Application for an Environmental Authorisation for the construction and operation of a wastewater pipeline between the Baviaanspoort Correctional Services Facility Pump Station and the Baviaanspoort Municipal Wastewater Treatment Works

Report Prepared for

Department of Public Works

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Report Number 498454/Baviaanspoort Pipeline Draft BAR

Report Prepared by

srk consulting

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SRK Consulting (South Africa) (Pty) Ltd.
Block A, Menlyn Woods Office Park
291 Sprite Avenue
Faerie Glen
Pretoria 0081
South Africa

e-mail: pretoria@srk.co.za
website: www.srk.co.za

Tel: +27 (0) 12 361 9821
Fax:+27 (0) 12 361 9912

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Compiled by:

Ndomupei Masawi
Principal Scientist

Peer Reviewed by:

Manda Hinsch
Principal Scientist/Partner

Email: hinm@srk.co.za

Authors:

M Hinsch; N Masawi

Executive Summary

Introduction

The Department of Public Works (DPW) owns and operates several Water Care Works with associated pump stations and reservoirs. Over the past few years some of the Water Care Works (WCW) owned by the DPW, which are situated in Gauteng and Mpumalanga have scored poorly on the Department of Water and Sanitation (DWS) Green Drop System (GDS), which has compelled the DPW to prioritise these identified works for upgrading and to ensure that they have adequate capacity to service present and future requirements.

SRK Consulting (South Africa) (Pty) Ltd (SRK) was appointed by the DPW to undertake the status quo assessment with the view to improve the works and to apply for any required authorisations for its Water Care Works. One of the affected WCW is the Baviaanspoort Correctional Services Facility (CSF).

The Baviaanspoort CSF is situated in Pretoria on the northern side of the Mamelodi community and the R513 in Baviaanspoort. The Baviaanspoort CSF domestic and piggery wastewater is pumped to the Tshwane Municipal Baviaanspoort Wastewater Treatment Works (WWTW) via a main Waste Pump Station (WPS). The main WPS and the piggery pre-treatment facilities are located at the north-western perimeter fence of the prison complex, next to the Pienaars River, on the eastern bank of Pienaars River. Several Baviaanspoort CSF infrastructure needing upgrading or refurbishment have been identified. These include the replacement of the existing pipeline that carries wastewater between the Baviaanspoort CSF main WPS and the Baviaanspoort Municipal WWTW.

DPW appointed the SRK Black Jill's Joint Venture to undertake the design process for replacing the existing pipeline between the Baviaanspoort Correctional Services Pump Station and the Baviaanspoort Municipal Wastewater Treatment Works (WWTW). The pipeline will be traversing the Pienaar's River which would require that a water use authorisation be applied for. The project also triggers listed activities in Listing Notice 1 and 3 of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and requires an Environmental Authorisation (EA). The NEMA listed activities triggered by the project are as follows:

Listing Notice 1:

Activity 10: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, 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;

Activity 12: *[The development of—xii) infrastructure or structures with a physical footprint of 100 square metres or more;], where such development occurs—(a) within a watercourse;*

Activity 19: *The infilling or depositing of any material of more than [5] 10 cubic* metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than [5] 10 cubic metres from [—(i)] a watercourse;

Activity 27: *The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation,*

Listing Notice 3: *Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.*

(a) In Gauteng: ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans

Who is conducting the impact assessment and compiling the EMPr?

SRK Consulting (SA) (Pty) Ltd (SRK) has been appointed by DPW as the independent Environmental Assessment Practitioner (EAP) to conduct the EA application process for the construction and operation of the proposed pipeline.

The reports and documentation for the EA application process will be compiled and finalised for submission to the Department of Environment, Forestry and Fisheries (DEFF) for the EA application in terms of the NEMA for consideration and decision making.

The DEFF will consult with other government authorities as required in terms of Section 24(K) of the NEMA.

Who will evaluate the impact assessment and EMPr?

Before the proposed construction and operation of the proposed pipeline can proceed, approval must be obtained from the regulatory authorities. The Basic Assessment Report (this report) will be submitted to the Competent Authority (CA), DEFF, for review and decision making as to whether the construction and operation of the proposed pipeline may proceed or not.

Description of the Proposed Development

A completely new pipeline will be designed and installed, parallel to the existing pipeline. The existing pipe will be replaced with a new continuous welded High-Density Polyethylene (HDPE). Horizontal drilling will be done for the road and river crossings.

The construction methodology for the proposed pipeline will be as follows:

- Develop final pipeline route and mark with stakes.
- Where required, portion of the existing pipeline will be removed.
- Prepare the ground by grading and removing vegetation along the pipeline route.
- Topsoil removal and stockpiling outside the 1:100-year floodline of the Pienaars River.
- Staking of the centre of the trench area, laying or stringing of sections of the pipeline along the pipeline route.
- Pipe is welded and contoured (if required).
- Pipe is lowered into trench.
- Pipe is placed in the trench and backfilled with stockpiled soil.
- Where the pipeline crosses the Pienaars River, a borer is used to open a tunnel under the riverbed where the new pipeline will be installed.
- Rehabilitation of site.

Project Need and Desirability

Authorisation of the upgrade of the Baviaanspoort CFS, including the pipeline will enable DPW to recognise the rights of access to basic water supply and basic sanitation necessary to ensure sufficient water and an environment not harmful to health or well-being, as captured by the Preamble of the Water Services Act, 1997 (Act No. 108 of 1997).

In terms of Section 24 of the Constitution of the Republic of South Africa (108 of 1996), 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 legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while prompting justifiable economic and social development. The needs of the environment, as well as affected parties, should thus be integrated into overall project management to fulfil the requirements of Section 24 of the Constitution.

The provision of sanitation forms part of the National Development Plan (NDP-2030) for South Africa, with Water and Sanitation infrastructure recognised as one of the Government's Strategic Integrated Projects (SIPs), SIP 18. Furthermore, DPW has the legal obligation to comply with Section 3 of the Act 108 of 1997, which states that:

- *Everyone has a right of access to basic water supply and basic sanitation.*
- *Every water services institution must take reasonable measures to realise these rights.*
- *Every water services authority must, in its water services development plan provide for measures to realise these rights.*

The construction and installation of a new pipeline will also reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. Authorising the construction of the new pipeline between the Baviaanspoort WWTW and Baviaanspoort CSF will reduce the chances of the pipeline failing and polluting the Roodeplaat Dam which is downstream from the works. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibres in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.

The needs and desirability assessment of the proposed pipeline as per notice 792 of 2012 is provided in Table ES-1.

Table ES-1: Needs and desirability assessment of the proposed pipeline

Questions (Notice 792, NEMA, 2012)		Response
PART I: NEED		
1.	Is the land use associated with the activity being applied for considered within the timeframe intended by the existing approved SDF agreed to be the relevant environmental authority?	N/A. The proposed project has no bearing on the SDF.
2.	Should the development, or if applicable, expansion of the town/area concerned in terms of this land use occurs here at this point in time?	Yes. Authorising the project will reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. The current asbestos cement pipeline poses a health risk to both aquatic organisms and downstream users.

	Questions (Notice 792, NEMA, 2012)	Response
	PART I: NEED	
3.	Does the community/area need the activity and the associated land use concerned? This refers to the strategic as well as local level.	Yes. Authorising the project will reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. The current asbestos cement pipeline poses a health risk to both aquatic organisms and downstream users.
4.	Are the necessary services with adequate capacity currently available (at the time of application) or must additional capacity be created to cater for the development?	No additional capacity will be required for the project.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of the services and opportunity cost)?	Not applicable. The objective of the project is to construct a new HDPE pipeline between Baviaanspoort WWTW and Baviaanspoort WPS to replace an old asbestos pipeline at risk of failing. The project will have no bearing on the infrastructure planning of the municipality.
6.	Is the project part of a national programme to address an issue of national concern or importance?	The protection of water resources forms part of the National Water Resources Strategy II that was adopted by the Government in 2013. The water resource protection theme emphasises the need to protect our freshwater ecosystems, which are under threat because of pollution from many sources. The NWRS (II) states that South Africa's water ecosystems are not in a healthy state. Of the 223 river ecosystem types, 60% are threatened, with 25% of these critically endangered. Less than 15% of river ecosystems are located within protected areas, many of which are threatened and degraded by upstream human activities. The project entails construction of a pipeline to replace an old pipeline, which will reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. The current asbestos cement pipeline poses a health risk to both aquatic organisms and downstream users.
	PART II: DESIRABILITY	
1.	Is the development the best practicable environmental option for this land/site?	Yes. Authorising the construction of the new pipeline between the Baviaanspoort WWTW and Baviaanspoort CSF will reduce the chances of the pipeline failing and polluting water resources. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibers in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.
2.	Would the approval of this application compromise the integrity of the existing approved and credible IDP and SDF as agreed to by the relevant authorities?	No. The project has no bearing on the IDP or SDF of the City of Tshwane. The objective of the project is to replace the old asbestos pipeline which will reduce the risk of the pipeline failing and contaminating water resources.
3.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the	No. The Gauteng EMF shows that the majority of the proposed Baviaanspoort pipeline is situated within the high control zone (outside zone 1) (EMF Zone 3) and the

	Questions (Notice 792, NEMA, 2012)	Response
	PART I: NEED	
	area (e.g., as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	remaining small southern portion fall within the Normal Control Zone, (EMF Zone 4). The project will however have no implications on the integrity of the EMFs. The objective of the project is to replace the old asbestos pipeline which will reduce the risk of the pipeline failing and contaminating water resources.
4.	Do location factors favor this land use at this place? (this relates to the contextualization of the proposed land use on this site within its broader context).	Yes. The proposed pipeline will connect the existing Baviaanspoort Water Pump Station (WPS), which is located on the western bank of the Pienaars River and will cross the Pienaars River and run on the eastern bank of Pienaars River to the Baviaanspoort WWTW. The pipeline will be constructed parallel to the existing pipeline commenting the WTS and WWTW.
5.	How will the activity of the land use associated with the activity being applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	The pipeline will run from the Baviaanspoort WPS, which is located on the western bank of the Pienaars River and will cross the Pienaars River and run on the eastern bank of Pienaars River to the Baviaanspoort WWTW. The proposed pipeline will result in the decommissioning and removal of some sections of the old pipeline that is currently being used for the transmission of wastewater from the Baviaanspoort WSP to the Baviaanspoort WWTW. The old asbestos pipeline will be replaced with a newer HDPE pipeline, which will reduce the chances of the pipeline failing and polluting the environment, including the Pienaars River. The construction and operation of the new pipeline will result in low and medium impacts, which can be mitigated to be of low significance. There are no cultural areas that will be affected by the project.
6.	How will the development impact on people's health and well-being? (E.g., In terms of noise, odors, visual character and sense of place, etc.)?	The project will result in the stabilisation of the riverbanks which are prone to erosion. This will provide a safer environment to the public as well as the people living along the Pienaars River. During construction, there will be particulate emissions (dust) related to debris handling; truck transport; materials storage, handling and transfer; open areas (windblown emissions). Gas emissions are also expected to occur due to vehicle and construction equipment activity (exhaust fumes). These impacts, however, can be mitigated and managed to acceptable levels, with a post mitigation impact that is not significant. Movement of construction vehicles and machinery result in the production of construction related noise from construction vehicles and machineries which may cause a nuisance to people living in the vicinity of the project area. However, the implementation of appropriate mitigation measures would reduce the noise levels to remain within applicable and acceptable SANS levels (SANS 10103:2008). Occupational health and safety standards will apply. It is expected that the project will not have an impact on the visual character and sense of place, especially since the pipeline will be located underground.

Questions (Notice 792, NEMA, 2012)		Response
PART I: NEED		
7.	Will the proposed activity or the land use associated with the activity being applied for, result in unacceptable opportunity costs?	No. The project is located on municipal land and will not result in any opportunity costs. The objective of the project is to replace the old asbestos pipeline which will reduce the risk of the pipeline failing and contaminating water resources.
8.	Will the proposed land use result in unacceptable cumulative impacts?	No. It is expected that the project may result in cumulative impacts on water quality. The impacts will be short lived, during the construction phase. It is however expected that implementation of the mitigation measures included in the EMPr will reduce the significance of the impact to *low*.

Alternatives Considered

Two pipeline route alternatives were considered. The assessment also included a no-go option as required by the NEMA.

Summary of the Baseline Environment

The environmental status quo is summarised in Table ES-2.

Table ES-2: Project Area Status Quo Assessment

Aspect	Description
Regional Climate	The pipeline falls within the Limpopo Water Management Area (WMA), within the Crocodile River catchment area. The climatic conditions across this catchment are temperate and semi-arid in the east to dry in the west. Rainfall is strongly seasonal, with most rainfall occurring as thunderstorms during the summer period of October to April. Mean annual rainfall ranges from 400 to 800 mm and decreases from the eastern to the western side of the WMA. The mean annual temperature ranges between 18 and 20 °C. Maximum and minimum temperatures are experienced during January and July respectively
Socio-Economic	The project is located within the City of Tshwane Local Municipality. According to the COT Integrated Development Plan (IDP), the largest share of population in Tshwane is within the young working age (25-44 years) age category, with 1.21 million or 36.5% of the total population. The age category with the second largest population share is the (0-14 years) age category, with 24.5%; then followed by the older working age population (i.e., 45-64 years age category), with 592 000 people. The age category with the lowest number of people is the elderly population (i.e., 65 years and older age category), with only 20 000 people. According to the IDP, the number of people without any schooling decreased between 2007 and 2017 by an average annual rate of -1.58%, while the number of people in the 'matric only' category increased from 533 000 to 802 000. The number of people with 'matric and a certificate/diploma' increased by an average annual rate of 4.35%, while the number of people with a 'matric and a Bachelor's' degree

Aspect	Description
	increased by an average annual rate of 6.18%. In 2017, the functional literacy rate in the City of Tshwane was approximately 91.02%. With a Gross Domestic Product (GDP) of R312 billion in 2017 (up from R236 billion in 2007), the City of Tshwane Metropolitan Municipality contributed 28.4% to the Gauteng Province GDP (R1.1 trillion) in 2017, increasing its share of the Gauteng Province GDP from 26.3% in 2007. The City of Tshwane contributes 10% to the GDP of South Africa, which had a total GDP of R3.12 trillion in 2017 (as measured in nominal or current prices). Its contribution to the national economy was similar in 2007, when it contributed 9% to South Africa's GDP. It is expected that City of Tshwane Metropolitan Municipality will grow at an average annual rate of 2.15% from 2017 to 2022. The average annual growth rate of Gauteng Province and South Africa is expected to be 2.19% and 2.02%, respectively. In 2022, City of Tshwane's forecasted GDP will be an estimated R348 billion (constant 2010 prices) or 28.3% of the total GDP of Gauteng Province. In 2017, a total of 1.22 million people were employed within the City of Tshwane , which is: 24.50% of total employment in Gauteng (4.99 million); 7.70% of total employment in South Africa (15.9 million). Employment in the City of Tshwane increased annually at an average rate of 2.62% from 2007 to 2017. the economic sector that recorded the highest employment figures in 2017 was the community services sector, with 290 000 employed people or 23.7% of total employment in the metropolitan municipality. The finance sector employs 269 000 people (22.0% of total employment in Tshwane), which is the sector with the second highest contribution to employment in the City. The electricity sector employs 5 570 people or 0.5% of total employment in Tshwane whilst the agriculture sector employs 12 300 people or 1.0% people employed in Tshwane, these sectors contribute the least to total employment in Tshwane. The number of people formally employed in City of Tshwane Metropolitan Municipality was 1.06 million in 2017, which was about 86.43% of total employment. The number of people employed in the informal sector was 166 000 or 13.57% of total employment. Informal employment in City of Tshwane increased from 144 000 in 2007 to an estimated 166 000 in 2017. In 2017, the trade sector recorded the highest number of informally employed people, with a total of 67 400 employees or 40.59% of total informal employment. This can be expected, as the barriers to enter the trade sector in terms of capital and skills required is lower than with most of the other sectors. The manufacturing sector has the lowest informal employment - 11 000 - and only contributes 6.65% to total informal employment. In 2017, there were a total of 386 000 people unemployed in City of Tshwane, which is an increase of 150 000 from 236 000 in 2007. The total number of unemployed people in City of Tshwane constitutes 18.64% of the total number of unemployed people in Gauteng. The City of Tshwane experienced an average annual increase of 5.06% in the

Aspect	Description
	number of unemployed people, which is better than that of Gauteng, which had an average annual increase in unemployment of 5.64%. The unemployment rate in City of Tshwane (based on the official definition of unemployment) was 24.01%, which is an increase of 4.16 percentage points.
Soils	Soils in the Pienaars River sub-catchment can be divided into three main groups moderate to deep sandy loam soils, moderate to deep clay loam soils and moderately shallow to moderately deep, clayey loam to clay-rich, fine-grained soils.
Geohydrology	A geohydrological study conducted at Baviaanspoort WWTW found that a shallow aquifer is intersected in monitoring boreholes at the WWTW in sandy soils at varying depths. The water table depths vary between 6 m to 24 m below the surface level. Groundwater flow appears to be in a general northerly and westerly direction towards the Pienaars River. The water tables are shallowest near the river.
Geology	Baviaanspoort WWTW is located on rocks belonging to the Magaliesberg and Smelterskop Formations of the Pretoria Group, Transvaal Supergroup. Shales in the Magaliesberg Formation have been altered to hornfels by the intrusion of diabase. The Smelterskop Quartzite consists of quartz partially felspathic, subgraywacke partially with shale, hornfels, lava and dolomitic limestone. Outcrops of bedrock are not common and the geological rock formations are largely underlying a sedimentary cover of recent age consisting of silica sand from weathering of Magaliesberg Quartzite as well as talus and weathered material originating from other rocks. The Pienaars River is winding through the Magaliesberg Mountains along north south trending geological structural features. The geological contact zones are mainly east west orientated and include contacts between quartzite, diabase and shale layers within the Pretoria Group. Fault structures on the 1:50 000 geological map are mainly northerly orientated, but a large fault located to the east on the WWTW has a NW to SE strike direction.
Areas of Conservation Concern	The pipeline will traverse areas classified as Critical Biodiversity Areas (CBAs) (irreplaceable ecological area) and Ecological Support Areas (ESAs).
Biodiversity	*Flora:* The broad-scale habitat types representing semi-transformed, degraded and transformed woodland and grassland are present along the pipeline alignment. A total of 204 plant taxa was recorded along the pipeline alignment, consisting of 146 dicotyledons, 56 monocotyledons and two pteridophytes (ferns). The most important vegetation portions representing semi-transformed graminoid and bushveld compositions are concentrated on the central parts of the pipeline alignment and along the Pienaars River. These floristic patches contain compositions

Aspect	Description
	reminiscent of near late successional assemblages very similar to recovering untransformed Rand Highveld Grassland and Marikana Thornveld *Fauna:* • Mammals: Approximately 66 mammal species have been recorded from the study area (according to QDC 2528CB; sensu MammalMap). • Amphibians: Twenty-two (22) frog species are known to be sympatric to the study region (according to QDC 2528CB). • Reptiles: Approximately 69 reptile taxa are known to be sympatric to the study region (according to QDC 2528CB). • Birds: According to the South African Bird Atlas Project (SABAP2), approximately 228 bird species have been recorded from the study area (sensu pentad grid 2540_2820).
Heritage Resources	• Stone Age: No Stone Age material was found during survey of the project area. • Iron Age: No Iron Age sites were recorded during the survey or on the survey of aerial imagery. • Historical Sites: Two historical sites were recorded during the foot survey of the proposed project area (these were not visible in the remote sensed imagery). However, both sites are located outside the pipeline footprint.
Palaeontology Sensitivity	The project area falls outside a paleontological sensitive area according to the SAHRIS database and therefore does not require desktop or field assessment will probably not be required.
Geotechnical Status	A geotechnical investigation was undertaken to assess the soil and rock conditions underlying the Baviaanspoort CSF. The intention of the investigation was to determine the excavatibility of the underlying material, determine the depth to refusal and test the engineering properties of the underlying material. The geotechnical investigation comprised the digging of numerous test pits on the site, logging them, interpret the results and make recommendations with regards to foundation designs. The study found that the Baviaanspoort site is underlined by soil horizons subject to both consolidation and collapse settlement, the soil class designation is C2. The study concluded that for the new structures, it is recommended that soil rafts be constructed as foundation.
Water Resources	The proposed pipeline will traverse the Pienaars River. The National Freshwater Ecosystem Priority Areas (NFEPA) database classifies the Pienaars River as C-moderately modified. Class C NFEPA rivers are

Aspect	Description
	rivers where a loss and change of natural habitat and biota has occurred but the basic ecosystem functions are still predominantly unchanged. Although the NFEPA wetlands database shows that there are wetlands associated with the Baviaanspoort WWTW, located within 500m of the proposed pipeline, these are dams located at the WWTW
Aquatic Ecology	The aquatic assessment found that whilst portions of the Pienaars River and associated riparian habitat displayed some wetland characteristics, overall, the system was more representative of a riparian system and this was used for further classification purposes. The assessment concluded that the ecological integrity and functionality of the Pienaars River has been largely to seriously modified primarily as the result of historic and ongoing industrial activities as well as other surrounding land uses such as agriculture and urbanization, to name a few. It is highly likely that the Pienaars River will receive both direct and indirect impacts from the proposed sewer pipeline, based on the proposed Baviaanspoort pipeline layout. However, these will likely be to a limited degree if appropriate mitigation measures are employed. Furthermore, direct leakage of sewage effluent into this river system at present, which is a result of the numerous leakages along the existing pipeline poses a greater threat to the ecology of the system than the anticipated short-term impacts associated with the construction of the new pipeline. As a result, construction of a new pipeline will be beneficial toward improving the current PES of the river and associated riparian habitat and is recommended to limit the amount of sewage effluent that currently enters the Pienaars River from leakages from the failing pipeline.
Agriculture Potential	The Gauteng Agriculture Potential Atlas indicates that the proposed pipeline will be in an area regarded as having medium to high agriculture potential

Impact Assessment Process

An Environmental Impact Assessment (EIA) seeks to identify the environmental consequences of a proposed project from the beginning, and helps to ensure that the project, over its life cycle, will be environmentally acceptable, and integrated into the surrounding environment in a sustainable way. Two parallel processes were followed; the environmental technical and impact assessment process and the stakeholder engagement process.

Stakeholder Engagement Process

The stakeholder engagement process, which was undertaken for this project, was aimed to comply with the relevant legislative requirements of the NEMA, as prescribed in Chapter 6 of the NEMA and GNR 982. The process included:

- Development of a stakeholder database:
- The compilation and management of the stakeholder database,

- Providing stakeholders with the opportunity to participate in the impact assessment process and to register as an Interested and Affected Party (I&AP) as announced in November 2018 through the following means:
    - Letter of invitations to register on 13 March 2020;
    - Media advertisements were placed in the Mamelodi Record in Friday, 13 March 2020 and Pretoria Moot Rekord in Friday, 13 March 2020 newspapers;
    - Site notices were erected at several places in and around the study area in Friday, 13 March 2020; and
    - Collation of comments received into a Comments and Responses Report (CRR).

The Draft Basic Assessment Report (draft BAR) will be made available for a 30-day commenting period between 28 February 2022 and 30 March 2022. All issues, comments and suggestions received from stakeholders will be collated into a Comments and Responses Report (CRR). Where necessary, comments from stakeholders will be incorporated into the Final BAR that will be submitted to the DEFF for decision-making.

Summary of Identified Possible Impacts

The identified potential positive and negative biophysical, socio-economic and cultural impacts are summarised in Table ES-3.

Table ES-3: Summary of Potential Environmental Impacts Associated with the Proposed Development

Element of Environment	Potential Impact Descriptions
Socio-Economic	Possible temporary job opportunities
Hydrogeology	Possible, but limited groundwater contamination.
Surface water	Possible, but limited surface water contamination.
Air Quality	Possible, but limited impact on air quality in the area.
Noise	Possible generation of noise during the construction activities.
Biodiversity	Possible loss of biodiversity and proliferation of alien invasive plant species
Surface Water Resources	Possible sedimentation and contamination of surface water resources due to movement of vehicles, personnel and machinery.

Specialist Studies

The DEFF Screening Tool identified the following specialist studies as essential for the proposed development, which have been included in the assessment:

- Plant Species Assessment (included in the Ecological Evaluation Specialist Report attached in Appendix E: DFFE Screening Report and
- Animal Species Assessment (included in the Ecological Evaluation Specialist Report attached in Appendix E: DFFE Screening Report.

In addition to the above-mentioned specialist studies, the following specialist studies were also undertaken:

- Wetlands and aquatic assessment;

- Heritage Resources; and
- Hydrology.

Summary of the Impact Assessment Process

This section contains the assessment of potentially positive and negative environmental impacts associated with both the preferred and alternative options.

Specific emphasis was placed on any relevant environmental, social and economic impacts identified by the specialist studies, comments received during the stakeholder engagement process, issues highlighted by relevant authorities; as well as a professional judgement of the EAP team through appraisals on the project description, listed activities and the receiving environment.

The objectives of the assessment for each of the potential environmental impacts identified was to determine their significance and to identify mitigation measures that may be implemented to reduce the impacts to an acceptable level where required.

Impacts Associated with the Preferred Option

The study found that the construction and operation of the pipeline may results in impacts on the environment (biodiversity, heritage resources, socio-economic environment, visual, noise, waste management; stormwater management, soils, land capability and land use, wetlands, air quality and hydrology).

During the operational phase, the most significant potential impact would be from leaking of wastewater from the pipeline. Regular monitoring and maintenance of the pipeline will reduce the likelihood of the impact occurring.

The potential impacts evident from the detailed impact assessment (Section 10) of the proposed project are both positive and negative in nature and can be managed to acceptable levels.

The summary of the quantitative impact assessment can be found in Table ES-4.

Table ES-4: Summary of Potential Environmental Impacts Associated with the proposed pipeline project

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
CONSTRUCTION	Social-economic	Ineffective communication with affected property owners and property occupiers leading to conflict	Low (-)	Low (-)
		Construction activities may result in an increase in petty crimes in the area	Low (-)	Low (-)
		Unauthorised access to private property may result in conflict with the property owners and occupiers	Low (-)	Low (-)
		Poor housekeeping will result in the deterioration of water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Lack of or poor sanitation will result in the contamination of surface runoff	Medium-Low (-)	Low (-)
		Possible boost in short-term local small business opportunities.	Medium-Low (+)	Medium-Low (+)
		Generation of dust potentially resulting in a health and nuisance impact.	Medium-Low (-)	Low (-)
		Clearing of land which may potentially impact on the sense of place.	Low (-)	Low (-)
	Groundwater	Local spillages of oils from construction vehicles and machinery leading to groundwater contamination.	Low (-)	Low (-)
		Improper storage and handling of hazardous materials leading to groundwater contamination.	Medium-Low (-)	Low (-)
	Surface Water Quality and Aquatic Ecosystems	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	Medium-High (-)	Low (-)
		Disturbance of the area may release suspended solids into the river during the construction of the temporary earth berm	Medium-High (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from construction vehicles and machinery.	Medium-Low (-)	Low (-)
		Deterioration of water quality due to the disposal of water that accumulated in the cofferdam.	Medium-High (-)	Low (-)
		Deterioration of water quality because of concrete that is poured in such a way that it will end up in the Spruit	Medium-High (-)	Low (-)
		Poor stormwater management leading to runoff from stockpiled material resulting in the erosion of the stockpiles causing sedimentation of the Pienaars River	Medium-Low (-)	Low (-)
		Diversion of the river resulting in the change in flow and an increase in sedimentation	Medium-High (-)	Low (-)
		Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	Medium-Low (-)	Low (-)
		Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality	Medium-High (-)	Low (-)
		Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	Medium-Low (-)	Low (-)
	Aquatic and Riparian Ecosystems	Loss of localised riparian biodiversity habitats within sensitive areas due to site clearance.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Sedimentation of riparian resources leading to smothering of flora	Medium-Low (-)	Low (-)
		Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance	Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-High (-)	Low (-)
		Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)
		Habitat fragmentation because of construction activities of the access roads leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity because of construction activities, erosion, poaching and faunal species trapping	Medium-Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Medium-Low (-)	Low (-)
	Air Quality	Possible increase in dust generation, PM10 and PM2.5 because of bulk earthworks, operation of heavy machinery, and material movement.	Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Increase in carbon emissions and ambient air pollutants (NO2 and SO2) because of movement of vehicles and operation of machinery/equipment.	Low (-)	Low (-)
	Climate change	Emissions of Green House Gases because of the use of construction vehicles and machinery.	Low (-)	Low (-)
	Visual	Visual intrusion because of the movement of machinery and the establishment of the required infrastructure.	Low (-)	Low (-)
		Indirect visual impact due to dust generation because of the movement of vehicles and materials, to and from the site area.	Low (-)	Low (-)
	Heritage Resources	Although no additional resources of cultural and/or heritage importance are known to be affected by the project, a possibility remains that there may be some additional resources may be discovered.	Low (-)	Low (-)
	Palaeontology Resources	Site clearance and laying of the plant foundation has potential to impact on Palaeontology resources.	Low (-)	Low (-)
	Flora	Loss of vegetation species including vegetation species of conservational concern due to site clearance.	Medium-Low (-)	Low (-)
		Direct loss of habitat and indirect loss of habitat quality.	Medium-Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
	Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)
		Habitat fragmentation because of construction activities leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity because of construction activities, erosion, poaching and faunal species trapping.	Medium-Low (-)	Low (-)
		Direct loss of faunal species of conservational concern.	Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Low (-)	Low (-)
	Noise	The use of vehicles and machinery during the construction phase may generate nuisance noise in the immediate vicinity	Low (-)	Low (-)
	Soils, land use and land capability	Localised chemical pollution of soils because of vehicle hydrocarbon spillages and compaction.	Medium-Low (-)	Low (-)
		Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	Low (-)	Low (-)
	Traffic	Increase in traffic volumes because of pre-construction activities which may lead to an increase in traffic congestion on roads around the project area increasing the chances of road accidents.	Medium-Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the Pienaars Rivers.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
OPERATION	Social	Potential leakage of sewage water may result in nuisance odor and flies which may result in conflict with communities around the project area.	Medium-Low (-)	Low (-)
	Groundwater	Seepage of contaminated water from the use of vehicles to access structure during inspection and maintenance processes, which may result in the spillages of hydrocarbon liquids from the vehicles and machinery.	Low (-)	Low (-)
		*Potential leakage of sewage water may result in percolation of contaminated water into the groundwater regime.	Medium-High (-)	Low (-)
	Surface Water	Erosion of the riverbeds and banks may result in siltation of the Pienaars River	Low (-)	Low (-)
		*Potential leakage of sewage water into the Pienaars River and associated riparian habitat thus resulting in altered water quality and alteration of the natural hydrological regime of the Pienaars River;	Medium-High (-)	Low (-)
	Aquatic Ecology	Stream diversion to allow for inspection and/or maintenance and repairs may result in a temporarily altered flow regime leading to possible loss of recharge to downstream areas impacting on downstream biota	Medium-Low (-)	Low (-)
		Diversion of the stream during the operation phase may result in a temporary altered flow regime, leading to loss of recharge to downstream users, impacting on downstream biota.	Medium-Low (-)	Low (-)
		Possible incision/erosion in the vicinity of the diversion because of temporary formation of a concentrated flow path	Medium-Low (-)	Low (-)
		*Potential leakage of the proposed Baviaanspoort pipeline and discharge of sewage into the Pienaars River and associated riparian zone because of maintenance activities;	Medium-High (-)	Low (-)
		Possible contamination of riparian soils and surface water leading to further reduced ability to support biodiversity.	Low (-)	Low (-)
	Flora	Disturbances to or removal of vegetation whilst accessing infrastructure to carry out maintenance activities may result in potential loss to indigenous vegetation and further proliferation of alien floral species.	Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Continued introduction and proliferation of alien invasive plant species and further transformation of natural habitat.	Low (-)	Low (-)
		Continued loss of biodiversity and SCC	Low (-)	Low (-)
	Fauna	Loss of faunal species because of collisions with maintenance vehicles	Low (-)	Low (-)
		Loss of faunal habitat and ecological structure because of vegetation removal whilst accessing infrastructure for maintenance purposes	Low (-)	Low (-)
	Noise	The use of vehicles and machinery during maintenance and/repair may generate noise in the immediate vicinity	Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the river	Low (-)	Low (-)

The alternative pipeline route will result in loss of or impacts on a small sub-population of the near threatened *Searsia gracillima* var. *gracillima* corresponding to Rand Highveld Grassland. This species is also endemic in Gauteng. In addition, both the Rand Highveld Grassland and Marikana Thornveld habitat units are considered as threatened ecosystems (on a national level) while they also coincide with an "irreplaceable area" according to the Gauteng conservation Plan. Therefore, it is evident that the pipeline alignment is located on habitat that is of high ecological sensitivity (c. Rand Highveld Grassland, semi-transformed Marikana Thornveld and riparian vegetation). The specialist recommended that a 600m buffer be maintained for any plant population that is near threatened and endemic to Gauteng.

The heritage assessment also identified two heritage sites near the pipeline alternative route. Although the heritage sites are not located in the direct line of the pipeline alternative, the sites are close enough for construction activities to impact on them.

The summary of the quantitative impact assessment can be found in Table ES-5.

Table ES-5: Summary of Potential Environmental Impacts Associated with the Alternative Pipeline Route

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
CONSTRUCTION	Social-economic	Ineffective communication with affected property owners and property occupiers leading to conflict	Low (-)	Low (-)
		Construction activities may result in an increase in petty crimes in the area	Low (-)	Low (-)
		Unauthorised access to private property may result in conflict with the property owners and occupiers	Low (-)	Low (-)
		Poor housekeeping will result in the deterioration of water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Lack of or poor sanitation will result in the contamination of surface runoff	Medium-Low (-)	Low (-)
		Possible boost in short-term local small business opportunities.	Medium-Low (+)	Medium-Low (+)
		Generation of dust potentially resulting in a health and nuisance impact.	Medium-Low (-)	Low (-)
		Clearing of land which may potentially impact on the sense of place.	Low (-)	Low (-)
	Groundwater	Local spillages of oils from construction vehicles and machinery leading to groundwater contamination.	Low (-)	Low (-)
		Improper storage and handling of hazardous materials leading to groundwater contamination.	Medium-Low (-)	Low (-)
	Surface Water Quality and Aquatic Ecosystems	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	Medium-High (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Disturbance of the area may release suspended solids into the river during the construction of the temporary earth berm	Medium-High (-)	Low (-)
		Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from construction vehicles and machinery.	Medium-Low (-)	Low (-)
		Deterioration of water quality due to the disposal of water that accumulated in the cofferdam.	Medium-High (-)	Low (-)
		Deterioration of water quality because of concrete that is poured in such a way that it will end up in the river	Medium-High (-)	Low (-)
		Poor stormwater management leading to runoff from stockpiled material resulting in the erosion of the stockpiles causing sedimentation of the Pienaars River	Medium-Low (-)	Low (-)
		Diversion of the river resulting in the change in flow and an increase in sedimentation	Medium-High (-)	Low (-)
		Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	Medium-Low (-)	Low (-)
		Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality	Medium-High (-)	Low (-)
		Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	Medium-Low (-)	Low (-)
	Aquatic and Riparian Ecosystems	Loss of localised riparian biodiversity habitats within sensitive areas due to site clearance.	Medium-Low (-)	Low (-)
		Sedimentation of riparian resources leading to smothering of flora	Medium-Low (-)	Low (-)
		Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance	Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-High (-)	Low (-)
		Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Habitat fragmentation because of construction activities of the access roads leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity because of construction activities, erosion, poaching and faunal species trapping	Medium-Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Medium-Low (-)	Low (-)
	Air Quality	Possible increase in dust generation, PM10 and PM2.5 because of bulk earthworks, operation of heavy machinery, and material movement.	Low (-)	Low (-)
		Increase in carbon emissions and ambient air pollutants (NO2 and SO2) because of movement of vehicles and operation of machinery/equipment.	Low (-)	Low (-)
	Climate change	Emissions of Green House Gases because of the use of construction vehicles and machinery.	Low (-)	Low (-)
	Visual	Visual intrusion because of the movement of machinery and the establishment of the required infrastructure.	Low (-)	Low (-)
		Indirect visual impact due to dust generation because of the movement of vehicles and materials, to and from the site area.	Low (-)	Low (-)
	Heritage Resources	A heritage site was identified 20 m of the west of the alternative pipeline route. Although no graves are known to be affected by the project, a possibility remains that there may be some additional resources may be discovered.	Low (-)	Low (-)
	Palaeontology Resources	Site clearance and laying of the plant foundation has potential to impact on Palaeontology resources.	Low (-)	Low (-)
	Flora	Loss of vegetation species including vegetation species of conservational concern due to site clearance.	High (-)	High (-)
		Direct loss of habitat and indirect loss of habitat quality.	Medium-Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
	Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)
		Habitat fragmentation because of construction activities leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity because of construction activities, erosion, poaching and faunal species trapping.	Medium-Low (-)	Low (-)
		Direct loss of faunal species of conservational concern.	Medium-Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Medium-Low (-)	Low (-)
	Noise	The use of vehicles and machinery during the construction phase may generate nuisance noise in the immediate vicinity	Low (-)	Low (-)
	Soils, land use and land capability	Localised chemical pollution of soils because of vehicle hydrocarbon spillages and compaction.	Medium-Low (-)	Low (-)
		Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	Low (-)	Low (-)
	Traffic	Increase in traffic volumes because of pre-construction activities which may lead to an increase in traffic congestion on roads around the project area increasing the chances of road accidents.	Medium-Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the Pienaars Rivers.	Medium-Low (-)	Low (-)
OPERATION	Social	Potential leakage of sewage water may result in nuisance odour and flies which may result in conflict with communities around the project area.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
	Groundwater	Seepage of contaminated water from the use of vehicles to access structure during inspection and maintenance processes, which may result in the spillages of hydrocarbon liquids from the vehicles and machinery.	Low (-)	Low (-)
		*Potential leakage of sewage water may result in percolation of contaminated water into the groundwater regime.	Medium-High (-)	Low (-)
	Surface Water	Erosion of the riverbeds and banks may result in siltation of the Pienaars River	Low (-)	Low (-)
		*Potential leakage of sewage water into the Pienaars River and associated riparian habitat thus resulting in altered water quality and alteration of the natural hydrological regime of the Pienaars River;	Medium-High (-)	Low (-)
	Aquatic Ecology	Stream diversion to allow for inspection and/or maintenance and repairs may result in a temporarily altered flow regime leading to possible loss of recharge to downstream areas impacting on downstream biota	Medium-Low (-)	Low (-)
		Diversion of the stream during the operation phase may result in a temporary altered flow regime, leading to loss of recharge to downstream users, impacting on downstream biota.	Medium-Low (-)	Low (-)
		Possible incision/erosion in the vicinity of the diversion because of temporary formation of a concentrated flow path	Medium-Low (-)	Low (-)
		*Potential leakage of the proposed Baviaanspoort pipeline and discharge of sewage into the Pienaars River and associated riparian zone because of maintenance activities;	Medium-High (-)	Low (-)
		Possible contamination of riparian soils and surface water leading to further reduced ability to support biodiversity.	Low (-)	Low (-)
	Flora	Disturbances to or removal of vegetation whilst accessing infrastructure to carry out maintenance activities may result in potential loss to indigenous vegetation and further proliferation of alien floral species.	Low (-)	Low (-)
		Continued introduction and proliferation of alien invasive plant species and further transformation of natural habitat.	Low (-)	Low (-)
		Continued loss of biodiversity and SCC	Medium-Low (-)	Low (-)
	Fauna	Loss of faunal species because of collisions with maintenance vehicles	Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Loss of faunal habitat and ecological structure because of vegetation removal whilst accessing infrastructure for maintenance purposes	Low (-)	Low (-)
	Noise	The use of vehicles and machinery during maintenance and/repair may generate noise in the immediate vicinity	Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the river	Low (-)	Low (-)

No-go alternative

Although the no-go option will not result in any biophysical environmental impacts as no construction activities will be required, it must be noted that the construction and installation of a new pipeline will also reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. Authorising the construction of the new pipeline between the Baviaanspoort WWTW and Baviaanspoort CSF will reduce the chances of the pipeline failing and polluting water resources. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibres in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users. The benefits of replacing the pipeline far outweigh the benefits during the construction phase.

