identified along the region surrounding the Vaal River, in

Potchefstroom and in the Gauteng Province around the Johannesburg and Pretoria regions (Huffman 2007).

Buispoort ceramics (AD 1700 – 1840), of the Moloko Branch, have been found to the north of Potchefstroom, and in the Gauteng Province around the Johannesburg and Pretoria regions (Mason 1962, 1986; Boeyens 2000; Huffman 2007). Buispoort ceramics are characterised by “rim notching, broadly incised chevrons and white bands” (Huffman 2007).

Several stone-walled structures have been identified in the Suikerbosrand Nature Reserve 30 km west of Nigel (Sadr & Rodier 2012). Studies conducted on the LIA classification of stone wall settlement patterns have been done by Maggs (1976) and Mason (1986). Mason (1968) focused his research on stone wall sites located in the Magaliesberg and Johannesburg region, it is also in this area that the 19th century Tswana town, Marothodi is located (Anderson 2009). Mason (1986) published a review of his stone wall settlement types following more research that was conducted in the area. His classifications indicated the general chronological development of Sotho-Tswana Settlement style. According to Mason (1986) earlier Sotho-Tswana settlements had a simple layout that became more complex during the later periods.

Maggs (1976) research focused on stone walls found in the Free State Province, where his approach included linking the different site types to Sotho oral traditions, history and identities. Maggs (1976) stone wall types included Type N (associated with the Early Fokeng and Kwena), V (attributed to the Sotho speaking groups collectively), Z (Kabung, a branch of the Rolong) and R (associated with bushman pastoralists). Type N walling, named after Ntsuanatsatsi hill in the Free State Province (Huffman 2007). According to Huffman (2007) Type N walling consists of cattle kraals linked to other walls in the centre of the settlement surrounded by an outer wall. Type N Iron Age walling settlements have been identified to the south of the Klipriviersberg (Tomose 2018)

Type V stone walls, named after Vegkop located near the town of Heilbron, in the Free State Province, developed from Type N walling (Huffman 2007). Type V walling is characterised by cattle kraals surrounded by huts and grain bins enclosed by an outer wall (Huffman 2007). Type Z walling, which is characterized by “bilobial huts” that surround the core of the settlement and dates to the 18th – 19th Centuries (Huffman 2007). Huffman (2007) identified another type of walling, called Molokwane walling, located in hilly regions in the Gauteng and North West Province. This type of walling is attributed to the Hurutshe and Kwena groups and dates to the late 18th century to the beginning of the historic period (Huffman 2007).

11.4.3 Historical Period

The Historical Period dates from AD 1600 and is generally the period related to colonial settlement in South Africa. Following disputes with the British the Dutch-speaking Voortrekkers migrated north into the interior of southern Africa from the Cape Colony in 1836's in search of creating a homeland, independent of British rule. This migration of approximately 12000 – 140000 Voortrekkers is referred to as the Great Trek. The Convention of Sandrivier was signed in 1852 between Great Britain and the Voortrekkers (Kruger 2018). In the Convention the Voortrekkers were given independence. The Voortrekkers then established the South African Republic (Transvaal) (Ashman 1996). The Convention was signed at the Sand River, south of Kroonstad near Ventersburg. After the signing of the Sand River convention, Boers moved into the Gauteng region in 1852.

The first gold reef was discovered mid-1886 at the Witwatersrand Main Reef (Emden 1935; Cartwright 1962; Appelgryn 1984; Beavon 2004). However, the two brothers Frederick and Henry William Struben have also claimed to have discovered gold during the same year (Cunningham 1987; Beck, 2013). When Cecil John Rhodes and Alfred Beit heard of the new discovery in the Witwatersrand they bought up claims and properties in the area (Beck 2013). Together they formed the company, Consolidated Gold Fields Limited (Beck 2013). When Cecil John Rhodes bought up claims and became interested in the Witwatersrand gold mines, the use of the compound system and migrant labour became the norm (Wentzel & Tlabela 2006). By the mid-1890s numerous other gold mining companies opened in the Rand, making the region the world biggest mining district at the time (Beck 2013). Large scale mining operations and developments soon took over, leading to investment and financial support from big companies overseas (Beck 2013).

The gold reef in Nigel was discovered by Nigel MacLeish, and he is possibly also the individual who the town was named after (Coetzee 2017). Another possibility is that the town was named after a character in the book "The Fortunes of Nigel" by Sir Walter Scott (Gaigher 2015b). Petrus Johannes Marais owned the farm Varkensfontein in the Heidelberg district and began prospecting for gold in 1888 (Gaigher 2015b). He later established the Nigel Gold Mining Company, after the character and plot of the book he was reading (Gaigher 2015b). President Paul Kruger declared the mining cap of Nigel as a public digging in 1888 (Gaigher 2013). The first mayor, Mr. C.L. Mackle was elected in 1930 (Gaigher 2013). In 1896 the Marievale Nigel Gold Mining Company was established in Nigel (Coetzee 2017). In the same year the Marievale Nigel Gold Mining company was known as the Marievale Nigel Gold Mining and Estate Ltd and later as the Marievale Consolidated Mines Ltd (Coetzee 2017). Today the Marievale Mine is owned by Gencor (Coetzee 2017).

The Air School of the South African Air Force was moved to Dunnottar Airbase near Nigel on 11 November 1940 after the Second World War (1939 to 1945) (Coetzee 2017). In 1946 the Air School stopped training pilots (Coetzee 2017). During the 1940's to 1990's, Springs was divided into middle- and upper-income white suburbs with the Indian areas located in Bakerton (Nieftagodien 1996). Black South Africans were relocated to KwaThema (Gaigher 2015c).

11.5 Geology and Paleontological Sensitivities

The sections below provide a summary of the findings as per the Paleontological Impact Assessment. Please refer to Appendix G for the detailed findings.

The regional geology and paleontological sensitivity plans are included in Appendix B as Plan 9 and Plan 12 respectively.

11.5.1 Geological Context

The routes for the pipelines are on rocks of the Malmani Subgroup, Chuniespoort Group (Figure 8, Table 17) for the central portion, surrounded by the Klipriviersberg Group. Around these are rocks of the Vryheid Formation which are considerably younger. Only the distal parts of the pipeline will impact on the Vryheid Fm.

Quartzites and shales of the Government Subgroup, West Rand Group, Witwatersrand Supergroup are the oldest rocks in the area and are part of the gold-bearing complex in the Witwatersrand Basin. The other rocks of the Witwatersrand Basin are also ancient. The meteorite impact that formed the Vredefort dome more than 2 000 million years ago exposed the basement rock in the centre and up-tilted and exposed the old rocks of the Central Rand and West Rand Groups in a semicircle around the dome. Ancient rocks of the Blackreef Formation (quartzite, conglomerate, shale and basalt) and the Malmani Subgroup (dolerites and cherts) have been similarly affected (Robb et al., 2006; McCarthy et al., 2006; van der Westhuizen et al., 2006). The Malmani Subgroup is up to 2000m thick and comprises five formations distinguished by the amount of chert, stromatolite morphology, intercalated shales and erosion surfaces (Eriksson et al., 2006). The basal Oaktree Fm overlies the Black Reef Formation, and is made up of carbonaceous shales, stromatolitic dolomites and locally developed quartzites. Above this is the Monte Christo Formation comprising erosive breccia, overlain by stromatolitic and oolitic platformal dolomites. Next is the Lyttleton Formation of shales quartzites and stromatolitic dolomites. The Eccles Formation comprises a series of erosional breccias and the overlying Frisco Formation is made up mostly of stromatolitic dolomites.

The Klipriviersberg Group is composed of a sequence of mafic lavas and tuffs with amygdaloidal and porphyritic inclusions in varying amounts, separating the five formations, from the base upwards, Alberton, Orkney, Jeanette, Lorraine and Edenvale Formations (van der Westhuizen et al., 2006), dated to around 2700 Ma.