Environmental Management Programme

An EMPr has been developed as part of this BA to ensure the mitigation of these impacts as far as practicable. It is anticipated that it will be possible to mitigate all the environmental impacts to acceptable levels and the implementation will be monitored and audited to determine the effectiveness of the measures implemented. The EMPr is considered adequate to assist the project in striving towards the principles of the NEMA.

The EMPr for the construction and operation of the proposed pipeline has been included in Appendix G: EMPr.

Conclusion

SRK has undertaken the impact assessment and EMPr for the proposed construction and operation of the wastewater pipeline in accordance with the requirements of the NEMA. This has included a comprehensive stakeholder engagement process which has sought to provide stakeholders with an adequate opportunity to participate in the project process and guide technical investigations that have taken place as part of this study. Specialist input has been included for all key environmental aspects.

To date, there are no fatal flaws or red flags that have been identified for the proposed project. An EMPr has been developed as part of this BA to ensure the mitigation of these impacts as far as practicable. Most of the impacts associated with the preferred option identified were classified as low (-) to medium (-) without mitigation. All the identified impacts can be mitigated to low (-) significance impact rating. The implementation of the mitigation measures will be monitored and audited to determine the effectiveness of the measures implemented. The EMPr is considered to assist the project in striving towards the principles of the NEMA.

The project team believes that the impact assessment undertaken for the project fulfils the process requirements of the NEMA. The EAP recommends that an EA be issued by the DEFF and that the construction and operation of the proposed pipeline should be conducted under duty of care and must be in accordance with the recommendations that were included in this BAR and the accompanying EMPr.

YOUR COMMENT ON THE DRAFT BASIC ASSESSMENT REPORT (DRAFT BAR)

This Draft BAR will be available for comment for a period of 30 days from **28 February 2022** to **30 March 2022**. Copies of the Draft BAR Report have been made available at the following public places for review:

Public Place	Locality	Telephone
Mamelodi West Community Library	38 Nthsabeleng St, Mamelodi - SA5, Pretoria, 0122	012 358 5591; Mamelodi@tshwane.gov.za
Stanza Bopape Community Library	98-102 Marishane St, Mamelodi, Pretoria, 0122	(012) 358 1249; (012) 801 7348 Stanza@tshwane.gov.za
SRK Website	www.srk.co.za	(012) 361 9821

An electronic copy will also be available on CD on request from the stakeholder engagement officers. Interested & Affected Parties (I&APs) are requested to provide comments and information on the following aspects of the proposed project:

1. Information on how I&APs consider that the proposed activities will impact on them or their socio-economic conditions;
2. Written responses stating their suggestions to mitigate the anticipated impacts of each activity;
3. Information on current land uses and their location within the area under consideration;
4. Information on the location of environmental features on site to make proposals as to how and to what standard the impacts on site can be remedied; and
5. How to mitigate the potential impacts on their socio-economic conditions and to make proposals as to how the potential impacts on their infrastructure can be managed avoided or remedied.

DUE DATE FOR COMMENT

30 March 2022

Please submit comments to the stakeholder engagement officers:

Ndomupei Masawi/Vusi Masango
SRK Consulting
P O Box 35290, Menlo Park, 0102
Phone: (012) 361 9821
Fax: (086) 231 3497
Email: Nmasawi@srk.co.za / vmasango@srk.co.za

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by the Department of Public Works (DPW). The opinions in this Report are provided in response to a specific request from DPW to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

AC	Asbestos Cement
BA	Basic Assessment
BAR	Basic Assessment Report
CARA	Conservation of Agricultural Resources Act
CBAs	Critical Biodiversity Areas
CoT	City of Tshwane
CRR	Comments and Responses Report
CSF	Correctional Services Facility
DEAT	Department of Environmental Affairs and Tourism
DEFF	Department of Environment, Forestry and Fisheries
DPW	Department of Public Works
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
ESAs	Ecological Support Areas
GDARD	Gauteng Department of Agriculture and Rural Development
GDS	Green Drop System
GIS	Geographical Information Systems
HDPE	High-Density Polyethylene
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
MAR	Mean Annual Runoff
NDP	National Development Plan
NEM: AQA	National Environmental Management: Air Quality Act
NEM: BA	National Environmental Management: Biodiversity Act
NEM:WA	National Environmental Management: Waste Act
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act
PAIA	Promotion of Access to Information Act
PPE	Personal Protective Equipment
PPP	Public Participation Process

SAHRA	South African National Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SIPs	Strategic Integrated Projects
SRK	SRK Consulting (South Africa) (Pty) Ltd
uPVC	Unplasticized Polyvinyl Chloride
WCW	Water Care Works
WPS	Waste Pump Station
WUA	Water Use Authorisation
WWTW	Wastewater Treatment Works

1 Introduction and Scope of Report

1.1 Background and Brief

The Department of Public Works (DPW) owns and operates several Water Care Works (WCW) with associated pump stations and reservoirs. Over the past few years some of the Water Care Works owned by the DPW in the Gauteng and Mpumalanga Provinces have scored poorly on the Department of Water and Sanitation (DWS) Green Drop System (GDS), which has compelled the DPW to prioritise these identified works for upgrading and to ensure that they have adequate capacity to service present and future requirements.

SRK Consulting (South Africa) (Pty) Ltd (SRK) was appointed by the DPW to undertake the status quo assessment and apply for any required authorisations for its Water Care Works refurbishment and upgrading processes. One of the affected WCW is the Baviaanspoort Correctional Services Facility (CSF).

The Baviaanspoort CSF is situated in Pretoria on the northern side of the Mamelodi community and the R513 in Baviaanspoort. The Baviaanspoort CSF domestic and piggery wastewater is pumped to the Tshwane Municipal Baviaanspoort Wastewater Treatment Works (WWTW) via a main Waste Pump Station (WPS). The main WPS and the piggery pre-treatment facilities are located at the north-western perimeter fence of the prison complex, next to the Pienaars River, on the eastern bank of Pienaars River. Several Baviaanspoort CSF infrastructure needing upgrading or refurbishment have been identified. These include the replacement of the existing pipeline that carries wastewater between the Baviaanspoort CSF main WPS and the Baviaanspoort Municipal WWTW.

DPW appointed the SRK Black Jill's Joint Venture to undertake the design process for replacing the existing pipeline between the Baviaanspoort CSF Pump Station and the Baviaanspoort Municipal WWTW. The pipeline will be traversing the Pienaar's River which would require that a Water Use Authorisation (WUA) be applied for. The project also triggers activities listed in Listing Notice 1 and 3 of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and requires an Environmental Authorisation (EA). The NEMA listed activities triggered by the project are as follows:

Listing Notice 1:

Activity 10: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, 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;

Activity 12: *[The development of—xii) infrastructure or structures with a physical footprint of 100 square metres or more;], where such development occurs—(a) within a watercourse;*

Activity 19: *The infilling or depositing of any material of more than [5] 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than [5] 10 cubic metres from [—(i)] a watercourse;*

Activity 27: *The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation,*

LN 1- Activity 31: *The decommissioning of existing facilities, structures or infrastructure for—*

Listing Notice 3: *Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.*

(b) In Gauteng: ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans

The reports and documentation for the EA application process will be compiled and finalised for submission to the Department of Environment, Forestry and Fisheries (DEFF) for the EA in terms of the NEMA for consideration and decision-making. The DEFF will consult with other government authorities as required in terms of Section 24(K) of the NEMA.

1.2 Purpose of this study

An Environmental Impact Assessment (EIA) is defined as the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made. The aim of an EIA is to prevent substantial damage to the environment.

The objectives of this study are:

- To comply with the requirements of NEMA and associated Regulations;
- Identify and assess the environmental (biophysical, socio-economic, and cultural) impacts of activities associated with the construction and operation of the Baviaanspoort pipeline. The cumulative impacts of the proposed development will also be identified and evaluated;
- Identify and evaluate potential management and mitigation measures that will reduce the possible negative impacts of the proposed development and enhance the positive impacts;
- Compile monitoring, management, mitigation and training needs in the EMPr; and
- Provide the decision-making authorities with sufficient and accurate information to make a sound decision on the proposed development and set conditions that must be adhered to.

Since the construction and operation of the proposed wastewater pipeline triggers activities listed in Listing Notices 1 and 3 of the NEMA, a Basic EIA process will be required.

1.3 Objectives of this Report

This Basic Assessment Report (BAR) was compiled with the aim to document the Basic EIA process that was conducted for the project. The Draft BAR will be made available to stakeholders for their comments. All comments received will be considered and incorporated into a Final BAR that will be submitted to the DEFF for decision making.

1.4 Report Index in Relation to the NEMA Regulations

Regulation 2, Appendix 1 of GNR 982 published in terms of NEMA stipulates the minimal requirements and issues that need to be addressed in the BAR. This report strives to address all these requirements as per regulations. Table 1-1 indicates the regulations that have been addressed and the section of the BAR where these requirements can be found.

Table 1-1: Requirements of Appendix 1 of GNR 982

Section of the EIA Regulations, 2014	Description of EIA Regulations Requirements for Basic Assessment Reports	Section
Appendix 1: 3 (1) (a)	Details of – the EAP who prepared the report; and the expertise of the EAP, including a curriculum vitae	Section 1.5.2
Appendix 1: 3 (1) (b)	The location of the activity, including – The 21-digit Surveyor General code of each cadastral land parcel; Where available, the physical address and farm name; Where the required information in items (i) and (ii) is not available, coordinates of the boundary of the property or properties.	Section 2
Appendix 1: 3 (1) (c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is – • A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or • On land where the property has not been defined, the coordinates within which the activity is to be undertaken; or.	Figure 3.2
Appendix 1: 3 (1) (d)	A description of the scope of the proposed activity, including – All listed and specified activities triggered and being applied for; A description of the activities to be undertaken, including associated structures and infrastructure.	Section 5 Section 6.2
Appendix 1: 3 (1) (e)	A description of the policy and legislative context within which the development is proposed including- • an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and have been considered in the preparation of the report; and • how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	Section 6
Appendix 1: 3 (1) (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 8
Appendix 1: 3 (1) (g)	A motivation for the preferred site, activity and technology alternative;	Section 8
Appendix 1: 3 (1) (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including-	
	Details of all alternatives considered;	Section 4
	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 7
	A summary of the issues raised by interested and affected parties, and an indication of the way the issues were incorporated, or the reasons for not including them;	Section 7.5
	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 9

Section of the EIA Regulations, 2014	Description of EIA Regulations Requirements for Basic Assessment Reports	Section
	The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which the impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed, or mitigated.	Section 10.4 Section 10.5
	The methodology used in deterring and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 10.3.3
	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographic, physical, biological, social, economic, heritage and cultural aspects;	Section 10.5
	The possible mitigation measures that could be applied and level of residual risk;	Section 10.5
	The outcome of the site selection matrix;	Section 10.5
	If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	N/A
	A concluding statement indicating the preferred alternatives, including preferred location of the activity.	Section 15
Appendix 1: 3 (1) (i)	a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including— • a description of all environmental issues and risks that were identified during the environmental impact assessment process; and • an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 10.5
Appendix 1: 3 (1) (j)	An assessment of each identified potentially significant impact and risk, including— • cumulative impacts; • the nature, significance and consequences of the impact and risk; • the extent and duration of the impact and risk; • the probability of the impact and risk occurring; • the degree to which the impact and risk can be reversed; • the degree to which the impact and risk may cause irreplaceable loss of resources; and • the degree to which the impact and risk can be avoided, managed or mitigated.	Section 10.5
Appendix 1: 3 (1) (k)	where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Section 10.5

Section of the EIA Regulations, 2014	Description of EIA Regulations Requirements for Basic Assessment Reports	Section
Appendix 1: 3 (1) (l)	an environmental impact statement which contains— • a summary of the key findings of the environmental impact assessment; • a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and • a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 15
Appendix 1: 3 (1) (m)	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed [impact management objectives and the impact management outcomes for the development for inclusion in the EMPr;	Section 10.5
Appendix 1: 3 (1) (n)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	N/A
Appendix 1: 3 (1) (o)	a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 11
Appendix 1: 3 (1) (p)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 14
Appendix 1: 3 (1) (q)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	N/A
Appendix 1: 3 (1) (r)	An undertaking under oath or affirmation by the EAP in relation to- • The correctness of the information provided in the report; • The inclusion of the comments and inputs from stakeholders and interested and affected parties; • The inclusion of inputs and recommendations from the specialist reports where relevant; and • Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	Section 16
Appendix 1: 3 (1) (s)	where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
Appendix 1: 3 (1) (t)	Any specific information required by the competent authority;	N/A
Appendix 1: 3 (1) (u)	Any other matter in terms of Section 24(4)(a) and (b) of the NEMA.	N/A

1.5 Contact Details

1.5.1 Applicant

Table 1-2 presents the details of the applicant and facility owner.

Table 1-2: Contact details of the Applicant

Name of Applicant:	Department of Public Works (DPW)
Responsible Person:	Mpafane Deyi
Contact Number (cell):	082 882 6436
Contact Email:	Mpafane.Deyi@dpw.gov.za

1.5.2 Environmental Assessment Practitioner

SRK was established in 1974 and has since undertaken a large variety of environmental studies. SRK is a South African founded international organisation of professionals providing a comprehensive range of consulting services to natural resource industries and organisations. South African offices are staffed with over 350 professional consultants in nine offices, operating in a range of disciplines, mainly related to the environment, water, social and mining sectors. Back-up and peripheral expertise are available within these offices for all environmental projects. The project team members as stipulated in Table 1-3 can be contacted for the purposes of this project.

Table 1-3: Details of the Project Team

Details	**Names**		
	Manda Hinsch	**Ndomupei Masawi**	**Vusi Masango**
Designation on Project	Project Manager	Environmental Assessment Practitioner	Stakeholder Engagement Officer
Address	PO Box 35290 Menlo Park 0081	PO Box 35290 Menlo Park 0081	PO Box 35290 Menlo Park 0081
Telephone	(012) 361 9821	(012) 361 9821	(012) 361 9821
Fax	(012) 361 9912	(012) 361 9912	(012) 361 9912
E Mail	mhinsch@srk.co.za	nmasawi@srk.co.za	vmasango@srk.co.za

The project manager, Manda Hinsch is an experienced and professionally certified environmental assessment practitioner with over 38 years of experience. Manda has an honour's degree in Water Utilisation from the University of Pretoria in South Africa. Manda is a Principal Environmental Consultant and Partner of SRK Consulting (South Africa), and presently heads the Pretoria Business Unit in SRK. She has worked on a wide range of water and environmental projects throughout Africa. She serves as project partner on large environmental and social impact assessments including in the mining sector.

Ms Ndomupei Masawi has a master's degree in Geographical Information Systems (GIS) and Remote Sensing for Environmental Management and more than 14 years of Integrated Environmental Management and project management experience. Ms Masawi is a registered as a Professional Natural Scientist (Pr.Sci.Nat 400045/14) and as an EAP under EAPASA (Reg 2020/401). Her experience includes Project Management, compiling Environmental Management Programmes, undertaking Public Participation Processes, providing Geographic Information System (GIS) Services and undertaking the processes and assessments to support applications for Environmental Authorisations, Water Use Licences, Waste Management Licences and Air Emission Licences, for

roads, railway lines, power stations, airports, dams, housing developments, and schools in South Africa, Tanzania, Botswana, Lesotho, Zimbabwe and Uganda.

Mr Vusi Masango is a Stakeholder engagement specialist with 7 years' experience. Vusi has been involved with many stakeholder engagement plans across the mining industry.

Appendix A: CVs Project Team contains the curriculum vitae of the impact assessment project team and Appendix B: SRK EIA company Experience contains background on experience gained by SRK in the field of Environmental Impact Assessments.

1.5.3 Details of the Specialists

Independent specialists were appointed to conduct specialist studies. Each specialist has provided a signed declaration of interest that is included in each study report as required by the NEMA. The specialists that conducted studies as part of the BA are provided in Table 1-4.

Table 1-4: Specialist Studies

Specialist field	Company	Contact Person	Year of Study
Hydrology Assessment	SRK Consulting	Tshilidzi Netshitangani	2019
Terrestrial Ecology	Pachnoda Consulting	Lukas Niemand	2019
Aquatic Ecology	Wetland Consulting Services	Stephen van Staden	2019
Heritage Assessment	Department of Anthropology & Archaeology University of South Africa	Dr Xander Antonites	2019

1.5.4 Competent Authority Details

The applicant is a Government Department and in terms of Section 24C of the NEMA, the Competent Authority will be the Minister of Environment, Forestry and Fisheries. The EA for the proposed project is therefore required from the DEFF. Details of the competent authorities are provided in Table 1-5.

Table 1-5: Competent Authority Details

Department	Contact Person	Contact Details	
DEFF	Chief Directorate - Integrated Environmental Authorisations: Mr Sabelo Malaza	Tel	(012) 399 8792
		Email	smalaza@environment.gov.za; smambane@environment.gov.za

1.5.5 Municipality and Ward Details

The project area is located within the jurisdiction of the City of Tshwane Metropolitan Municipality. Details of the relevant municipality are provided in Table 1-6.

Table 1-6: Local and District Municipality Details

Department	Contact Person	Contact Details	
City of Tshwane Metropolitan Municipality	Ms Rudzani Mukheli (Deputy Director: Environmental Impact Management)	Tel	012 358 9999
		Email	Rudzanim@tshwane.gov.za

Table 1-6: Local and District Municipality Details provides an illustration of the relevant district and local municipalities surrounding the proposed project.

Figure 1-1: Applicable District and Local Municipalities

1.6 Environmental Authorisation Application process

All activities that trigger activities listed in Listing Notices 1 and 3, require that a Basic Assessment (BA) process be followed. The BA process will entail:

- Compilation of an Initial Draft BAR and draft EMPr for the public to comment on before the submission of the application to DEFF.
- Submission of the EA Application to the DEFF.
- Finalisation of the Draft BAR and EMPr for the official public participation comment period of 30 days.
- Incorporation of stakeholder comments into the final BAR and EMPr.
- Public Participation Process (PPP).

The BA process will follow the procedure as prescribed in Regulations 19 to 20 and is summarised in Figure 1-2.

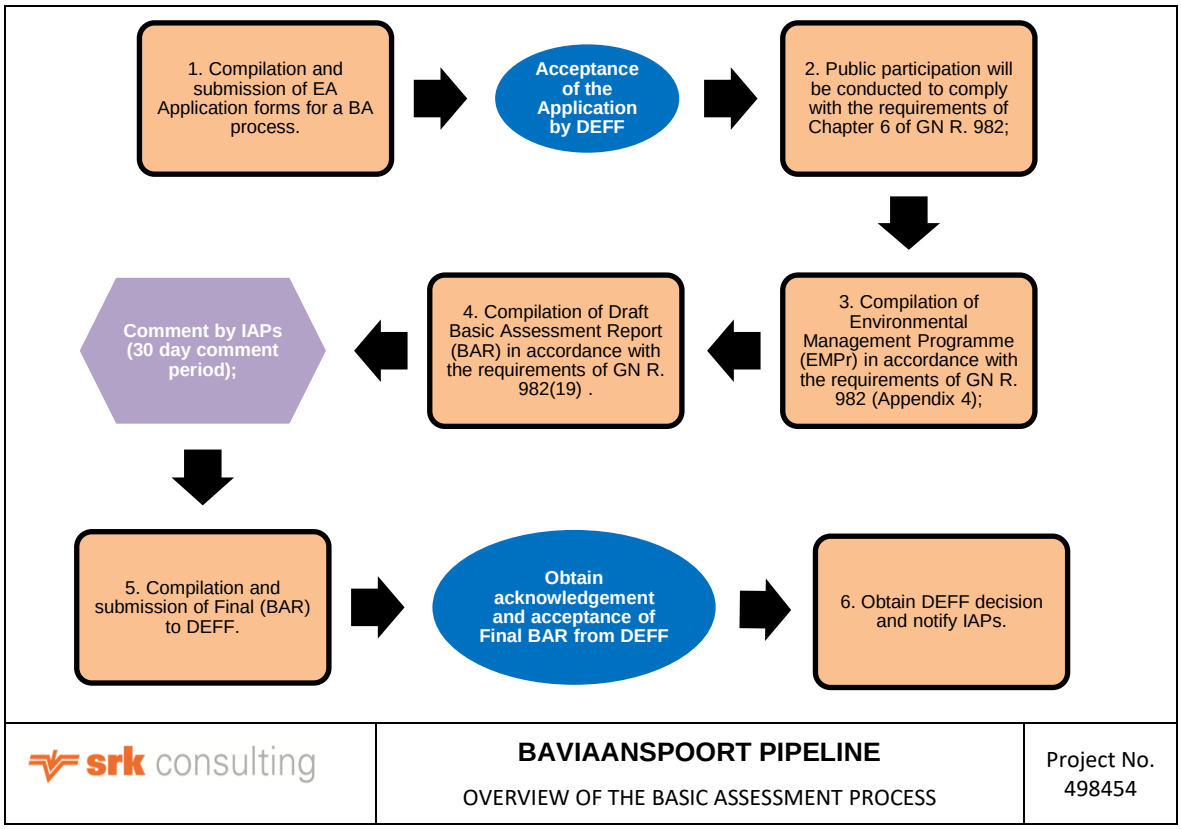


Figure 1-2: Overview the Basic Assessment Process

The DEFF will have a maximum of 107 days to review and decide on the application once the final BAR has been submitted.

2 Location of the Project

2.1 General Project Area Location.

The proposed pipeline is in the Gauteng Province, under the jurisdiction of the City of Tshwane Metropolitan Municipality (Figure 1-1). The pipeline will run from the Baviaanspoort WPS, which is located on the western bank of the Pienaars River and will cross the Pienaars River and run on the eastern bank of Pienaars River to the Baviaanspoort WWTW. The project is located approximately 1 km north of Mamelodi Township and about 4.89 km south of Roodeplaat Dam. The major land uses surrounding the project area vary from agriculture, Baviaanspoort Prison north of Zambezi Drive (R513) and scattered human inhabitation.

2.2 Ownership of Affected Impacted Properties

The affected properties and details of the property owners are summarised in Table 2-1. Figure 2-1 shows the properties affected by and adjacent to the pipeline.

Table 2-1: List of Affected Properties and Property Owners

Farm Name	Portion Number	Title Deed	21-SG Code	Property Owner
Baviaanspoort 330 JR	1	T9753/1984	T0JR00000000033000001	Government National Government of the Republic of South Africa Colin Cloete: Manager: Gauteng: Provincial State Land
Baviaanspoort 330 JR	2	T1451/1888	T0JR00000000033000002	Government National Government of the Republic of South Africa Colin Cloete: Manager: Gauteng: Provincial State Land

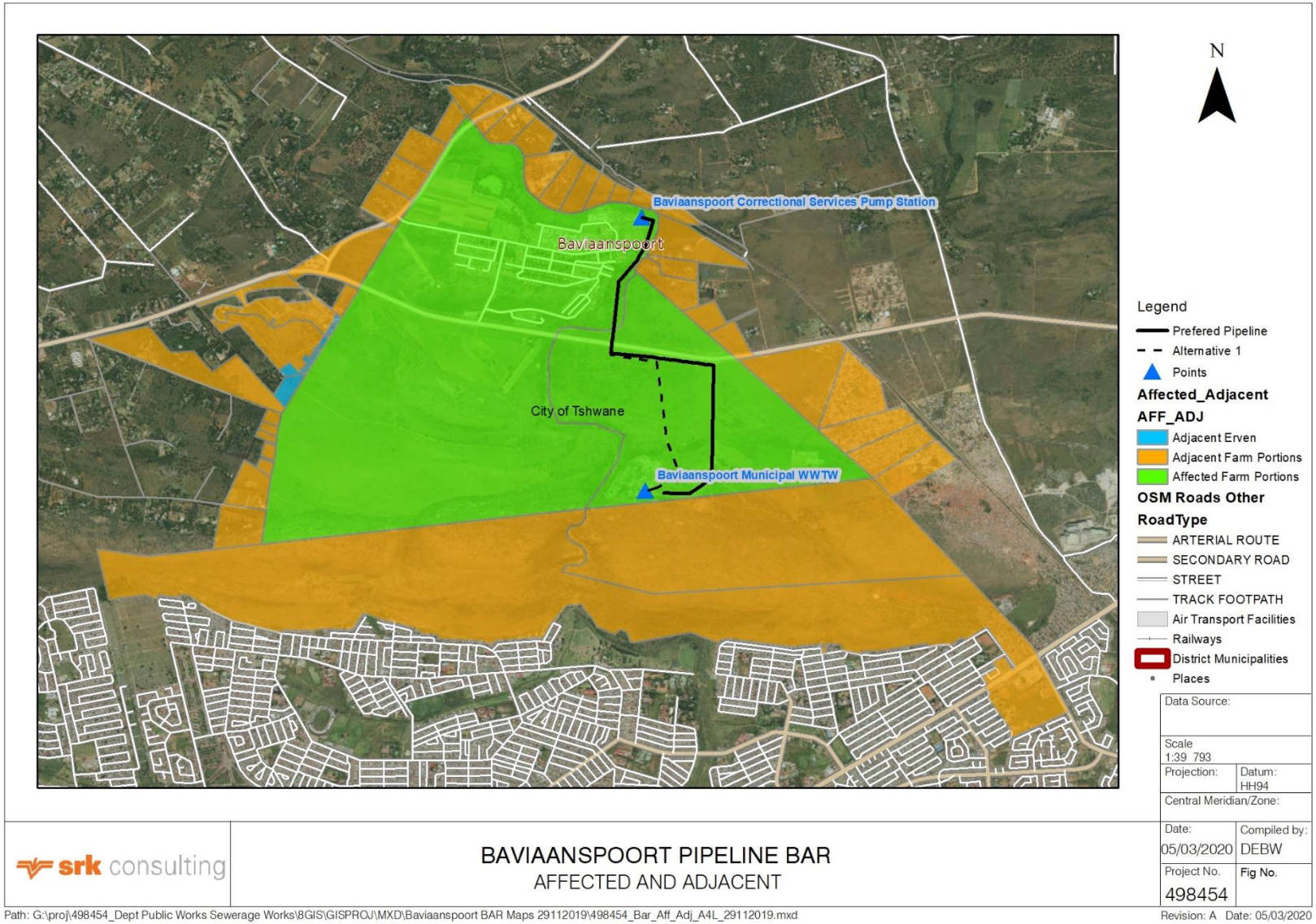


Figure 2-1: Affected and Adjacent Properties

2.3 Land Use Zoning

The affected land is zoned for agricultural purposes and the adjacent land is zoned as “undetermined and agricultural". Figure 2-2 as provides the land use zoning for the affected and adjacent properties.

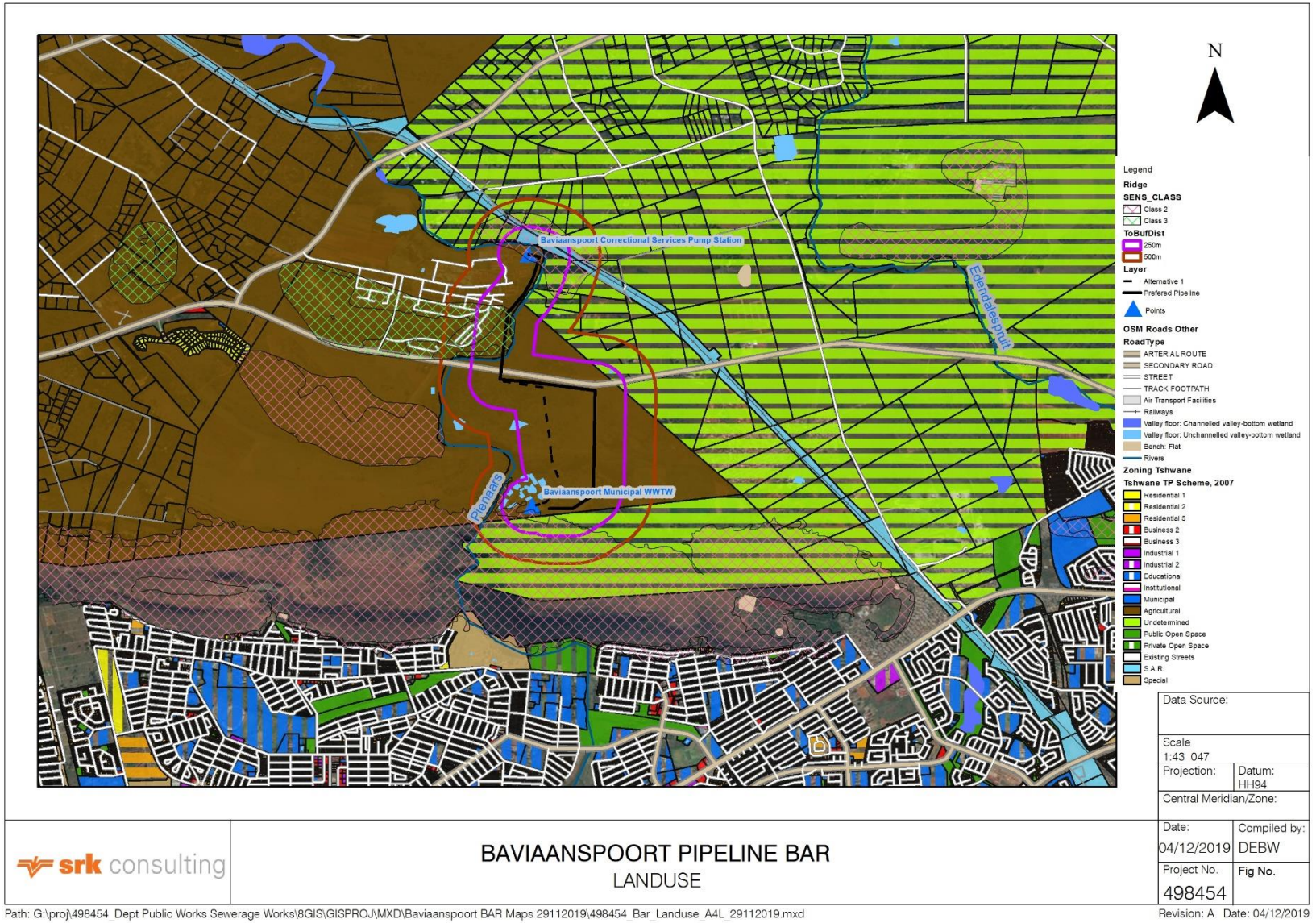


Figure 2-2: Land use Zoning

3 Description of the project

The existing rising main, that discharges the sewage from the Baviaanspoort prison to the Baviaanspoort WWTW, has been causing numerous problems over time. Regular pipe bursts have occurred over the past years causing environmental spillage concerns.

The existing rising main is approximately 33 years old and has reached the end of its operational life. The existing pipe is mainly Asbestos Cement (AC) with an approximate diameter of 250mm. Limited sections have been replaced with Unplasticized Polyvinyl Chloride (uPVC).

As part of the WWTW upgrade project, a complete new pipeline will be designed and installed, parallel to the existing pipeline. The existing pipe will be replaced with a new continuous welded High-Density Polyethylene (HDPE). Horizontal drilling will be done for the road and river crossings.

Table 3-1 and Figure 3-1 provide a summary of the properties and design parameters of the proposed pipeline.

Table 3-1: Proposed New Pipeline and Pump Parameters

Description	Unit	Value
Material	N/A	HDPE, PE100
Standard Diameter Ratio (SDR)	N/A	13.6
Nominal Diameter	mm	250
Pressure Rating	Bar	PN 12,5 /PN 10
Average Wall Thickness	mm	20
Internal Diameter	mm	212
Assumed Friction Factor (New)	C	140
Manning	n	0.01
Joining Method	N/A	Butt-Welded
Length	m	2900
Flow Velocity	m/s	1.3 / 2.8
Static Head (Ave)	m	46.5
Design Capacity	m3/h	162
Calculated Pump Head	m	63.2

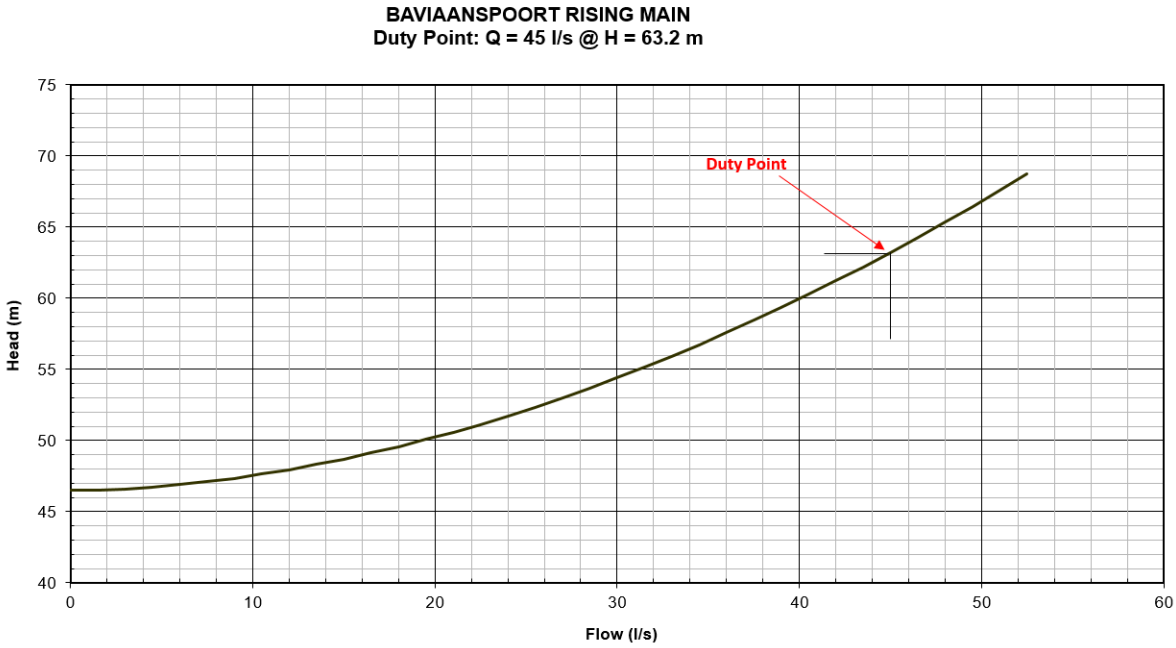


Figure 3-1: Baviaanspoort Rising Main System Curve

For the section of the pipeline crossing the Pienaars River, there are two options that are currently being considered. The engineers will make the final judgement of the best option once they have inspected the current pipeline. The options include:

- Cutting off current uPVC pipeline and replacing it with a new piece of pipeline; or
- Making use of a boring machine and installing a new pipeline underneath the Pienaars River.

The layout plan of the proposed pipeline is provided in Figure 3-2 and included in Appendix C.

Figure 3-2: Layout plan for the development

4 Alternatives Considered

4.1 Preferred Option

The study site is located on Portion 1 and Portion 2 of the Farm Baviaanspoort 330 JR immediately north of the Magaliesberg Range and south of Roodeplaat Dam. The proposed pipeline alignment traverses from the WWTW at the Baviaanspoort Prison in a northerly direction. From the WWTW, the pipeline runs to the East and runs parallel to an existing road up to R513, where it turns to the west and follows the R543. From the R543, it continues northwards to the Baviaanspoort CFS Pump Station. Figure 4-1 provides a map showing the preferred and alternative pipeline route.

4.2 Alternative Option

The study site is also located on Portion 1 and Portion 2 of the Farm Baviaanspoort 330 JR immediately north of the Magaliesberg Range and south of Roodeplaat Dam. The proposed pipeline alignment traverses from the WWTW at the Baviaanspoort Prison in a northerly direction and cuts across a veld to a part where it runs along the R513 and ends at the Baviaanspoort WWTW. Figure 4-1 provides a map showing the preferred and alternative pipeline route.

4.3 No-Go Option

The no-go option will entail leaving the situation as is. Although this option will in the short term not result in any biophysical environmental impacts as no construction activities will be required, the risk of the existing pipeline failing and contaminating water resources will also remain high. The current pipeline is approximately 33 years old and has reached its end of operational life. The pipeline has already had numerous instances of leaking which impact on the environment, including the Pienaars River.

In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibres in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.

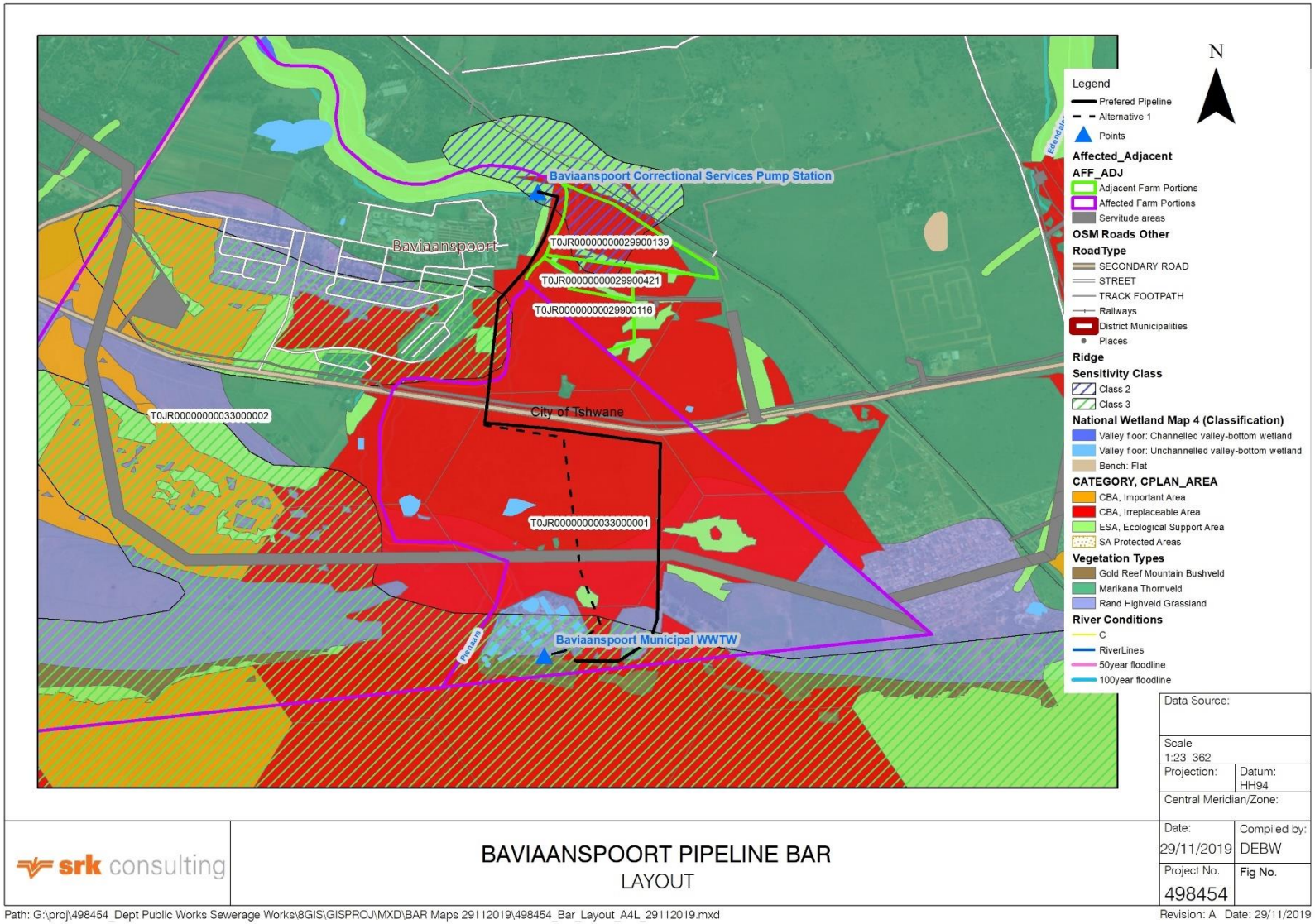


Figure 4-1: Preferred and Alternative Pipeline Routes

5 Construction Activities

5.1 Access

The existing access roads will be used throughout the construction period. Access to the river will be controlled and will be through one access point that will be determined prior to commencement of construction activities across the Pienaars River. Indiscriminate movement into and across the river will be strictly forbidden.

5.2 Water for construction purposes

Water for construction will be obtained from the City of Tshwane.

5.3 Power

All machinery used during the construction will be diesel/petrol driven. Where required, electricity will be procured from the normal service provider since the area is electrified.

5.4 Sanitation

Appropriate sanitary facilities will be provided for the life of the construction phase and all waste removed to an appropriate waste facility. All sanitary facilities will remain outside of the delineated 1:100-year floodline of the Pienaars River.

5.5 Contractors Camp and Laydown Area

The contractor's camp and laydown areas shall be located outside the 1:100-year floodline of the Pienaars River.

5.6 Materials Handling

5.6.1 Stockpiles of Raw Materials

The stockpiles will be stored in such a way that they will not impact on any water resources. It is anticipated that the Contractor will make use of a local supplier of ready-mix concrete and that it will not be necessary to store material such as cement, sand and stone for the mixing of concrete on site.

5.6.2 Construction Materials

- **Bulk earthworks:** Suitable excavated material from the trench will be stockpiled adjacent to the excavated area and used as backfill after the pipe has been laid. Material not suitable for backfilling and all excess excavated material that is not required for backfilling will be disposed of at an approved landfill site.
- **Pipeline:** Pipes will be sourced and delivered from one of the main pipeline suppliers and will be laid and welded together on site.

5.7 Employment and Occupational Health and Safety

It is anticipated that the contractor who will be appointed to do the work will be responsible for recruiting people, including those from the surrounding area.

As a basis, all contractor employees and visitors will undergo induction training regarding health, safety and the environment. This training will be required prior to entering the site for the first time and will be required each time the conditions on-site change such that additional training is required.

Personal Protective Equipment (PPE) will be issued to all persons entering the construction site. PPE includes safety shoes, goggles, earplugs, gloves, hard hats, masks, etc. The PPE required will be dependent on the area that the person is working in, as well as the activity being undertaken.

5.8 Construction Methodology for the Pipeline

The construction methodology for the proposed pipeline will be as follows:

- Develop final pipeline route and mark with stakes;
- Where required, portion of the existing pipeline will be removed;
- Prepare the ground by grading and removing vegetation along the pipeline route;
- Topsoil removal and stockpiling outside the 1:100-year floodline of the Pienaars River;
- Laying or stringing of sections of the pipeline along the pipeline route;
- Pipe is welded and contoured (if required);
- Pipe is lowered into trench;
- Pipe is placed in the trench and backfilled with stockpiled soil;
- Where the pipeline crosses the Pienaars River, a borer is used to open a tunnel under the riverbed where the new pipeline will be installed;
- Rehabilitation of site.

A wayleave approval for the project issued by the Gauteng Department of Roads and Transport is included in Appendix C with the project layout plan.

5.9 Maintenance

The DPW will be responsible for the management, maintenance and repair of the proposed pipeline.

6 Legal and Policy Framework

The following Acts and regulations are applicable during the construction and operational phases of the pipeline. Environmental legislation applicable to the proposed project operation includes, but is not limited to, the following:

- The Constitution of the Republic of South Africa (Act No. 108 of 1996);
- NEMA (Act No. 107 of 1998, as amended);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM: AQA);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM: BA);
- National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM: WA);
- Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA);
- Promotion of Access to Information Act (Act No. 2 of 2000) (PAIA);
- The NWA (Act No. 36 of 1998); and
- The National Heritage Resources Act (Act No. 25 of 1999) (NHRA).

Legislation most applicable to the proposed project has been described in detail in Section 6.1 to Section 6.11.

6.1 The Constitution of the Republic of South Africa

In terms of Section 24 of the Constitution of the Republic of South Africa (108 of 1996), 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 legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while prompting justifiable economic and social development. The needs of the environment, as well as affected parties, should thus be integrated into overall project management to fulfil the requirements of Section 24 of the Constitution.

6.2 National Environmental Management Act (107 of 1998)

The NEMA provides the overarching legislation for environmental governance in South Africa, giving effect to Section 24 of the Constitution of the Republic of South Africa. NEMA sets out the fundamental principles of Integrated Environmental Management that must be adhered to to ensure sustainable development. These principles should apply to environmental decision making. Of particular importance is NEMA's ruling that the interpretation of any law concerning the protection and management of the environment must be guided by the principles of NEMA. The core nature of the NEMA principles is the principle on sustainable development, which strives towards promoting development that is meeting the needs of the present generations without compromising the needs of future generations to come.

Section 4(b) of the NEMA states that environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must consider the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option. According to the NEMA, the best practicable environmental option or most preferred option, means the option that provides the most benefit or

causes the least damage to the environment, at a cost acceptable to society in the long term as well as in the short term.

Section 28 of the NEMA includes a far-reaching general "Duty of Care" whereby care must be taken to prevent, control and rehabilitate the effect of significant pollution and environmental degradation. This section stipulates the necessity to protect the environment from degradation and pollution, irrespective of the operations taking place or activities triggered/not triggered under GNR 983, GNR 984 and GNR 985 printed in terms of NEMA. This section places emphasis on the fact that it is a criminal offense to cause significant pollution or environmental degradation and is punishable by this legislative framework.

The EIA Regulations (GNR 982) were promulgated in terms of Sections 24 of the NEMA, to manage the process, methodologies and requirements for the undertaking of an EIA. The current EIA regulations were published on 4 December 2014 and came into effect on 8 December 2014 and were amended on 7 April 2017. the 2017 amendments to the EIA regulations have been considered during the EIA process. The GNR 982 stipulates that the applicant for a development listed under GNR 983, 984 or 985 must appoint an independent EAP to manage the EIA process. It defines two broad categories of EIA, namely a basic assessment and a full EIA.

The project triggered activities listed in Listing Notices 1 and 3 (GNR983 and 985) and requires an EA from the DEFF prior to commencement of construction activities. All activities listed in Listing Notices 1 and 3 of the NEMA require that a basic assessment process be followed. The process for a basic assessment is described in Appendix 1 of GNR 982. The environmental consultant must conduct a basic impact assessment, with stakeholder engagement, as set out in Regulation 39 to 44 of GNR 982. Activities triggered by the proposed project are summarised in Table 6-1.

Table 6-1: NEMA Listed Activities Triggered by the Project

Relevant Government Regulation	**Comment**
GNR 983 (as amended by GNR327 of 7 April 2017)	
Activity 10: The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, wastewater, 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;*	The proposed project entails the construction and operation of a wastewater pipeline which will be more than 0.36m in diameter.
Activity 12: *[The development of—xii) infrastructure or structures with a physical footprint of 100 square metres or more;], where such development occurs—(a) within a watercourse;*	The pipeline will cross the Pienaars River and will require establishment of a foundation with a total footprint which may be more than 100 m^2.
Activity 19: *The infilling or depositing of any material of more than [5] 10 cubic* metres into, or the dredging, excavation, removal or moving of soil,	The pipeline will cross the Pienaars River and will require dredging and infilling of more than 10m^3 for construction purposes.

Relevant Government Regulation	Comment
sand, shells, shell grit, pebbles or rock of more than [5] 10 cubic metres from [–(i)] a watercourse;	
The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation,	The construction of the pipeline will result in clearance of more than 1 ha of vegetation.
LN 1- Activity 31: *The decommissioning of existing facilities, structures or infrastructure for—*	The project required decommissioning of the existing pipeline.
GNR 985 (as amended by GNR324 of 7 April 2017)	
Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (a) *In Gauteng: ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans*	The proposed pipeline will traverse areas classified as Critical Biodiversity Areas (CBAs) (irreplaceable ecological area) and Ecological Support Areas (ESAs).

6.3 National Environmental Management: Waste Act (Act No. 59 of 2008)

The NEM: WA was implemented on 1 July 2009 and Section 20 of the Environment Conservation Act (Act No. 73 of 1989), under which waste management was previously governed, was repealed. The main objectives of the NEM: WA is to:

Reform the law regulating waste management to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; and to provide for:

- *National norms and standards for regulating the management of waste by all spheres of government;*
- *Specific waste management measures;*
- *The licensing and control of waste management activities;*
- *The remediation of contaminated land; to provide for the national waste information system; and*
- *Compliance and enforcement.*

The objectives of NEM: WA involve the protection of health, wellbeing and the environment by providing reasonable measures for the minimisation of natural resource consumption, avoiding and minimising the generation of waste, reducing, recycling and recovering waste, and treating and safely disposing of waste as a last resort.

In terms of the NEM: WA, all waste management activities must be licenced. According to Section 44 of the Act, the licensing procedure must be integrated with an EIA process in accordance with the Regulations GNR 982 published in terms of the NEMA. Government Notice 719, which was implemented on 3 July 2009, removed all waste management activities from the EIA regulations GNR 718 listed the waste management activities that require licensing. On 29 November 2013, GNR 718

was repealed and replaced by a new list of waste activities under GNR 921. A distinction is made between Category A waste management activities, which require a basic assessment, Category B activities, which require a full EIA, and Category C waste management activities which do not require a waste management licence but compliance with relevant requirements or standards. On 24 July 2015, the waste management activities were further amended in GNR 633, which included the establishment or reclamation of a residue stockpile or residue deposit resulting from prospecting or mining activities as a listed activity.

No NEM: WA listed activities will be triggered by the proposed project. However, it is expected that the applicant will implement the waste management hierarchy (reduce, reuse and recycle) where possible. Waste Management measures to be implemented during the project have been included in the EMPr.

6.4 National Environmental Management: Air Quality Act (Act No. 39 of 2004)

The NEM: AQA was implemented on 24 February 2005 and reforms the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto.

On 22 November 2013 the list of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage was published under GNR 893 in Governmental Gazette 37054, in terms of section 21(1)(b) of the NEM: AQA thereby repealing the previous list of activities which were promulgated on 31 March 2010.

No NEM: AQA listed activities will be triggered because of the proposed project, however the principles of the act focusing on minimisation of pollutant emissions will be taken cognisance of in the development of the EMPr.

6.5 National Heritage Resources Act (Act No. 25 of 1999)

The protection and management of South Africa's heritage resources are controlled by the NHRA. The enforcing authority for this act is the South African National Heritage Resources Agency (SAHRA). In terms of the Act, historically important features such as graves, trees, archaeology and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection. In terms of Section 38 of the NHRA, SAHRA can call for a Heritage Impact Assessment (HIA) where certain categories of development are proposed. The Act also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is deemed adequate, a separate HIA is not required. Should a permit be required for the damage or removal of specific heritage resources, DPW will submit a separate application for these activities to the SAHRA for approval, should these resources be found in the project area. Activities identified in the Act requiring a notification from SAHRA include:

Section 38 (1) (a): (a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

The pipeline will be approximately 3 km long and will require a notification from SAHRA. A HIA was conducted as part of the EA application and found that there are two sites near the alternative pipeline

route. It is expected that the sites will not be affected by the construction activities and mitigation measures and buffer zones included in the HIA will apply and have been included in the EMPr.

6.6 National Water Act (Act No. 36 of 1998)

The NWA is the primary regulatory legislation controlling and managing the use of water resources as well as the pollution thereof. This act provides for fundamental reformation of legislation relating to water resource use. The preamble to the NWA recognises that the aim of water resource management is to achieve sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The purpose of the Act is stated in Section 2 and enforced by the Department of Water and Sanitation (DWS).

The Act presents strategies to facilitate sound management of water resources, provides for the protection of water resources, and regulates use of water by means of Catchment Management Agencies, Water User Associations, Advisory Committees and International Water Management.

As this Act is founded on the principle that the government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, an industry (including mines) can only be entitled to use water if the use is permissible under the NWA.

A section of the proposed pipeline will be located within the 1: 100-year floodlines of the Pienaars River and will therefore require a Section 21 (c) and (i) Water Use Authorisation from the Department of Water and Sanitation (DWS). The DWS will also be provided with an opportunity to participate in the process and to review and comment on the findings of the BA process as a commenting authority.

6.7 National Environmental Management: Biodiversity Act (Act No. 10 of 2004)

The NEM: BA provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected. Threatened ecosystems are listed to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value.

In line with the Convention on Biological Diversity, the NEM: BA aims to legally provide for biodiversity conservation, sustainable use and equitable access and benefit sharing. The NEM: BA established the South African National Biodiversity Institute (SANBI). The NEM: BA creates a basic legal framework for the formation of a national biodiversity strategy and action plan and the identification of biodiversity hotspots and bioregions, which will then be given legal recognition. It imposes obligations on landowners (state or private) governing alien invasive species as well as regulates the introduction of genetically modified organisms. Furthermore, the NEM: BA serves to regulate bioprospecting, making provision for communities to share the profits of any exploitation of natural materials involving indigenous knowledge.

The biodiversity study investigated biodiversity hotspots and bioregions to determine the potential effect which the proposed pipeline may have on the biodiversity. The establishment of alien invasive species on the impacted areas during all the phases of the project, will be governed by the NEM: BA. The NEM: BA ensures that provision is made by the site developer to remove any aliens, which have been introduced to the site or are present on the site.

6.8 Promotion of Access to Information Act (Act No. 2 of 2000)

The PAIA recognises that everyone has a right of access to any information held by the state and by another person when that information is required to exercise or protect any right. The purpose of the Act is to promote transparency and accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their right. The EIA/EMPr process to be undertaken in terms of the NEMA, with the associated stakeholder consultation process, will be aligned with the PAIA in the sense that all I&APs will be given an opportunity to register as an I&AP prior to the initiation of the project and all registered stakeholders will in turn be provided a fair opportunity to review and comment on any reports submitted to the competent authorities for decision making.

6.9 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The CARA aims to provide for control over the utilisation of natural agricultural resources to promote the conservation of soil, water resources and vegetation and to combat weeds and invader plants. The Act makes provision for control measures to be applied to achieve the objectives of the Act, these measures relate to inter alia:

- Cultivation of virgin soil;
- Utilisation/protection of wetlands, marshes, water sponges, water courses/sources;
- The regulating of the flow pattern of run-off water;
- The utilisation and protection of vegetation;
- The grazing capacity of veld and the number and type of animals;
- The control of weeds and invader plants; and
- The restoration or reclamation of eroded land or land, which is disturbed or denuded.

The EMPr includes measures on how to manage and/or avoid proliferation of alien invasive plant species due to the project.

6.10 Provincial and Municipal Bylaws

The City of Tshwane Metropolitan Municipality and Gauteng Province have developed local bylaws and various policies relating to waste disposal, water, economic development, air quality, etc. The proposed project must ensure that such policies and bylaws are adhered to as far as possible during the construction and operation of the proposed pipeline.

6.11 Guidelines

The following documents will be considered during the impact assessment process and compilation of the EMPr of the proposed project:

- Gauteng Province Biodiversity Conservation Plan (CPlan);
- City of Tshwane Local Municipality Integrated Development Plan (IDP) (2019/20);
- City of Tshwane Local Municipality Spatial Development Framework (SDF) (2014-2034);
- DWS, 2010. Operational Guideline: Integrated Water and Waste Management Plan. Resource Protection and Waste;

- Department of Water Affairs and Forestry, 2008. Best Practice Guideline A6: Water Management for Underground Mines.
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G1 Storm Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G3. Water Monitoring Systems;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline G4: Impact Prediction;
- DEAT. 2002. Integrated Environmental Management, Information series 2: Scoping. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 3: Stakeholder Engagement. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 4: Specialist Studies. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 12: Environmental Management Programmes. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEA. 2010. Companion to the EIA Regulations 2010 for Comment, Integrated Environmental Management Guideline Series 5, Department of Environmental Affairs;
- DEA. 2010. Companion to the EIA Regulations 2010 for Comment, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs;
- DEA. 2012. Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 5, Department of Environmental Affairs;
- DEA. 2012. Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs; and
- Western Cape Department of Environmental Affairs and Tourism. 2010. EIA Guideline and Information Document Series: Guideline on Need and Desirability.

7 Stakeholder Engagement Process

The stakeholder engagement process forms an important part of the impact assessment process. The stakeholder engagement process is primarily aimed at affording I&AP's the opportunity to gain an understanding of the proposed project. In addition, the purpose of consultation with the landowners, key stakeholders, and I&AP's is to provide them with the necessary information about the proposed project so that they can make informed decisions as to whether the project will affect them and provide the EIA team with local knowledge of the area and raise concerns relating to the biophysical, socio-economic and cultural impacts that may arise.

The stakeholder engagement process is conducted in terms of NEMA, which provides clear guidelines for stakeholder engagement during an EIA. Chapter 1 of the NEMA outlines the principles of environmental management, several pertaining to public consultation (e.g., Chapter 1, subsections (2), (3), (4) (f), (g), (h), (k), (q) and (r). Chapter 6, Regulations 39 – 44 of the amended EIA Regulations GNR) 982, promulgated on 8 December 2014, specify the minimum requirements for stakeholder engagement in an EIA process conducted under the NEMA. In 2017, the Minister of Environmental Affairs published, in terms of Section 24J of the NEMA, Public Participation Guidelines which guide the Public Participation Process (PPP) to give effect to Section (2)(4)(f), (o) and 24 (1A)(C) of the NEMA.

Figure 7-1 provides a summary of the stakeholder engagement process followed for the proposed project.

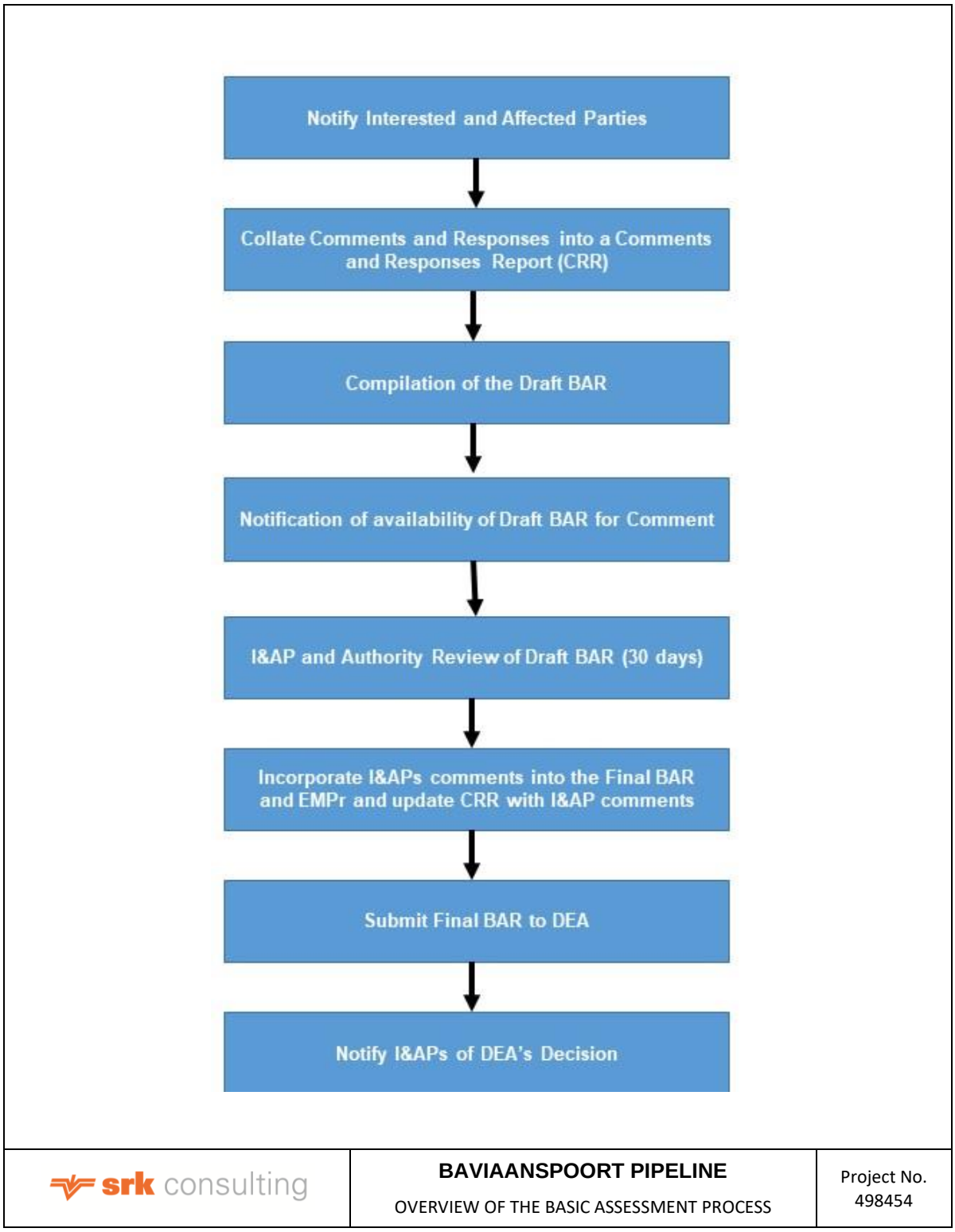


Figure 7-1: Summary of the Stakeholder Engagement Process followed

The application will be submitted to the DEFF for authorisation as the competent authority. Identified commenting authorities on this application include:

- DWS – Regional Office;
- SAHRA – Provincial;
- Gauteng Department of Transport/SANRAL; and
- City of Tshwane Metropolitan Municipality;

7.1 Stakeholder Identification Interested and Affected Parties

An Interested and Affected Parties (I&APs) register was developed using information from the Surveyor General's website to identify the adjacent and affected landowners and land occupiers. Responses to the newspaper advertisements and on-site notices announcing the project were also used to identify I&APs.

The I&APs register will be maintained for the duration of the study where the details of stakeholders are captured and automatically updated upon communication to the EAP. The identification, registration, and comments from I&APs will be an on-going activity. Please refer to Appendix D 1 for a copy of the I&AP register.

The affected properties are provided in Table 7-1.

Table 7-1: List of Affected Farm and Farm Portions

Farm Name	Portion Number	Title Deed	21-SG Code	Property Owner
Baviaanspoort 330 JR	1	T9753/1984	T0JR00000000033000001	Government National Government of the Republic of South Africa Colin Cloete: Manager: Gauteng: Provincial State Land
Baviaanspoort 330 JR	2	T1451/1888	T0JR00000000033000002	Government National Government of the Republic of South Africa Colin Cloete: Manager: Gauteng: Provincial State Land

A map of the affected and adjacent farm portions and farm portions of the site are illustrated in Figure 7-2

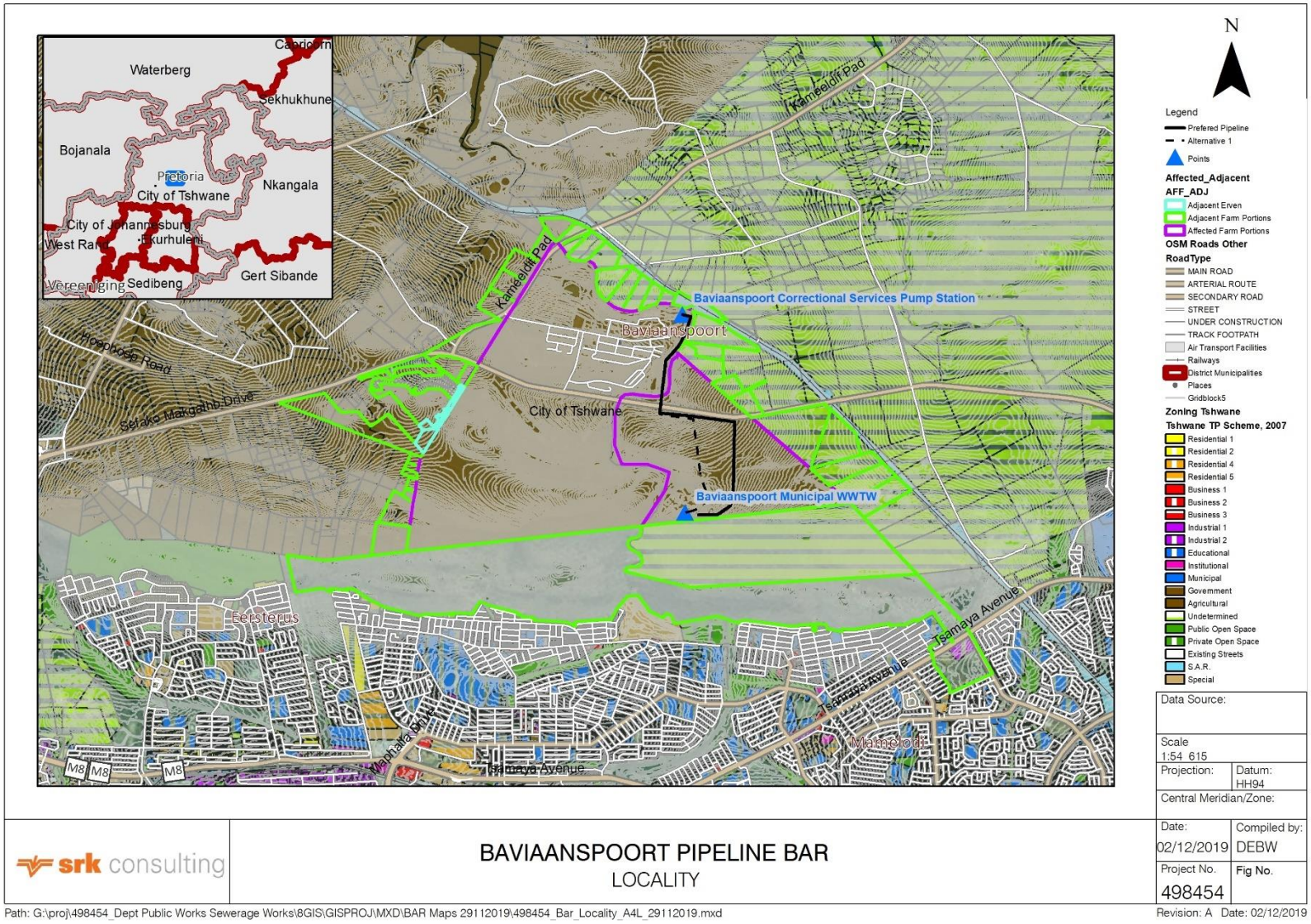


Figure 7-2: Affected and Adjacent Properties

7.2 Confirmation of Land Claims

SRK approached the Office of the Gauteng Regional Land Claims Commissioner during the EA application for the construction and operation of the Baviaanspoort pipeline to verify whether any possible land claims existed on the affected properties. A letter received from the Regional Land Claims Commissioners office stated that, according to their database, there are no land claims lodged on the affected properties. The land claims confirmation letter is attached in Appendix D 7.

7.3 Project Announcement

SRK made use of various methods to inform stakeholder of DPW's intention to undertake the EA application process. Stakeholders were provided with the opportunity to participate and register as I&AP's during the announcement Phase of the project.

7.3.1 Distribution of Notification Letters

Notification letters were sent to identified I&AP's on Friday, March 13, 2020, informing them of the proposed project. A copy of the notification letter is attached as Appendix D 2.

7.3.2 Site Notice Placements

Sites notice boards (Size A2: 600 mm X 420 mm) notifying stakeholders and I&AP's of the proposed construction and operation of the pipeline were placed at conspicuous places in the project area on Friday, March 13, 2020. A copy of the site notices and proof of their placement is provided in Appendix D 3. Table 7-2 provides a list of these site locations.

Table 7-2: Site Notice Location and Coordinates

Site Notice	Location	Coordinates	
		Longitude	Latitude
1	Baviaanspoort Prison Workshop -	25.670037	28.362632
2	Baviaanspoort Prison Entrance -	25.676942	28.351588
3	Corner R513 and Local Road -	25.679858	28.364633
4	Along R513 (Local Shop)	-25.679157	28.377439

7.3.3 Newspaper Advertisements

Newspaper advertisements notifying stakeholders about the proposed project and the opportunity to participate in the EIA process were placed in the newspapers listed in Table 7-3 and can be found in Appendix D 4.

Table 7-3: Newspaper Advertisements

Newspaper Advertisements			
Newspaper	**Distribution**	**Languages**	**Date**
Mamelodi Record	Mamelodi	English	13 March 2020
Pretoria Moot Rekord	Mamelodi Derdepoort Park and East Lynne	English	13 March 2020

7.4 Public Review of the Draft Basic Assessment Report

The Draft BAR was compiled in terms of the requirements of GNR 982. All comments received during the announcement phase of the stakeholder engagement process were incorporated into Draft BAR

and collated into a Comments and Responses Report (CRR). The Draft BAR will be made available for a 30-day commenting period from 28 February 2022 to 30 March 2022.

The availability of the Draft BAR was announced by means of letters and emails to registered I&APs.

Copies of the draft BAR will be made available at the venues listed in Table 7-4.

Table 7-4: List of places the Draft BAR will be places for public review

Public Place	Locality	Telephone
Mamelodi West Community Library	38 Nthsabeleng St, Mamelodi - SA5, Pretoria, 0122	012 358 5591; Mamelodi@tshwane.gov.za
Stanza Bopape Community Library	98-102 Marishane St, Mamelodi, Pretoria, 0122	(012) 358 1249; (012) 801 7348 Stanza@tshwane.gov.za
SRK Website	www.srk.co.za	(012) 361 9821

The draft BAR will also made available to the competent and commenting authorities during the 30-day review and comment period.

7.5 Key Comments Received.

Table 7-5 provides a summary of the comments received to date following the newspaper adverts, site notices, written notification of the project and the Draft BAR review period.

Table 7-5: Key Comments Received

Comment Date	Comment raised by	Comment	SRK Response
16 March 2020	Kerneels C.M Esterhuyse (City of Tshwane)	Please find attached my registration as Interested and Affected Party.	Mr Kerneels is registered as an Interested and Affected Party
13 March 2020	Fundiswa Ndaba (Drdlr)	I am acknowledging the receipt of your enquiry and the turnaround time for enquiries is 14 working days due to office internal processes.	Noted
13 March 2020	Rammutla Thabang (DWS)	On behalf of the Acting Director-General of Department of Water and Sanitation, I hereby acknowledge receipt of your e-mail forwarded to us on 13 March 2020, with thanks. Kindly be informed that the content of your e-mail is noted and is receiving necessary attention.	Noted

7.6 Comments and Response Report

All issues and concerns raised by I&AP's will be recorded and responded to in the CRR.

8 Need and Desirability

Authorisation of the upgrade of the Baviaanspoort CFS, including the pipeline will enable DPW to recognise the rights of access to basic water supply and basic sanitation necessary to ensure sufficient water and an environment not harmful to health or well-being, as captured by the Preamble of the Water Services Act, 1997 (Act No. 108 of 1997). The provision of sanitation forms part of the National Development Plan (NDP-2030) for South Africa, with Water and Sanitation infrastructure recognised as one of the Government's Strategic Integrated Projects (SIPs), SIP 18. Furthermore, DPW has the legal obligation to comply with Section 3 of the Act 108 of 1997, which states that:

- *Everyone has a right of access to basic water supply and basic sanitation.*
- *Every water services institution must take reasonable measures to realise these rights.*
- *Every water services authority must, in its water services development plan provide for measures to realise these rights.*

The construction and installation of a new pipeline will reduce the risk of the pipeline failing and contaminating water resources. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibres in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.

8.1 Government Notice 792 needs and desirability assessment

The needs and desirability assessment of the proposed pipeline as per notice 792 of 2012 is provided in Table 8-1.

Table 8-1: needs and desirability assessment of the proposed pipeline

Questions (Notice 792, NEMA, 2012)		Response
PART I: NEED		
7.	Is the land use associated with the activity being applied for considered within the timeframe intended by the existing approved SDF agreed to be the relevant environmental authority?	N/A. The proposed project has no bearing on the SDF.
8.	Should the development, or if applicable, expansion of the town/area concerned in terms of this land use occurs here now?	Yes. Authorising the project will reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. The current asbestos cement pipeline poses a health risk to both aquatic organisms and downstream users.
9.	Does the community/area need the activity and the associated land use concerned? This refers to the strategic as well as local level.	Yes. Authorising the project will reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. The current asbestos cement pipeline poses a health risk to both aquatic organisms and downstream users.
10.	Are the necessary services with adequate capacity currently available (at the time of application) or must additional capacity be created to cater for the development?	No additional capacity will be required for the project.
11.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the	Not applicable. The objective of the project is to construct a new HDPE pipeline between Baviaanspoort WWTW and Baviaanspoort WPS to replace an old asbestos

	Questions (Notice 792, NEMA, 2012)	Response
	PART I: NEED	
	infrastructure planning of the municipality (priority and placement of the services and opportunity cost)?	pipeline at risk of failing. The project will have no bearing on the infrastructure planning of the municipality.
12.	Is the project part of a national programme to address an issue of national concern or importance?	The protection of water resources forms part of the National Water Resources Strategy II that was adopted by the Government in 2013. The water resource protection theme emphasises the need to protect our freshwater ecosystems, which are under threat because of pollution from many sources. The NWRS (II) states that South Africa's water ecosystems are not in a healthy state. Of the 223 river ecosystem types, 60% are threatened, with 25% of these critically endangered. Less than 15% of river ecosystems are located within protected areas, many of which are threatened and degraded by upstream human activities. The project entails construction of a pipeline to replace an old pipeline, which will reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. The current asbestos cement pipeline poses a health risk to both aquatic organisms and downstream users.
	PART II: DESIRABILITY	
9.	Is the development the best practicable environmental option for this land/site?	Yes. Authorising the construction of the new pipeline between the Baviaanspoort WWTW and Baviaanspoort CSF will reduce the chances of the pipeline failing and polluting water resources. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibers in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.
10.	Would the approval of this application compromise the integrity of the existing approved and credible IDP and SDF as agreed to by the relevant authorities?	No. The project has no bearing on the IDP or SDF of the City of Tshwane. The objective of the project is to replace the old asbestos pipeline which will reduce the risk of the pipeline failing and contaminating water resources.
11.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g., as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	No. The Gauteng EMF shows that the majority of the proposed Baviaanspoort pipeline is situated within the high control zone (outside zone 1) (EMF Zone 3) and the remaining small southern portion fall within the Normal Control Zone, (EMF Zone 4) (Figure 8-1). The project will however have no implications on the integrity of the EMFs. The objective of the project is to replace the old asbestos pipeline which will reduce the risk of the pipeline failing and contaminating water resources.
12.	Do location factors favor this land use at this place? (this relates to the contextualization of the proposed land use on this site within its broader context).	Yes. The proposed pipeline will connect the existing Baviaanspoort Water Pump Station (WPS), which is located on the western bank of the Pienaars River and will cross the Pienaars River and run on the eastern bank of Pienaars River to the Baviaanspoort WWTW. The pipeline will be constructed parallel to the existing pipeline commenting the WTS and WWTW.