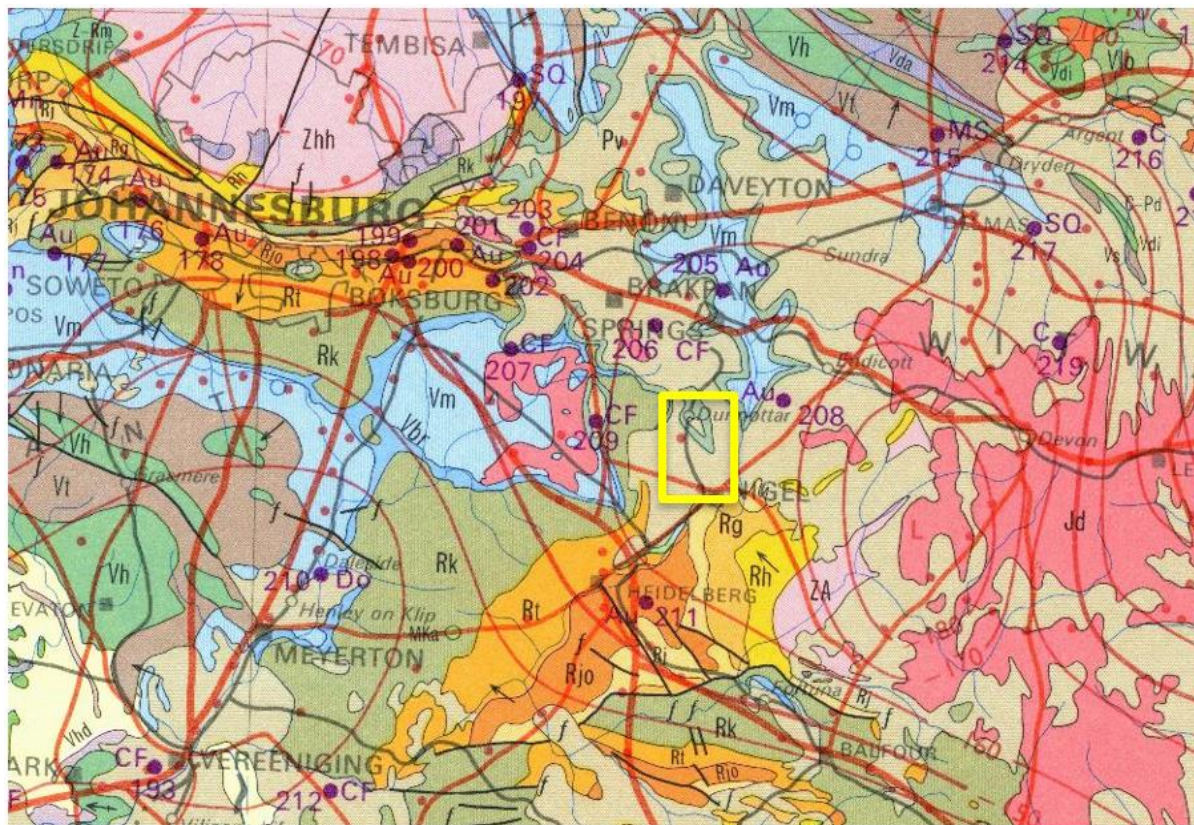


Figure 8: Geological map of the area around Nigel and Dunnottar.

Table 17: Description of symbols for the geological map and approximate ages

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Neogene, ca 25 Ma to present
Jd	Jurassic dykes	Dolerite	Jurassic ca 183 Ma
Pv	Vryheid Formation, Ecca Group, Karoo Supergroup	Sandstone, shale, coal	Early Permian, middle Ecca
Vt	Timeball Hill Fm and Rooihoogte Fm, Pretoria Group, Ventersdorp SG	Quartzite	< 2420 Ma
Vbr	Black Reef Fm,	Quartzite, conglomerate, shale, basalt	Ca 2650 – 2640 Ma
Vm	Malmani Subgroup, Chuniespoort Group, Transvaal Basin	Dolomite, chert	Ca 2750 – 2650 Ma
Rk	Klipriviersberg Group, Ventersdorp SG	Andesite, tuff	Ca 2714 Ma
Rt	Turfontein Subgroup, Central Rand Group, Witwatersrand SG	Conglomerate, quartzite	Ca 2750 Ma

Symbol	Group/Formation	Lithology	Approximate Age
Rjo	Johannesburg Subgroup, Central Rand Group, Witwatersrand SG	Quartzite, conglomerate, shale	
Rj	Jeppestown Subgroup, West Rand Group, Witwatersrand SG	Shale, quartzite, lava	
Rg	Government Subgroup, West Rand Group, Witwatersrand SG	Quartzite, shale	
Rh	Hospital Hill Subgroup, West Rand Group, Witwatersrand SG	Shale quartzite	Ca 2950 Ma
ZA	Granite, gneiss, Vredefort Dome	Granite, gneiss	Ca 3100 Ma

11.5.2 Paleontological Context

The palaeontological sensitivity of the area under consideration is presented in Plan 12 in Appendix B. In the central part of the greater project area the Klipriviersberg Group mafic lavas and tuffs do not preserve fossils as they are too old for body fossils and are volcanic in origin. These rocks are indicated as blue in the map (low sensitivity).

Around the central area are rocks of the Malmani Group that may preserve trace fossils. The Malmani Group contains a number of stromatolitic dolomites. These were formed in warm shallow sea and are the accumulation of layer upon layer of minerals deposited by blue-green algae (also known as cyanobacteria) and rarely some filamentous algae. Minerals deposited by the algae include calcium carbonate, calcium sulphate and magnesium carbonate. Very rarely are the algal cells preserved in the stromatolites and these are microscopic. Stromatolites are essentially trace fossils and these ones are 2750 to 2650 million years old and very abundant. They can appear as small to large domes (few cm in diameter to 1-2m) or as irregular stratified sheets, depending on the conditions under which they formed over 2600 million years ago

Around the periphery of the project area are sandstones and shales of the Vryheid Formation of the Ecca Group, early Permian and these could potentially preserve fossil plants of the Glossopteris flora. The Glossopteris flora formed coal deposits in part of the Karoo Basin and the plants include Glossopteris predominantly in the form of leaf impressions, as well as cortaitaleans, lycopods, sphenophytes, ferns and rare gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Johnson et al., 2006). Terrestrial vertebrate fossils are not present in this area at this time.

From the SAHRIS map (Plan 12 in Appendix B) the pipeline in the south west branch and the very distal ends of the two northern pipelines are indicated as highly sensitive (red). The rest of the pipeline falls on moderately sensitive rocks in the north (green) and low to insignificant sensitivity in the south section (blue). No fossils however, have been recorded from this area and the land surface is highly disturbed from earlier agricultural and current urban activities.

12 Methodology used in Determining and Ranking the Nature, Significance, Consequence, Extent, Duration and Probability of Potential Environmental Impacts and Risks

Details of the impact assessment methodology used to determine the significance of environmental impacts are provided below.

12.1 Impact Rating

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by use of the Input-Output model. It must be noted that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defensible methodology of rating the relative significance of impacts in a specific context. This will give the project applicant a greater understanding of the impacts of the project and the issues which need to be addressed by management. It will also give the regulators information on which to base their decisions.

The significance rating process follows the established impact/risk assessment formula given in Figure 9.

<p>Significance = consequence of an event x probability of the event occurring</p> <p>where</p> <p>Consequence = Type of impact x (Intensity + Spatial Scale + Duration)</p> <p>and</p> <p>Probability = Likelihood of an impact occurring</p> <p>In the formula for calculating consequence:</p> <p>Type of impact = +1 (for positive impacts) or -1 (for negative impacts)</p>

Figure 9: Significance Rating Methodology

The matrix calculates the rating out of 147, whereby Severity, Spatial Scale, Duration and Probability is rated out of seven. Please refer to Table 18 for the parameter ratings which will be used to assign a weighting for both positive and negative impacts.

The significance of an impact is determined and categorised into one of eight categories, as indicated in Table 19 which is extracted from Figure 10.

Impacts are rated prior to mitigation and again after consideration of the proposed mitigation measure included in the EMP.

Table 18: Impact Assessment Parameter Ratings

Rating	Severity/Intensity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
7	<p>Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage.</p> <p>The positive impact will result in a significant improvement to the initial/post disturbance environmental status and will benefit ecological and natural resources.</p>	<p>Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.</p> <p>The positive impact will be of high significance which will result the improvement of the socio-economic status of a greater area beyond the boundary of the directly affected of the community and/or promote archaeological and heritage awareness and contribute towards research and documentation of sites and artefacts through phase two assessments.</p>	<p>International</p> <p>The effect will occur across international borders</p>	<p>Permanent: No Mitigation</p> <p>No mitigation measures of natural process will reduce the impact after implementation.</p>	<p>Certain/ Definite.</p> <p>The impact will occur regardless of the implementation of any preventative or corrective actions.</p>
6	<p>Significant impact on highly valued species, habitat or ecosystem.</p> <p>The positive impact is of high significance which will result in a vast improvement to the environment such as ecological diversification and/or rehabilitation of endangered species</p>	<p>Irreparable damage to highly valued items of cultural significance or breakdown of social order.</p> <p>The positive impact will be of high significance and will result in the upliftment of the surrounding community and/or contribute towards research and documentation of sites and artefacts through phase two assessments</p>	<p>National</p> <p>Will affect the entire country</p>	<p>Permanent:</p> <p>Mitigation measures of natural process will reduce the impact.</p>	<p>Almost certain/Highly probable</p> <p>It is most likely that the impact will occur.</p>

Rating	Severity/Intensity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
5	<p>Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate</p> <p>The positive impact will be moderately high and will have a long term beneficial effect on the natural environment</p>	<p>Very serious widespread social impacts. Irreparable damage to highly valued items</p> <p>The positive impact will be moderately high and will result in visible improvements on the socio-economic environment of the local and regional community, and/or promote archaeological and heritage awareness through mitigation</p>	<p>Cercle/ Region</p> <p>Will affect the entire Cercle or region</p>	<p>Project Life</p> <p>The impact will cease after the operational life span of the project.</p>	<p>Likely</p> <p>The impact may occur.</p>
4	<p>Serious medium term environmental effects. Environmental damage can be reversed in less than a year</p> <p>The positive impact on the environment will be moderate with visible improvement to the natural resources and regional biodiversity</p>	<p>On-going serious social issues. Significant damage to structures / items of cultural significance</p> <p>The positive impact on the socio-economic environment will be of a moderate extent and benefits should be experience across the local extent and/or potential benefits for archaeological and heritage conservation</p>	<p>Commune Area</p> <p>Will affect the whole municipal area</p>	<p>Long term</p> <p>6-15 years</p>	<p>Probable</p> <p>Has occurred here or elsewhere and could therefore occur.</p>