	Questions (Notice 792, NEMA, 2012)	Response
	PART I: NEED	
13.	How will the activity of the land use associated with the activity being applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	The pipeline will run from the Baviaanspoort WPS, which is located on the western bank of the Pienaars River and will cross the Pienaars River and run on the eastern bank of Pienaars River to the Baviaanspoort WWTW. The proposed pipeline will result in the decommissioning and removal of some sections of the old pipeline that is currently being used for the transmission of wastewater from the Baviaanspoort WSP to the Baviaanspoort WWTW. The old asbestos pipeline will be replaced with a newer HDPE pipeline, which will reduce the chances of the pipeline failing and polluting the environment, including the Pienaars River. The construction and operation of the new pipeline will result in low and medium impacts, which can be mitigated to be of low significance. There are no cultural areas that will be affected by the project.
14.	How will the development impact on people's health and well-being? (E.g., In terms of noise, odors, visual character and sense of place, etc.)?	The project will result in the stabilisation of the riverbanks which are prone to erosion. This will provide a safer environment to the public as well as the people living along the Pienaars River. During construction, there will be particulate emissions (dust) related to debris handling, truck transport; materials storage, handling and transfer; open areas (windblown emissions). Gas emissions are also expected to occur due to vehicle and construction equipment activity (exhaust fumes). These impacts, however, can be mitigated and managed to acceptable levels, with a post mitigation impact that is not significant. Movement of construction vehicles and machinery result in the production of construction related noise from construction vehicles and machineries which may cause a nuisance to people living in the vicinity of the project area. However, the implementation of appropriate mitigation measures would reduce the noise levels to remain within applicable and acceptable SANS levels (SANS 10103:2008). Occupational health and safety standards will apply. It is expected that the project will not have an impact on the visual character and sense of place, especially since the pipeline will be located underground.
15.	Will the proposed activity or the land use associated with the activity being applied for, result in unacceptable opportunity costs?	No. The project will not result in any opportunity costs. The objective of the project is to replace the old asbestos pipeline which will reduce the risk of the pipeline failing and contaminating water resources.
16.	Will the proposed land use result in unacceptable cumulative impacts?	No. It is expected that the project may result in cumulative impacts on water quality. The impacts will be short lived, during the construction phase. It is however expected that implementation of the mitigation measures included in the EMPr will reduce the significance of the impact to *low*.

8.2 Environmental Management Framework (EMF)

The Spatial Development Framework (SDF) is the legislated component of the municipality's Integrated Development Plan (IDP) that prescribes development strategies and policy guidelines to restructure and reengineer the urban and rural form. The SDF is the municipality's long-term vision of what it wishes to achieve spatially, and within the IDP programmes and projects. The SDF should not be interpreted as a blueprint or master plan aimed at controlling physical development, but rather the framework giving structure to an area while allowing it to grow and adapt to changing circumstances. The proposed project has been considered and is guided by the Regions SDF and IDP priorities of the area. It aims to empower the local economy, which is individuals and local business in terms of job creation and skills development.

According to the Gauteng Province Environmental Management Framework, which forms part of the Gauteng SDF, the project is located within Zone 3 and Zone 4 (Figure 8-1).

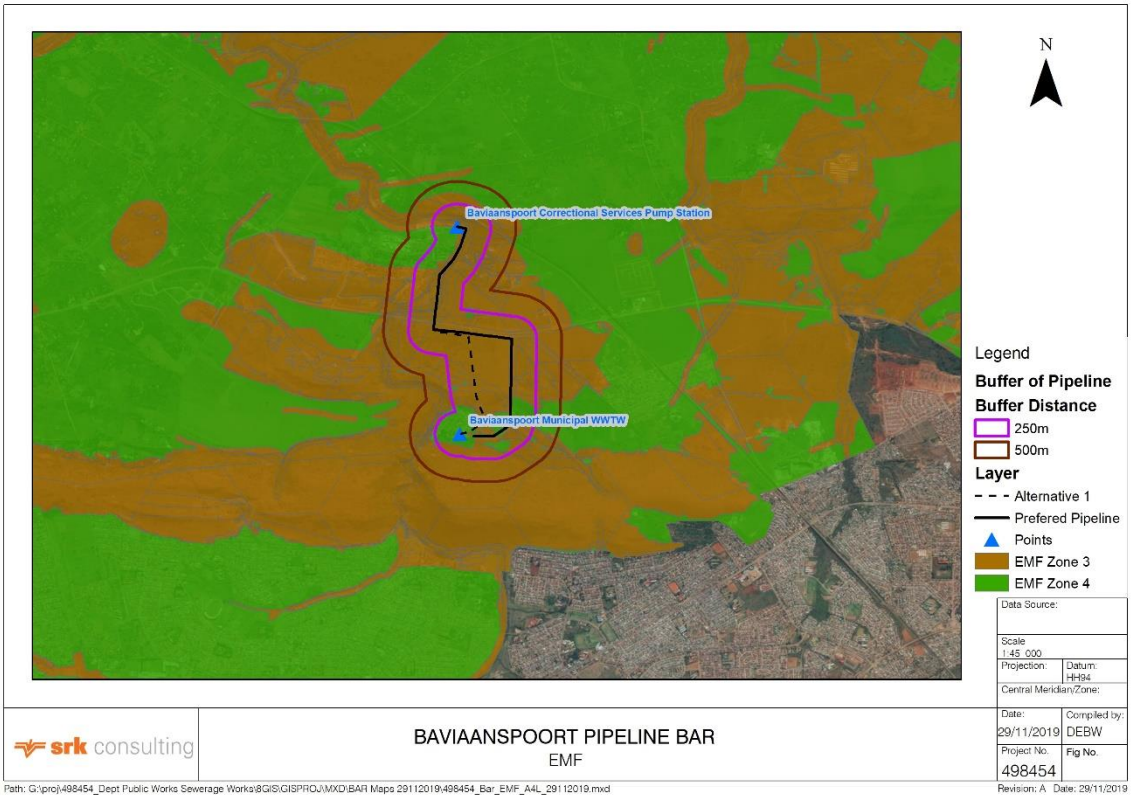


Figure 8-1: Gauteng EMF (GPEMF, 2018)

Zone 3 (High control zone (outside the urban development zone)): This zone is sensitive to development activities and in several cases also have specific values that need to be protected. Conservation and related tourism and recreation activities should dominate development in this zone.

Zone 4 (4: Normal control zone): This zone is dominated by agricultural uses outside the urban development zone. Agricultural and rural development that support agriculture should be promoted.

The proposed project will not have any negative bearing on the SDF for the CoT or the EMF for the Gauteng Province as it will not compromise the integrity of the existing approved and credible municipal IDP and SDF. The project will reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. The current asbestos cement pipeline poses a health risk to both aquatic organisms and downstream users

9 Description of the Baseline Environment

9.1 Regional Climate

The region is characterized by summer rainfall with thunderstorms, with annual rainfall figures of 706 mm (Pretoria – Onderstepoort weather station) recorded at the closest weather station to the site. Winters are dry and frost is common. The warmest months are normally December and January and the coldest months are June and July. According to the contour map of Weinert's climatic N-Value, the value for Pretoria is 2.5. Thus, chemical decomposition of rocks will be dominant over mechanical disintegration, and deep soil horizons are expected in areas of poor drainage. The involved geotechnical engineer advised that stormwater drainage and road pavement design must make provision for these climatic conditions.

9.2 Socio Economic

The 2019/20 City of Tshwane Integrated Development Plan (IDP) was used to discuss the socio-economic status of the city (COT, 2020).

9.2.1 Age Distribution and Population

With an estimated 3.31 million population, the City of Tshwane Metropolitan Municipality housed 5.8% and 24.1% of South Africa's and Gauteng's total population in 2017 respectively. Between 2007 and 2017, the population growth rate in the City of Tshwane averaged 2.92% per annum, which is close to double the growth rate of South Africa as a whole (1.56%) (Table 9-1).

Table 9-1: Population Growth in the City of Tshwane (COT, 2020)

	2007	2012	2017	Average
City of Tshwane	2 478 557	2 921 997	3 306 198	2.92%

The largest share of population in Tshwane is within the young working age (25-44 years) age category, with 1.21 million or 36.5% of the total population. The age category with the second largest population share is the (0-14 years) age category, with 24.5%; then followed by the older working age population (i.e., 45-64 years age category), with 592 000 people. The age category with the lowest number of people is the elderly population (i.e., 65 years and older age category), with only 20 000 people. Figure 9-1 provides the population pyramid for the CoT.

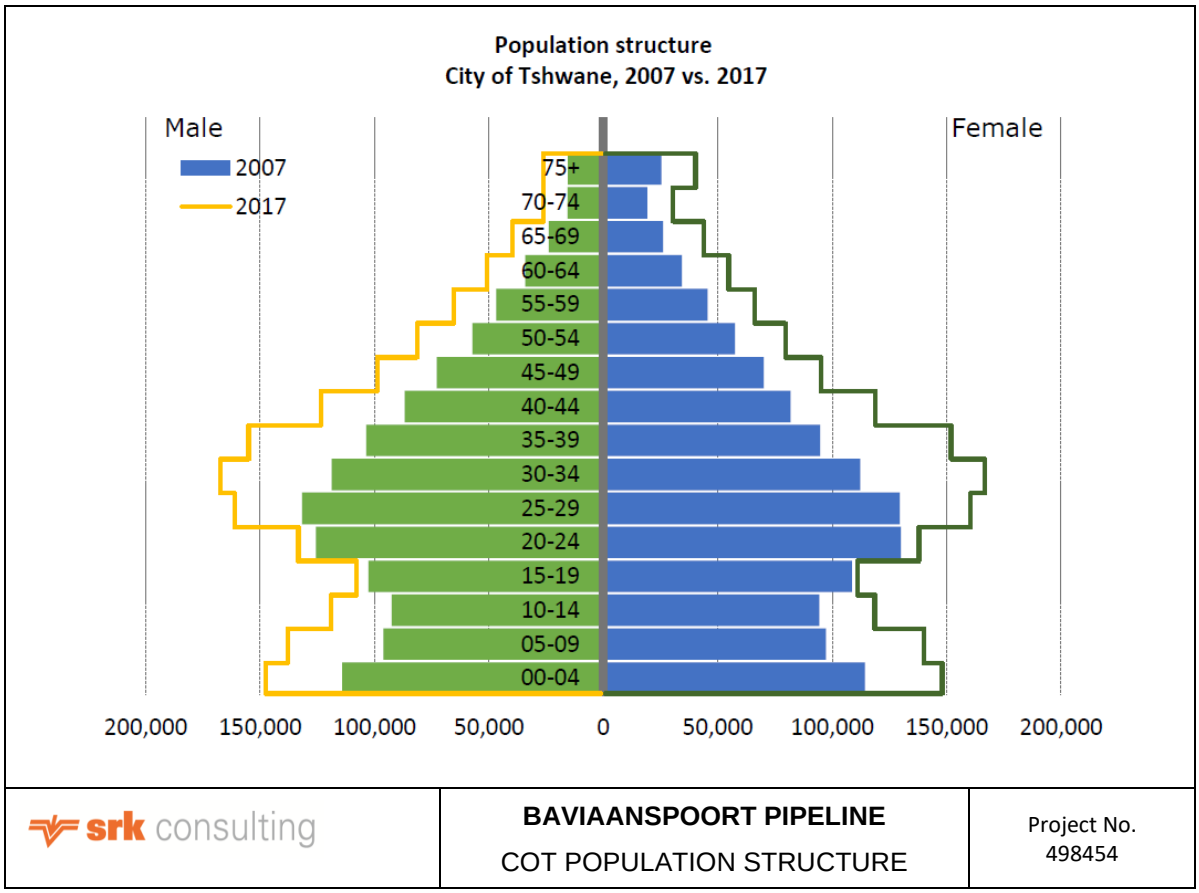


Figure 9-1: Population Pyramid City of Tshwane Metropolitan Municipality, 2007 Vs. 2017 (COT, 2020)

9.2.2 Education

According to the IDP, the number of people without any schooling decreased between 2007 and 2017 by an average annual rate of -1.58%, while the number of people in the 'matric only' category increased from 533 000 to 802 000. The number of people with 'matric and a certificate/diploma' increased by an average annual rate of 4.35%, while the number of people with a 'matric and a Bachelor's' degree increased by an average annual rate of 6.18%. Table 9-2 provides a summary of the highest level of education from the age of 15.

Table 9-2: Highest level of education: age 15+ - City of Tshwane, Gauteng and national total, 2017

	COT	Gauteng	National	COT as % of the Province	COT as % of the National
No schooling	78 800	280 000	2 360 000	*28.1%*	*3.3%*
Grade 0-2	22 100	101 000	702 000	*22.0%*	*3.2%*
Grade 3-6	111 000	506 000	3 170 000	*21.9%*	*3.5%*
Grade 7-9	256 000	1 230 000	6 060 000	*20.7%*	*4.2%*
Grade 10-11	457 000	2 180 000	8 270 000	*21.0%*	*5.5%*
Certificate/ diploma without matric	14 600	58 200	192 000	*25.0%*	*7.6%*
Matric only	802 000	3 300 000	10 400 000	*24.3%*	*7.7%*
Matric certificate/diploma	226 000	753 000	2 150 000	*30.0%*	*10.5%*
Matric Bachelor's degree	201 000	612 000	1 520 000	*32.9%*	*13.3%*

	COT	Gauteng	National	COT as % of the Province	COT as % of the National
Matric Postgrad. Degree	109 000	314 000	722 000	*34.7*%	*15.1*%

91.02% of the population in the CoT were considered functionally literate in 2017, which indicates an increase of 0.045 percentage points since 2007 (86.48%). The number of illiterate individuals decreased on average by -1.18% annually from 2007 to 2017.This is attributed to the higher levels of urbanization where access to schools is less of a problem.

9.2.3 Economy

The City of Tshwane is the fourth biggest municipality in South Africa and second biggest in Gauteng in terms of gross value added by region with gross value add of R313 billion. In 2017, City of Tshwane contributed 28.4 percent to the provincial economy.

The City of Tshwane has a large government sector (community services), reflecting the presence of national and provincial departments and parastatals. The sector recorded 30.2 percent contribution to Tshwane's Gross Value Added (GVA) in 2017. The five main sectors in 2017 were community services (30.2 percent), finance (24.9 percent), trade (13.1 percent), manufacturing (11.7 percent) and transport (11.6 percent). Overall, the significant sectors of growth in Tshwane include construction, trade, transport and finance with the green economy and research and innovation and development representing crucial multi-dimensional and dynamic sectors of growth.

The City of Tshwane is also home to a range of higher-value functions such as corporate headquarters, financial and business services and manufacturing, and high- order public services, such as national departments, universities and major hospitals. The city accommodates more than 30 Johannesburg Stock Exchange (JSE) listed companies, is home of national government departments, three Universities, hosts 134 foreign embassies and missions and 26 international organisations, giving it the largest concentration of diplomatic and foreign missions in the world after Washington DC in the USA.

It is expected that City of Tshwane Metropolitan Municipality will grow at an average annual rate of 2.15% from 2017 to 2022. The average annual growth rate of Gauteng Province and South Africa is expected to be 2.19% and 2.02%, respectively. In 2022, City of Tshwane's forecasted GDP will be an estimated R348 billion (constant 2010 prices) or 28.3% of the total GDP of Gauteng Province. At a 2.15% average annual GDP growth rate between 2017 and 2022, City of Tshwane ranked third compared to the other regional economies (COT, 2020).

9.2.4 Employment

In 2017, 1.22 million people were employed in the City of Tshwane , which is: 24.50% of total employment in Gauteng , 7.70% of total employment in South Africa. Employment in the City of Tshwane increased annually at an average rate of 2.62% from 2007 to 2017. The economic sector that recorded the highest employment figures in 2017 was the community services sector, providing 23.7% of total employment in the metropolitan municipality. The finance sector employed 22.0% of total employment in Tshwane, the electricity sector employed 0.5% and the agriculture sector employed 1.0% (COT, 2020).

In 2017, the trade sector recorded the highest number of informally employed people, with a total of 67 400 employees or 40.59% of total informal employment. The manufacturing sector had the lowest informal employment - 11 000 - and only contributes 6.65% to total informal employment.

9.2.5 Unemployment

In 2017, there were a total of 386 000 people unemployed in City of Tshwane, which is an increase of 150 000 from 236 000 in 2007. The total number of unemployed people in City of Tshwane constitutes 18.64% of the total number of unemployed people in Gauteng. The City of Tshwane experienced an average annual increase of 5.06% in the number of unemployed people, which is better than that of Gauteng, which had an average annual increase in unemployment of 5.64%.

The unemployment rate in City of Tshwane (based on the official definition of unemployment) was 24.01%, which is an increase of 4.16 percentage points.

9.3 Soils

Soils in the Pienaars River sub-catchment can be divided into three main groups:

- Moderate to deep sandy loam soils on flat and undulating terrain overlying dolomite, limestone and sandstones in the upper reaches of the catchment;
- Moderate to deep clay loam soils over much of the middle portions of the sub-catchment (located away from the river channels), overlying the more porous unconsolidated sedimentary material; and
- Moderately shallow to moderately deep, clayey loam to clay-rich, fine-grained soils over most of the lower reaches of the sub-catchment.(Water Institute of Southern Africa, 2017).

9.4 Geohydrology

A geohydrological study conducted at Baviaanspoort WWTW found that a shallow aquifer is intersected in monitoring boreholes at the WWTW in sandy soils at varying depths. The water table depths vary between 6 m to 24 m below the surface level. Groundwater flow appears to be in a general northerly and westerly direction towards the Pienaars River. The water tables are shallowest near the river.

9.4.1 Geology and structural geology

Africon Engineering (2003) conducted geophysical ground surveys which was used to delineate geological features such as weathered zones, dykes, faults, rock features and lithological contacts (Africon, 2003).

The study found that Baviaanspoort WWTW is located on rocks belonging to the Magaliesberg and Smelterskop Formations of the Pretoria Group, Transvaal Supergroup. Shales in the Magaliesberg Formation have been altered to hornfels by the intrusion of diabase. The Smelterskop Quartzite consists of quartz partially felspathic, subgraywacke partially with shale, hornfels, lava and dolomitic limestone. Outcrops of bedrock are not common and the geological rock formations are largely underlying a sedimentary cover of recent age consisting of silica sand from weathering of Magaliesberg Quartzite as well as talus and weathered material originating from other rocks (Africon, 2003).

The Pienaars River is winding through the Magaliesberg Mountains along north-south trending geological structural features. The geological contact zones are mainly east-west orientated and include contacts between quartzite, diabase and shale layers within the Pretoria Group. Fault structures on the 1:50 000 geological map are mainly northerly orientated, but a large fault located to the east on the WWTW has a NW to SE strike direction (Africon, 2003).

9.4.2 Detailed Geology

The existing geological map for the general area (sheet no. 2528 CB Silverton) shows the site to be underlain by diabase bedrock, with the quartzite ridge immediately to the southern boundary (IILISO Consulting, 2013). The 25º to 30º northerly dip of the quartzite indicates that it extends into the WWTW beneath the diabase. Both rock types are mantled by a soil being expected to overlie a varying thickness of residual clayey to sandy soil, respectively derived from diabase and quartzite. A prominent NW-SE trending fault is present in the quartzite ridge (Magaliesberg Ridge) close to the southern boundary of the site and possibly extends some distance beneath a cover of transported soil (IILISO Consulting, 2013).

9.4.3 Transported Soil

The transported soil generally comprises a sandy hill wash layer, which is replaced near Pienaars River by clayey sand alluvium that seemingly contains boulders and/or course diabase gravel (IILISO Consulting, 2013).

9.4.4 Bedrock

The bedrock encountered in the Baviaanspoort area consists of dark grey diabase, greenish grey shale and pale grey to pale greenish grey quartzite predominate.

9.5 Areas of Conservation Importance

The Gauteng Department of Agriculture and Rural Development (GDARD) has developed a database which shows which areas in Gauteng is critical for protecting the natural physical environment. The Gauteng Conservation Plan (Gauteng Department of Agriculture and Rural Development, 2014) , identifies sites that are critical for maintaining biodiversity The CPlan shows that the pipeline will traverse areas classified as Critical Biodiversity Areas (CBAs) (irreplaceable ecological area) and Ecological Support Areas (ESAs) as shown in Figure 9-2 (GDARD, 2014).

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. **Ecological Support Areas (ESAs)** are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services **(GDARD, 2014)**.

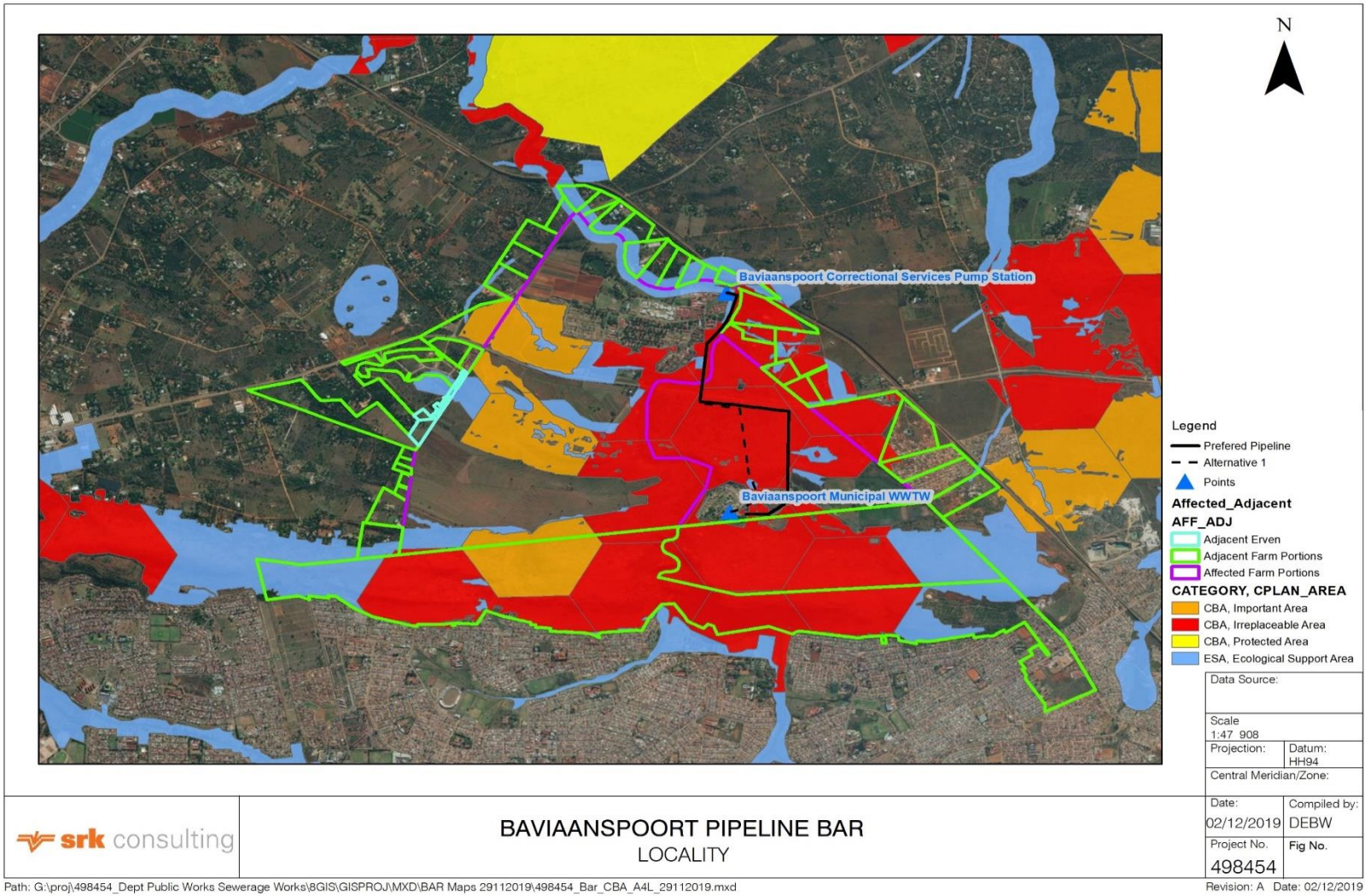
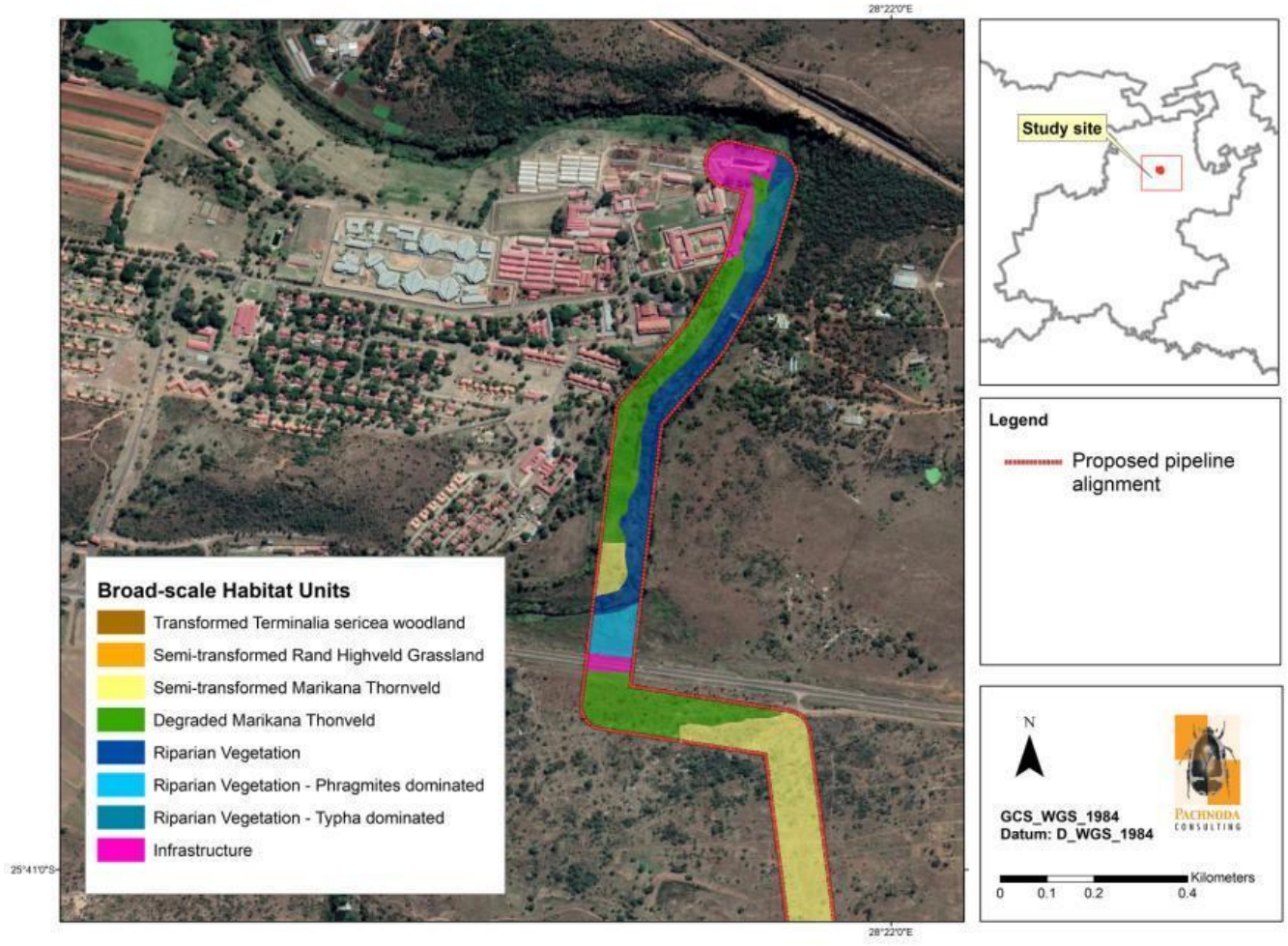


Figure 9-2: Areas of Conservation Concern Affected by the proposed pipeline and pipeline alternative

9.6 Terrestrial Biodiversity

A terrestrial biodiversity assessment conducted by Pachnoda Ecological Consutling for the project found that the broad-scale habitat types representing semi-transformed, degraded and transformed woodland and grassland are present along the pipeline alignment are provided in Figure 9-3 to Figure 9-4. A total of 204 plant taxa was recorded along the pipeline alignment, consisting of 146 dicotyledons, 56 monocotyledons and two pteridophytes (ferns) (Pachnoda Ecological Consulting, 2019).

The most important vegetation portions representing semi-transformed graminoid and bushveld compositions are concentrated on the central parts of the pipeline alignment and along the Pienaars River. These floristic patches contain compositions reminiscent of near late successional assemblages very similar to recovering untransformed Rand Highveld Grassland and Marikana Thornveld, which are invariably dominated by *Eragrostis chloromelas, Triumfetta sonderi, Dombeya rotundifolia, Combretum molle, Vachellia karoo, Senegalia caffra, Hyparrhenia hirta, Panicum maximum* and *Aloe davyana*. The remainder of the pipeline alignment is dominated by degraded bushveld and woodland dominated by *Cynodon dactylon, Panicum schinzii, Tecoma stans*, Tipuana tipu** and *Tagetes minut* (Pachnoda Ecological Consulting, 2019)..



srk consulting	BAVIAANSPOORT PIPELINE BROAD-SCALE HABITAT UNITS	Project No. 498454

Figure 9-3: A map illustrating the broad-scale habitat units (vegetation associations) along the northern section of the pipeline alignment

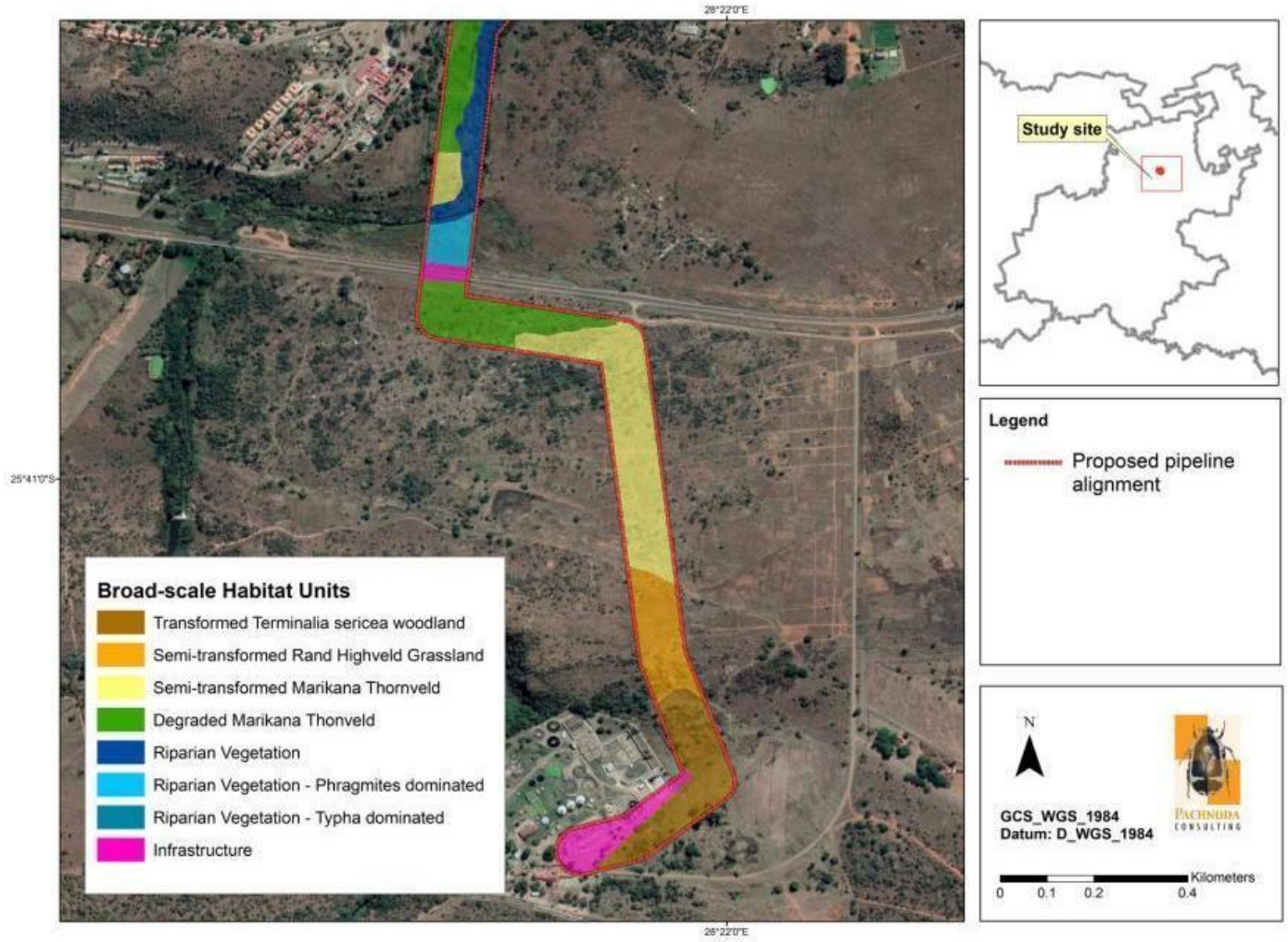
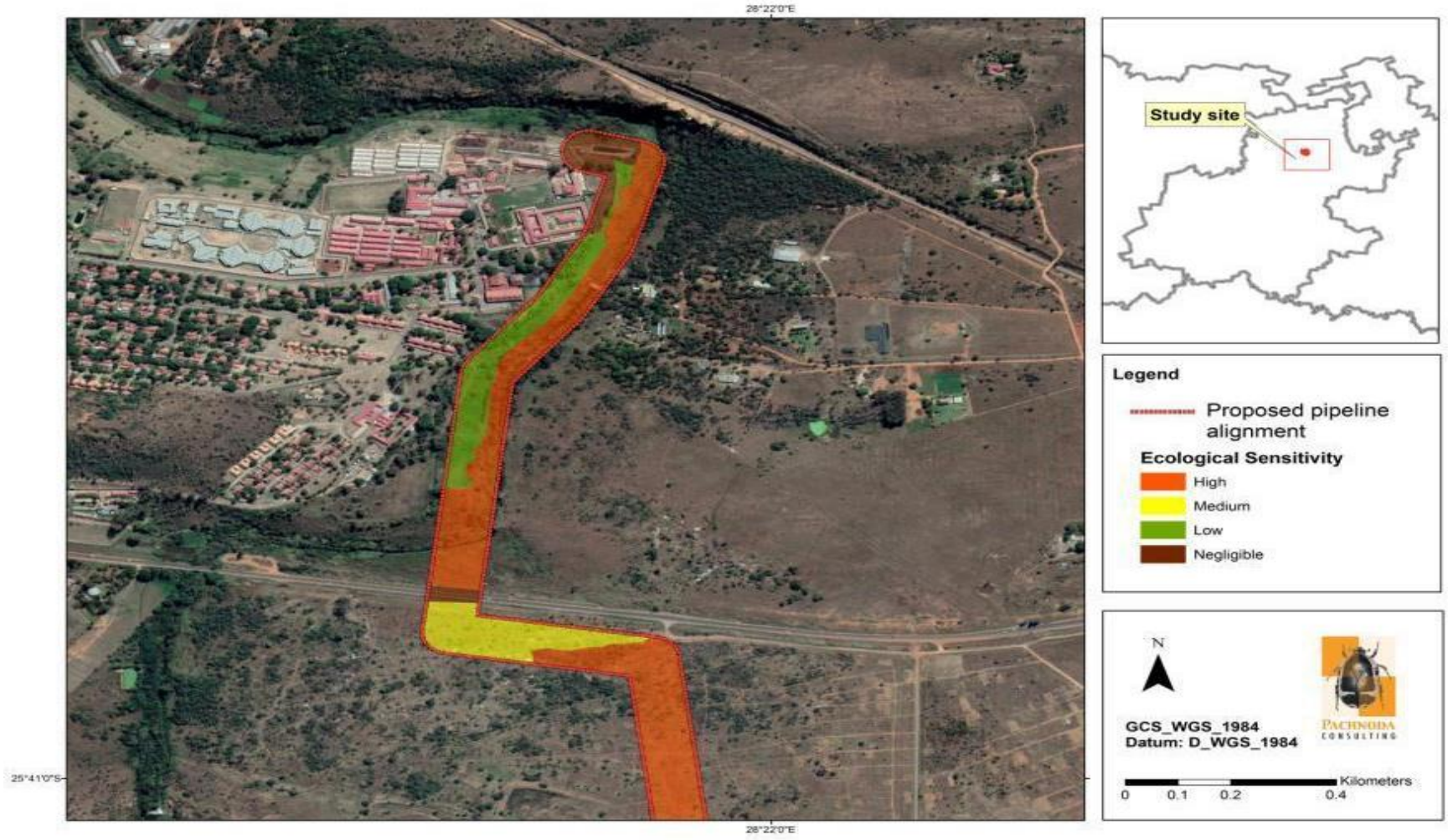
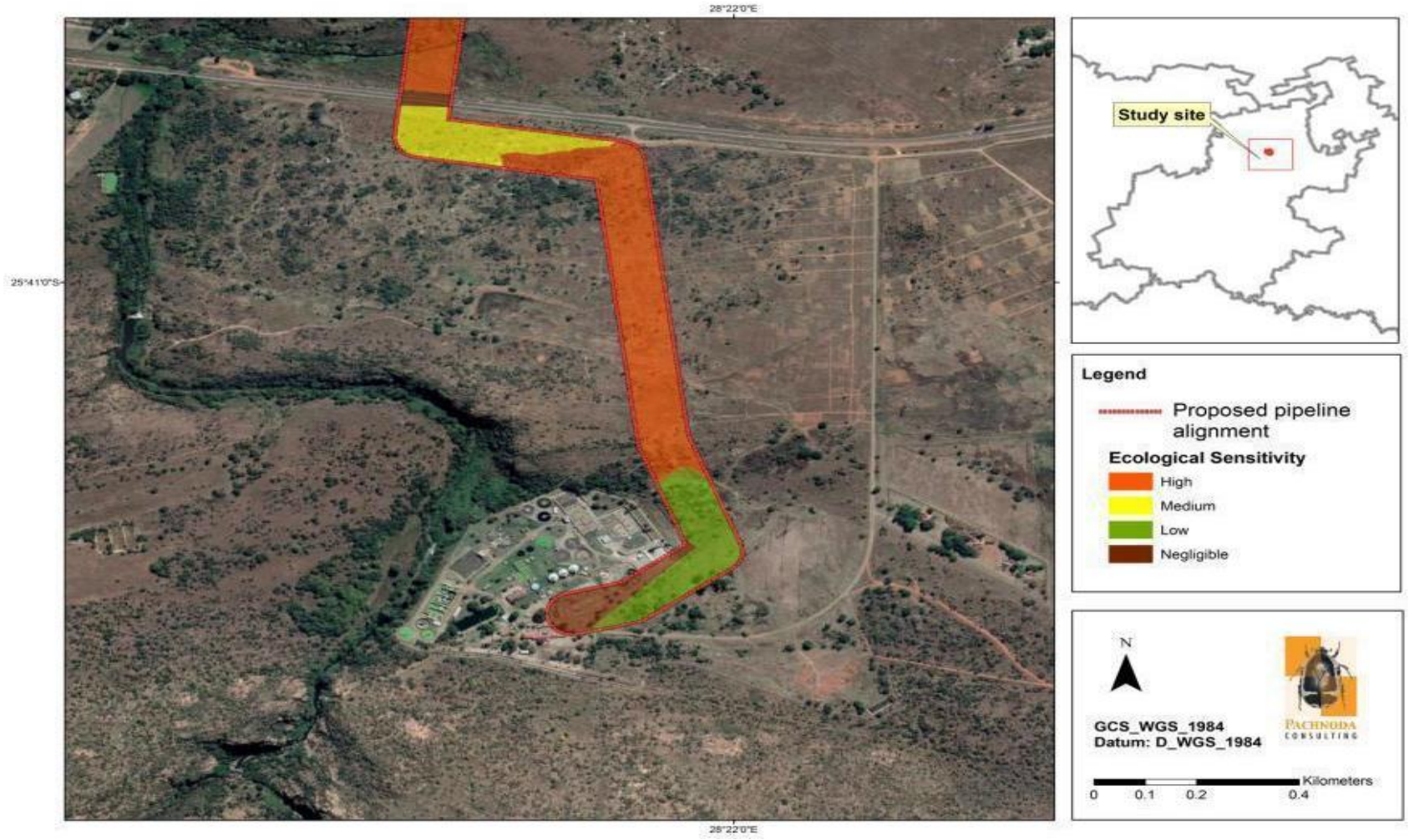


Figure 9-4: A map illustrating the broad-scale habitat units (vegetation associations) along the southern section of the pipeline alignment.



srk consulting	**BAVIAANSPOORT PIPELINE** BROAD-SCALE HABITAT UNITS	Project No. 498454

Figure 9-5: A sensitivity map of habitat units on the northern section of the pipeline alignment



srk consulting	**BAVIAANSPOORT PIPELINE** BROAD-SCALE HABITAT UNITS	Project No. 498454

Figure 9-6: A sensitivity map of habitat units on the southern section of the pipeline alignment.