Rating	Severity/Intensity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
3	<p>Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month.</p> <p>The positive impact will be moderately beneficial to the natural environment, but will be short lived.</p>	<p>Ongoing social issues. Damage to items of cultural significance.</p> <p>The positive impact will be moderately beneficial for some community members and/or employees, but will be short lived and/or there will be a moderate possibility for archaeological and heritage conservation</p>	<p>Local</p> <p>Local extending only as far as the development site area</p>	<p>Medium term</p> <p>1-5 years</p>	<p>Unlikely</p> <p>Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur.</p>
2	<p>Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants.</p> <p>The positive impacts will be minor and slight environmental improvement will be visible.</p>	<p>Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.</p> <p>Minor positive impacts on the social/cultural and/ or economic environment</p>	<p>Limited</p> <p>Limited to the site and its immediate surroundings</p>	<p>Short term</p> <p>Less than 1 year</p>	<p>Rare/ improbable</p> <p>Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures</p>

Rating	Severity/Intensity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
1	Limited damage to minimal area of low significance, (e.g. ad hoc spills within plant area). Will have no impact on the environment. The positive impact on the environment will be insignificant and will not result in visible improvements.	Low-level repairable damage to commonplace structures. The positive impact on social and cultural aspects will be insignificant	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month	Highly unlikely/None Expected never to happen.

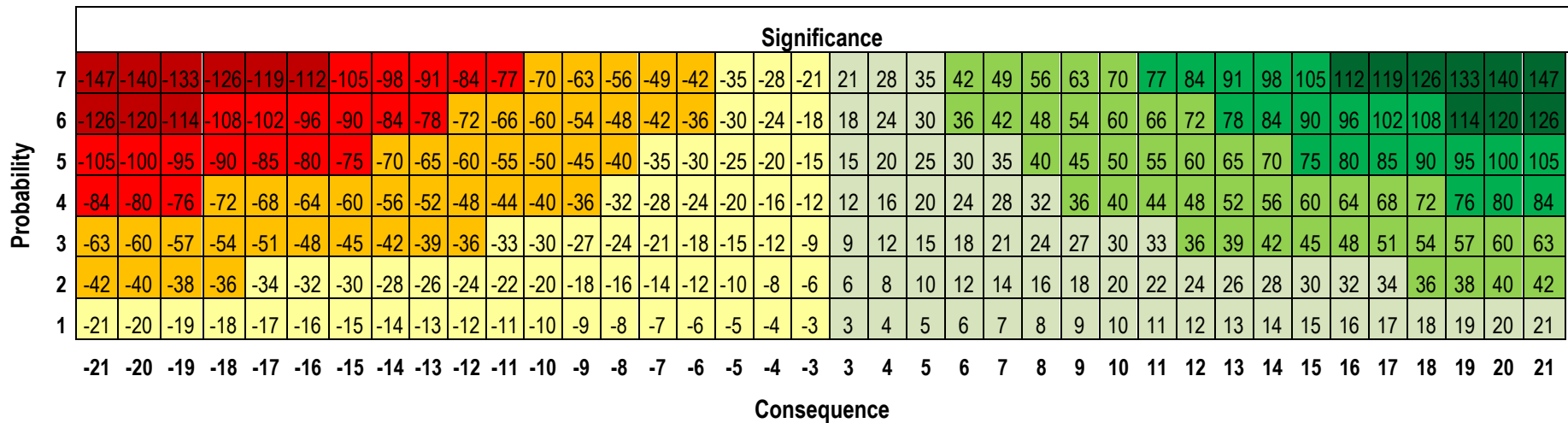


Figure 10: Relationship between Consequence, Probability and Significance Ratings

Table 19: Significance Ratings

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and / or natural environment	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and / or natural environment	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and / or natural environment	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe effects	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects	Major (negative)

13 Full Description of the Process undertaken to Identify, Assess and Rank the Impacts and Risks the Activity will impose on the Preferred Site (In respect of the Final Site Layout Plan) through the Life of the Activity

Alternatives were considered with regards to the material of the pipeline and has been investigated in detail as described in Section 9 of this report. Stakeholders will be given the opportunity during the public review period to provide comments on the alternatives provided in this report. Should comments be received, the alternative will be revised where applicable.

14 Assessment of each Identified Potentially Significant Impact and Risk

Table 20 provides all identified impacts associated with each phase and each aspect.

Table 20: Assessment of Each Identified Potentially Significant Impact

Activity/Aspect	Impact	Phase	Nature	Intensity	Spatial Scale	Duration	Probability	Rating Pre Mitigation	Mitigation measures	Rating Post Mitigation
Access to the Construction site	Soil compaction caused by vehicles and heavy machineries onsite.	Construction	Negative (-1)	Moderate (3)	Site only (2)	Medium Term (3)	High (6)	Minor (negative) (-48)	<ul style="list-style-type: none"> Access to site must be gained through use of existing roads; The contractor must use the existing tracks that run along the pipeline servitude for access; The areas that were disturbed e.g. areas used for parking, must be ripped and reseeded during rehabilitation. 	Negligible (negative)
Vegetation Clearing for the construction activities	Removal of the natural vegetation	Construction	Negative (-1)	Moderate (3)	Site only (2)	Long term (4)	Definite (7)	Minor (negative) (-63)	<ul style="list-style-type: none"> Areas designated for vegetation clearing should be identified and visibly marked off. Exposed areas should be rehabilitated with indigenous plants to the project area as soon as construction is finished. 	Negligible (negative)
	Disturbance to animals on site	Construction	Negative (-1)	Low (2)	Site only (2)	Long term (4)	High (6)	Minor (negative) (-48)	<ul style="list-style-type: none"> Do not disturb nests, breeding sites or young ones (especially along the streams that the pipeline crosses). Do not attempt to kill or capture snakes unless directly threatening the safety of employees. Dogs or other pets are not allowed to the worksite as they are threats to the natural wild animal A low speed limit should be enforced on site to reduce wild animal-vehicle collisions No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site. Severe contractual fines must be imposed and immediate dismissal on any contract employee who is found attempting to snare or otherwise harms remaining faunal species. The ECO must conduct regular site inspections of removing any snares or traps that have been erected. Employees and contractors should be made aware of the presence of, and rules regarding, flora and fauna through suitable induction training and on-site signage. 	Negligible (negative)
	Increased soil erosion, increase in silt loads and sedimentation	Construction	Negative (-1)	High (5)	Local (3)	Long term (4)	Definite (7)	Moderate (negative) (-84)	<ul style="list-style-type: none"> Following construction, rehabilitation of disturbed areas is required; especially next to the drainage lines the loop crosses. Avoid areas with sensitive soils, steep slopes during rain or windy season. Must have rehabilitation strategy as part of EMP such as a clean-up plan/strategy if spills occur and proper facilities (ablution) to ensure no sewerage spills into drainage lines and streams. 	Negligible (negative)
	Establishment and spread of declared weeds	Construction and Maintenance	Negative (-1)	High (5)	Local (3)	Long term (4)	Definite (7)	Moderate (negative) (-84)	<ul style="list-style-type: none"> The best mitigation measure for alien and invasive species is the early detection and eradication of these species which will be ensured with the use of a monitoring programme. An alien invasive management programme should be developed and implemented in order to control alien invasive species 	Negligible (negative)

Activity/Aspect	Impact	Phase	Nature	Intensity	Spatial Scale	Duration	Probability	Rating Pre Mitigation	Mitigation measures	Rating Post Mitigation
Vegetation Clearing for the construction activities	Loss of wetland Features Habitat and Ecological Structure	Construction	Negative (-1)	High (5)	Local (3)	Medium Term (3)	Medium (6)	Minor (negative) (-66)	<ul style="list-style-type: none"> Ensure that vegetation clearing and indiscriminate vehicle driving does not occur outside of the demarcated areas; Minimize construction footprints prior to commencement of the construction and control the edge effects from construction activities; and Implement alien vegetation control program within the wetland features. Ensure that all activities impacting on the wetland features are managed according to the relevant DWS Licensing regulations (where applicable); and As far as possible, all construction activities should occur in the low flow season, during the drier winter months 	Negligible (negative)
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Unlikely (3)	Negligible (negative) (-18)	<ul style="list-style-type: none"> Any areas where active erosion within the wetland features are observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is reinstated to conditions which are as natural as possible; Cutting/ clearing of the herbaceous layer within the wetland areas along the linear development should be avoided so as to retain soil stability provided by the grass root structures 	Negligible (negative)
	Changes to Ecological and Socio-Cultural Services Provision	Construction	Negative (-1)	Serious (4)	Local (3)	Short Term (2)	Likely (5)	Minor (negative) (-45)	<ul style="list-style-type: none"> During construction use techniques which support the hydrology and sediment control functions of the freshwater features; and normal as soon as possible after construction. Limit excavations to a limited extent to ensure that drainage patterns within the features returns to pre-construction state Restrict construction to the drier winter months if possible to avoid sedimentation of the freshwater feature and to minimize the severity of disturbance of the features and hydraulic function. 	Negligible (negative)
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Likely (5)	Negligible (negative) (-30)	<ul style="list-style-type: none"> Monitor the wetland feature for erosion and incision; Maintain the REC for each of the wetland features, as stated within the report during the life of the development; and Implement an alien vegetation control program within the wetland features and ensure establishment of indigenous species within areas previously dominated by alien vegetation. 	Negligible (negative)
	Loss of hydrological function and sediment balance	Construction	Negative (-1)	High (5)	Commune area (4)	Long term (4)	High (6)	Moderate (negative) (-78)	<ul style="list-style-type: none"> Any construction-related waste must not be placed in the vicinity of the wetland features; and Limit the footprint area of the construction activity to what is absolutely essential in order to minimize environmental damage. Stockpiled soil must be removed and the area must be levelled to avoid sedimentation of the wetland features from runoff; and As far as possible, all construction activities should occur in the low flow season, during the drier summer months. 	Negligible (negative)
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Rare / improbable (3)	Negligible (negative) (-12)	<ul style="list-style-type: none"> Vehicles should not be driven indiscriminately within the wetland features during maintenance activities to prevent soil compaction 	Negligible (negative)

Activity/Aspect	Impact	Phase	Nature	Intensity	Spatial Scale	Duration	Probability	Rating Pre Mitigation	Mitigation measures	Rating Post Mitigation
Excavation of trenches and associated soil stockpiling	Increased soil erosion	Construction	Negative (-1)	High (5)	Local (3)	Long term (4)	High (6)	Minor (negative) (-72)	<ul style="list-style-type: none"> Do not stockpile soil for more than four (4) month; Earth works e.g. excavation, must be prioritised during the dry winter season; The speed limit on site should be kept at 20kmph to minimise dust generation; Install stormwater control measures e.g. berms around stockpiled soil to minimise the impact of surface water runoff. 	Negligible (negative)
	Loss of wetland Features Habitat and Ecological Structure	Construction	Negative (-1)	High (5)	Local (3)	Medium Term (3)	Medium (6)	Minor (negative) (-66)	<ul style="list-style-type: none"> Ensure that vegetation clearing and indiscriminate vehicle driving does not occur outside of the demarcated areas; Minimize construction footprints prior to commencement of the construction and control the edge effects from construction activities; and Implement alien vegetation control program within the wetland features. Ensure that all activities impacting on the wetland features are managed according to the relevant DWS Licensing regulations (where applicable); and As far as possible, all construction activities should occur in the low flow season, during the drier winter months 	Negligible (negative)
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Unlikely (3)	Negligible (negative) (-18)	<ul style="list-style-type: none"> Any areas where active erosion within the wetland features are observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is reinstated to conditions which are as natural as possible; Cutting/ clearing of the herbaceous layer within the wetland areas along the linear development should be avoided so as to retain soil stability provided by the grass root structures 	Negligible (negative)
	Changes to Ecological and Socio-Cultural Services Provision	Construction	Negative (-1)	Serious (4)	Local (3)	Short Term (2)	Likely (5)	Minor (negative) (-45)	<ul style="list-style-type: none"> During construction use techniques which support the hydrology and sediment control functions of the freshwater features; and normal as soon as possible after construction. Limit excavations to a limited extent to ensure that drainage patterns within the features returns to pre-construction state Restrict construction to the drier winter months if possible to avoid sedimentation of the freshwater feature and to minimize the severity of disturbance of the features and hydraulic function. 	Negligible (negative)
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Likely (5)	Negligible (negative) (-30)	<ul style="list-style-type: none"> Monitor the wetland feature for erosion and incision; Maintain the REC for each of the wetland features, as stated within the report during the life of the development; and Implement an alien vegetation control program within the wetland features and ensure establishment of indigenous species within areas previously dominated by alien vegetation. 	Negligible (negative)
	Loss of hydrological function and sediment balance	Construction	Negative (-1)	High (5)	Commune area (4)	Long term (4)	High (6)	Moderate (negative) (-78)	<ul style="list-style-type: none"> Any construction-related waste must not be placed in the vicinity of the wetland features; and Limit the footprint area of the construction activity to what is absolutely essential in order to minimize environmental damage. Stockpiled soil must be removed and the area must be levelled to avoid sedimentation of the wetland features from runoff; and As far as possible, all construction activities should occur in the low flow season, during the drier summer months. 	Negligible (negative)

Activity/Aspect	Impact	Phase	Nature	Intensity	Spatial Scale	Duration	Probability	Rating Pre Mitigation	Mitigation measures	Rating Post Mitigation
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Rare / improbable (3)	Negligible (negative) (-12)	<ul style="list-style-type: none"> Vehicles should not be driven indiscriminately within the wetland features during maintenance activities to prevent soil compaction 	Negligible (negative)
Waste generation	Pollution due to oil and fuel spills, erosion, and ablution facilities.	Construction and Maintenance	Negative (-1)	High (5)	Local (3)	Long term (4)	Definite (7)	Moderate (negative) (-84)	<ul style="list-style-type: none"> Proper ablution facilities on site must be provided. Regular monitoring of the pipeline to ensure that there are no leaks Proper storage facilities of construction materials. Proper Standard Operating Procedures in place regulating refuelling and other potential polluting activities. 	Negligible (negative)
	Pollution due to construction waste	Construction	Negative (-1)	High (5)	Local (3)	Short Term (2)	Medium (6)	Minor (negative) (-60)	<ul style="list-style-type: none"> Use a licensed waste contractor to dispose of any waste generated on site Do not bury wastes on-site. 	Negligible (negative)
Installation of the pipeline	Loss of wetland Features Habitat and Ecological Structure	Construction	Negative (-1)	High (5)	Local (3)	Medium Term (3)	Medium (6)	Minor (negative) (-66)	<ul style="list-style-type: none"> Ensure that vegetation clearing and indiscriminate vehicle driving does not occur outside of the demarcated areas; Minimize construction footprints prior to commencement of the construction and control the edge effects from construction activities; and Implement alien vegetation control program within the wetland features. Ensure that all activities impacting on the wetland features are managed according to the relevant DWS Licensing regulations (where applicable); and As far as possible, all construction activities should occur in the low flow season, during the drier winter months 	Negligible (negative)
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Unlikely (3)	Negligible (negative) (-18)	<ul style="list-style-type: none"> Any areas where active erosion within the wetland features are observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is reinstated to conditions which are as natural as possible; Cutting/ clearing of the herbaceous layer within the wetland areas along the linear development should be avoided so as to retain soil stability provided by the grass root structures 	Negligible (negative)
	Changes to Ecological and Socio-Cultural Services Provision	Construction	Negative (-1)	Serious (4)	Local (3)	Short Term (2)	Likely (5)	Minor (negative) (-45)	<ul style="list-style-type: none"> During construction use techniques which support the hydrology and sediment control functions of the freshwater features; and normal as soon as possible after construction. Limit excavations to a limited extent to ensure that drainage patterns within the features returns to pre-construction state Restrict construction to the drier winter months if possible to avoid sedimentation of the freshwater feature and to minimize the severity of disturbance of the features and hydraulic function. 	Negligible (negative)
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Likely (5)	Negligible (negative) (-30)	<ul style="list-style-type: none"> Monitor the wetland feature for erosion and incision; Maintain the REC for each of the wetland features, as stated within the report during the life of the development; and Implement an alien vegetation control program within the wetland features and ensure establishment of indigenous species within areas previously dominated by alien vegetation. 	Negligible (negative)
	Loss of hydrological	Construction	Negative (-1)	High (5)	Commune area (4)	Long term (4)	High (6)	Moderate (negative) (-78)	<ul style="list-style-type: none"> Any construction-related waste must not be placed in the vicinity of the wetland features; and 	Negligible (negative)