Table 9-3: Nature, transformation status and size of the vegetation associations on the study site

Vegetation association	Transformation Status	Area (ha)	% of total
Transformed *Terminalia sericea* woodland	Transformed	3.46	12.59%
Semi-transformed Rand Highveld Grassland	Semi-transformed	2.37	8.62%
Semi-transformed Marikana Thornveld	Semi-transformed	6.24	22.73%
Degraded Marikana Thornveld	Degraded	6.41	23.37%
Riparian Vegetation	Untransformed/semi-transformed	5.66	20.62%
Infrastructure	Transformed	3.31	12.07%
Natural (semi-transformed & degraded units)		20.68	75.34
Transformed		6.77	24.66
Total		27.45	100.00%

- Transformed *Terminalia sericea* woodland: Species richness was moderate with approximately 47 species recorded. This unit is considered to be of low ecological sensitivity for the following reasons:
    - It is representative of transformed vegetation with a low potential to revert back to the original composition that represents Rand Highveld Grassland;
    - Floristic composition is typical of a disturbed system and consisted of many alien invaders and weed taxa;
    - Plant species of conservation concern were absent from this vegetation type.
- Semi-transformed Rand Highveld Grassland: Species richness was very high with approximately 133 species recorded. A small sub-population of the near threatened *Searsia gracillima* var. *gracillima* is present on the alternative pipeline alignment. This grassland unit is considered to be of high ecological sensitivity for the following reasons:
    - It is representative of semi-transformed Rand Highveld Grassland confined to a threatened ecosystem;
    - The unit provides habitat for one near threatened plant species, and potential suitable habitat for other threatened and near threatened plant species.
- Semi-transformed Marikana Thornveld: Approximately 76 plant species were recorded during fieldwork. This grassland unit is considered to be of high ecological sensitivity for the following reasons:
    - It is representative of semi-transformed Marikana Thornveld confined to a threatened ecosystem.
    - Vertical heterogeneity was high, and subsequently provides habitat for a higher number of avifauna taxa.
    - Floristic composition is moderately high and the regeneration (resilience) potential of the floristic composition after disturbance regimes is high.
    - The palatability of the graminoid composition is high, making this unit especially attractive to herbivores, although susceptible to overgrazing.
    - Some parts show a high soil moisture as evidenced by the occurrence of Cyperus cf. *denudatus, Imperata cylindrica* and *Verbena bonariensis*, which could provide evidence of localised seep zones.
- Degraded Marikana Thornveld: Approximately 82 plant species were recorded during fieldwork. This unit is regarded to be of medium ecological sensitivity based on the attribute that this section of Marikana Thornveld could be restored to its near original condition, or at least to an ecological condition with similar floristic attributes to the semi-transformed

Marikana Thornveld. The remaining part of this unit (north of the R513) is considered to be of low ecological sensitivity for the following reasons:

- It is degraded and highly modified, thereby emphasising an ecological function of low importance.
- Floristic composition is typical of a secondary and pioneer successional sere.
- The floristic composition contains many alien and ruderal weed species.
- No threatened, near threatened or protected plant species were observed.

- Riparian vegetation: A total of 56 species was recorded during fieldwork. The riparian vegetation is considered to be of high ecological sensitivity for the following reasons:
  - It acts as a critical important dispersal corridor for animal dispersal and hence facilitates ecological connectivity.
  - The dense overhanging vegetation and perennial character of the Pienaars River provide suitable habitat for the vulnerable African Finfoot (*Podica senegalensis*), near threatened Half-collared Kingfisher (*Alcedo semitorquata*) and the near threatened Cape Clawless Otter (*Aonyx capensis*).

9.6.1 Occurrence of Plant 'Species of Conservation Concern'

Plant species of conservation concern: One near threatened species (c. *Searsia gracillima* var. *gracillima*) was confirmed from the semi-transformed Rand Highveld Grassland along the alternative pipeline alignment, with another seven species having a moderate to high probability of occurrence (mainly confined to the semi-transformed Rand Highveld Grassland) (Pachnoda Ecological Consulting, 2019).

GDARD Red list Plant Species Conservation Guidelines and Buffer Zones: The near threatened *Searsia gracillima* var. *gracillima* was confirmed from the semi-transformed Rand Highveld Grassland along the alterative pipeline alignment. *S. gracillima var. gracillima* is currently only known from seven to 10 localities where it is restricted to the quartzite outcrops in a small area to the north-east of Pretoria (von Staden, 2008). It is considered an A1 priority species (according to the GDARD, 2017b policy) since it is endemic to Gauteng. Given its endemic status to Gauteng, it must be afforded maximum protection of the species since they occur nowhere else in the world. In addition, to ensure the persistence of any population, it is imperative that all ecological processes (e.g., pollinators) be conserved in accordance with the following measures. In addition, the geophytes *Boophone disticha* and *Hypoxis hemerocallidea* were observed along the alternative pipeline alignment and are declining in Gauteng and KwaZulu-Natal due to their medicinal properties. The former was confirmed from the semi-transformed Rand Highveld Grassland and the latter from the semi-transformed and degraded Marikana Thornveld (Pachnoda Ecological Consulting, 2019).

Protected plant species: A number of plant species occurring in Gauteng are not considered to be threatened or near threatened (sensu Raimondo et al., 2009), but are protected under Schedule 11 of the Transvaal Nature Conservation Ordinance (No.12 of 1983). Although old, the Act is still applicable to the province. A permit is required to remove or disturb a protected plant. However, during the site visit, four plant species listed in Schedule 11 were observed on the study site (Table 9-4) (Pachnoda Ecological Consulting, 2019).

Table 9-4: Protected plant species observed along the alternative pipeline alignment.

Species	Occurrence status	Habitat Unit
Protea caffra (Proteaceae)	Localised (single individual)	Semi-transformed Rand Highveld Grassland
Cheilanthes hirta (Sinopteridaceae)	Common	Semi-transformed Rand Highveld Grassland

Species	Occurrence status	Habitat Unit
Pellaea calomelanos (Sinopteridaceae)	Common	Semi-transformed Rand Highveld Grassland
Boophone disticha	Localised	Semi-transformed Rand Highveld Grassland

9.6.2 Declared Invader Plant Species (Study Site Only)

Twenty-four (24) Declared Weeds and Invader species belonging to NEM: BA Category 1b, 2 and 3 were observed on the pipeline servitude (Pachnoda Ecological Consulting, 2019).

In addition, the study site corresponds to listed threatened ecosystems (Rand Highveld Grassland and Marikana Thornveld), meaning that individuals of *Eucalyptus cf. camaldulensis* should preferably be removed. In addition to the removal of *E. cf. camaldulensis*, priority should be given to the eradication of *Campuloclinium macrocephalum* (current infestation rate is low), *Tecoma stans, Melia azedarach* and *Lantana camara* since these species are respectively highly noxious within semi- transformed vegetation units.

9.6.3 Occurrence of Vertebrate Species of Conservation Concern'

Mammals: Approximately 66 mammal species have been recorded from the study area (according to QDC 2528CB; sensu MammalMap). According to MammalMap, six mammal species of conservation concern have been recorded in the study area, of which only one species (c. South African Hedgehog *Atelerix frontalis*) have a high probability of occurrence and another (c. Robert's Marsh Rat *Dasymys robertsii)* with a moderate to low probability of occurrence. However, apart from these species, another two species (c. Cape Clawless Otter *Aonyx capensis* and Serval *Leptailurus serval*) also have a high probability of occurrence based on the availability of suitable habitat even though they were not observed in the area. The near threatened South African Hedgehog (*Atelerix frontalis*) is predicted to be present in most habitat units present. It is also highly adapted to urban environments and therefore frequently encountered in urban gardens (Skinner & Smithers, 1990). It will readily adapt to new development, if emphases are placed on preserving the natural function of the semi-transformed habitat units while minimising the unnecessary use of exotic ornamental plant species and the construction of roads (Pachnoda Ecological Consulting, 2019).

Dasymys robertsii was previously known as *D. incomtus* but differs based on molecular and morphological characters (Mullin *et al*., 2002; 2004). *D. robertsii* is a regional vulnerable (*sensu* Child et al., 2016) species found along intact wetland systems. Taylor (1998) stated that members of the genus *Dasymys* (sensu lato) are not as rare as previously thought, at least within KwaZulu-Natal. *D. incomtus* has been recorded in a wide variety of habitat types, although it prefers well-vegetated wetlands with reedbeds. Skinner and Smithers (1990) reported that they also utilise reedbeds along rivers and streams. It is possible that this species was previously overlooked based on its shy and elusive habits and life history traits which explains its ominous absence from the study area. However, it is known from two records in the area with the most recent observation being 2002 (sensu MammalMap), hence could associate with the riparian vegetation unit (Pachnoda Ecological Consulting, 2019).

The Cape Clawless Otter (*Aonyx capensis*) has a high probability of occurring along the Pienaars River and riparian vegetation (although it was not recorded in the area *sensu* MammalMap). In addition, the Cape Clawless Otter is known to be present in the study region (according to MammalMap). The global conservation status of *Aonyx capensis* was recently up listed from least concern to near threatened due to widespread habitat alteration and pollution (Jacques *et al*., 2015). Although *A. capensis* is considered to be occupying a large distribution range in Africa, recent evidence suggests that the spatial size of its occupied habitat has declined significantly, possibly

because of the effects of climate change and human conflict for resources such as water and prey (Jacques *et al.,* 2015). In addition, much of its habitat in South Africa is subjected to habitat degradation and poor sanitary infrastructure that resulted in water pollution (as evidenced along the Pienaars River; pers. obs.).

The Serval (*Leptailurus serval*) is listed as "least concern" on the global IUCN Red List although Child et al. (2016) have listed it as near threatened. Servals show a wide distribution range but are limited by their obligate preference for surface water. Therefore, they are always found near water and in areas with sufficient shelter such as tall grass (Skinner & Smithers, 1990) with an abundance of suitable prey – mainly Murid rodents (e.g., genera *Mastomys*, *Mus* and *Otomys*). This species is a specialised rodent hunter and appears to be tolerant towards agricultural activities and adapts readily to abandoned cultivation and secondary growth as long as they are not persecuted or persistently disturbed (in Wilson & Mittermeier, 2009). Although observations of this species are lacking in the study region (sensu MammalMap), a single individual was flushed from short *Phragmites mauritianus* habitat (part of the riparian vegetation) on 22 November 2019 (pers. obs.) (Pachnoda Ecological Consulting, 2019).

Amphibians: Twenty-two (22) frog species are known to be sympatric to the study region (according to QDC 2528CB). Currently, one of these, namely the Giant Bullfrog (*Pyxicephalus adspersus*) is near threatened (Measey, 2010) and is known from seven records for the QDC 2528CB. However, the probability of occurrence for this species on the study site is low and it is unlikely to breed on the study site owing to the absence of suitable breeding habitat (mainly natural pans and depressions), although it is possible that individuals could be present along the riparian vegetation during post-breeding dispersal from nearby wetland systems. Most of the species that could be present will only be detected during high precipitation events and during dispersal events.

Reptiles: Approximately 69 reptile taxa are known to be sympatric to the study region (according to QDC 2528CB). The surface outcrops of the Rand Highveld Grassland unit provide potential refuge for the near threatened Coppery Grass Lizard (*Chamaesaura aenea*) and the near threatened Striped Harlequin Snake (*Homoroselaps dorsalis*). Both species are notoriously difficult to find and detect, which explains the low reporting rates and historical records for both species (respectively 1915 and 1900) from the study area.

C. aenea occurs within fairly pristine grasslands and does not appear to tolerate any significant disturbances or habitat alterations. The national population of this species is scattered and appears to have experienced population declines over the last decade due to fragmentation and afforestation of its primary grassland habitat. It is also vulnerable towards veld fires and relies heavily on the presence of outcrops or rocky cover for protection against veld fires. However, it remains to be a very rare and unobtrusive species. For example, Whittington-Jones *et al*. (2008) recorded only two specimens from Rietvlei Dam Nature Reserve over a period of *ca*. eight years (Pachnoda Ecological Consulting, 2019).

Homoroselaps dorsalis is relatively widespread in South Africa but regarded to be rare in most parts of their geographic distribution. The population of *H. dorsalis* is highly fragmented and prone towards local extinction. Although not often encountered and mostly overlooked it could occur at low densities given the occurrence of suitable habitat, being the presence of outcrops and *termitaria* (both observed from the rocky grassland units).

Birds: According to the South African Bird Atlas Project (SABAP2), approximately 228 bird species have been recorded from the study area (sensu pentad grid 2540_2820). This equates to 23 % of the approximate 979 species listed for the southern African subregion. A total of 73 bird species were observed in the study area (Pachnoda Ecological Consulting, 2019).

According to SABAP1 and SABAP2, 17 species show distributions sympatric to the study area, of which only the vulnerable Lanner Falcon (*Falco biarmicus*) was observed from the study area during

2019 (sensu SABAP2). However, the Lanner Falcon is regarded as an occasional foraging visitor to the study site and is unlikely to be adversely affected by the proposed construction of the pipeline. However, it is worth noting that the vulnerable African Finfoot (*Podica senegalensis*) and the near threatened Half-collared Kingfisher (*Alcedo semitorquata*) could occur along the Pienaars River owing to the presence of optimal habitat. The remaining taxa are either (1) vagrant or (2) unlikely to be present on the study site due to the absence of suitable habitat (Pachnoda Ecological Consulting, 2019).

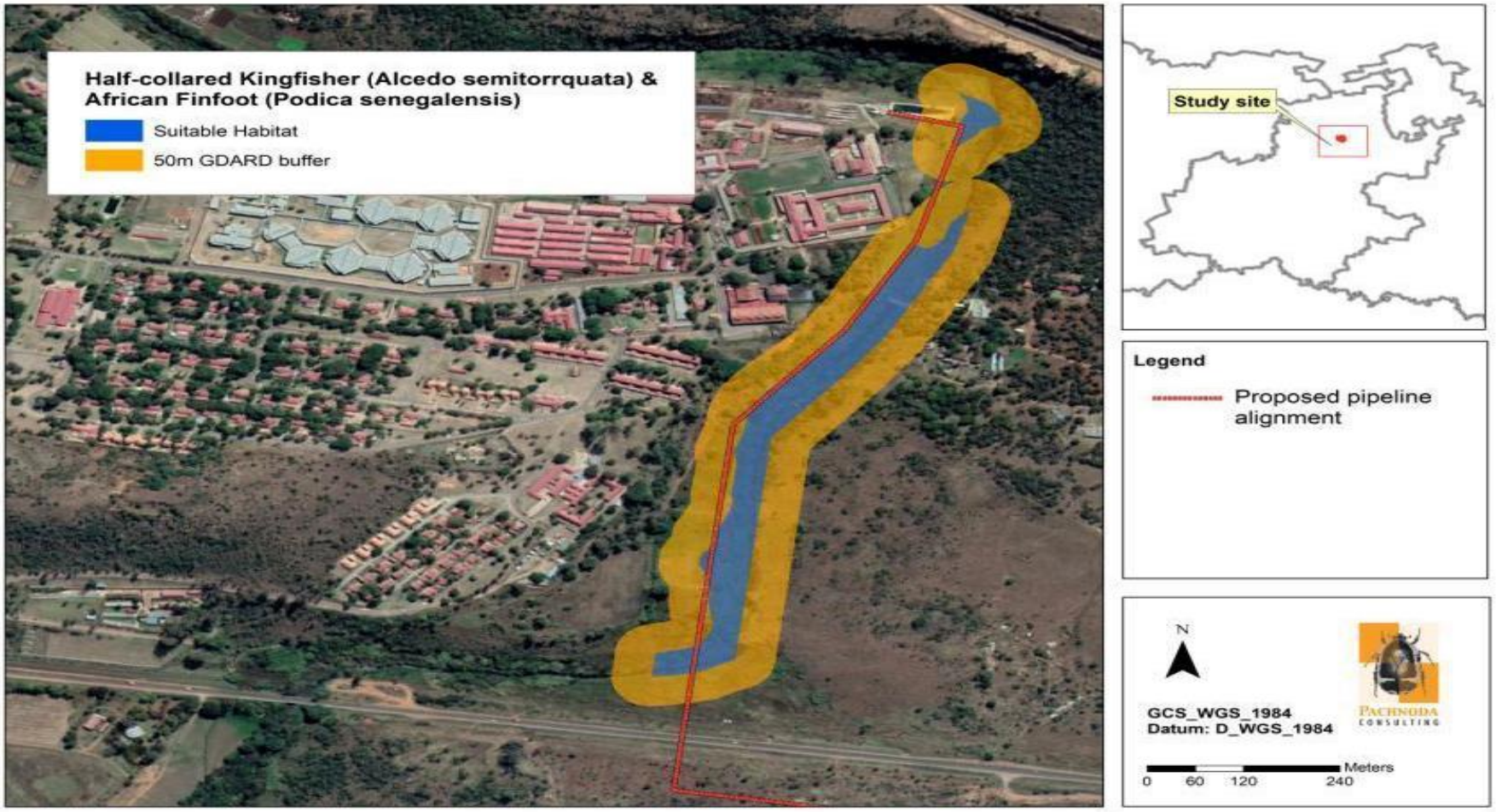
The occurrence of Half-collared Kingfisher depends on the following important factors:

- Clear, unpolluted fast-flowing perennial rivers or streams with alternating riffle water and slower sections comprising of deeper pools;
- Dense marginal vegetation (well-wooded) bordering the river or stream; and
- Breeding habitat in the form of steep alluvial embankments, in particular broken escarpment terrain. Each pair requires at least 1 km of suitable riverine habitat.

The Half-collared Kingfisher is categorised as near threatened in the Red Data book of Birds (Taylor et al., 2015). It is in general uncommon throughout its distribution range and threatened by the widespread degradation (e.g., siltation, erosion, pollution, clearing of riparian vegetation and water extraction) of its preferred habitat (Barnes, 2000).

The Pienaars River is regarded as an important breeding, roosting and foraging habitat for the Half-collared Kingfisher in Gauteng. Although it was not observed from the study site, the riparian vegetation that borders the Pienaars River provides optimal habitat for this species to occur. In addition, the riparian vegetation along the Pienaars River supports potential foraging, nesting and roosting habitat for this aquatic species, based on the presence of steep, vertical embankments (suitable for roosting and breeding) and the presence of overhanging vegetation alongside riffle water where bedrock occurs within the main river channel (Figure 9-7). It is recommended that a 50 m buffer zone of terrestrial habitat be allocated from the edge of riparian zone of the Pienaars River (Pachnoda Ecological Consulting, 2019).

Figure 9-7: Typical Half-collared Kingfisher (*Alcedo semitorquata*) habitat along the Pienaars River consisting of (a) fast-running riffle habitat bordered by marginal vegetation and (b) breeding habitat as provided by the vertical earth banks.



srk consulting	BAVIAANSPOORT PIPELINE LOCATION OF HISTORICAL FIDNINGS	Project No. 498454

Figure 9-8: A map illustrating the presence of suitable habitat along the Pienaars River for the occurrence of the near threatened Half-collared Kingfisher (*Alcedo semitorquata*) and the vulnerable African Finfoot (*Podica senegalensis*).

African Finfoot *(Podica senegalensis):* The African Finfoot is categorised as Vulnerable in the Red Data book of Birds (Taylor *et al.*, 2015) and its presence depends on the occurrence of slow-moving rivers bordered by dense overhanging vegetation. It is a shy species, which is seldom observed, and only known from scattered localities in Gauteng (e.g., Pienaars River, Hennops River and Magalies River). The national population is highly fragmented and the continual reduction of water flow, damming and degradation of riverine vegetation are some of the major threats for the survival of this species (Taylor *et al.*, 2015). The Pienaars River on the study site was found to be suitable for the African Finfoot to occur (Figure 9-9). Even though this species was not observed during the site visits, it is highly likely to occur (Pachnoda Ecological Consulting, 2019).

Figure 9-9: Typical African Finfoot (*Podica senegalensis*) habitat along the Pienaars River consisting of (a-b) dense overhanging vegetation bordering the river.

9.7 Heritage Resources

A heritage resources specialist study was undertaken by University of Pretoria (Enterprises).

9.7.1 Stone Age

No Stone Age material was found during survey of the project area (University of Pretoria, 2019).

9.7.2 Iron Age

No Iron Age sites were recorded during the survey or on the survey of aerial imagery (University of Pretoria, 2019).

9.7.3 Historical Sites

Two historical sites were recorded during the foot survey of the proposed project area (these were not visible in the remote sensed imagery). However, both of these sites are located outside the preferred and alternative pipeline footprints (University of Pretoria, 2019).

srk consulting	**BAVIAANSPOORT PIPELINE** LOCATION OF HISTORICAL FIDNINGS	Project No. 498454

Figure 9-10: Historical Period Sites identified during survey

Figure 9-11: Aerial imagery series dating to 1948 (left), 1958 (middle) and 1979 (right). Note foot paths to and from sites in earlier images, but absent in 1979

Site UP-BAV-2528-01

- Coordinates: S25.685759° E 28.364876°
- Farm: Baviaanspoort 330-JR
- 50K Map Series: 2528CB Silverton
- Type: Historical Period Ruins

This site is the remains of several stone and mud buildings. The original structures were constructed with dry stone walls and likely had a clay plastering. The buildings are poorly preserved, and the original layout is difficult to determine. However, it seems as though the main architectural feature was a series rectangular structures, spaced around the north, west and southern perimeters of a courtyard. A low stone perimeter wall is visible on the western side of the buildings and a small circular feature (c. 1.5m in diameter and 0.3m high) is located to the north of the main structures. The latter may have been a small stock pen (University of Pretoria, 2019).

Porcelain fragments, decorated with a floral transfer print, were noted on the surface at the site. The small size of the site meant that the walls were not visible in historical aerial photos. However, imagery from 1948 and 1958, faint pathways leading to and from the general areas of the site is visible, which would suggest that it was likely occupied during at the time the images were recorded. These pathways are not visible on 1939 photos, nor on the 1979 images. This suggests an estimated age of approximately 70 years for these structures (i.e., mid-20th century).

The layout does conform to the extended U-shape settlement with square buildings which typifies Ndebele homesteads from the 1950s onwards (Vuuren 1987, 106; van Vuuren 1993, 46) and therefore could be one of the numerous dispersed Ndebele homesteads that occurred in the area as tenant farmers and labourers. Most Ndebele communities north of Pretoria were forcibly relocated in the 1950s-1960s to Vlakfontein (now Mamelodi) and other locations further afield (Kusel 2000).

The site is rated is as medium significance at a local level since: (a) it relates to an important but largely untold part of Pretoria's history, (b) similar sites are increasingly under threat of urban encroachment and (c) that the site has the potential to answer important future research questions about a rarely studied segment of 20th century South Africa's population (c.f. van Schalkwyk 2014).

The site is approximately 40m west of the proposed pipeline alignment and is therefore unlikely to be directly impacted. Should there be any impact on the site by the proposed project activities, a permit for the alteration or destruction of the site is required subject to the NHRA .

Outline of rectangular structures (Site UP-BAV-2528-01). Pipeline in green.

UP-BAV-2528-01 viewed from the east.

Extant walling on UP-BAV-2528-01

Fieldwork Findings at UP-BAV-2528-01

Figure 9-12: Findings at Site UP-BAV-2528-01

Site UP-BAV-2528-02

- Coordinates: S25.687057° E 28.365356°
- Farm: Baviaanspoort 330-JR
- 50K Map Series: 2528CB Silverton
- Site Type: Historical Period Ruins

This site is located against the southern slope where the terrain dips down to the Pienaars River and WWTW. The site is comprised of poorly preserved, square dry stone-walls. The structures seem to be rectangular and organised around a courtyard area, but the general layout could not be defined but the original stone wall foundations likely had clay plastering. No surface material or artefacts were identified. A dirt road cuts through the eastern edge of the site and likely destroyed some of the features on the site.

No visible material culture was found on the site. The ephemeral nature of the site means that it was not possible to identify the site on historical imagery. However, as with UP-BAV-2528-01, the 1958 aerial imagery indicates pathways to and from the site area which suggests a mid-20th century date and likely has a similar date and archaeological identity as UP-BAV-2528-02.

The site is rated as Low significance since (a) large parts of the site has already been destroyed by a road and (b) very little surface deposits remain due to slope erosion (University of Pretoria, 2019).

The site is approximately 20m west of the proposed pipeline alignment and is therefore unlikely to be directly impacted. Should there be any impact on the site by the proposed project activities, a permit for the alteration or destruction of the site is required subject to the NHRA (University of Pretoria, 2019).

Walling on UP-BAV-2528-02 with road cut through the site in the foreground.

Collapsed walling at UP-BAV-2528-02

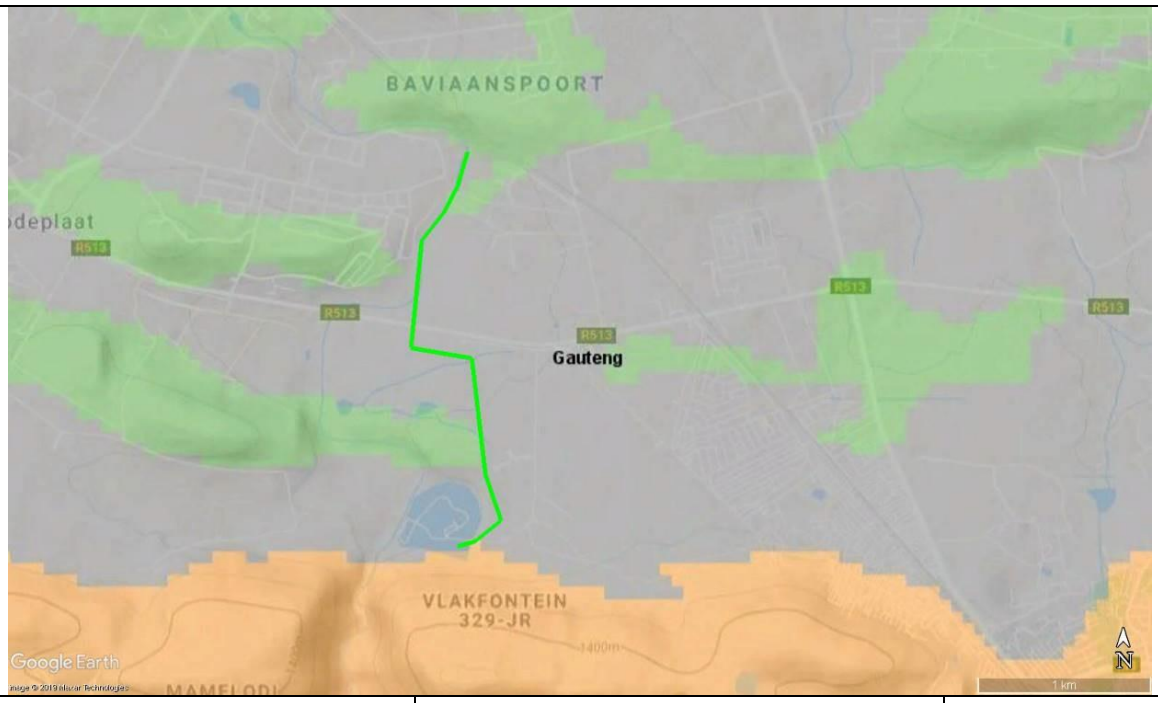
Building rubble and road east of UP-BAV-2528-02

Walling on UP-BAV-2528-02 with road cut through the site in the foreground.

Figure 9-13: Findings at Site UP-BAV-2528-02

9.7.4 Palaeontological Sensitivity

The project area falls outside a paleontological sensitive area according to the South African Heritage Resources Information System (SAHRIS) database and therefore does not require desktop or field assessment will probably not be required. This is ultimately subject to review and recommendations by the relevant heritage authorities (University of Pretoria, 2019).



srk consulting	**BAVIAANSPOORT PIPELINE** SAHRIS PALEO-SENSITIVITY MAP	Project No. 498454

Figure 9-14: SAHRIS paleo-sensitivity map with from with project area indicated.

9.8 Geotechnical Status

A geotechnical investigation was undertaken to assess the soil and rock conditions underlying the Baviaanspoort CSF. The intention of the investigation was to determine the excavatibility of the underlying material, determine the depth to refusal and test the engineering properties of the underlying material.

The geotechnical investigation comprised the digging of numerous test pits on the site, logging them, interpreting the results and making recommendations with regards to foundation designs. The study found that the Baviaanspoort site is underlined by soil horizons subject to both consolidation and collapse settlement, the soil class designation is C2. The study concluded that for the new structures, it is recommended that soil rafts be constructed as foundation.

9.9 Water Resources

9.9.1 Surface Water Resources

The proposed pipeline falls within the Crocodile (West) major catchment which is included in the Limpopo Water Management Area as shown in Figure 9-15. The Crocodile (West) and Marico Rivers lie primarily within the North-West Province with parts of it in the northern region of Gauteng and the south-western periphery of the Limpopo Province. The Crocodile and Marico rivers are two major rivers in this WMA, which at their confluence forms the Limpopo River that flows eastwards to the Indian Ocean. The proposed development falls within a sub-catchment of the Apies Pienaars River Catchment.

Apies-Pienaars River Sub-Catchment Area

A major part of this area is densely populated with the City of Tshwane (Pretoria) situated in the higher lying southern portion of the sub-catchment. The bulk of the water requirements of this area are supplied by Rand Water, sourced from the Vaal River System, although significant quantities are also

supplied from groundwater and from local sources. Irrigation in this sub-area is significant, with an estimated 67 km^2 of irrigated crops.

A23A Quaternary Catchment

The proposed pipeline will be located within quaternary catchment area A23A and will run across the Pienaars River. The Pienaars River originates east of Pretoria, City of Tshwane, Gauteng Province, flowing northwards into Roodeplaat Dam (north of Mamelodi), from where it carries on northward until it passes under the N1 and turns westward. North of Makapanstad the Apies River (or rather a short section of the Tshwane River) joins it from the left, as well as the Plat River from the right. The Pienaars continues flowing westward to the Klipvoor Dam. About 25 km further downstream it joins the Crocodile River's right bank.

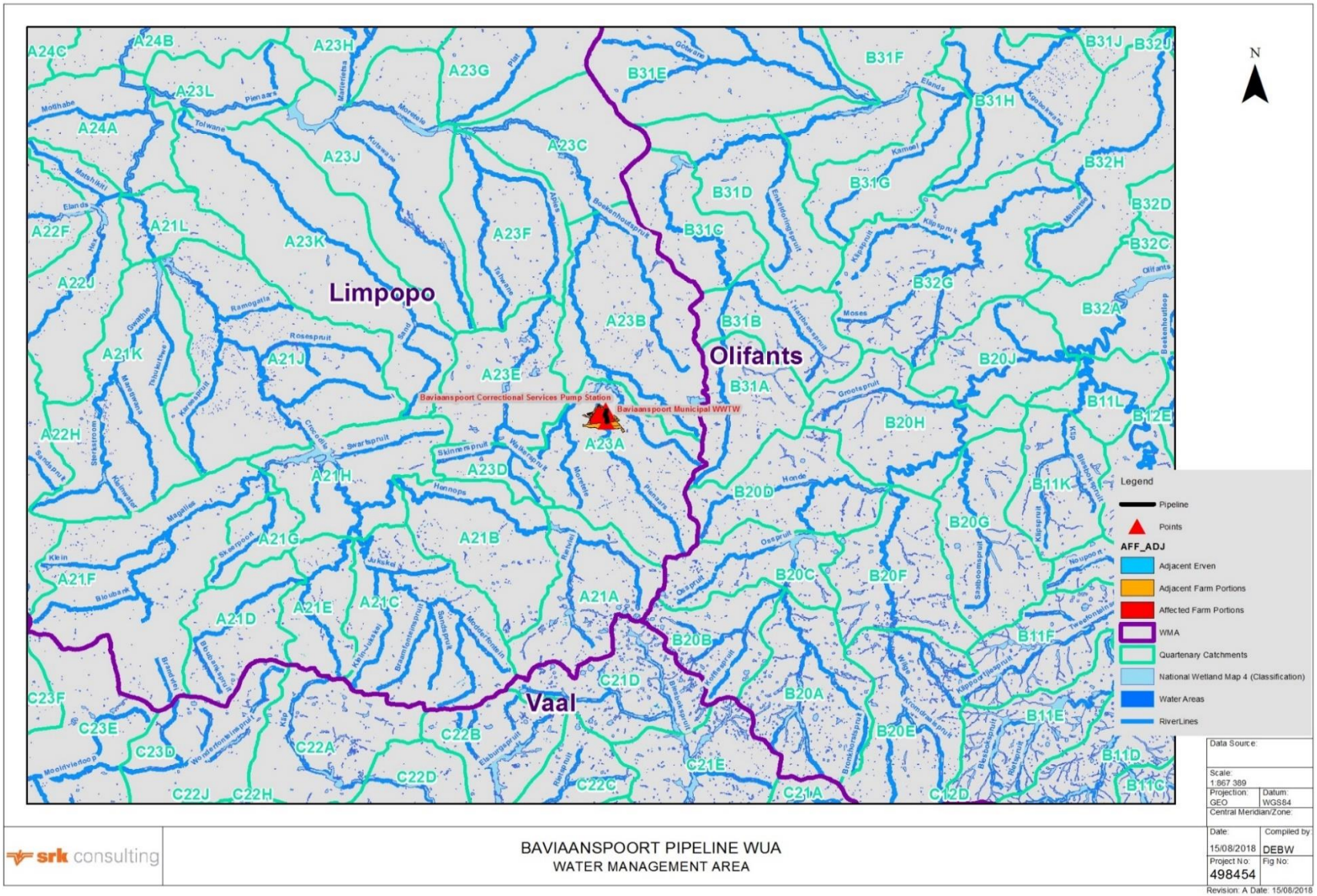


Figure 9-15: Border of the Limpopo Water Management Area in relation to the development

9.9.2 Surface Water Quality

The closest Water Quality Monitoring site from the proposed development is WMS 90239 A2H127Q01 Pienaars River at Baviaanspoort. It has been monitored since 1995 and the last available results are for last quarter of 2016. The chart showing the results can be viewed in Figure 9-17.

Prior to 2015 it appears that the water quality appears to have been very stable. Higher Total Dissolved Solids, Phosphates and Nitrates were reported in 2016.These may be indicative of pollution from the Baviaanspoort Wastewater Treatment and/or agricultural activities and not from upstream development in the catchment. The extreme values may have been linked to specific incidents since the median values are well within acceptable parameters. The summary values can be seen in Table 9-5.