Activity/Aspect	Impact	Phase	Nature	Intensity	Spatial Scale	Duration	Probability	Rating Pre Mitigation	Mitigation measures	Rating Post Mitigation
	function and sediment balance								<ul style="list-style-type: none"> Limit the footprint area of the construction activity to what is absolutely essential in order to minimize environmental damage. Stockpiled soil must be removed and the area must be levelled to avoid sedimentation of the wetland features from runoff; and As far as possible, all construction activities should occur in the low flow season, during the drier summer months. 	
		Operational	Negative (-1)	Low (2)	Site only (2)	Short term (2)	Rare / improbable (3)	Negligible (negative) (-12)	<ul style="list-style-type: none"> Vehicles should not be driven indiscriminately within the wetland features during maintenance activities to prevent soil compaction 	Negligible (negative)
Construction of the Pipeline and associated clearance activities	Creation of employment opportunities	Construction	Positive (+1)	Low (2)	Commune area (4)	Short term (2)	Probable (4)	Negligible (positive) (+32)	<ul style="list-style-type: none"> Where feasible, promote the creation of employment opportunities for women and youth; Where possible, construction workers must be sourced from areas within the EMM; Source goods and services within the local study area to maximise economic growth for SMEs; Partner with existing community organisations and social departments to jointly assist affected communities, to strengthen the economic development opportunities provided as a result of the project. 	Minor (positive)
	Enhancement of the local economy through sourcing of goods and services									
Maintenance of the pipeline	Continuation of jobs during the operational phase of the pipeline through maintenance of the pipeline	Operational	Positive (+1)	Low (2)	Local (3)	Long term (4)	Unlikely (3)	Negligible (positive) (+27)	<ul style="list-style-type: none"> Empower the workforce to develop skills that could be transferred to other sectors of the economy; Training and skills development initiatives should be initiated; and 	Minor (positive)
	Reduced theft of the steel material for resale as HDPE material will be used for the upgrades	Operational	Positive (+1)	Moderate (3)	Local (3)	Project life (5)	Probable (4)	Minor (positive) (+44)	<ul style="list-style-type: none"> Ensure that the HDPE material is used for the upgrades of the pipeline to reduce theft and resale of steel material. 	Minor (positive)

15 Summary of Specialist Reports

Table 21 provides a summary of the specialist studies that were undertaken for the proposed construction and operation of the pipeline.

Table 21: Specialist Studies that have been undertaken for the Project

List of studies undertaken	Summary of the specialist reports	Specialist Recommendations that have been included in the EIA report
Biodiversity Impact Assessment	<ul style="list-style-type: none"> ▪ The proposed project area falls within the Tsakane Clay Grassland regarded as Endangered. According to the Gauteng Conservation Plan, the entire pipeline route is within sensitive areas categorised of critical biodiversity area (CBA) as well as ecological support area (ESA); ▪ The ground-truthing of the site revealed that the site comprises of five vegetation units which are; Eucalyptus woodland, Mined area, Natural grassland, Ridge and Vegetation associated with watercourses; ▪ All ablation facilities must be placed away from the water bodies including their buffer zones; ▪ Where possible, construction along water bodies should proceed during the dry winter months (low or zero flow periods) in order to limit the potential for erosion linked to high runoff rates; ▪ An alien and invasive management plan must be developed and adhered to; and ▪ Ensure active re-vegetation of cleared areas as being important in-order to limit erosion potential. 	All recommendations have been considered and included in the BAR and EMP.
Wetland Delineation and Impact Assessment	<ul style="list-style-type: none"> ▪ The assessment on the stream and wetland crossings along the designated pipeline routes has found no potential impacts that could be considered to be fatal flaws. Despite this, there is substantial environmental sensitivity, with the watercourses and their surrounds being the primary features of concern. The potential impacts on the systems have been assessed. Key concerns include damage to the wetland and riparian vegetation, and to the deposition of sediment and waste materials into the systems. It will be possible to mitigate against the impacts and recommendations in this regard have been put forward. If the recommendations are adhered to then the pipeline upgrade project should have no long-lasting effects. ▪ From a functional perspective, wetlands within the study area serve to improve habitat within and downstream of the study area through the provision of various ecosystem services such as streamflow regulation, flood attenuation, groundwater recharge, sediment trapping, toxicant removal, particle assimilation and provision of other natural resources. The Ecological Importance and Sensitivity (EIS) was determined to be High, while the Present Ecological Status (PES) was moderate. ▪ Ensure there is minimum disturbance to the watercourses by ensuring construction activities are limited within the route of the pipeline; ▪ It is also recommended that the designer utilise existing wetland crossing concrete structures in relation to the sections where the pipeline crosses the wetland so as to minimise the impact of dredging and excavation within the watercourse. 	All recommendations have been considered and included in the BAR and EMP.
Heritage Impact Assessment	<ul style="list-style-type: none"> ▪ It must be noted that although there were no archaeological or heritage resources identified during the various project surveys; some archaeological material, including artefacts and graves can be buried underground and as such, may not have been identified during the initial survey and site visits. In the case where the proposed development activities bring these materials to the surface, they should be treated as Chance Finds. Should such resources be unearthed it is recommended that, the development activities be stopped immediately, and an archaeologist be contacted to conduct a site visit and make recommendations on the mitigation of the finds. SAHRA and PHRA-G should also be informed immediately on such finds; ▪ A portion of the pipeline falls within a Palaeontological Sensitive Layer, should the construction activities involve trenching to a depth of over 1.5m to 2m a palaeontological monitoring programme should be implemented by a qualified palaeontologist; ▪ The proposed development will not have an impact on the heritage and archaeological resources in the broader Nigel area 	All recommendations have been considered and included in the BAR and EMP.
Paleontological Impact Assessment	<ul style="list-style-type: none"> ▪ Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the stromatolites of the Malmani Subgroup. ▪ Since there is a small chance of fossils being disturbed when excavations commence, a Fossil Chance Find Protocol should be added to the EMP so that a representative collection can be made if they occur there. ▪ if fossils are found once excavations have commenced then they should be rescued, and a palaeontologist called to assess and collect a representative sample. 	All recommendations have been considered and included in the BAR and EMP.

16 Environmental Impact Statement

The key findings from the construction and operation of the pipeline are associated with its impact on the receiving environment, specifically the areas of the pipeline route which traverses watercourses and high ecological sensitivity.

16.1 Summary of the Key Findings of the Environmental Impact Assessment

This section of the report summarises all the potential environmental impacts identified during each phase of the proposed Project. The significance of the impacts associated with the biophysical environment, pre-mitigation and post-mitigation, is summarised in Table 22.

Table 22: Summary of Potential Impacts on the Biophysical Environment

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation	Post-Mitigation
Construction	Biodiversity	<ul style="list-style-type: none"> Removal of the natural vegetation Disturbance to animals on site 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Increased soil erosion, increase in silt loads and sedimentation Establishment and spread of declared weeds 	Moderate (-ve)	Negligible (-ve)
Construction and Maintenance		<ul style="list-style-type: none"> Pollution due to oil and fuel spills, erosion, and ablution facilities. 	Moderate (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Pollution due to construction waste 	Minor (-ve)	Negligible (-ve)
Construction	Soil and land capability	<ul style="list-style-type: none"> Soil compaction caused by vehicles and heavy machineries onsite 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Increased soil erosion 	Minor (-ve)	Negligible (-ve)
Construction	Water resources	<ul style="list-style-type: none"> Loss of wetland Features Habitat and Ecological Structure 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Changes to Ecological and Socio-Cultural Services Provision 	Minor (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Loss of hydrological function and sediment balance 	Moderate (-ve)	Negligible (-ve)
Operational	Water resources	<ul style="list-style-type: none"> Loss of wetland Features Habitat and Ecological Structure 	Negligible (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Changes to Ecological and Socio-Cultural Services Provision 	Negligible (-ve)	Negligible (-ve)
		<ul style="list-style-type: none"> Loss of hydrological function and sediment balance 	Negligible (-ve)	Negligible (-ve)
Construction	Social	<ul style="list-style-type: none"> Creation of employment opportunities during the construction of the pipeline Enhancement of the local economy 	Negligible (+ve)	Minor (+ve)

Operational	<ul style="list-style-type: none"> ▪ Continuation of jobs during the operational phase of the pipeline through maintenance of the pipeline 	Negligible (+ve)	Minor (+ve)
	<ul style="list-style-type: none"> ▪ Reduced theft of the steel material for resale as HDPE material will be used for the upgrades 	Minor (+ve)	Minor (+ve)

17 Proposed Impact Management Objectives and the Impact Management Outcomes for Inclusion in the EMPR

The EMPR seeks to achieve a required end state and describes how activities that have, or could have, an adverse impact on the environment will be mitigated, controlled and monitored.

The EMPR will address the environmental impacts during the construction and operational phases of the proposed project. Due regard must be given to environmental protection during the entire project; various environmental recommendations are made to achieve overall environmental protection. These recommendations are aimed at ensuring that the contractor maintains adequate control over the proposed project to:

- Minimise the extent of an impact during the life of the proposed project;
- Ensure appropriate restoration of areas affected by the proposed project; and
- Prevent long term environmental degradation.

18 Aspects for Inclusion as Conditions of Authorisation

The implementation of the mitigation and monitoring measures provided in this report must be a condition of authorisation. It is recommended that the proposed project be granted Environmental Authorisation, with the implementation of all recommendations made in this report.

19 Description of any Assumptions, Uncertainties and Gaps in Knowledge

Baseline environment investigations were undertaken to assess and identify the sensitivities and potential risks associated with the project. The uncertainties and assumptions as a result of gaps in knowledge for the proposed project are discussed below.

19.1 Basic Assessment Report

The following assumptions were made during the compilation of the BAR:

- As no detail engineering designs were available at the time of the BAR compilation it was assumed the proposed upgrades of the pipeline 10.5 km in length with a diameter of 0.315 to 0.9 metres (m); and

- This environmental authorisation application is for upgrades on an existing sewer pipeline and as such all the construction works will be undertaken within the existing servitude.

19.2 Fauna and Flora Specialist Study

The following limitations were encountered as part of the Biodiversity Impact Assessment:

- Ecological studies should be conducted during the growing season of all plant species that may potentially occur. This may require more than one season's survey with two visits undertaken preferably from November to February. However, due to the urgency of the project, this assessment was conducted in August 2018 before the rainfall and as such many plant species including grasses were still not yet in their growing period.
- The entire site (pipeline route) was walked on foot and sampled by the specialist. All species included in the plant species list were observed and recorded in the study area and any comments or observations made in this regard are based on observations, literature review, the expert knowledge and relevant professional experience of the specialist.

19.3 Wetlands Specialist Study

The following limitations were encountered as part of the Wetland Delineation and Impact Assessment:

- Wetland boundaries are essentially based on GPS coordinate waypoints taken onsite. The accuracy of the GPS device therefore affects the accuracy of the maps produced. A hand-held Garmin Montana 680 was used to delineate the wetland boundaries.
- The assessment of the Present Ecological State (PES), the provision of ecosystem goods and services, and the ecological importance and sensitivity of the identified wetland systems was based on a one-day field investigation conducted in August 2018. Site visits should ideally be conducted over differing seasons in order to better understand the hydrological and geomorphologic processes driving the characteristics of the water resource and the functional integrity of the wetland system.
- The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological issues arising from the field survey and based on the assessor's working knowledge and experience with similar development projects. No construction work methodology was provided.

19.4 Heritage Specialist Study

Although a comprehensive physical survey was undertaken it should be noted that some of the archaeological material, including artefacts and graves can be buried underground and as such, may not have been identified during the initial survey and site visit. In the case where the proposed development activities bring these materials to the surface, they should be

treated as Chance Finds. Should such resources be unearthed it is recommended that, the development activities be stopped immediately, and an archaeologist be contacted to conduct a site visits and make recommendations on the mitigation of the finds. SAHRA and PHRA-G should also be informed immediately on such finds. In this case no archaeological material of graves should be moved from the site, until the heritage specialist has been able to make an assessment regarding the significance of the site and archaeological material, which is also subject to SAHRA approval.

20 Reasoned opinion as to whether the proposed activity should or should not be authorised

The sewerage system draining the areas of Marievale, Dunnottar, Sharon Park, a military base and Coca-Cola depot is in dire need of infrastructure upgrade. Currently, the infrastructure has greatly deteriorated due to aging and vandalism. The vandalism of the infrastructure is mainly perpetuated by the illegal mining activities. The illegal miners have, in some sections of the pipeline, removed the covers of the manhole and dug out furrows to divert the waste water to areas where they are mining. As a consequence of the vandalism and aging infrastructure sewer spillages are noticeable in various sections of the pipeline. The damages noticeable on the sewer pipeline result in waste water flowing through to the nearby water courses / drainage line and thereby negatively impacting on the ecological value of the area.

The preliminary engineering design report indicates that the City of Ekurhuleni Metropolitan Municipality spends huge sums of money on the operation and maintenance of its sewerage infrastructure at the expense of other competing needs. It is further stated that the Ekurhuleni Metropolitan Municipality intends to undertake refurbishment and/or upgrade works of the existing sewerage drainage infrastructure aimed at improving their functionality and operation and maintenance, efficiency. Broadly, it is intended that these measures will bring about a balance between efficiency and cost of operation and maintenance of the overall sewerage service delivery system.

Should the mitigation measures included in this report be correctly implemented the most significant impacts will be reduced to a negligible significance. Therefore, It is therefore recommended that authorisation for the construction and operation of the proposed pipeline be granted on condition that the mitigation measures provided be explicitly implemented.

20.1 Conditions that must be included in the Authorisation

- Monitoring to be undertaken during the construction phase of the pipeline must be completed daily by an external independent Environmental Control Officer (ECO);
- An external independent ECO must be appointed prior to the commencement of the construction activities;
- The ECO must keep monthly environmental monitoring reports on site;

- The ECO must approve all method statements and procedures to be implemented during construction e.g. vegetation method statement, alien and invasive species management procedure/plan etc;
- The ECO must conduct a monthly compliance audits to assess compliance to the condition of the EA;
- Construction vehicles and machinery repairs may not be undertaken within the project area. A designated workshop at the construction camp must be established for repairs;
- Extra precautions should be taken in areas within 500 meters of the channel to prevent any potential impact to the water course, which includes effective stormwater control measures around soil stockpiles to prevent sedimentation of the channel;
- Extra precautions should be taken in areas within 32 meters of the wetland areas to prevent any potential impact to the water course, which includes effective stormwater control measures around soil stockpiles to prevent sedimentation of the wetland areas;
- The pipeline must be constructed in sections not exceeding 200 m per section. A maximum of four sections may be active at the same time, by the undertaking of one of the following activities per section:
 - Vegetation Clearance;
 - Digging of the trench (where applicable);
 - Installation of the pipeline; or
 - Backfilling of the trench and rehabilitation of the footprint.

This means that no more than 800m of pipeline route will be affected at any given time, and concurrent rehabilitation of the pipeline footprint will be implemented. For example, the project will commence with vegetation clearance on Section 1. Once complete, vegetation clearance can continue to Section 2, while excavation of the trench can commence on Section 1. Once complete, vegetation clearance will continue to Section 3, with trench excavation continuing on Section 2, and pipe installation commencing on Section 1. Finally, Section 1 will be backfilled and rehabilitated, Pipe installation will be undertaken in Section 2, Excavation of the trench will progress to Section 3 and vegetation clearance will progress to Section 4 of the pipeline route. Soil removed for the pipeline construction should be stockpiled and utilised as backfill once each section of pipeline has been constructed;

- Soil removed for the pipeline construction should be stockpiled and utilised as backfill once each section of pipeline has been constructed;
- Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation;
- All surfaces that are susceptible to erosion must be re-vegetated as soon as construction is completed;

- Limit the footprint area of the construction activities to what is essential. Clearing of vegetation must be kept within a 10 m corridor during the construction phase;
- No material may be dumped or stockpiled within 32m of any wetlands or within 100 m of any rivers, tributaries or drainage lines in the vicinity of the proposed pipeline;
- An alien and invasive management plan must be developed and adhered to;
- Wetland monitoring should be carried out monthly during construction and decommissioning and annually during rehabilitation;
- Ongoing wetland rehabilitation is necessary within and in the vicinity of the proposed construction;
- The refuelling of vehicles must take place at the construction camp within a bunded area or a petrol station;
- Hazardous chemicals must be clearly labelled and stored within a bunded area. During transportation of these substances, the use of drip tray is recommended;
- The use of existing access road is recommended to minimise soil compaction.
- Establish Project-specific Chance and Fossil Find Protocols and Procedures (CFPs).

21 Period for which the Environmental Authorisation is required

It is proposed that the upgrades to the pipeline will be completed within twenty-four (24) months of commencement of construction works, however a contingency has been provided should delays be experienced (due to economic circumstances, adverse weather conditions or other unforeseen circumstances). Therefore, the authorisation to complete the construction phase should be valid for 3 years. It is unknown how long the pipeline will operate for therefore authorisation for the operation of the pipeline should be authorised indefinitely until the pipeline is no longer required and is decommissioned.

22 Undertaking

Please refer to Part B, Section 12 for the complete undertaking applicable to the BA and EMP sections of this report.

23 Financial Provision

This section is considered to be not applicable.

23.1 Explain how the aforesaid Amount was derived

This section is considered to be not applicable.

23.2 Confirm that this Amount can be provided for from Operating Expenditure

This section is considered to be not applicable.

24 Specific Information required by the competent Authority

24.1 Impact on the Socio-Economic Conditions of any Directly Affected Person

Positive social impacts associated with the project have been identified and summarised below:

- Creation of jobs during the construction phase of the pipeline;
- Continuation of jobs during the operational phase of the pipeline through maintenance of the pipeline; and
- Reduced theft of the steel material for resale as HDPE material will be used for the upgrades

24.2 Impact on any National Estate referred to in Section 3(2) of the National Heritage Resources Act.

A Heritage Impact Assessment was undertaken. No heritage resources were identified within the study area. To this effect, no direct impacts to heritage resources are envisaged. The pipeline is underlain by paleontologically sensitive layers. However, it is unlikely that any impact to these layers should arise due to the limited depth of pipeline construction (to be confirmed with finalisation of detailed engineering designs).

25 Other matters required in terms of Sections 24(4)(a) and (b) of the Act

Section 24(4)(b)(i) of the NEMA (as amended), provides that an investigation must be undertaken of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity. The outcome of the investigation has been provided in Section 7 to Section 14 Part A of this Basic Assessment Report.

Part B: Environmental Management Programme Report

1 Details of the EAP

Muny Consultants has been appointed by Tangos Consultants as the independent Environmental Assessment Practitioner (EAP) to conduct the Basic Assessment process according to the NEMA and EIA Regulations, 2014 (as amended), as well as the required Public Participation Process (PPP). The details of the EAP undertaking the Basic Assessment process is supplied in Table 23: Details of the EAP.