Table 9-5: Summary of concentrations of selected compounds

Compound	Min mg/l	Max mg/l	Number of Samples	90thPercentile mg/l	Median mg/l
TDS	128	511	402	436	361
Phosphate as PO_4	0.005	7.12	478	0.474	0.06
Nitrate and Nitrite as NO_2 and NO_3	0.02	30.7	472	0.658	0.071

The National Freshwater Ecosystem Priority Areas (NFEPA) database classifies the Pienaars River as C-moderately modified. Class C NFEPA rivers are rivers where a loss and change of natural habitat and biota has occurred but the basic ecosystem functions are still predominantly unchanged.

Although the NFEPA wetlands database shows that there are wetlands associated with the Baviaanspoort WWTW, located within 500m of the proposed pipeline, these are dams located at the WWTW.

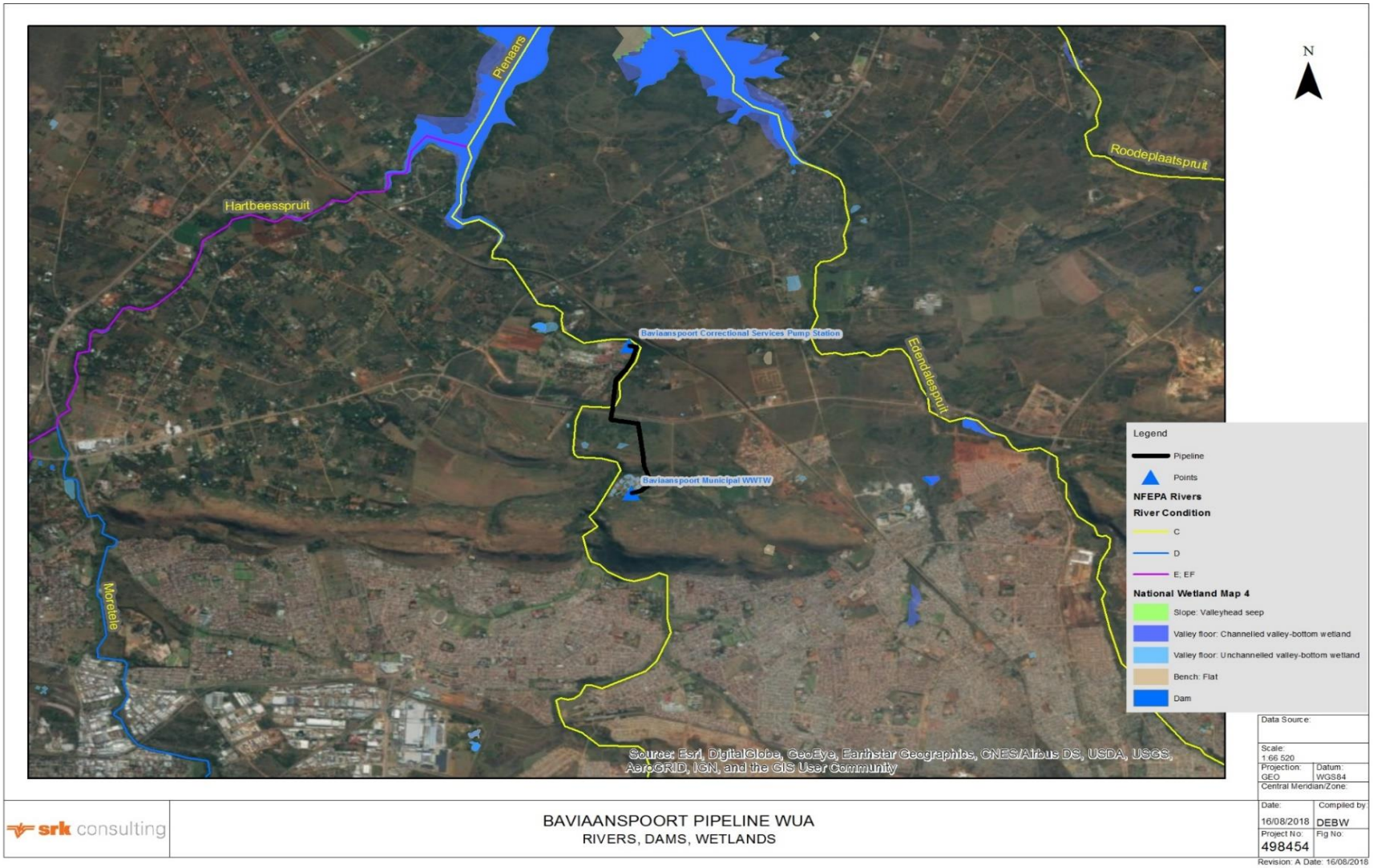
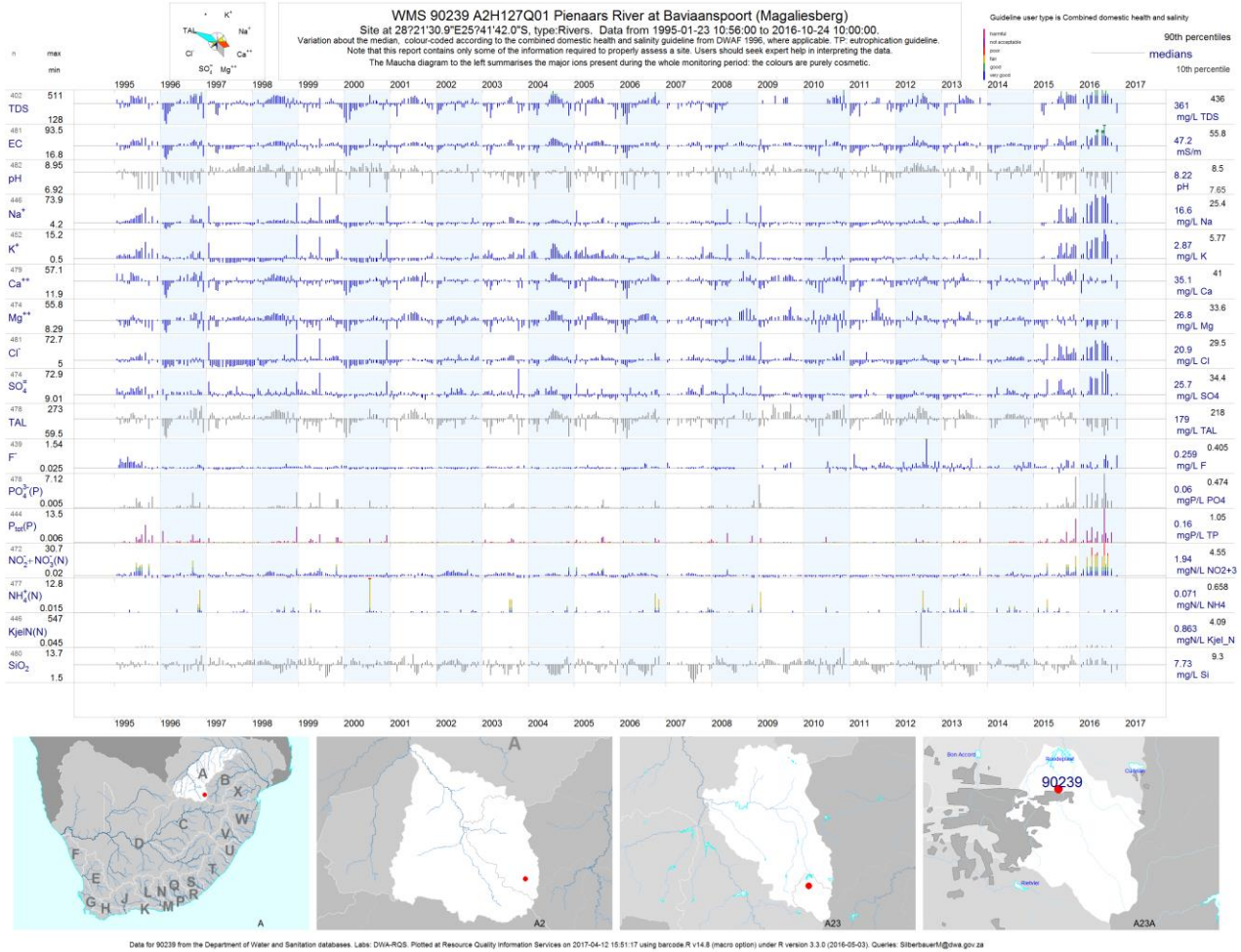


Figure 9-16: Water Resources



srk consulting	**Baviaanspoort Pipeline** Water Quality Trends of Pienaars River	Project No. 498454

Figure 9-17: Water Quality Results for samples taken by the Department of Water and Sanitation between 1995 and 2016 on the Pienaars River at Baviaanspoort

9.9.3 Mean Annual Runoff (MAR)

The natural surface Mean Annual Runoff (MAR) is approximately 646 million m3/annum. The theoretical recharge of this WMA is estimated to be 260 million m3/annum, with only about half of this currently being utilised. A summary of the natural MAR, together with the desktop estimate of the ecological requirements (Ecological Reserve) is provided in Table 9-6 (DWAF, 2004).

Table 9-6: Natural MAR and Ecological Reserve (million m^3/annum) (DWAF, 2004)

Sub-area	Natural MAR	Ecological Reserve
Upper Crocodile	253	57
Apies / Pienaars	142	34
Elands	113	15
Lower Crocodile	138	25
Total for WMA	646	131

9.10 Floodlines and Hydrology

A floodline determination study was undertaken by SRK Consulting. According to the study, the general topography was determined using 1:50 000 topographical map. In order to improve the accuracy of the aerial survey an additional terrestrial survey was carried out along the proposed development area. The survey was supplied by Pherekgong Geo Consulting. This survey gave cross sectional data of the floodplains while the 1m contours from CoT gave cross sectional data of the watercourse (SRK Consulting , 2019).

The catchment area was delineated using the 1:50 000 topographical map together with the 1m contours from CoT. The hydrological and hydraulic parameters of all the catchments contributing towards the proposed site of development were calculated (SRK Consulting (SA) Pty Ltd, 2017). The catchment hydrology was determined by characterising the hydrological and hydraulic parameters of the catchment within which the future developments may take place. In order to obtain realistic and integrated flood peak data, the City of Tshwane (CoT) municipality was divided into seven major basins. The SWMM (SCS) hydrological model was then compiled for each of the seven basins for potential fully developed land-use as obtained from the CoT Town Planning Department to determine the peak flow rates. The peak flow rates were then entered into the HECRAS model to determine relevant flood levels and associated floodlines (SRK Consulting , 2019).

The extracted flood peaks together with the catchment area are summarised in Table 9-7.

Table 9-7: Summary of flood peaks (Future Development Conditions)

River Segment & Chainage	Catchment Area (km^2)	Peak Flow Rate (m^3/s)	
		1:50	1:100
PN6427	355.4	887	1026
PN5385	357.7	892	1032

The floodline study found that:

- The portion of the pipeline between R513 and Baviaanspoort Correctional Services Pump Station is situated within the 1:100 Year Floodline.
- The 1:100-year water levels range between 1251.9 mamsl at PN7592 and 1230.7 mamsl at chainage PN5385.

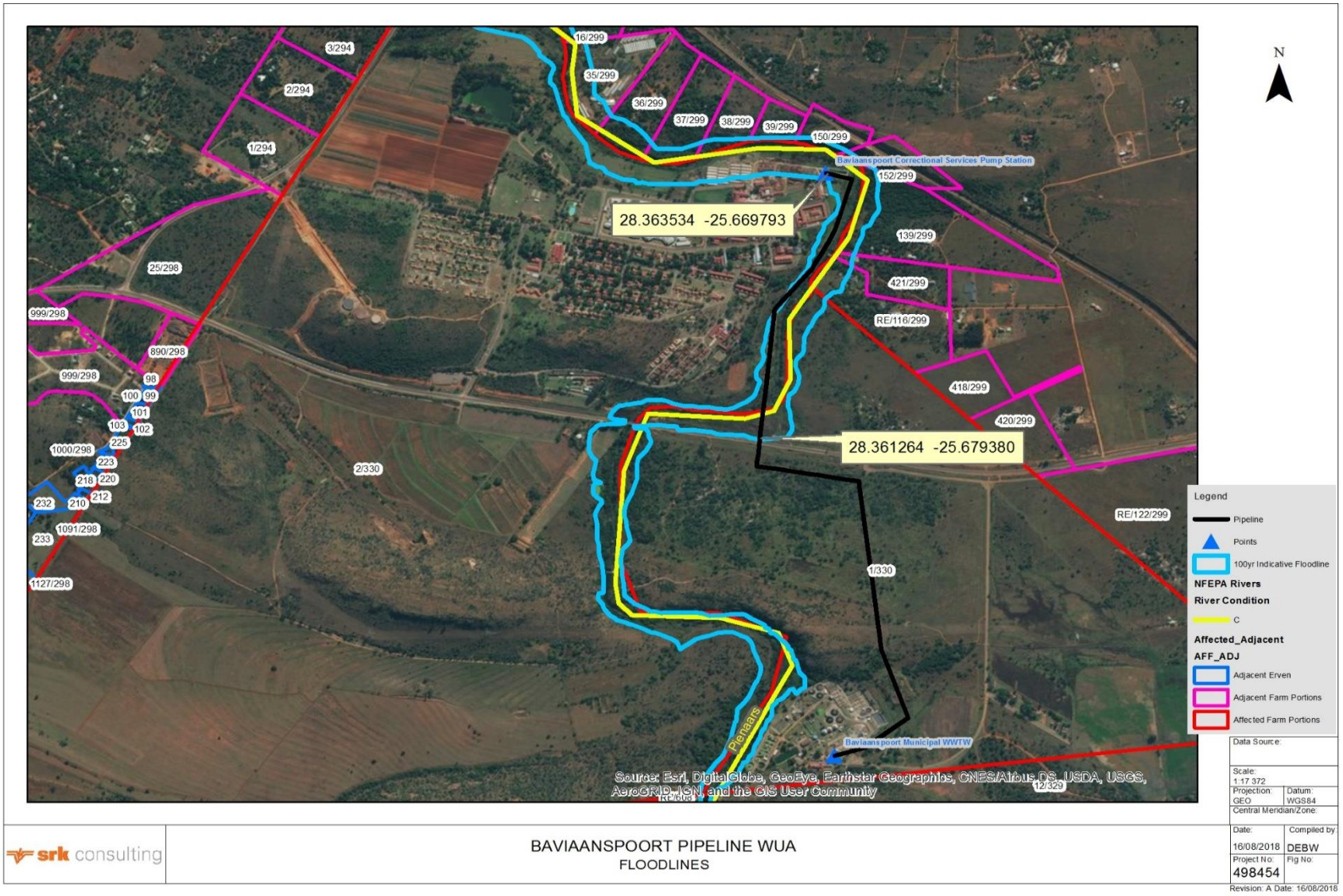


Figure 9-18: Floodlines

9.11 Aquatic Ecology

The results of the freshwater ecological assessment undertaken by Scientific Aquatic Services indicate that the watercourse associated with the proposed Baviaanspoort pipeline is a riparian system that is known as the Pienaars River and displayed some degree of wetland characteristics, however the system was identified to be more representative of a riparian system and this was used for further classification purposes (SAS, 2019). The Pienaars River is considered to be in a seriously modified condition with urbanization and industrial activities being the main impact on the assessed watercourse. Modifiers to the Pienaars River that were assessed include clearing of riparian vegetation and associated proliferation of alien invasive species, streambank incision and erosion, and the construction of flow-modifying structures (such as road crossings and bridge structures). It was also evident that the Pienaars River experienced a recent sewage event, likely as result of the leakage from the degraded pipeline.

The assessed watercourse was deemed to provide intermediate levels of ecological services was of a moderate ecological importance and sensitivity. The Pienaars River system had a limited assemblage of aquatic biota upon the field assessment with no fish present during sampling. The results of the freshwater assessments are summarised in Table 9-12 (SAS, 2019).

Table 9-8: Summary of results of the watercourse assessment

Watercourse	PES	Ecoservices	EIS	REC / RMO / BAS
Pienaars River 1	E	Intermediate	Moderate	REC: Category D RMO: E/F Improve

[1] Assessed October 2019 (water quality, VEGRAI, IHI, IHAS, SASS5, MIRAI, FRAI, EcoStatus determination – for a description of abbreviations see discussion below);

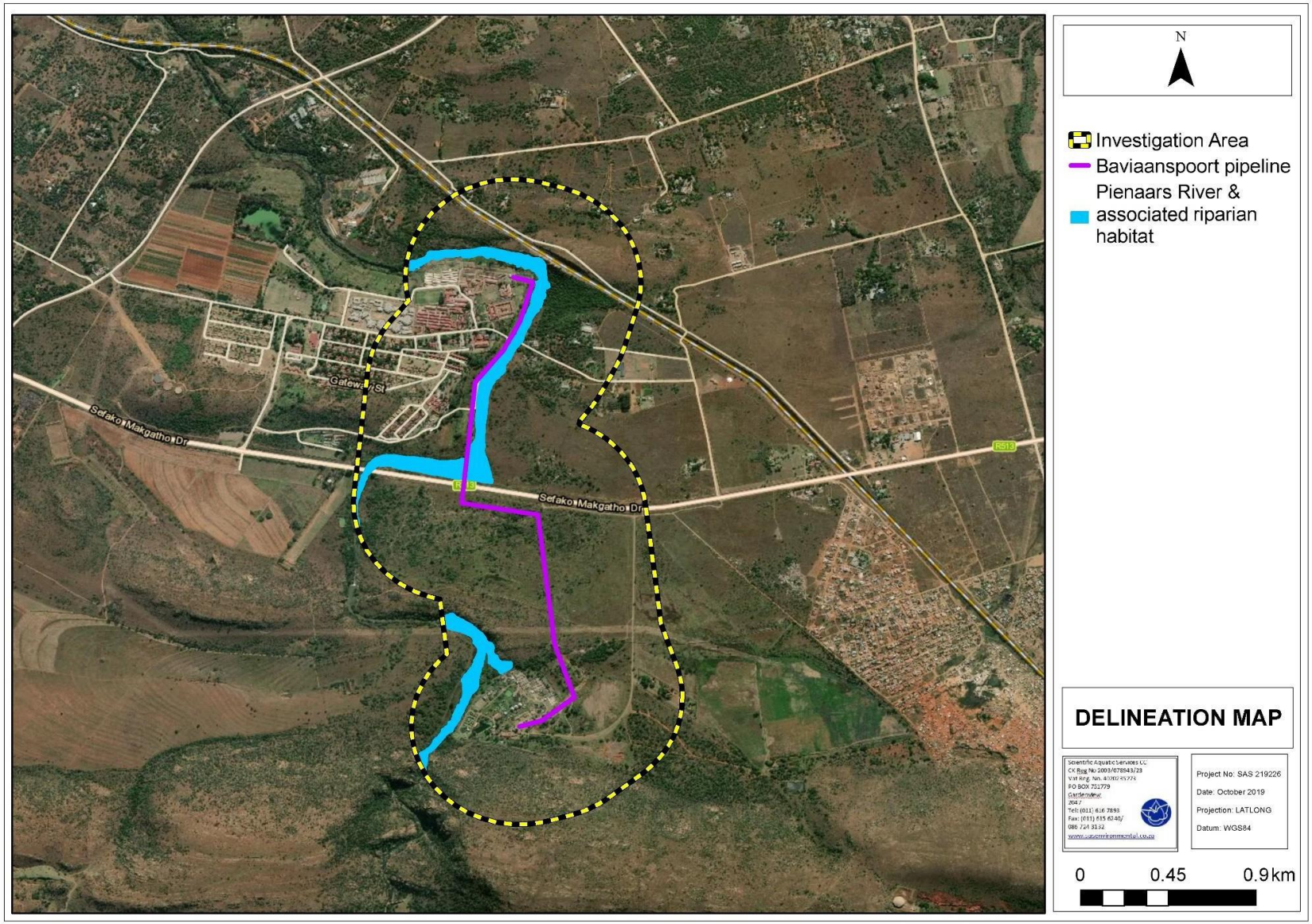


Figure 9-19: A representation of the identified watercourse associated with the proposed Baviaanspoort pipeline, depicted on digital satellite imagery.

Following the site visit, various assessments were undertaken to determine the following (SAS, 2019):

- The PES assessment for the watercourse according to the resource directed measures guideline
- Service provision of the Pienaars River, which incorporates biodiversity maintenance, flood attenuation, streamflow regulation and assimilation, to name a few;
- The EIS of the watercourses was determined according to the method described by Rountree & Kotze (2013);
- An appropriate Recommended Ecological Category (REC) and Resource Management Objectives (RMO) to guide the management of the Pienaars River with the intent of enhancing the ecological integrity of the wetland where feasible; and
- Assessment of impacts of the construction and operation of the proposed Baviaanspoort pipeline on the Pienaars River.

The results of the assessments are presented in the “dashboard style” report below.

Table 9-9: Summary of the aquatic ecological assessment data of the Pienaars River

Water management area: Crocodile (West) and Marico	
Quaternary Catchment: A23A	
Ecoregion: Majority Western Bankenveld and remaining Eastern Bankenveld	
Weather condition: Warm and clear	
Flows: Moderate to low	
Water Clarity: Dark brown to dark grey	

Map: Two representative monitoring points were selected on the Pienaars River to indicate the PES prior to construction and upgrade of the proposed Baviaanspoort pipeline.

Coordinates: BV 1: 25°40'42.18"S 28°21'26.67"E

BV 2: 25°41'27.10"S 28°21'37.70"E

Freshwater Assessments

Water quality:

BV 1

pH	7.1
EC (mS/m)	83
Temperature (ºC)	25.48
DO (mg/L)	0.98
DO saturation (%)	11.97

BV 2

pH	7.42
EC (mS/m)	98.5
Temperature (ºC)	27.65
DO (mg/L)	3.81
DO saturation (%)	55.1

Aquatic Macro-invertebrate community assessment:

BV1

SASS5 Score:	7
ASPT Score:	1.75
Dallas (2007):	Category E/F (Severely modified)
MIRAI:	38.4% (Category E. Severely Modified)

BV2

SASS5 Score:	8
ASPT Score:	2.7
Dallas (2007):	Category E/F (Severely modified)
MIRAI:	26 % (Category E. Severely Modified)

Invertebrate Habitat Assessment:

BV1

Class:	Borderline adequate
IHAS Score:	55

BV2

Class:	Poor
IHAS Score:	45

Fish Response Assessment Index: (assessed once for both sites considering proximity and similarity of habitat conditions):

FRAI: 38.2% (Category E Severely

Modified) Historical data was employed. No live fish were collected during the assessment sampling efforts.	
Habitat Integrity (assessed for both sites considering close proximity and similarity of habitat conditions): <u>BV1 and BV2</u> Instream IHI: 75.3 (Category C. Moderately Modified) Riparian IHI: 70.7 (Category C. Moderately Modified)	
Riparian Vegetation Response Assessment Index: <u>BV 1 and BV2</u> VEGRAI: 41.1 (Category D/E Severely Modified)	
Integrated Ecological Category: (Category D. Largely Modified) The EcoStatus classifications indicates the overall Integrated Ecostatus Category for this section of the Pienaars River is Category E (Seriously Modified), which is not congruent with the DWS RQIS PES classification of Category D (Largely Modified) conditions for the applicable SQR of the Pienaars River.	

9.12 Agriculture Potential

The Gauteng Agriculture Potential Atlas indicates that the proposed pipeline will be located in an area regarded as having medium to high agriculture potential as shown in Figure 9-20.

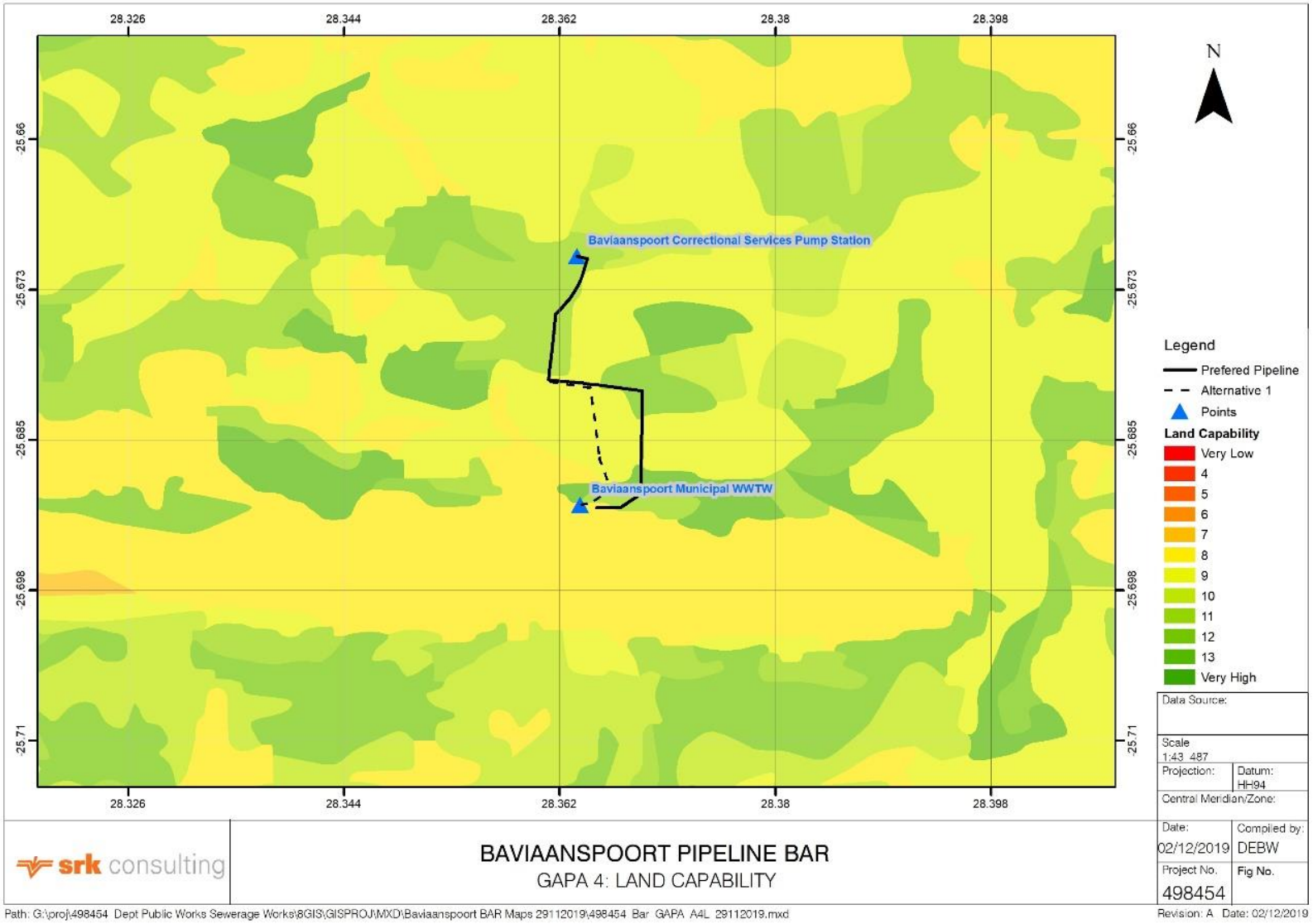


Figure 9-20: Agriculture Potential

10 Environmental Impact Assessment

A basic environmental impact assessment was conducted for the project as required by GNR 982 of the NEMA. The impact assessment considered specialist findings from the BA process for the construction and operation of the pipeline. The impact assessment process entailed the following:

- Baseline characterisation (provided in Section 9);
- Identification of potential impacts, including potential impacts identified in the specialist studies; and
- Quantification of the significance of the identified potential impacts before and after implementation of mitigation measures. .

10.1 Environmental Screening

An environmental screening was conducted for the BA which identified the following development site environmental sensitivities. A copy of the screening report is attached as Appendix F.

Table 10-1: Proposed Development Area Environmental Sensitivity

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme		X		
Civil Aviation Theme		X		
Plant Species Theme			X	
Defence Theme			X	
Terrestrial Biodiversity Theme	X			

10.2 Specialist Studies

The DEFF Screening Tool identified the following specialist studies as essential for the proposed development, which have been included in the assessment:

- Plant Species Assessment (included in the Ecological Evaluation Specialist Report attached in Appendix G); and
- Animal Specie s Assessment (included in the Ecological Evaluation Specialist Report attached in Appendix G).

In addition to the above-mentioned specialist studies, the following specialist studies were also undertaken:

- Aquatic Assessment;
- Heritage Resources; and
- Hydrology.

10.3 Impact Assessment Methodology

The main objective of the impact assessment is to identify the negative environmental impacts that can be avoided and/or mitigated and the benefits of the positive impacts that can be enhanced during the construction and operation of the proposed pipeline.

A quantitative impact assessment methodology was used for the impact assessment. This method makes use of the basic risk assessment approach of deriving an expression for risk from the product of likelihood (probability) and consequences.

10.3.1 Baseline Characterisation of the Environment

The baseline characterisation of the environment included in Section 9 of this BAR is based on findings from specialist studies and other existing information and GIS databases. The characterisation provides a description of the current status of the environment, based on which an impact assessment will be conducted.

The specialist studies reports have been attached as Appendix G.

10.3.2 Identification of Key Issues

Key potential environmental risks have been identified as part of the impact assessment through the stakeholder engagement process as well as the specialist studies conducted for the proposed project. The assessment also considered any anticipated cumulative impacts that may occur as a result of the construction and operation of the proposed pipeline.

10.3.3 Quantitative Impact Rating (Significance)

The anticipated impacts associated with the proposed project will be assessed according to SRK's standardised impact assessment methodology, which is presented below. This methodology has been utilised for the assessment of environmental impacts where the consequence (severity of impact, spatial scope of impact and duration of impact) and likelihood (frequency of activity and frequency of impact) have been considered in parallel to provide an impact rating and hence an interpretation in terms of the level of environmental management required for each impact.

The first stage of any impact assessment is the identification of potential environmental activities[1], aspects[2] and impacts, which may occur during the commencement, and implementation of a project. This is supported by the identification of receptors[3] and resources[4], which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. Environmental impacts[5] (social and biophysical) are then identified based on the potential interaction between the aspects and the receptors/resources.

The significance of the impact is then assessed by rating each variable numerically according to defined criteria as outlined in Table 10-2.

[1]An ***activity*** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation.
[2]An ***environmental aspect*** is an 'element of an organisations activities, products and services which can interact with the environment'. The interaction of an aspect with the environment may result in an impact.
[3]***Receptors*** comprise but are not limited to people or man-made structures.
[4]***Resources*** include components of the biophysical environment.
[5]***Environmental impacts*** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. Receptors can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers, flora and palaeontology. In the case where the impact is on human health or well-being, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity6, spatial scope7 and duration8 of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity9 and the frequency of the impact10 together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix table as shown in Table 10-3.

This matrix thus provides a rating on a scale of 1 to 150 (low, medium low, medium high or high) based on the consequence and likelihood of an environmental impact occurring.

Natural and existing mitigation measures, including built-in engineering designs, are included in the pre-mitigation assessment of significance. Measures such as demolishing of infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

[6]***Severity*** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
[7]***Spatial scope*** refers to the geographical scale of the impact.
[8]***Duration*** refers to the length of time over which the stressor will cause a change in the resource or receptor.
[9]***Frequency of activity*** refers to how often the proposed activity will take place.
[10]***Frequency of impact*** refers to the frequency with which a stressor (aspect) will impact on the receptor.

Table 10-2: Criteria for Assessing Significance of Impacts

SEVERITY OF IMPACT	RATING
Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful	5

SPATIAL SCOPE OF IMPACT	RATING
Activity specific	1
Project site specific	2
Local area (within 5 km of the pipeline)	3
Regional (Greater COT MM area)	4
National	5

DURATION OF IMPACT	RATING
One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure / permanent	5

CONSEQUENCE

FREQUENCY OF ACTIVITY / DURATION OF ASPECT	RATING
Annually or less / low	1
6 monthly / temporary	2
Monthly / infrequent	3
Weekly / life of operation / regularly / likely	4
Daily / permanent / high	5

FREQUENCY OF IMPACT	RATING
Almost never / almost impossible	1
Very seldom / highly unlikely	2
Infrequent / unlikely / seldom	3
Often / regularly / likely / possible	4
Daily / highly likely / definitely	5

LIKELIHOOD

Table 10-3: Interpretation of Impact Rating

Likelihood \ Consequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
6	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
7	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
8	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
9	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
10	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

	High	76 to 150	Improve current management
	Medium High	40 to 75	Maintain current management
	Medium Low	26 to 39	
	Low	1 to 25	No management required

SIGNIFICANCE = CONSEQUENCE x LIKELIHOOD

10.4 Summary of Identified Possible Impacts

The identified potential positive and negative biophysical, socio-economic and cultural impacts are summarised in Table 10-4: Summary of Potential Environmental Impacts Associated with the Proposed Development.

Table 10-4: Summary of Potential Environmental Impacts Associated with the Proposed Development

Element of Environment	Potential Impact Descriptions
Socio-Economic	Possible temporary job opportunities
Hydrogeology	Possible, but limited groundwater contamination.
Surface water	Possible, but limited surface water contamination.
Air Quality	Possible, but limited impact on air quality in the area.
Noise	Possible generation of noise during the construction activities.
Biodiversity	Possible loss of biodiversity ad proliferation of alien invasive plant species
Surface Water Resources	Possible sedimentation and contamination of surface water resources due to movement of vehicles, personnel and machinery.

10.5 Quantitative Environmental Impact Assessment Results

The construction and installation of a new pipeline will also reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. Authorising the construction of the new pipeline between the Baviaanspoort WWTW and Baviaanspoort CSF will reduce the chances of the pipeline failing and polluting water resources. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibres in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.

Other benefits, although short term (during construction) include creation of employment. The socio-economic impact assessment conducted for the project showed that although the impact in terms of employment will diminish once the construction phase concludes, skills transfer will enable the individuals to seek other construction related employment.

During the construction phase, the project has the potential to have a positive impact on economic activity in the local area, region, province, and possibly nationally (depending on the location of the contractors). Estimates indicate that a total of approximately R5.9 million will be spent on the entire construction phase representing a low investment. Nonetheless, over and above the originally invested money during the construction phase, additional limited revenue would be generated due to the multiplier effect in the different sectors of the economy. The local area and its activities (businesses and shops, etc.) are also expected to be stimulated economically, due to the increased spending expected from the increased salaries and wages paid to employees during construction. All of this will have a positive impact due to the increased direct employment by construction contractors, as well as stimulation of local businesses and informal traders.

The mitigation measures listed in the accompanying EMPr are deemed adequate to avoid further degradation of the environment.

10.5.1 Planning Phase

The potential impacts associated with the planning stage (pre-construction phase) of the project include:

- Infrastructure placement and design leading to overall loss of floral and faunal SCC; and
- Poor planning leading to an increased construction footprint.

The significance of the impacts of both the preferred and alternative option are expected to be of the same significance. The results from the quantification of the identified potential impacts associated with the planning phase of the project are summarised in Table 10-5.

Table 10-5: Summary of the potential impacts that can be expected during the planning phase

Activity	Nature **of potential impact/risk**	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Planning	Planning of infrastructure placement and design within sensitive habitat	2	1	3	1	2	18	Low (-)	• The proposed development footprint shall be kept to a minimum. • The proposed development should be planned in a way that will keep impacts on the aquatic environment to a minimum.	1	1	3	1	2	15	Low (-)
	Poor planning leading to an increased footprint.	2	1	3	1	2	18	Low (-)		1	1	3	1	2	15	Low (-)

10.5.2 Construction Phase

Movement of earth moving equipment within the project area will be required for the removal of any existing infrastructure and transportation of construction material and waste. The removal of any existing pipeline sections from the riverbed will potentially result in the loss of and/or changes to the instream habitat and instream biota.

Site clearance for construction results in removal of the riparian and terrestrial habitat. The vegetation in the proposed pipeline location has been disturbed because of surrounding urban and anthropogenic activities which include illegal dumping, bush clearing during firewood collection, infestation by alien declared plant taxa and inappropriate veld fires. The extensive alien plant growth has also resulted in a significant loss of indigenous floral species.

Apart from these disturbances, recent GoogleEarth satellite imagery show that part of the study area is currently being earmarked for informal settlement as evidenced by the "grid" like patterns of tracks and claims to the east of the pipeline route (also observed along the pipeline route). Therefore, the long-term viability of the natural vegetation associations on the study site is questionable, and persistence and ecological connectivity between these systems will only be maintained by immediate intervention.

Some of the vegetation associations on the alternative pipeline location remained in semi-transformed ecological condition (e.g., Rand Highveld Grassland and part of the Marikana Thornveld) with relatively high floristic richness values. In addition, the alternative pipeline route will also traverse a small sub-population of the near threatened *Searsia gracillima* var. *gracillima* corresponding to Rand Highveld Grassland. This species is also endemic in Gauteng. In addition, both the Rand Highveld Grassland and Marikana Thornveld habitat units are considered as threatened ecosystems (on a national level) while they also coincide with an "irreplaceable area" according to the Gauteng conservation Plan. Therefore, it is evident that the alternative pipeline alignment is located on habitat that is of high ecological sensitivity (c. Rand Highveld Grassland, semi-transformed Marikana Thornveld and riparian vegetation). Furthermore, a 600m buffer is recommended for any plant population that is near threatened and endemic to Gauteng. It must be noted that the preferred pipeline route is located outside the 600m buffer as recommended by the ecologist.

The impact on terrestrial ecology by the preferred pipeline alignment is expected to be of medium-low significance. Due to the location of the species of conservation concern on the alternative pipeline, it is expected that the alternative pipeline route will have an impact of high significance. Where proactive alien invasive plant species control and management is not implemented, this will lead to proliferation of alien invasive plant species, which will have an impact on both aquatic and terrestrial biodiversity. The impact will be localised since it may not be contained to the project site and will last for the duration of the construction phase.

It is expected that construction activities will be conducted during the dry months and this will likely result in an increase in nuisance dust. The impact will occur for the duration of the construction phase but will be localised.

Earth moving equipment and construction vehicles may potentially increase ambient noise levels. The duration of the impact will be throughout the construction phase while construction activities are underway. Once the construction activities conclude, the ambient noise levels will return to what it was prior to the construction activities.