Table 23: Details of the EAP

EAP Company Name:	Muny Consultants (Pty) Ltd
EAP:	Mamane Moeketsane
Telephone Number	010 005 5770
Email Address	mamane@munyconsult.com
Physical Address	Maxwell Office Park Building 4 Magwa Crescent Waterfall City 2090

2 Description of the aspects of the activity

A summary of the baseline environment in the proposed project area is provided in Section 11 of Part A. It should be noted that the following specialist studies have been undertaken for the proposed project:

- Biodiversity Impact Assessment (Appendix D);
- Wetland Delineation and Impact Assessment (Appendix E); and
- Heritage Impact Assessment (Appendix F).

3 Composite Map

The composite plan for the project area, indicating biodiversity sensitive areas, heritage resources, watercourse buffers, is included as Plan 15 in Appendix B.

4 Description of Impact Management Objectives including Management Statements

The EMPR seeks to achieve a required end state and describes how activities that have, or could have, an adverse impact on the environment will be mitigated, controlled and monitored.

The EMPR will address the environmental impacts during the construction and operational phases of the proposed project. Due regard must be given to environmental protection during the entire project; various environmental recommendations are made to achieve overall environmental protection. These recommendations are aimed at ensuring that the contractor maintains adequate control over the proposed project to:

- Minimise the extent of an impact during the life of the proposed project;
- Ensure appropriate restoration of areas affected by the proposed project; and
- Prevent long term environmental degradation.

4.1 Volumes and Rate of Water Use required for the Operation

It is unknown at this stage as to the volume of water required for the proposed upgrades.

4.2 Has a Water Use Licence has been applied for

A WULA will be submitted to the Department of Water and Sanitation (DWS) for the triggered water uses under Section 21 of the NWA.

5 Impacts to be Mitigated in their Respective Phases and Impact Management Outcomes

The proposed mitigation measures and its compliance with the relevant standards are presented in Table 24 below.

Table 24: Impacts to be mitigated

Activities	Aspect Affected	Phase	Mitigation Measures	Compliance with standards	Time period for implementation	Standard to be achieved
Proposed pipeline route and design	Wetland ecology	Pre-construction	<ul style="list-style-type: none"> Ensure that as far as possible all infrastructures result in the least disturbance to delineated freshwater features present; 	The NWA Section 21 (c) and (i) of the NWA Section 24 of the Constitution NEM:BA NEMA Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005);	Planning and Pre-Construction phase	To prevent and minimise impacts to identified wetlands in proximity of the pipeline and those that the pipeline traverses
Construction of the Pipeline and associated clearance activities	Biodiversity & Wetland ecology	Construction	<ul style="list-style-type: none"> Construction vehicles and machinery repairs must only take place a designated workshop area at the construction camp; Vehicles must be maintained according to their maintenance plans; Stationary vehicles should have a drip tray placed below the machine; The management of general and other forms of waste must ensure collection and disposal into clearly marked bins that can be collected by approved contractors for disposal to the appropriate licensed sites. 	NWA NEMA	Construction phase	To prevent the loss of flora and faunal species and to prevent soil contamination
Site clearing and access	Biodiversity & Wetland ecology	Construction	<ul style="list-style-type: none"> Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation; Any construction work that involves site clearance, digging or trenching during installation services should be suspended during heavy rains to avoid erosion and sedimentation of the water course. Active rehabilitation, re-sloping, and re-vegetation of disturbed areas immediately after construction; Clearing of vegetation be kept within a 10 m corridor during the construction phase All erosion noted within the construction footprint should be remedied immediately and included as part of an ongoing rehabilitation plan; Soils which were compacted as a result of construction activities should be ripped/scarified (<300 mm) and profiled A suitable Alien and Invasive Plants control programme must be put in place so as to prevent any encroachment as a result of disturbance to the surrounding terrestrial zones; The construction site shall be demarcated. Demarcate the servitude so that no vehicles or heavy machinery are allowed to drive indiscriminately within any wetland areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the construction footprint; All vehicles shall be put onto planned maintenance and shall be inspected for leaks on a daily basis prior to entering the construction area; Re-fuelling must take place within a bunded area at the site camp to prevent ingress of hydrocarbons into topsoil; 	The NWA Section 21 (c) and (i) of the NWA Section 24 of the Constitution NEM:BA NEMA Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005);	Construction phase	To prevent the loss of flora and faunal species.

Activities	Aspect Affected	Phase	Mitigation Measures	Compliance with standards	Time period for implementation	Standard to be achieved
			<ul style="list-style-type: none"> ▪ An emergency spillage response plan and spill kits should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) for all hazardous substances shall be kept on site during construction for reference at any time in terms of handling, storage and disposal of materials. ▪ All spills shall be cleaned up immediately and all contaminated material shall be disposed of as hazardous material to an appropriate licensed waste landfill facility; ▪ Appropriate sanitary facilities must be provided for the duration of the construction activities and all waste must be removed to an appropriate licensed waste facility. ▪ Existing access roads must be utilised to gain access to the servitude. 			
Construction of the Pipeline and associated clearance activities	Wetland ecology	Construction and Operation	<ul style="list-style-type: none"> ▪ Ensure that vegetation clearing and indiscriminate vehicle driving does not occur outside of the demarcated areas; ▪ Minimize construction footprints prior to commencement of the construction and control the edge effects from construction activities; and ▪ Implement alien vegetation control program within the wetland features. ▪ Ensure that all activities impacting on the wetland features are managed according to the relevant DWS Licensing regulations (where applicable); and ▪ Any areas where active erosion within the wetland features are observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is reinstated to conditions which are as natural as possible; ▪ Cutting/ clearing of the herbaceous layer within the wetland areas along the linear development should be avoided so as to retain soil stability provided by the grass root structures ▪ During construction use techniques which support the hydrology and sediment control functions of the freshwater features; and normal as soon as possible after construction. ▪ Limit excavations to a limited extent to ensure that drainage patterns within the features returns to pre-construction state ▪ Restrict construction to the drier winter months if possible to avoid sedimentation of the freshwater feature and to minimize the severity of disturbance of the features and hydraulic function. ▪ Monitor the wetland feature for erosion and incision; ▪ Maintain the REC for each of the wetland features, as stated within the report during the life of the development; and ▪ Implement an alien vegetation control program within the wetland features and ensure establishment of indigenous species within areas previously dominated by alien vegetation. ▪ Any construction-related waste must not be placed in the vicinity of the wetland features; and ▪ Limit the footprint area of the construction activity to what is absolutely essential in order to minimize environmental damage. ▪ Stockpiled soil must be removed and the area must be levelled to avoid sedimentation of the wetland features from runoff; and ▪ As far as possible, all construction activities should occur in the low flow season, during the drier summer months. ▪ Vehicles should not be driven indiscriminately within the wetland features during maintenance activities to prevent soil compaction 	The NWA Section 21 (c) and (i) of the NWA Section 24 of the Constitution NEM:BA NEMA Department of Water and Forestry (DWAFF) guidelines for the delineation of wetlands (2005);	Construction and Operation	To prevent and minimise impacts to identified wetlands in proximity of the pipeline and those that the pipeline traverses

Activities	Aspect Affected	Phase	Mitigation Measures	Compliance with standards	Time period for implementation	Standard to be achieved
Construction of the Pipeline and associated clearance activities	Soil and Land capability	Construction	<ul style="list-style-type: none"> ▪ Install stormwater management systems around the soil stockpiles to minimise the effect of surface water runoff; ▪ Speed limit on site to be kept at 20kmph to minimise dust generation ▪ Soil removed for the pipeline construction should be stockpiled and utilised as backfill once each section of pipeline has been constructed; ▪ Soil should be deposited on top of the pipeline up to or above ground level so as to prevent trenches from developing which can result in increased erosion; ▪ All surfaces that are susceptible to erosion must be covered with a suitable vegetative cover as soon as construction is completed. 	CARA	Construction phase	To prevent soil contamination and degradation as well as the loss of topsoil and to prevent dust generation
Construction of the Pipeline and associated clearance activities	Heritage	Construction and Operation	<ul style="list-style-type: none"> ▪ Establish Project-specific Chance and Fossil Find Protocols and Procedures (CFPs) as a condition of authorisation 	The National Heritage Resources Act, 1999 (Act No. 25 of 1999) Regulations to the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (GN R 548) (SAHRA Regulations)	Construction phase	To prevent any disturbance and / or destruction of unknown heritage resources.

6 Rehabilitation Mitigation Measures

The following rehabilitation mitigation measures must be implemented where the pipeline has been installed. These measures have been listed below

- Contractors must only clear bushes and trees larger than 1 m. The remaining vegetation must be stripped with the topsoil to conserve as much of the nutrient cycle, organic matter and seed bank as possible.
- Active rehabilitation, shaping, and re-vegetation of disturbed areas immediately after construction;
- The wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; All erosion noted within the construction footprint should be remedied immediately and included as part of an ongoing rehabilitation plan;
- Soils which were compacted as a result of construction activities should be ripped/scarified (<300 mm) and profiled;
- A suitable AIP control programme must be put in place so as to prevent any encroachment as a result of disturbance to the surrounding terrestrial zones;
- Soil removed for the pipeline construction should be stockpiled and utilised as backfill once each section of pipeline has been constructed.
- Areas where vegetation is cleared (either for the pipeline where vegetation is present or for the laydown area), should be rehabilitated with a suitable indigenous vegetation cover once construction has been completed;
- Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion.
- Refuelling of vehicles should take place in contained/ bunded areas.
- Rehabilitation to be monitored bi-annually for the first year after completion of the construction phase.

7 Financial Provision

This section is considered to be not applicable

7.1 Determination of the amount of Financial Provision

This section is considered to be not applicable

7.1.1 Describe the Closure Objectives and the extent to which they have been aligned to the Baseline Environment described under the Regulation

This section is considered to be not applicable

7.1.2 Confirm specifically that the Environmental Objectives in relation to Closure have been consulted with Landowner and Interested and Affected Parties

This section is considered to be not applicable

7.1.3 Provide a Rehabilitation Plan that describes and shows the scale and aerial extent of the Main Mining Activities, including the Anticipated Mining Area at the time of Closure

This section is considered to be not applicable

7.1.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the Closure Objectives

This section is considered to be not applicable

7.1.5 Calculate and state the quantum of the Financial Provision required to manage and Rehabilitate the Environment in accordance with the applicable guideline

This section is considered to be not applicable

7.1.6 Confirm that the Financial Provision will be provided as determined

This section is considered to be not applicable

8 Monitoring Compliance with and Performance Assessment

The applicant will be responsible for ensuring compliance with the EMP as well as the implementation of all monitoring and mitigation measures. The recommended monitoring for the identified impacts is detailed below. The applicant will keep a record of all environmental monitoring taken on site. A summary of the environmental monitoring to be undertaken is included in Table 25 below.

8.1 Monitoring of Impact Management Actions

The identified impacts that require monitoring programmes includes the following:

- Site clearing and establishment:
 - Removal of vegetation and alien invasive species; and
 - Soil erosion.
- Construction
 - Soil erosion; and
 - Stormwater generated.

-
- Heritage resources;
 - Hydrocarbon spillages; and
 - Domestic waste (including sewage);

Reasonable measures will be taken to prevent the disturbance of wetlands, this includes:

- Implementation of storm water management to prevent erosion and siltation
- Prevention of hydrocarbon spillages.

8.2 Monitoring and Reporting Frequency

The monitoring and reporting frequency is discussed in Table 25 below.

8.3 Responsible Persons

The roles and responsibilities associated with the monitoring programme are set out in Table 25.

8.4 Time period for Implementing Impact Management Actions

Table 25 provides the time period for implementing impact management actions.

8.5 Mechanism for Monitoring Compliance

Table 25 sets out the method of monitoring, the implementation of the impact management actions, the frequency of monitoring the implementation of the impact management actions, an indication of the persons who will be responsible for the implementation of the impact management actions, the time periods within which the impact management actions must be implemented and the mechanism for monitoring compliance with the identified impact management actions.

Table 25: Monitoring and Management of Environmental Impacts

Source Activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
All activities throughout the project activities	Removal of vegetation and alien invasive species	Compile and Implement alien plant monitoring to prevent the establishment of alien invasive plant species and only the necessary vegetation required for the construction of the pipeline will be cleared	Alien invasive species monitoring utilising the AIP should be undertaken by an independent Environmental Control Officer (ECO)	Bi-annually for the first year after completion of the construction phase
	Soil erosion	All topsoil removed will be stored in a stockpile and protected from erosion for use during rehabilitation. Daily site inspection will be undertaken by the Environmental Officer to ensure that all soil erosion mitigation measures are in place and implemented adequately.	Environmental Officer	Daily
	Soil contamination through oil leaks	Heavy machinery and vehicles must be maintained and serviced regularly.	Environmental Officer	As and when required
	Soil compaction	Use existing tracks that run along the pipeline to access the pipeline servitude. The ECO must monitor that there are no multiple tracks created during construction	Environmental Control Officer (ECO)	Daily
	Use of hydrocarbons	Daily inspections of machinery must be undertaken and drip trays will be placed under the machinery to collect any hydrocarbon leaks and spillages in the event it is required. Should spillages occur, the soil must be cleared and treated utilising bioremediation techniques. Should the soil not be adequately treated on site, the soil must be removed from the site and disposed of at a licenced waste handling facility.	Environmental Officer	Daily
	Ablution facilities	The contents of the chemical toilets must be emptied on a regular basis, at least twice on a weekly basis, to prevent sewage spillages	Environmental Officer	Weekly
	Domestic waste	Bins will be placed at each active site to collect the domestic waste generated during construction and will be disposed of at a registered waste handling facility.	Environmental Officer	Weekly
Audit Reporting	Auditing against the construction conditions outlined within the approved EMP and EA (EMP Performance Assessment)	To determine compliance to EMP conditions.	Environmental Officer Environmental Control Officer (ECO)	Daily monitoring by Internal Environmental Officer during construction Monthly monitoring by external ECO during construction phase
Rehabilitation	Rehabilitation of disturbed areas	Review of rehabilitation after each pipeline section has been rehabilitated must be done.	Environmental Officer Environmental Control Officer (ECO)	After completion of each pipeline section

9 Indicate the Frequency of the Submission of the Performance Assessment / Environmental Audit Report

Monitoring to be undertaken during the construction phase of the pipeline must be completed daily by the internal Environmental Officer appointed and by an external independent ECO. The reports must be submitted to the GDARD on a monthly basis.

10 Environmental Awareness Plan

10.1 Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

The purpose of an Environmental Awareness Plan is to outline the methodology that will be used to inform the operating personnel of any environmental risks which may result from their work and the manner in which the risks must be dealt with to avoid contamination or the degradation of the environment. The environmental awareness plan ensures that training needs are identified and appropriate training is provided.

The objective of this Environmental Awareness Plan is to:

- Inform employees and contractors of any environmental risks which may result from their work; and
- Inform employees and contractors of the manner in which the identified possible risks must be dealt with to prevent degradation of the environment.

In general, the purpose of implementing an Environmental Awareness Plan is to optimise the awareness of those partaking in the mining and related activities which have the potential to impact negatively on the environment and in doing so, promote sustainable development.

The awareness training of employees, supervisors, sub-contractors and contractors will ensure that co-operation in terms of environmental management will occur. This will contribute to the successful implementation of the conditions set out in the EMP and EA, and thus to the environmental sustainability of the project. In addition, it will ensure the success of the proposed project regarding compliance with legislation and avoid possible future liabilities and legal action due to a lack of environmental awareness.

10.1.1 Specific Environmental Training

Environmental Awareness Training will be undertaken to make employees and contractors aware of the following:

- The importance of conforming with the environmental policy and procedures and with the requirements of the EMP;

-
- The significant social and environmental impacts of their work activities and the environmental benefits of improved personal performance;
 - Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirements of the environmental management system;
 - The potential consequences of departure from specified operating procedures; and
 - Possible archaeological finds action steps for mitigation measures, surface collections, excavations and communication routes to follow in the case of a discovery.

10.2 Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Management shall establish and maintain procedures for the internal communication between the various levels and functions of the organisation, and receiving, documenting and responding to relevant communication from external I&APs. The applicant shall consider processes for external communication on its significant environmental aspects and record its decision. Environmental risks will be dealt with through training and communication to ensure minimal degradation of the environment.

11 Specific Information required by the Competent Authority

No request for specific information has been requested for this proposed project by GDARD to date.

12 Undertaking

The EAP herewith confirms:-

- the correctness of the information provided in the reports
- the inclusion of comments and inputs from stakeholders and I&APs ;
- the inclusion of inputs and recommendations from the specialist reports where relevant; and
- the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

Signature of the Environmental Assessment Practitioner:	
Name of Company	Muny Consultants (Pty) Ltd
Date	

Tangos Consultants (Pty) Ltd

Basic Assessment Report for the proposed upgrades of the KwaThema to Grundlingh
WWTW Bulk Outfall Sewer near Nigel, Gauteng Province

TSG 0406



Appendix A: EAP's CV

Tangos Consultants (Pty) Ltd

Basic Assessment Report for the proposed upgrades of the KwaThema to Grundlingh
WWTW Bulk Outfall Sewer near Nigel, Gauteng Province

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Appendix B: Plans

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Basic Assessment Report for the proposed upgrades of the KwaThema to Grundlingh
WWTW Bulk Outfall Sewer near Nigel, Gauteng Province

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Appendix C: Public Participation Process

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Appendix C 1: Stakeholder Database

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Appendix C 2: Background Information Document

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Appendix C 3: Advertisement

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Appendix D: Biodiversity Impact Assessment

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Appendix E: Wetland Delineation and Impact Assessment

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Appendix F: Heritage Impact Assessment

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Appendix G: Paleontological Impact Assessment