Due to the nature of construction activities hydrocarbon spillages is likely to occur. This will result in the deterioration of the water quality and contamination of soils and changes to the instream biota. The impact may occur throughout the construction phase but will be of local importance since the water may not be contained to the immediate site. The impact will reduce the functionality of the receiving environment, but it will continue to function in a modified way. Thus, the impact will have a medium significance prior to the implementation of any mitigation measures. The implementation of mitigation measures will reduce the probability that an incident may occur, and should the necessary materials be available the impact will be contained to the immediate site.

The removal of the existing structures and movement of construction vehicles and personnel will result in the disturbance of the soil, which may result in the erosion of the riverbeds and banks. The erosion will result in an increase in suspended solids and the loss of soil. This impact will be localised but will have a high severity due to the loss of soils, which cannot be recovered without difficulty.

Vegetation material removed from the construction area will be stockpiled. Uncontrolled runoff from the stockpiles will result in erosion of the stockpiles.

Construction waste generation including the concrete and asbestos from the dismantled pipeline could result in an increase in general and hazardous waste to be managed and disposed of. This will have a high severity should it occur but will have a short duration limited to the construction phase.

The probability that proliferation of alien and weed species in any of the disturbed areas will lead to the altered vegetation communities within the terrestrial ecosystems is likely. Active rehabilitation will be required to address the impact and will continue throughout the medium term if rehabilitation during construction phase was not successful.

Inadequate sanitation and poor housekeeping during the construction phase could result in the contamination of the environment and downstream water resources. The impact will be for the duration of the construction phase. The lack of waste management will result in the deterioration of surface water, loss of instream habitat and an increase in general and hazardous waste to be managed. This will have a have high severity should it occur but will have a short duration.

Laydown areas will be provided for the construction equipment in agreement with the landowners and/or land occupiers. Surface water can be contaminated due to insufficient bunding of hydrocarbon fuels or provision of maintenance areas for the construction equipment. This impact will be for the duration of the construction phase.

The results from the quantification of the identified potential impacts associated with the construction of the proposed pipeline are summarised in Table 10-6.

Table 10-6: Summary of the potential impacts that can be expected during the construction phase (Preferred Option)

Activity	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Social-economic	Ineffective communication with affected property owners and property occupiers leading to conflict	2	2	2	2	2	24	Low (-)	• Random and regular alcohol and drug testing shall be conducted on all personnel responsible for operating machinery and driving construction vehicles to ensure the safety of the public. • Security and safety should be emphasized. • Liaise with the SAPD and existing forums in order to implement effective crime prevention strategies. • No construction workers shall be allowed to access private properties without the owner's knowledge and consent. • A register of complaints from the affected residents shall be kept on site and made available for inspection on request. • Where possible, a community liaison officer shall be appointed to deal with complaints from the affected residents. • Encourage the local employment for the following: ○ Employment opportunities for local SMME contractors during site clearance, preparation and construction. ○ Secondary service provision of food, toilet hires, and equipment. ○ Appointment of contractors as drivers, cleaners and security personnel.	1	1	3	1	2	15	Low (-)
	Construction activities may result in an increase in petty crimes in the area	2	2	2	2	2	24	Low (-)		2	1	2	2	2	20	Low (-)
	Unauthorised access to private property may result in conflict with the property owners and occupiers	2	2	2	2	2	24	Low (-)		2	1	2	2	2	20	Low (-)
	Poor housekeeping will result in the deterioration of water quality, increase in E coli resulting in potential health effects	3	2	2	2	3	35	Medium-Low (-)		1	1	3	1	2	15	Low (-)
	Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in E coli resulting in potential health effects	1	1	2	3	5	32	Medium-Low (-)		2	1	2	2	2	20	Low (-)
	Lack of or poor sanitation will result in the contamination of surface runoff	1	1	2	3	5	32	Medium-Low (-)		2	1	2	2	2	20	Low (-)
	Possible boost in short-term local small business opportunities.	1	1	2	3	5	32	Medium-Low (+)		1	1	2	3	5	32	Medium-Low (+)
	Generation of dust potentially resulting in a health and nuisance impact.	3	2	2	2	3	35	Medium-Low (-)		2	2	2	2	2	24	Low (-)
	Clearing of land which may potentially impact on the sense of place.	2	1	3	1	2	18	Low (-)		1	1	3	1	2	15	Low (-)
Groundwater	Local spillages of oils from construction vehicles and machinery leading to groundwater contamination.	2	2	2	2	2	24	Low (-)	• No washing of vehicles shall be allowed outside demarcated areas. Washing bays for vehicles and other equipment shall be provided with appropriate soak ways, will be clearly demarcated and will not be allowed to contaminate any surface runoff. • Sufficient areas shall be provided for the maintenance and washing of vehicles. • Refuelling of vehicles will only be allowed in designated areas. • All construction equipment shall be parked in a demarcated area Drip trays shall be used when equipment is used for some time. • On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. • Bunded areas shall contain 110% of the stored volume. • Bund areas must be impermeable. • Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, • Contaminated water shall be pumped into a container for removal by an approved service provider. • Regular inspections shall be carried out to ensure the integrity of the bund walls. • All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. • Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall	2	1	2	2	2	20	Low (-)
	Improper storage and handling of hazardous materials leading to groundwater contamination.	2	2	2	2	2	24	Medium-Low (-)		2	1	2	2	2	20	Low (-)

Activity	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
									be situated outside the 1:100-year flood lines of the Pienaars River. • Runoff from this area shall be contained. • Spill kits shall be made available, and all personnel shall be trained, and training records shall be made available on request.							
Surface Water Quality and Aquatic Ecosystems	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	3	3	3	3	2	45	Medium-High (-)	• Adequate stormwater management must be incorporated into the design of the project order to prevent erosion and the associated sedimentation of the river system. • Only essential construction personnel shall be permitted within the 1:100year floodlines. • All demarcated sensitive zones outside of the construction area shall be kept off limits during the construction phase. • Edge effects during construction and operation need to be strictly controlled. • The footprint area of the construction activities shall be limited to what is essential to minimise environmental damage. • During construction across the Pienaars River, erosion protection berms shall be installed to prevent gully formation. Berms every 50 m should be installed where the track has a slope of less than 2%, every 25 m where the track slopes between 2% and 10%, every 20 m where the track slopes between 10% and 15% and every 10 m where the track slope is greater than 15%. • Riparian areas shall be rehabilitated upon completion of the construction phase to ensure that the river system functions are re-instated, • Disturbed areas must be reseeded with indigenous grasses as specified by a suitably qualified specialist (ecologist). • Areas which are at risk of erosion shall be identified and relevant legislative approvals obtained for any activities to be undertaken within the river system to rectify excessive erosion. • Where possible, construction activities shall be restricted to the drier winter months, if possible, to avoid sedimentation of the river system. • Reprofiling of the banks of disturbed drainage areas to a maximum gradient of 1:3 to ensure bank stability must be conducted. • Sediment control measures must be put in please prior to commencement of construction activities. • The duration of impacts on the riparian areas must be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised (construction period must be kept as short as is possible). • All construction activities within the active channel should take place in the low flow period of winter.	2	2	2	2	2	24	Low (-)
	Disturbance of the area may release suspended solids into the river during the construction of the temporary earth berm	3	3	3	3	2	45	Medium-High (-)		2	2	2	2	2	24	Low (-)
	Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from construction vehicles and machinery.	3	2	2	2	2	28	Medium-Low (-)		2	2	2	1	2	18	Low (-)
	Deterioration of water quality due to the disposal of water that accumulated in the cofferdam.	3	3	2	3	2	40	Medium-High (-)		2	2	2	2	2	24	Low (-)
	Deterioration of water quality as a result of concrete that is poured in such a way that it will end up in the Spruit	3	3	2	3	2	40	Medium-High (-)		2	2	2	2	2	24	Low (-)
	Poor stormwater management leading to runoff from stockpiled material resulting in the erosion of the stockpiles causing sedimentation of the Pienaars River	2	3	2	2	2	28	Medium-Low (-)		2	2	2	2	2	24	Low (-)
	Diversion of the river resulting in the change in flow and an increase in sedimentation	3	3	2	3	2	40	Medium-High (-)		2	2	2	1	2	18	Low (-)
	Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	3	2	2	2	3	35	Medium-Low (-)		2	1	2	2	1	15	Low (-)
	Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality	3	3	3	3	2	45	Medium-High (-)		2	2	2	2	1	18	Low (-)
	Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	2	1	2	3	3	30	Medium-Low (-)		2	2	2	2	2	24	Low (-)

Activity	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
									• Construction areas must be reseeded with indigenous species as soon as the pipeline construction has been completed. • Sediment and erosion control measures must be maintained throughout the construction phase to minimise sedimentation downstream of the work areas.							
Aquatic and Riparian Ecosystems	Loss of localised riparian biodiversity habitats within sensitive areas due to site clearance.	3	2	2	2	2	28	Medium-Low (-)	• Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. • Indigenous vegetation shall be retained as much as is possible. • Where possible, rehabilitation cleared areas shall be undertaken in tandem with construction.	2	2	2	2	2	24	Low (-)
	Sedimentation of riparian resources leading to smothering of flora	3	2	2	2	2	28	Medium-Low (-)	• Ensure that sedimentation control devices are in place prior to commencement of construction. • Ensure that adequate stormwater control and management in incorporated into the detailed designs • Movement of construction vehicles, personnel and machinery in the riparian zones shall be kept to a minimum. • Adequate stormwater management must be incorporated into the design of the proposed remedial measures in order to prevent erosion and the associated sedimentation of the river system. • Only essential construction personnel shall be permitted within the floodlines. • All demarcated sensitive zones outside of the construction area shall be kept off limits during the construction phase. • Edge effects during construction and operation need to be strictly controlled. • The footprint area of the construction activities shall be limited to what is essential in order to minimise environmental damage.	2	2	2	2	2	24	Low (-)
	Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance	2	2	2	2	2	24	Low (-)	• All sites disturbed by construction activities shall be monitored for colonisation by exotic or invasive plants; • Exotic or invasive plants shall be controlled as they emerge; • An alien vegetation control program must be developed and implemented within the riparian and all disturbed areas. After removal of alien vegetation, the affected areas must be re-assessed to determine the success of the program and any follow up measures that may be required.; • The eradicated plant material must be disposed of at an approved solid waste disposal site; • During post-construction, an alien vegetation removal and monitoring plan must be compiled for those areas which were not effectively rehabilitated; • The extent of invasion must be established through investigation to identify priority areas; • Priority species shall be identified to control and develop protocols for the removal of all alien species	2	1	2	1	1	10	Low (-)
	Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	3	3	2	3	2	40	Medium-High (-)		2	2	2	2	2	24	Low (-)
	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	2	2	2	2	2	24	Medium-Low (-)		2	2	2	2	2	24	Low (-)
	Habitat fragmentation as a result of construction activities of the access roads leading to loss of floral diversity.	2	2	2	2	2	24	Medium-Low (-)		2	1	2	2	1	15	Low (-)

Activity	Nature **of potential impact/risk**	**Environmental Impact Significance Before Mitigation**							**Impact Management Actions (Proposed Mitigation Measures)**	**Environmental Impact Significance After Mitigation**						
		Consequence			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**		**Consequence**			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**
		Severity	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**				**Severity**	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**		
	Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping	2	2	2	2	2	24	Medium-Low (-)	e.g., mechanical removal, herbicidal treatment etc. Mechanical, methods must be favoured to chemical methods where possible for the removal of alien invasive species. Chemical removal shall only be undertaken by a suitably qualified and approved person; • All disturbed areas shall be re-vegetated with indigenous riparian species; and • As much vegetation growth as possible must be promoted in order to protect soils. In this regard, special mention is made of the need to use indigenous vegetation species where hydro seeding, rehabilitation planting (where applicable) is to be implemented. • Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. • Indigenous vegetation shall be retained as much as is possible. • No trapping or hunting of fauna is shall be permitted. • Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed. • Should any SCC be encountered within the study area, these species will be relocated to similar habitat within or in the vicinity of the study area with the assistance of a suitably qualified specialist. • No informal fires in the vicinity of construction areas shall be permitted. • An alien vegetation control plan must be developed and implemented in order to manage alien plant species occurring within the study area, and to prevent further faunal habitat loss.	2	1	2	2	1	15	Low (-)
	Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	2	2	2	2	2	24	Medium-Low (-)		2	1	2	2	1	15	Low (-)
Air Quality	Possible increase in dust generation, PM10 and PM2.5 as a result of bulk earthworks, operation of heavy machinery, and material movement.	2	2	2	2	2	24	Low (-)	• Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. • Appropriate dust suppression measures may include spraying with water. • Areas along the river where topsoil is to be removed for the construction of the gabions must be limited to the immediate footprint required and only when construction work is to take place immediately. • Where practical possibly rehabilitation should be undertaken progressively. • Dust from the construction activities shall not disturb the landowners in the area. • A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. • All construction equipment must be scheduled for preventative maintenance to limit air pollution.	2	1	2	1	1	10	Low (-)
	Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.	2	2	2	2	2	24	Low (-)	• The number of construction vehicles and trips shall be kept to a minimum • All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency and minimise emissions. • Mitigation measures must be implemented to reduce dust levels from the entrainment of dust. These measures will range from watering of roads,	2	1	2	1	1	10	Low (-)

Activity	Nature **of potential impact/risk**	**Environmental Impact Significance Before Mitigation**							**Impact Management Actions (Proposed Mitigation Measures)**	**Environmental Impact Significance After Mitigation**						
		Consequence			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**		**Consequence**			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**
		Severity	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**				**Severity**	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**		
									application of a chemical dust suppressant and/or paving of roads. • A speed limit of 40 km/h shall apply to limit vehicle entrained dust from the unpaved roads. • All construction equipment must be scheduled for preventative maintenance to ensure the functioning of the exhaust systems to reduce excessive emissions and limit air pollution. • Chemical toilets must be emptied / serviced on a regular basis. Proof of this must be kept on file.							
Climate change	Emissions of Green House Gases as a result of the use of construction vehicles and machinery.	2	1	2	2	1	15	Low (-)	• All the construction vehicles shall undergo maintenance on a regular basis to ensure the combustion engine vehicle efficiency.	2	1	2	1	1	10	Low (-)
Visual	Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	2	1	2	2	1	15	Low (-)	• The number of construction vehicles and machinery to be used shall be kept to a minimum. • Movement of vehicles shall be kept to outside busy hours to minimise the visual impacts on the residents. • Where possible, rehabilitation of the work areas shall be undertaken in tandem with construction to ensure that areas stripped of vegetation are kept to a minimum. • The landscaping and green engineering solutions shall be utilised for rehabilitation and to minimise visual impacts.	2	1	2	1	1	10	Low (-)
	Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	2	1	2	2	1	15	Low (-)	• Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. • Appropriate dust suppression measures may include spraying with water. • Areas along the river where topsoil is to be removed for the construction of the gabions must be limited to the immediate footprint required and only when construction work is to take place immediately. • Where practical possibly rehabilitation should be undertaken progressively. • Dust from the construction activities shall not disturb the landowners in the area. • A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. • All construction equipment must be scheduled for preventative maintenance to limit air pollution.	2	1	2	1	1	10	Low (-)
Heritage Resources	Although no additional resources of cultural and/or heritage importance are known to be affected by the project, a possibility remains that there may be some additional resources may be discovered.	2	1	2	2	1	15	Low (-)	• Contractors and personnel involved in clearing and earthworks should be required to participate in training and awareness programs to ensure that they are aware of work stoppage and reporting procedures should archaeological sites or graves be exposed during development activities. • All employees and contractors are required to stop work and report any additional heritage or archaeological site discovered in the vicinity of the construction activity, to a heritage practitioner so that an investigation and evaluation of the findings can be made. No heritage artefacts or graves may be destroyed or moved without the necessary permits.	2	1	2	1	1	10	Low (-)
Palaeontology Resources	Site clearance and laying of the plant foundation has potential to impact on Palaeontology resources.	2	1	2	2	1	15	Low (-)		2	1	2	1	1	10	Low (-)
Flora	Loss of vegetation species including vegetation species of conservational concern due to site clearance.	3	2	2	2	3	35	Medium-Low (-)	**Development footprint** • Vegetation clearance shall be kept to a minimum and	2	2	2	2	1	18	Low (-)

Activity	Nature **of potential impact/risk**	**Environmental Impact Significance Before Mitigation**							**Impact Management Actions (Proposed Mitigation Measures)**	**Environmental Impact Significance After Mitigation**						
		Consequence			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**		**Consequence**			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**
		Severity	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**				**Severity**	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**		
	Direct loss of habitat and indirect loss of habitat quality.	3	2	2	2	3	35	Medium-Low (-)	all activities must be contained within the construction footprint to minimise disturbance outside these areas. • Vehicles must be restricted to travelling on designated access roads to limit the ecological footprint of the proposed activity. **Weed Control and Management** • Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation. • Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used. • Removal of species should take place throughout the construction and operational phases. **Rehabilitation** • All disturbed habitat areas outside the construction footprint area must be rehabilitated as soon as possible to ensure that floral ecology is re-instated. • Reseeding with indigenous grasses should be implemented. **Fires** • Only controlled fires in designated areas must be allowed during all development phases. **Floral** • Sensitive floral species, if encountered, must be rescued and relocated. The following should be ensured: • If any threatened species, or nationally or provincially protected floral will be disturbed, ensure effective relocation of individuals to suitable similar habitat. • All rescue and relocation plans should be overseen by a suitably qualified specialist.	2	2	2	2	1	18	Low (-)
	Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	3	3	2	2	2	32	Medium-Low (-)		2	2	2	2	2	24	Low (-)
Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	2	3	2	2	2	28	Medium-Low (-)	• The proposed development footprint areas should remain as small as possible. • No trapping or hunting of fauna is to take place. • Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed in disturbed areas. • Should any SCC be noted within the study area, these species should be relocated to similar habitat within or in the vicinity of the study area with the assistance of a suitably qualified specialist. • All informal fires in the vicinity of construction areas should be prohibited. • It is recommended that a speed limit of 40km/h is implemented on all roads running through the study area during the construction phase in order to minimise risk to fauna from vehicles.	2	2	2	2	2	24	Low (-)
	Habitat fragmentation as a result of construction activities leading to loss of floral diversity.	3	3	2	2	2	32	Medium-Low (-)		2	2	2	2	2	24	Low (-)
	Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping.	3	2	2	2	2	28	Medium-Low (-)		3	2	2	2	1	21	Low (-)
	Direct loss of faunal species of conservational concern.	2	2	2	2	2	24	Low (-)		2	2	2	2	1	18	Low (-)
	Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	2	2	2	2	2	24	Low (-)		2	2	2	2	1	18	Low (-)

Activity	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Noise	The use of vehicles and machinery during the construction phase may generate nuisance noise in the immediate vicinity	2	2	2	2	2	24	Low (-)	• Correct personal Protective Equipment (PPE) must be worn at all times by the personnel on the construction site. • Establish noise abatement measures for construction vehicles and activities. • All equipment should be provided with standard mufflers. Muffling units on vehicles and equipment must be kept in good working order. • Construction staff should wear ear protection equipment where necessary. • All equipment must be kept in good working order, with immediate attention being paid to defective silencers, slipping fan-belts, worn bearings and other sources of noise. • Noise/vibration producing activities shall be limited to daylight hours (Monday to Friday 07H00 to 16H00 and Saturday 07H00 -14H00). • The contractor (s) shall comply with the traffic regulations. • Equipment must be operated within specifications and capacity (e.g., no overloading of machines). • Regular maintenance of equipment must be undertaken. • Equipment shall be switched off when not in operation. • Appropriate directional and intensity settings must be maintained on all hooters and sirens.	2	1	2	2	2	20	Low (-)
Soils, land use and land capability	Localised chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	3	2	2	2	2	28	Medium-Low (-)	• On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. • Bunded areas shall contain 110% of the stored volume. • Bund areas must be impermeable. • Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, • Contaminated water shall be pumped into a container for removal by an approved service provider. • Regular inspections shall be carried out to ensure the integrity of the bund walls. • All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. • Emergency areas shall be demarcated and protected with an impermeable surface. • The emergency area shall be situated outside the 1:100 year flood lines. • Runoff from this area shall be contained. • Spill kits shall be made available, and all personnel shall be trained and training records shall be made available on request.	2	2	2	2	1	18	Low (-)
	Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	2	2	2	2	1	18	Low (-)	• Vegetation removal to be kept to a minimum and preferably only alien floral species to be removed. Retain as much indigenous vegetation as possible. • Exposed soils to be protected by means of a suitable geotextile covering such as hessian sheeting. • Where possible, the rehabilitation of the work areas shall be undertaken in tandem with construction to minimize the amount of time soils are left exposed to weather elements.	1	2	2	2	1	15	Low (-)

Activity	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion on roads around the project area increasing the chances of road accidents.	3	3	2	2	2	32	Medium-Low (-)	• Local speed limits and traffic laws shall apply at all times to minimise the occurrences of accidents on public roads; • Where possible the transportation of construction materials and rubbish shall be undertaken outside traffic peak hours to minimise inconveniencing residents; • Materials transported on public roads must be covered.	2	2	2	2	2	24	Low (-)
Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	3	3	2	2	2	32	Medium-Low (-)	**Separation of waste** • All waste shall be separated into general waste and hazardous waste. • Hazardous waste shall not be mixed with general waste increasing the quantities of hazardous waste to be managed. • General waste can further be separated in waste that can be recycled and/or reused. • No littering shall be allowed in and around the site, enough bins shall be provided for the disposal of waste. • Where necessary dedicate a storage area on site for collection of construction waste. **Storage of waste** • General waste will be collected in an adequate number of litter bins located throughout the construction site. • Bins must have lids to keep rainwater out. • Bins shall be emptied regularly to prevent the bins from overflowing. • All work areas shall be always kept clean and tidy. • All waste management facilities will be maintained in good working order. • Waste shall be stored in demarcated areas according to type of waste. • Runoff from any area demarcated for waste will be contained and managed. • Flammable substances must be kept away from sources of ignition and from oxidizing agents. • No builder's rubble shall be disposed of to the riparian area. • If builder's rubble is not removed immediately it shall be stockpiled outside the 1:50 year floodline and outside the sensitive riparian areas. • Demolition waste and surplus concrete shall be disposed of responsibly. • Waste shall not be buried or burned on site. **Disposal of hazardous waste** • No dumping shall be allowed in or near the construction site. • Hazardous containers shall be disposed of at an appropriate licensed site. • Hazardous waste will be removed and managed by an approved service provider. • A safe disposal certificate will be provided by the approved service provider as proof of responsible disposal of hazardous waste. • The safe disposal certificates shall be stored and	2	2	2	2	2	24	Low (-)
	Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	3	3	2	2	2	32	Medium-Low (-)		2	2	2	2	2	24	Low (-)
	Stockpiling material resulting in secondary pollution and contamination of the Pienaars Rivers.	3	3	2	2	2	32	Medium-Low (-)		2	2	2	2	1	18	Low (-)

Activity	Nature **of potential impact/risk**	**Environmental Impact Significance Before Mitigation**							**Impact Management Actions (Proposed Mitigation Measures)**	**Environmental Impact Significance After Mitigation**						
		Consequence			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**		**Consequence**			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**
		Severity	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**				**Severity**	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**		
									provided on request. **Disposal of general waste** • No dumping shall take place in or near the construction site. • All general waste shall be disposed of to a licensed landfill site. • Demolition waste and builder's rubble shall be disposed of to an appropriate licensed landfill site.							

Table 10-7: Summary of the potential impacts that can be expected during the construction phase (Alternative Option)

Activity	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Social-economic	Ineffective communication with affected property owners and property occupiers leading to conflict	Same as for Preferred Alternative														
	Construction activities may result in an increase in petty crimes in the area															
	Unauthorised access to private property may result in conflict with the property owners and occupiers															
	Poor housekeeping will result in the deterioration of water quality, increase in E coli resulting in potential health effects															
	Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in E coli resulting in potential health effects															
	Lack of or poor sanitation will result in the contamination of surface runoff															
	Possible boost in short-term local small business opportunities.															
	Generation of dust potentially resulting in a health and nuisance impact.															
	Clearing of land which may potentially impact on the sense of place.															
Groundwater	Local spillages of oils from construction vehicles and machinery leading to groundwater contamination.	Same as for Preferred Alternative														
	Improper storage and handling of hazardous materials leading to groundwater contamination.															
Surface Water Quality and Aquatic Ecosystems	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	Same as for Preferred Alternative														
	Disturbance of the area may release suspended solids into the river during the construction of the temporary earth berm															
	Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from construction vehicles and machinery.															
	Deterioration of water quality due to the disposal of water that accumulated in the cofferdam.															
	Deterioration of water quality as a result of concrete that is poured in such a way that it will end up in the Spruit															

Activity	Nature **of potential impact/risk**	**Environmental Impact Significance Before Mitigation**							**Impact Management Actions (Proposed Mitigation Measures)**	**Environmental Impact Significance After Mitigation**						
		Consequence			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**		**Consequence**			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**
		Severity	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**				**Severity**	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**		
	Poor stormwater management leading to runoff from stockpiled material resulting in the erosion of the stockpiles causing sedimentation of the Pienaars River															
	Diversion of the river resulting in the change in flow and an increase in sedimentation															
	Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.															
	Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality															
	Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.															
Aquatic and Riparian Ecosystems	Loss of localised riparian biodiversity habitats within sensitive areas due to site clearance.	Same as for Preferred Alternative														
	Sedimentation of riparian resources leading to smothering of flora															
	Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance															
	Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.															
	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.															
	Habitat fragmentation as a result of construction activities of the access roads leading to loss of floral diversity.															
	Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping															

Activity	Nature **of potential impact/risk**	**Environmental Impact Significance Before Mitigation**							**Impact Management Actions (Proposed Mitigation Measures)**	**Environmental Impact Significance After Mitigation**						
		Consequence			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**		**Consequence**			**Probability**		**Significance (Degree to which impact may cause irreplaceable loss of resources/damage)**	**Significance Rating**
		Severity	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**				**Severity**	**Spatial**	**Duration**	**Frequency: Activity**	**Frequency: Impact**		
	Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.															
Air Quality	Possible increase in dust generation, PM10 and PM2.5 as a result of bulk earthworks, operation of heavy machinery, and material movement.	Same as for Preferred Alternative														
	Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.															
Climate change	Emissions of Green House Gases as a result of the use of construction vehicles and machinery.	Same as for Preferred Alternative														
Visual	Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	Same as for Preferred Alternative														
	Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.															
Heritage Resources	A heritage site was identified 20 m of the west of the alternative pipeline route. Although no graves are known to be affected by the project, a possibility remains that there may be some additional resources may be discovered.	2	2	2	2	2	24	Low (-)	• Given that the project is an upgrade of an existing subterranean pipeline, the prospect of discovering new graves during construction remains low. • There is a heritage site located approximately 20 m West of the alternative pipeline route which although considered to be of low significance must not be affected without a permit from SAHRA. • Mitigation measures (avoidance, site management, site monitoring / grave relocation) must be implemented if any burials are encountered. • Contractors and personnel involved in clearing and earthworks should be required to participate in training and awareness programs to ensure that they are aware of work stoppage and reporting procedures should archaeological sites or graves be exposed during development activities. • All employees and contractors are required to stop work and report any additional heritage or archaeological site discovered in the vicinity of the construction activity, to a heritage practitioner so that an investigation and evaluation of the findings can be made. No heritage artefacts or graves may be destroyed or moved without the necessary permits.	2	2	2	2	1	18	Low (-)
Palaeontology Resources	Site clearance and laying of the plant foundation has potential to impact on Palaeontology resources.	2	1	2	2	1	15	Low (-)		2	1	2	1	1	10	Low (-)
Flora	Loss of vegetation species including vegetation species of conservational concern due to site clearance.	5	4	4	3	3	78	High (-)		5	4	4	3	3	78	High (-)
	Direct loss of habitat and indirect loss of habitat quality.	3	2	2	2	3	35	Medium-Low (-)	• Mitigation is not possible or likely to be ineffective. Protected plants (apart from Protea caffra) can be rescued with the relevant permits. • The only feasible mitigation option is to avoid the near threatened population by re-alignment of the pipeline.	3	2	2	2	3	35	Medium-Low (-)
	Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	3	3	2	2	2	32	Medium-Low (-)		3	3	2	2	2	32	Medium-Low (-)

Activity	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	2	3	2	2	2	28	Medium-Low (-)	• The proposed development footprint areas should remain as small as possible. • No trapping or hunting of fauna is to take place. • Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed in disturbed areas. • Should any SCC be noted within the study area, these species should be relocated to similar habitat within or in the vicinity of the study area with the assistance of a suitably qualified specialist. • All informal fires in the vicinity of construction areas should be prohibited. • It is recommended that a speed limit of 40km/h is implemented on all roads running through the study area during the construction phase in order to minimise risk to fauna from vehicles.	2	3	2	2	2	28	Medium-Low (-)
	Habitat fragmentation as a result of construction activities leading to loss of floral diversity.	3	3	2	2	2	32	Medium-Low (-)		3	3	2	2	2	32	Medium-Low (-)
	Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping.	3	2	2	2	2	28	Medium-Low (-)		3	2	2	2	2	28	Medium-Low (-)
	Direct loss of faunal species of conservational concern.	2	3	2	2	2	28	Medium-Low (-)		2	3	2	2	2	28	Medium-Low (-)
	Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	3	3	2	2	2	32	Medium-Low (-)		3	3	2	2	2	32	Medium-Low (-)
Noise	The use of vehicles and machinery during the construction phase may generate nuisance noise in the immediate vicinity	Same as for Preferred Alternative														
Soils, land use and land capability	Localised chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	Same as for Preferred Alternative														
	Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.															
Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion on roads around the project area increasing the chances of road accidents.	Same as for Preferred Alternative														
Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Same as for Preferred Alternative														
	Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.															
	Stockpiling material resulting in secondary pollution and contamination of the Pienaars Rivers.															

10.5.3 Operational Phase

The operational phase of the project may result in the following potential impacts:

- Continued loss of biodiversity and SCC;
- Contamination of water resources as a result of leakage from the pipeline; and
- Continuous introduction and proliferation of alien invasive plant species and further transformation of natural habitat.

If disturbed areas are not properly rehabilitated, then they will result in the proliferation of alien and invasive species in the disturbed areas, which will result in continued loss of floral SCC. Ongoing disturbances of soils during maintenance will result in alteration of vegetation community structures. This impact will be of low significance that can be mitigated to an impact with a very low significance.

Any leakages from the pipeline will result in seepage into the soil and groundwater as well as surface water resources.

The ineffective rehabilitation of the area disturbed by the pipeline will likely result in the transformation of aquatic habitat and biota due to erosion and sedimentation of the Pienaars River, leading to reduced ability to support aquatic vegetation and faunal species occurring within the system. The transformation of the habitat will result in the loss of biodiversity and the inability to support aquatic biodiversity. This impact will have a low severity and will be contained to the project site until such time that the rehabilitation is undertaken and is sustainable.

The impacts that may result as a result of activities during the operation phase are summarised in Table 10-8.

Table 10-8: Summary of the potential impacts that can be expected during the operational phase for the preferred option

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Mitigation Measures	Environmental Impact Significance After Mitigation						Significance Rating
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Social	Potential leakage of sewage water may result in nuisance odor and flies which may result in conflict with communities around the project area.	3	2	2	2	2	28	Medium-Low (-)	• The pipeline must be regularly maintained to ensure that their integrity has not be compromised • Should any leakage occur, it must be attended to as soon as possible to minimise the exposure of communities to leaking wastewater and associated vermin and odours	2	1	1	1	1	8	Low (-)
Groundwater	Seepage of contaminated water from the use of vehicles to access structure during inspection and maintenance processes, which may result in the spillages of hydrocarbon liquids from the vehicles and machinery.	2	2	2	2	2	24	Low (-)	• No washing of vehicles shall be allowed outside demarcated areas. Washing bays for vehicles and other equipment shall be provided with appropriate soak ways, will be clearly demarcated and will not be allowed to contaminate any surface runoff. • Sufficient areas shall be provided for the maintenance and washing of vehicles. • Refuelling of vehicles will only be allowed in designated areas. • All equipment shall be parked in a demarcated area Drip trays shall be used when equipment is used for some time. • On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. • Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be situated outside the 1:100-year flood lines of the Pienaars River. • Runoff from this area shall be contained. • Spill kits shall be made available, and all personnel shall be trained, and training records shall be made available on request. • The pipeline must be regularly maintained to ensure that their integrity has not be compromised	2	1	1	1	1	8	Low (-)
	*Potential leakage of sewage water may result in percolation of contaminated water into the groundwater regime.	3	3	2	3	2	40	Medium-High (-)		2	2	2	2	2	24	Low (-)
Surface Water	Erosion of the riverbeds and banks may result in siltation of the Pienaars River	2	1	1	1	2	12	Low (-)	• Adequate stormwater management must be incorporated into the design of the project order to prevent erosion and the associated sedimentation of the river system. • Only essential personnel shall be permitted within the 1:100year floodlines. • Edge effects during construction and operation need to be strictly controlled. • The pipeline must be regularly maintained to ensure that their integrity has not be compromised • Areas which are at risk of erosion shall be identified and areas prone to excessive erosion must be protected	2	1	1	1	1	8	Low (-)
	*Potential leakage of sewage water into the Pienaars River and associated riparian habitat thus resulting in altered water quality and alteration of the natural hydrological regime of the Pienaars River;	3	3	2	3	2	40	Medium-High (-)		2	2	2	2	2	24	Low (-)
Aquatic Ecology	Stream diversion to allow for inspection and/or maintenance and repairs may result in a temporarily altered flow regime leading to possible loss of recharge to downstream areas impacting on downstream biota	3	2	2	2	2	28	Medium-Low (-)	• Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. • Edge effects during construction and operation need to be strictly controlled. • Movement of construction vehicles, personnel and machinery in the riparian zones shall be kept to a minimum. • Adequate stormwater management must be incorporated into the design of the proposed remedial measures in order to prevent erosion and the associated sedimentation of the river system. • Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. • The pipeline must be regularly maintained to ensure that their integrity has not be compromised	2	2	1	1	1	10	Low (-)
	Diversion of the stream during the operation phase may result in a temporary altered flow regime, leading to loss of recharge to downstream users, impacting on downstream biota.	3	2	2	2	3	35	Medium-Low (-)		2	2	1	1	1	10	Low (-)
	Possible incision/erosion in the vicinity of the diversion because of temporary formation of a concentrated flow path	3	2	2	2	3	35	Medium-Low (-)		2	2	1	1	1	10	Low (-)
	*Potential leakage of the proposed Baviaanspoort pipeline and discharge of sewage into the Pienaars River and associated riparian zone because of maintenance activities;	3	3	2	3	2	40	Medium-High (-)		2	2	2	2	2	24	Low (-)
	Possible contamination of riparian soils and surface water leading to further reduced ability to support biodiversity.	2	2	2	2	2	24	Low (-)		2	2	1	1	1	10	Low (-)

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Mitigation Measures	Environmental Impact Significance After Mitigation						Significance Rating
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Flora	Disturbances to or removal of vegetation whilst accessing infrastructure to carry out maintenance activities may result in potential loss to indigenous vegetation and further proliferation of alien floral species.	2	1	1	1	1	8	Low (-)	• Maintenance vehicles shall be restricted to travelling only on designated roadways to limit the ecological footprint of the operational activities. • An alien vegetation control plan shall be implemented in order to manage alien plant species occurring within the study area, and to prevent further habitat loss of faunal species. • Monitoring of relocation success shall continue into the operational phase. • Ensure that maintenance related activities are kept strictly within the development footprint. • Restrict maintenance vehicles to travelling only on designated roadways to limit the ecological footprint of the proposed development activities. • The pipeline must be regularly maintained to ensure that their integrity has not be compromised	2	1	1	1	1	8	Low (-)
	Continued introduction and proliferation of alien invasive plant species and further transformation of natural habitat.	2	2	1	1	2	15	Low (-)		2	2	1	1	1	10	Low (-)
	Continued loss of biodiversity and SCC	2	2	1	1	2	15	Low (-)		2	2	1	1	1	10	Low (-)
Fauna	Loss of faunal species because of collisions with maintenance vehicles	2	2	1	1	2	15	Low (-)	• No trapping or hunting of fauna is to take place. • Edge effects of all operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed in disturbed areas. • All informal fires should be prohibited. • It is recommended that a speed limit of 40km/h is implemented on all roads running through the study area r to minimise risk to fauna from vehicles.	2	2	1	1	1	10	Low (-)
	Loss of faunal habitat and ecological structure because of vegetation removal whilst accessing infrastructure for maintenance purposes	2	1	1	1	2	12	Low (-)		2	1	1	1	1	8	Low (-)
Noise	The use of vehicles and machinery during maintenance and/repair may generate noise in the immediate vicinity	2	1	1	1	2	12	Low (-)	• Correct personal Protective Equipment (PPE) must be worn at all times by the personnel on the site. • Establish noise abatement measures for vehicles and activities. • All equipment should be provided with standard mufflers. Muffling units on vehicles and equipment must be kept in good working order. • All equipment must be kept in good working order, with immediate attention being paid to defective silencers, slipping fan-belts, worn bearings and other sources of noise. • Noise/vibration producing activities shall be limited to daylight hours (Monday to Friday 07H00 to 16H00 and Saturday 07H00 -14H00). • The contractor (s) shall comply with the traffic regulations. • Equipment must be operated within specifications and capacity (e.g., no overloading of machines). • Regular maintenance of equipment must be undertaken. • Equipment shall be switched off when not in operation. • Appropriate directional and intensity settings must be maintained on all hooters and sirens.	2	1	1	1	1	8	Low (-)
Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	2	2	2	1	2	18	Low (-)	**Separation of waste** • All waste shall be separated into general waste and hazardous waste. • Hazardous waste shall not be mixed with general waste increasing the quantities of hazardous waste to be managed. • General waste can further be separated in waste that can be recycled and/or reused. • No littering shall be allowed in and around the site, enough bins shall be provided for the disposal of waste. • Where necessary dedicate a storage area on site for collection of construction waste. **Storage of waste** • General waste will be collected in an adequate number of litter bins located throughout the construction site. • Bins must have lids to keep rainwater out. • Bins shall be emptied regularly to prevent the bins from overflowing. • All work areas shall be always kept clean and tidy. • All waste management facilities will be maintained in good working order. • Waste shall be stored in demarcated areas according to type of waste. • Runoff from any area demarcated for waste will be contained and managed. • Flammable substances must be kept away from sources of ignition and from oxidizing agents.	2	2	1	1	1	10	Low (-)
	Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	2	2	2	1	2	18	Low (-)		2	2	1	1	1	10	Low (-)
	Stockpiling material resulting in secondary pollution and contamination of the river	2	2	2	1	2	18	Low (-)		2	2	1	1	1	10	Low (-)

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Mitigation Measures	Environmental Impact Significance After Mitigation						Significance Rating
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
									• No builder's rubble shall be disposed of to the riparian area. • If builder's rubble is not removed immediately it shall be stockpiled outside the 1:50 year floodline and outside the sensitive riparian areas. • Demolition waste and surplus concrete shall be disposed of responsibly. • Waste shall not be buried or burned on site. **Disposal of hazardous waste** • No dumping shall be allowed in or near the construction site. • Hazardous containers shall be disposed of at an appropriate licensed site. • Hazardous waste will be removed and managed by an approved service provider. • A safe disposal certificate will be provided by the approved service provider as proof of responsible disposal of hazardous waste. • The safe disposal certificates shall be stored and provided on request. **Disposal of general waste** • No dumping shall take place in or near the construction site. • All general waste shall be disposed of to a licensed landfill site. Demolition waste and builder's rubble shall be disposed of to an appropriate licensed landfill site.							

Table 10-9: Summary of the potential impacts that can be expected during the operational phase for the Alternative Option

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Mitigation Measures	Environmental Impact Significance After Mitigation						Significance Rating
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact		
Social	Potential leakage of sewage water may result in nuisance odor and flies which may result in conflict with communities around the project area.	Same as for the Preferred Alternative														
Groundwater	Seepage of contaminated water from the use of vehicles to access structure during inspection and maintenance processes, which may result in the spillages of hydrocarbon liquids from the vehicles and machinery.	Same as for the Preferred Alternative														
	*Potential leakage of sewage water may result in percolation of contaminated water into the groundwater regime.															
Surface Water	Erosion of the riverbeds and banks may result in siltation of the Pienaars River	Same as for the Preferred Alternative														
	*Potential leakage of sewage water into the Pienaars River and associated riparian habitat thus resulting in altered water quality and alteration of the natural hydrological regime of the Pienaars River;															
Aquatic Ecology	Stream diversion to allow for inspection and/or maintenance and repairs may result in a temporarily altered flow regime leading to possible loss of recharge to downstream areas impacting on downstream biota	Same as for the Preferred Alternative														
	Diversion of the stream during the operation phase may result in a temporary altered flow regime, leading to loss of recharge to downstream users, impacting on downstream biota.															
	Possible incision/erosion in the vicinity of the diversion because of temporary formation of a concentrated flow path															
	*Potential leakage of the proposed Baviaanspoort pipeline and discharge of sewage into the Pienaars River and associated riparian zone because of maintenance activities;															
	Possible contamination of riparian soils and surface water leading to further reduced ability to support biodiversity.															
Flora	Disturbances to or removal of vegetation whilst accessing infrastructure to carry out maintenance activities may result in potential loss to indigenous vegetation and further proliferation of alien floral species.	2	2	1	1	2	15	Low (-)	• Maintenance vehicles shall be restricted to travelling only on designated roadways to limit the ecological footprint of the operational activities. • An alien vegetation control plan shall be implemented in order to manage alien plant species occurring within the study area, and to prevent further habitat loss of faunal species. • Monitoring of relocation success shall continue into the operational phase. • Ensure that maintenance related activities are kept strictly within the development footprint. • Restrict maintenance vehicles to travelling only on designated roadways to limit the ecological footprint of the proposed development activities. • The pipeline must be regularly maintained to ensure that their integrity has not be compromised	2	1	1	1	1	8	Low (-)
	Continued introduction and proliferation of alien invasive plant species and further transformation of natural habitat.	2	2	1	1	2	15	Low (-)		2	1	1	1	1	8	Low (-)
	Continued loss of biodiversity and SCC	3	2	2	2	2	28	Medium-Low (-)		2	2	1	1	2	15	Low (-)
Fauna	Loss of faunal species because of collisions with maintenance vehicles															

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Mitigation Measures	Environmental Impact Significance After Mitigation							Significance Rating
		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)	Significance Rating		Consequence			Probability		Significance (Degree to which impact may cause irreplaceable loss of resources/damage)		
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact			
	Loss of faunal habitat and ecological structure because of vegetation removal whilst accessing infrastructure for maintenance purposes																
Noise	The use of vehicles and machinery during maintenance and/repair may generate noise in the immediate vicinity	Same as for the Preferred Alternative															
Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Same as for the Preferred Alternative															
	Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse																
	Stockpiling material resulting in secondary pollution and contamination of the river																

10.5.4 Decommissioning and Closure Phase

At this point of the project planning process, the necessity for and timing of the decommissioning of the proposed project is unknown. Like construction phase impacts, decommissioning impacts are inherently temporary in duration. The DEFF will be appropriately notified and consulted prior to decommissioning taking place. An application in terms of the prevailing EIA Regulations at the time when decommissioning will be required for the relevant Environmental Authorisation will be lodged if applicable.

Although the impacts during the decommissioning phase are expected to be the same as for the constructionn phase, the significance of the impacts is expected to be lower than for the construction phase.

10.5.5 Cumulative Impacts

Incomparable activities can result in a number of complex effects on the natural biophysical and social environment. These impacts are mainly identified as direct and immediate effects on the environment by a single entity affecting a variable of the environment. These direct impacts have the potential to combine and interact with other activities, depending on the surrounding environmental state and land use. These impacts may aggregate or interact with other impacts to cause additional effects, not easily quantified when assessing an individual entity.

The NEMA, 2014, specifically requires that cumulative impacts be assessed. This section provides a description and analysis of the potential cumulative effects of the proposed cement-ash mixing plant, and past and present projects hereby considering the effects of any changes on the:

- Biophysical; and
- Socio – Economic conditions.

For the analysis of cumulative effects to be utilised as a useful tool for decision makers and stakeholders, it must be limited to the effects that can be meaningfully evaluated, rather that expanding on resources or receptors that are no longer affected by the development or are not of interest to the stakeholders. Two important aspects require consideration prior to the evaluation of cumulative effects:

- The determination of appropriate spatial and temporal boundaries for evaluation of cumulative effects of the project; and
- The evaluation of relevant projects for consideration in the cumulative effects analysis.

Spatial and temporal boundaries for analysis of cumulative effects are dependent on a number of factors, including:

- The size and nature of the project and its potential effects;
- The size, nature and location of past and (known) future projects and activities in the area,
- The aspect of the environment impacted by the cumulative effect; and
- The period of occurrence of effects.

The spatial extent of the cumulative impact analysis is generally aligned with the zone of influence of the project and other projects in the vicinity. Most impact will be localised; however, others may be experienced on a regional scale. This is taken into consideration during the assessment of cumulative impacts.

Hydrological and Surface Water Impacts

The potential groundwater and surface water quality impact associated with the pipeline relates to the potential contamination as a result of mismanagement of materials stored and leakages from vehicles

and machinery and potential for leakage of wastewater from the pipeline. Mitigation measures have been proposed for the impacts on ground water and surface water contamination. It is expected that with the implementation of the mitigation measures this impact will be reduced to an acceptable level. The construction and operation of the pipeline's contribution to cumulative impact will be negligible.

Air Quality Impacts

The potential air quality impacts associated with the pipeline relate to the potential generation of $PM_{2.5}$, PM_{10} and fugitive dust emissions as a result of site clearance, vehicular movements, and the material (cement and ash mixture) plant exposed to wind erosion and dust generation during operation.

Mitigation measures have been proposed to mitigate these adverse impacts. It is expected that the implementation of these mitigation measures will reduce this impact to an acceptable standard.

Mismanagement of dust generation sources may lead to an increase in air quality contamination in the atmosphere surrounding the pipeline, but the cumulative impact will be negligible.

Noise Impacts

The potential noise nuisance associated with the pipeline relates to the movement of vehicles and operation of machinery on site. Mitigation measures have been proposed to avoid and/or reduce the nuisance noise impacts. It is expected that with the implementation of the mitigation measures this impact will be reduced to an acceptable level. It is not anticipated that the pipeline project will have a negative impact on the cumulative impact in the area.

Biodiversity

The potential impacts on biodiversity associated with the pipeline and alternative pipeline route relate to the clearance of the construction footprint and proliferation of alien invasive plant species, which will result in further loss of habitat and species of conservation concern. The biodiversity assessment found that although the project area is characterised by disturbed areas, the pipeline alternative route will impact on Rand Highveld Grassland and part of the Marikana Thornveld with relatively high floristic richness values and considered to be threatened ecosystems. The pipeline alternative route will also traverse a small sub-population of the near threatened *Searsia gracillima* var. *gracillima* which is also endemic in Gauteng. The pipeline alternative will therefore contribute to the cumulative loss of SCC (*Searsia gracillima* var. *gracillima).*

The implementation of the preferred route will avoid areas with *Searsia gracillima* var. *gracillima* (outside the recommended 600m buffer). It is therefore not anticipated that the preferred pipeline project will have a negative impact on the cumulative impact in the area.

11 Assumptions, uncertainties and gaps in knowledge

SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data.

Opinions presented in this report apply to the information about the site and the project as it existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

All the data and information supplied to SRK is assumed to be accurate and reflective of the current condition of the affected area. It is assumed that the baseline information scrutinised and used to explain the environmental profile is accurate.

DPW will comply with all legislation pertaining to the activities of this proposed project and that all permits and licenses that may be required will be identified and applied for prior to commencement of construction activities.

The public involvement process has been sufficiently effective in identifying the critical issues needing to be addressed in the BAR and EMPr by the EAP. The public involvement process has sought to involve key stakeholders and individual landowners.

Wherever possible the information requested, and comments raised by I&APs during the EIA has been sufficiently addressed and incorporated into the BAR and EMPr that will be submitted to the DEFF for decision making.

SRK assumes that DPW will implement the measures contained in the EMPr and will adhere to any monitoring procedures. A monitoring and evaluation system, including auditing, will be established and operationalized to track the implementation of the EMPr ensuring that management measures are effective to avoid, minimize and mitigate impacts and that corrective action is being undertaken to address shortcomings and / or non-conformances.

The following assumptions and limitation apply to the different specialist studies that were conducted for the proposed pipeline.

11.1 Hydrology

The following assumptions and limitation apply to the hydrology assessment:

- The estimated design rainfall depths were determined for durations ranging from 15 minutes to 24 hours and for return periods ranging from 1:2 to 1:200 years for the CoT Municipality's area of jurisdiction based on 1903 to 2000 rainfall data.
- 2001 to 2019 rainfall data not included;
- The 2013 1m contour data was used; and
- Manning values were assumed for sections that were no accessible.

11.2 Terrestrial Biodiversity

In order to obtain a comprehensive understanding of the dynamics of the floristic and faunal communities on the study site, as well as the status of endemic, rare or threatened species in any area, ecological surveys should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints such long-term studies were not feasible. According to the experience of the author, the current survey was considered to be

sufficient (from a floristic richness perspective) since it describes approximately 70-75 % of the plant richness that is expected to be present. However, additional follow-up surveys may be required in search of cryptic threatened and near -threatened plant species which are only conspicuous (or flowering) at different times of the year.

It must be noted that the inventories and the number of taxa listed in this document is by no means complete and is merely a reflection of the dominant taxa on the study site obtained during a single ("snapshot") instantaneous sampling session. In addition, focus was placed on the occurrence or potential occurrence of threatened and near threatened fauna taxa, instead of providing a long list of species that could be present. Therefore, a comprehensive inventory, irrespective of the taxon or group of taxa could only be achieved during long-term temporal sampling. Therefore, a comprehensive species list of the untransformed parts of the study site cannot be compiled based on a brief, once-off field survey. In addition, the report provides a broad ecological investigation of the habitat units on the study site based on dominant floristic characters. Quantitative methods (*sensu stricto*), phytosociological sampling techniques were excluded owing to the linear area of the study site although semi-quantified methods were implemented to provide a less subjective interpretation of the broad-scale habitat units.

The information as presented in this document only has reference to the investigated study site boundaries and cannot be applied to any other area without prior investigation. This company, the consultants and/or specialist investigators do not accept any responsibility for conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from the surveys or requests made to them at the time of this report.

11.3 Aquatic Ecology

The following assumptions and limitations are applicable to the aquatic ecological assessment:

- Extent and detail of Investigation: All watercourses identified within 500m of the proposed Baviaanspoort pipeline were delineated in fulfilment of Regulation GN 509 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) using desktop methods and verification thereof undertaken according to "Department of Water Affairs and Forestry (DWAF) (2008): Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas".
- Reference conditions are unknown: The composition of aquatic biota associated with the proposed Baviaanspoort pipeline, prior to major disturbance, is unknown. For this reason, reference conditions are hypothetical, and are based on professional judgement and/or inferred from limited data available such as the Department of Water and Sanitation (DWS) Resource Quality Information Services (RQIS) PES/EIS database.
- Temporal variability: The data presented in this report is based on a single site visit. The effects of natural seasonal and long-term variation in the ecological conditions and aquatic biota found in the system is, therefore, unknown. Ideally, aquatic assessments should be undertaken as a minimum in the summer/high flow and winter/low flow seasons to account for and define seasonal variability. However, consideration was given to local data on the DWS RQIS PES/EIS database which assists in understanding variability in the system and thus ensures that observations and discussions on impacts are adequately understood to inform this study.
- Ecological assessment timing: Aquatic and terrestrial ecosystems are dynamic and complex. It is possible that aspects, some of which may be important, could have been overlooked. A more reliable assessment of the biota would require seasonal sampling, with sampling being undertaken under both low flow and high flow conditions. Due to the impacted nature of the Pienaars River, the observations made in this study are however deemed adequate to provide

the information required to define the risk to the aquatic ecosystem and to ensure that sufficient insight into management, and mitigation measures is provided to adequately protect the system and to maintain the PES of the system.

- Accessibility: Due to access constraints relating to terrain and personal safety concerns, limitations were experienced in site selection as well as the verification of the extent and characteristics of some sections of some watercourses. Due to the limitations, some aspects of the aquatic ecology of the area, some of which may be important, may have been overlooked (also see previous point, “Ecological assessment timing”). However, based on the available desktop assessment reference and assessment results, it is deemed adequate to provide the required level of understanding of the systems for the study. Furthermore, limitations were experienced in accessing the full extent of the watercourse along the proposed pipeline and 500m thereof during the site visits, specifically at the downstream portion of the Pienaars River which was inaccessible at the time of the field assessment. Where field assessment was feasible, the desktop delineations proved to be accurate, and the delineations as presented in this report are thus regarded as a best estimate of the temporary or riparian zone boundaries (as applicable) based on the site conditions present at the time of assessment;
- Some areas surrounding the proposed Baviaanspoort pipeline have undergone significant anthropogenic influences (industrial and road construction, urbanization, grazing and cultivation activities) which have further altered the soil profiles and vegetation composition. As a result, identification of the outer boundary of the temporary zone of the watercourse proved difficult in some areas. Therefore, the watercourse delineations as presented in this report are regarded as a best estimate of the boundaries based on the site conditions present, as observed during the site assessment. These delineations are, however, deemed accurate enough to guide the authorisation process.
- Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur however, the delineations as provided in this report are deemed accurate enough to fulfil the authorisation requirements as well as implementation of the mitigation measures provided. If more accurate assessments are required, the watercourse will need to be surveyed and pegged according to surveying principles;
- Freshwater and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the watercourse boundary may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results; and
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the proposed Baviaanspoort pipeline activities have been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of riparian and wetland ecology.

11.4 Heritage Resources

The following applies to the Heritage Resources Assessment:

- Access: The project was accessed via access roads from the R513 to the Baviaanspoort Correctional Facility and the Baviaanspoort WWTW. No access restrictions were encountered.

- Visibility: The surrounding vegetation in the study area is with trees with wetland and riparian vegetation in places. Generally, the visibility at the time of the AIA site inspection (11 November 2019) varied from low to high. Low visibility was encountered on the flood terrace of the Pienaars River, but due to the alluvial processes at work here, this area has a very low probability of any sites. South of the R513 large amounts of building rubble dumped. North of the WWTW and large mounds of soil related have been dumped. In several instanced sub-surface inspection was possible, and these were inspected for archaeological deposits.

12 Environmental Management Programme

An EMPr has been developed as part of this BA to ensure the mitigation of these impacts as far as practicable. It is anticipated that it will be possible to mitigate all the environmental impacts to acceptable levels and the implementation will be monitored and audited to determine the effectiveness of the measures implemented. The EMPr is considered adequate to assist the project in striving towards the principles of the NEMA.

The EMPr for the construction and operation of the proposed pipeline has been included in Appendix G.

13 Period for which the Environmental Authorisation should be Issued

It is not anticipated that the proposed pipeline will be decommissioned in the foreseeable future. It is requested that the EA be issued for a minimum period of 40 years.

14 Opinion and Conditions of the Environmental Authorisation

This BAR addresses a detailed analysis of the potential impacts associated with the proposed pipeline project. The proposed development will have an impact of *low* significance, provided that the mitigation measures contained in this report and the EMPr are effectively implemented. The construction of the pipeline must be conducted under duty of care and must be in accordance with the mitigation measures that were included in the EMPr to ensure that impacts are prevented and if they do occur, they are kept to the minimum.

The construction and installation of a new pipeline will also reduce the risk of the pipeline failing and contaminating water resources. It will also allow the DPW to replace the asbestos cement with a HDPE pipeline. Authorising the construction of the new pipeline between the Baviaanspoort WWTW and Baviaanspoort CSF will reduce the chances of the pipeline failing and polluting water resources. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibres in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.

It is therefore recommended that the proposed project is approved, subject to the following conditions and mitigation measures:

- The EMPr of this proposed development must form part of the contractual agreement and be adhered to by both the contractors and the applicant.
- Adequate stormwater management must be incorporated into the design of the project in order to prevent erosion and the associated sedimentation of the aquatic system;
- The construction footprint shall be kept to a minimal.
- All hazardous storage containers, storage areas and bunding areas for hazardous substances must comply with the relevant SANS standards to prevent leakage;
- Bulk storage of hydrocarbons must be stored in a dedicated area outside the project site and must include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substances;
- The time in which soils are exposed during construction activities will remain as short as possible;
- Stockpiles shall be maintained until the topsoil is required for backfilling purposes;
- All construction materials shall be kept out of the 1:100-year floodline and riparian areas associated with the Pienaars River, as delineated by the Hydrologist;
- Exotic or invasive plants shall be controlled as they emerge;
- An alien vegetation control program must be developed and implemented within the riparian and all disturbed areas. After removal of alien vegetation, the affected areas must be re-assessed to determine the success of the program and any follow up measures that may be required.;
- A suitably qualified specialist (ecologist) shall be contracted to identify alien species and carry out eradication measures according to the Conservation of Agricultural Resources Act and Associated Regulations as follows:
    - Category 1 weeds and invader plants: The Contractor shall actively remove all growth forms of Category 1 weeds from all work areas, at all times; and

    - Category 2 and 3 weeds and invader plants: The Contractor shall actively remove all Category 2 and 3 plants prior to flowering.
- The eradicated plant material must be disposed of at an approved solid waste disposal site;
- During post-construction, an alien vegetation removal and monitoring plan must be compiled for those areas which were not effectively rehabilitated.
- A WUA must be obtained for the construction activities within the 1:100-year floodline of the Pienaars River.

It is the opinion of the EAP that the proposed construction and installation of a pipeline will comply with current relevant legislation, and that with the implementation of the mitigation measures contained in this BAR, there are no environmental impacts identified as highly detrimental to the environment.

15 Environmental Impact Statement

This section of the report presents the outline of the key findings of the Impact Assessment. A Basic Environmental Impact Assessment has been conducted in accordance with the NEMA regulations which included the required PPP aimed at the key Organs of State and the identified I&APs. Where potential biophysical or social impacts have been identified mitigation and management measures have been proposed to control and monitor the magnitude of impacts associated with the various aspects of the proposed project.

The identified impacts are manageable through the implementation of mitigation measures contained in the EMPr.

15.1 Summary of Key Findings of the EIA

The study found that the construction and operation of the pipeline may result in impacts on the environment (biodiversity, heritage resources, socio-economic environment, visual, noise, waste management; stormwater management, soils, land capability and land use, wetlands, air quality and hydrology).

During the operational phase, the most significant potential impact would be from leaking of wastewater from the pipeline. Regular monitoring and maintenance of the pipeline will reduce the likelihood of the impact occurring.

The potential impacts evident from the detailed impact assessment (Section 10) of the proposed project are both positive and negative in nature and can be managed to acceptable levels.

Table 15-1 provides a summary of findings from the impact assessment.

Table 15-1: Summary of Potential Environmental Impacts Associated with the proposed pipeline project

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
CONSTRUCTION	Social-economic	Ineffective communication with affected property owners and property occupiers leading to conflict	Low (-)	Low (-)
		Construction activities may result in an increase in petty crimes in the area	Low (-)	Low (-)
		Unauthorised access to private property may result in conflict with the property owners and occupiers	Low (-)	Low (-)
		Poor housekeeping will result in the deterioration of water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Lack of or poor sanitation will result in the contamination of surface runoff	Medium-Low (-)	Low (-)
		Possible boost in short-term local small business opportunities.	Medium-Low (+)	Medium-Low (+)
		Generation of dust potentially resulting in a health and nuisance impact.	Medium-Low (-)	Low (-)
		Clearing of land which may potentially impact on the sense of place.	Low (-)	Low (-)
	Groundwater	Local spillages of oils from construction vehicles and machinery leading to groundwater contamination.	Low (-)	Low (-)
		Improper storage and handling of hazardous materials leading to groundwater contamination.	Medium-Low (-)	Low (-)
	Surface Water Quality and Aquatic Ecosystems	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	Medium-High (-)	Low (-)
		Disturbance of the area may release suspended solids into the river during the construction of the temporary earth berm	Medium-High (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from construction vehicles and machinery.	Medium-Low (-)	Low (-)
		Deterioration of water quality due to the disposal of water that accumulated in the cofferdam.	Medium-High (-)	Low (-)
		Deterioration of water quality as a result of concrete that is poured in such a way that it will end up in the Spruit	Medium-High (-)	Low (-)
		Poor stormwater management leading to runoff from stockpiled material resulting in the erosion of the stockpiles causing sedimentation of the Pienaars River	Medium-Low (-)	Low (-)
		Diversion of the river resulting in the change in flow and an increase in sedimentation	Medium-High (-)	Low (-)
		Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	Medium-Low (-)	Low (-)
		Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality	Medium-High (-)	Low (-)
		Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	Medium-Low (-)	Low (-)
	Aquatic and Riparian Ecosystems	Loss of localised riparian biodiversity habitats within sensitive areas due to site clearance.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Sedimentation of riparian resources leading to smothering of flora	Medium-Low (-)	Low (-)
		Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance	Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-High (-)	Low (-)
		Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)
		Habitat fragmentation as a result of construction activities of the access roads leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping	Medium-Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Medium-Low (-)	Low (-)
	Air Quality	Possible increase in dust generation, PM10 and PM2.5 as a result of bulk earthworks, operation of heavy machinery, and material movement.	Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.	Low (-)	Low (-)
	Climate change	Emissions of Green House Gases as a result of the use of construction vehicles and machinery.	Low (-)	Low (-)
	Visual	Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	Low (-)	Low (-)
		Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	Low (-)	Low (-)
	Heritage Resources	Although no additional resources of cultural and/or heritage importance are known to be affected by the project, a possibility remains that there may be some additional resources may be discovered.	Low (-)	Low (-)
	Palaeontology Resources	Site clearance and laying of the plant foundation has potential to impact on Palaeontology resources.	Low (-)	Low (-)
	Flora	Loss of vegetation species including vegetation species of conservational concern due to site clearance.	Medium-Low (-)	Low (-)
		Direct loss of habitat and indirect loss of habitat quality.	Medium-Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
	Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)
		Habitat fragmentation as a result of construction activities leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping.	Medium-Low (-)	Low (-)
		Direct loss of faunal species of conservational concern.	Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Low (-)	Low (-)
	Noise	The use of vehicles and machinery during the construction phase may generate nuisance noise in the immediate vicinity	Low (-)	Low (-)
	Soils, land use and land capability	Localised chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	Medium-Low (-)	Low (-)
		Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	Low (-)	Low (-)
	Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion on roads around the project area increasing the chances of road accidents.	Medium-Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the Pienaars Rivers.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
OPERATION	Social	Potential leakage of sewage water may result in nuisance odour and flies which may result in conflict with communities around the project area.	Medium-Low (-)	Low (-)
	Groundwater	Seepage of contaminated water from the use of vehicles to access structure during inspection and maintenance processes, which may result in the spillages of hydrocarbon liquids from the vehicles and machinery.	Low (-)	Low (-)
		*Potential leakage of sewage water may result in percolation of contaminated water into the groundwater regime.	Medium-High (-)	Low (-)
	Surface Water	Erosion of the riverbeds and banks may result in siltation of the Pienaars River	Low (-)	Low (-)
		*Potential leakage of sewage water into the Pienaars River and associated riparian habitat thus resulting in altered water quality and alteration of the natural hydrological regime of the Pienaars River;	Medium-High (-)	Low (-)
	Aquatic Ecology	Stream diversion to allow for inspection and/or maintenance and repairs may result in a temporarily altered flow regime leading to possible loss of recharge to downstream areas impacting on downstream biota	Medium-Low (-)	Low (-)
		Diversion of the stream during the operation phase may result in a temporary altered flow regime, leading to loss of recharge to downstream users, impacting on downstream biota.	Medium-Low (-)	Low (-)
		Possible incision/erosion in the vicinity of the diversion as a result of temporary formation of a concentrated flow path	Medium-Low (-)	Low (-)
		*Potential leakage of the proposed Baviaanspoort pipeline and discharge of sewage into the Pienaars River and associated riparian zone as a result of maintenance activities;	Medium-High (-)	Low (-)
		Possible contamination of riparian soils and surface water leading to further reduced ability to support biodiversity.	Low (-)	Low (-)
	Flora	Disturbances to or removal of vegetation whilst accessing infrastructure to carry out maintenance activities may result in potential loss to indigenous vegetation and further proliferation of alien floral species.	Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Continued introduction and proliferation of alien invasive plant species and further transformation of natural habitat.	Low (-)	Low (-)
		Continued loss of biodiversity and SCC	Low (-)	Low (-)
	Fauna	Loss of faunal species as a result of collisions with maintenance vehicles	Low (-)	Low (-)
		Loss of faunal habitat and ecological structure as a result of vegetation removal whilst accessing infrastructure for maintenance purposes	Low (-)	Low (-)
	Noise	The use of vehicles and machinery during maintenance and/repair may generate noise in the immediate vicinity	Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the river	Low (-)	Low (-)

15.2 Alternatives assessment

The alternative pipeline route will result in loss of or impacts on a small sub-population of the near threatened *Searsia gracillima* var. *gracillima* corresponding to Rand Highveld Grassland. This species is also endemic in Gauteng. In addition, both the Rand Highveld Grassland and Marikana Thornveld habitat units are considered as threatened ecosystems (on a national level) while they also coincide with an "irreplaceable area" according to the Gauteng conservation Plan. Therefore, it is evident that the pipeline alignment is located on habitat that is of high ecological sensitivity (c. Rand Highveld Grassland, semi-transformed Marikana Thornveld and riparian vegetation). The specialist recommended that a 600m buffer for any plant population that is near threatened and endemic to Gauteng.

The heritage assessment also identified two heritage sites in close proximity to the pipeline alternative route. Although the heritage sites are not located in the direct line of the pipeline alternative, the sites are close enough for construction activities to impact on them.

A summary of the findings from the impact assessment is provided in Table 15-2.

Table 15-2: Summary of Potential Environmental Impacts Associated with the Alternative Pipeline Route

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
CONSTRUCTION	Social-economic	Ineffective communication with affected property owners and property occupiers leading to conflict	Low (-)	Low (-)
		Construction activities may result in an increase in petty crimes in the area	Low (-)	Low (-)
		Unauthorised access to private property may result in conflict with the property owners and occupiers	Low (-)	Low (-)
		Poor housekeeping will result in the deterioration of water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in E coli resulting in potential health effects	Medium-Low (-)	Low (-)
		Lack of or poor sanitation will result in the contamination of surface runoff	Medium-Low (-)	Low (-)
		Possible boost in short-term local small business opportunities.	Medium-Low (+)	Medium-Low (+)
		Generation of dust potentially resulting in a health and nuisance impact.	Medium-Low (-)	Low (-)
		Clearing of land which may potentially impact on the sense of place.	Low (-)	Low (-)
	Groundwater	Local spillages of oils from construction vehicles and machinery leading to groundwater contamination.	Low (-)	Low (-)
		Improper storage and handling of hazardous materials leading to groundwater contamination.	Medium-Low (-)	Low (-)
	Surface Water Quality and Aquatic Ecosystems	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	Medium-High (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Disturbance of the area may release suspended solids into the river during the construction of the temporary earth berm	Medium-High (-)	Low (-)
		Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from construction vehicles and machinery.	Medium-Low (-)	Low (-)
		Deterioration of water quality due to the disposal of water that accumulated in the cofferdam.	Medium-High (-)	Low (-)
		Deterioration of water quality as a result of concrete that is poured in such a way that it will end up in the river	Medium-High (-)	Low (-)
		Poor stormwater management leading to runoff from stockpiled material resulting in the erosion of the stockpiles causing sedimentation of the Pienaars River	Medium-Low (-)	Low (-)
		Diversion of the river resulting in the change in flow and an increase in sedimentation	Medium-High (-)	Low (-)
		Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	Medium-Low (-)	Low (-)
		Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality	Medium-High (-)	Low (-)
		Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	Medium-Low (-)	Low (-)
	Aquatic and Riparian Ecosystems	Loss of localised riparian biodiversity habitats within sensitive areas due to site clearance.	Medium-Low (-)	Low (-)
		Sedimentation of riparian resources leading to smothering of flora	Medium-Low (-)	Low (-)
		Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance	Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-High (-)	Low (-)
		Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		Habitat fragmentation as a result of construction activities of the access roads leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping	Medium-Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Medium-Low (-)	Low (-)
	Air Quality	Possible increase in dust generation, PM10 and PM2.5 as a result of bulk earthworks, operation of heavy machinery, and material movement.	Low (-)	Low (-)
		Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.	Low (-)	Low (-)
	Climate change	Emissions of Green House Gases as a result of the use of construction vehicles and machinery.	Low (-)	Low (-)
	Visual	Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	Low (-)	Low (-)
		Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	Low (-)	Low (-)
	Heritage Resources	A heritage site was identified 20 m of the west of the alternative pipeline route. Although no graves are known to be affected by the project, a possibility remains that there may be some additional resources may be discovered.	Low (-)	Low (-)
	Palaeontology Resources	Site clearance and laying of the plant foundation has potential to impact on Palaeontology resources.	Low (-)	Low (-)
	Flora	Loss of vegetation species including vegetation species of conservational concern due to site clearance.	High (-)	High (-)
		Direct loss of habitat and indirect loss of habitat quality.	Medium-Low (-)	Low (-)
		Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium-Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
	Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium-Low (-)	Low (-)
		Habitat fragmentation as a result of construction activities leading to loss of floral diversity.	Medium-Low (-)	Low (-)
		Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal species trapping.	Medium-Low (-)	Low (-)
		Direct loss of faunal species of conservational concern.	Medium-Low (-)	Low (-)
		Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Medium-Low (-)	Low (-)
	Noise	The use of vehicles and machinery during the construction phase may generate nuisance noise in the immediate vicinity	Low (-)	Low (-)
	Soils, land use and land capability	Localised chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	Medium-Low (-)	Low (-)
		Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	Low (-)	Low (-)
	Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion on roads around the project area increasing the chances of road accidents.	Medium-Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc. will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse.	Medium-Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the Pienaars Rivers.	Medium-Low (-)	Low (-)
OPERATION	Social	Potential leakage of sewage water may result in nuisance odour and flies which may result in conflict with communities around the project area.	Medium-Low (-)	Low (-)
	Groundwater	Seepage of contaminated water from the use of vehicles to access structure during inspection and maintenance processes, which may result in the spillages of hydrocarbon liquids from the vehicles and machinery.	Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
		*Potential leakage of sewage water may result in percolation of contaminated water into the groundwater regime.	Medium-High (-)	Low (-)
	Surface Water	Erosion of the riverbeds and banks may result in siltation of the Pienaars River	Low (-)	Low (-)
		*Potential leakage of sewage water into the Pienaars River and associated riparian habitat thus resulting in altered water quality and alteration of the natural hydrological regime of the Pienaars River;	Medium-High (-)	Low (-)
	Aquatic Ecology	Stream diversion to allow for inspection and/or maintenance and repairs may result in a temporarily altered flow regime leading to possible loss of recharge to downstream areas impacting on downstream biota	Medium-Low (-)	Low (-)
		Diversion of the stream during the operation phase may result in a temporary altered flow regime, leading to loss of recharge to downstream users, impacting on downstream biota.	Medium-Low (-)	Low (-)
		Possible incision/erosion in the vicinity of the diversion as a result of temporary formation of a concentrated flow path	Medium-Low (-)	Low (-)
		*Potential leakage of the proposed Baviaanspoort pipeline and discharge of sewage into the Pienaars River and associated riparian zone as a result of maintenance activities;	Medium-High (-)	Low (-)
		Possible contamination of riparian soils and surface water leading to further reduced ability to support biodiversity.	Low (-)	Low (-)
	Flora	Disturbances to or removal of vegetation whilst accessing infrastructure to carry out maintenance activities may result in potential loss to indigenous vegetation and further proliferation of alien floral species.	Low (-)	Low (-)
		Continued introduction and proliferation of alien invasive plant species and further transformation of natural habitat.	Low (-)	Low (-)
		Continued loss of biodiversity and SCC	Medium-Low (-)	Low (-)
	Fauna	Loss of faunal species as a result of collisions with maintenance vehicles	Low (-)	Low (-)
		Loss of faunal habitat and ecological structure as a result of vegetation removal whilst accessing infrastructure for maintenance purposes	Low (-)	Low (-)

PHASE	NATURE OF POTENTIAL IMPACT/RISK		SIGNIFICANCE RATING BEFORE MITIGATION	SIGNIFICANCE RATING AFTER MITIGATION
	Noise	The use of vehicles and machinery during maintenance and/repair may generate noise in the immediate vicinity	Low (-)	Low (-)
	Waste Management	Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Disposal of hazardous waste including hydrocarbon contaminated soils, rags etc will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Low (-)	Low (-)
		Stockpiling material resulting in secondary pollution and contamination of the river	Low (-)	Low (-)

15.3 No-go alternative

Although the no-go option will not result in any biophysical environmental impacts as no construction activities will be required, it must be noted that the construction and installation of a new pipeline will also reduce the risk of the pipeline failing and contaminating water resources. It will allow the DPW to replace the asbestos cement with a HDPE pipeline. Authorising the construction of the new pipeline between the Baviaanspoort WWTW and Baviaanspoort CSF will reduce the chances of the pipeline failing and polluting water resources. The current pipeline is approximately 33 years old and has reached its end of operational life. In addition, the current pipeline is made of asbestos cement, which poses a threat of asbestos fibres in wastewater, which may end up in water resources, posing a health risk to aquatic organisms as well as downstream users.

16 Undertaking of Oath by the EAP

Section 16 (1) (b) (iv), and Appendix 3 Section 2 (j) of the EIA Regulations, 2014 (promulgated in terms of the NEMA), require an undertaking under oath or affirmation by the EAP in relation to:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs from stakeholders and I&APs; and
- Any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs.

SRK and the EAPs managing this project hereby affirm that:

- To the best of our knowledge the information provided in the report is correct, and no attempt has been made to manipulate information to achieve a particular outcome. Some information, especially pertaining to the project description, was provided by the applicant and/or their sub-contractors. In this respect, SRK's standard disclaimer pertaining to information provided by third parties applies.
- To the best of our knowledge all comments and inputs from stakeholders and I&APs have been captured in the report and no attempt has been made to manipulate such comment or input to achieve a particular outcome. Written submissions are appended to the report while other comments are recorded within the report. For the sake of brevity, not all comments are recorded verbatim, and in instances where many stakeholders have made similar comments, they are grouped together, with a clear listing of who submitted which comment(s).
- Information and responses provided by the EAP to I&APs are clearly presented in the report. Where responses are provided by the applicant (not the EAP), these are clearly indicated.

17 Conclusion and Recommendations

SRK has undertaken the impact assessment and EMPr for the proposed construction and operation of the wastewater pipeline in accordance with the requirements of the NEMA. This has included a comprehensive stakeholder engagement process which has sought to provide stakeholders with an adequate opportunity to participate in the project process and guide technical investigations that have taken place as part of this study. Specialist input has been included for all key environmental aspects.

To date, there are no fatal flaws or red flags that have been identified for the proposed project. An EMPr has been developed as part of this BA to ensure the mitigation of these impacts as far as practicable. The majority of the impacts associated with the preferred option identified were classified as low (-) to medium (-) without mitigation. All the identified impacts can be mitigated to low (-) significance impact rating. The implementation of the mitigation measures will be monitored and audited to determine the effectiveness of the measures implemented. The EMPr is considered to assist the project in striving towards the principles of the NEMA.

The project team believes that the impact assessment undertaken for the project fulfils the process requirements of the NEMA. The EAP recommends that an EA be issued by the DEFF and that the construction and operation of the proposed pipeline should be conducted under duty of care and must be in accordance with the recommendations that were included in this BAR and the accompanying EMPr.

Prepared by

Prepared by

Ndomupei Masawi

Principal Environmental Scientist

Reviewed by

Manda Hinsch

Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

18 References

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Appendices

Appendix A: Project Team

Appendix B: SRK EIA Company Experience

Appendix C: Layout Plan and Gautrans Wayleave Approval Letter

Appendix D: Stakeholder Engagement Documents

Appendix D1: I&AP Database

Appendix D2: Stakeholder Notification Letter

Appendix D3: Site Notices and Proof of Placement

Appendix D4: Newspaper Advertisements

Appendix D5: Land Claims Confirmation Letter

Appendix E: DFFE Screening Report

Appendix F: Specialist Reports

Appendix G: EMPr

SRK Report Distribution Record

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