VAAL GAMAGARA REGIONAL WATER SUPPLY SCHEME PHASE 2:

UPGRADING OF THE EXISTING SCHEME

BASIC ASSESSMENT REPORT

FEBRUARY 2020

FINAL

DEFF REFERENCE: 14/12/16/3/3/1/2062

PREPARED FOR: SEDIBENG WATER

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Title and Approval Page

Project Name:	Vaal Gamagara Regional Water Supply Scheme Phase 2: Upgrading of the Existing Scheme
Report Title:	Basic Assessment Report
Authority Reference:	14/12/16/3/3/1/2062
Report Status:	Final

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Report Reference:	10689-VGRWSS-II: Upgrade BAR			R-PRO-REP|20170216

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Amendments Page

Date:	Nature of Amendment	Amendment Number:
27/08/2019	Draft BAR for Public and Authority Review	0
05/12/2019	Draft BAR for Second Public and Authority Review	1
03/02/2020	Final BAR submission to DEFF	2

Executive Summary

A. INTRODUCTION

The Vaal Gamagara Regional Water Supply Scheme (VGRWSS) is a water supply scheme located in the Northern Cape Province that was completed in 1968 by the Department of Water Affairs, now Department of Human Settlements, Water and Sanitation (DHSWS), and transferred to Sedibeng Water in 2008.

The Scheme currently supplies approximately 22 million m^3/a to domestic consumers, mines and farmers. The Scheme transfers water from Delportshoop on the Vaal River (60km to the north west of Kimberley) via Postmasburg to the iron ore mines at Kathu. From Kathu, a pipeline continues to the manganese mines at Hotazel and finally terminates at Black Rock.

The current scheme is operating at capacity and is not able to supply the increasing future water demands, and deal with the increasing water supply interruptions. The major driving force of the increased water demand is the iron ore and manganese mining operations. These mines of the Northern Cape produce 84% of South Africa's iron ore and 92% of the world's high-grade manganese deposits are in the Kalahari basin. Diamond and lime mining operations also contribute to the water demand, but to a lesser degree.

Secondary to the expected increased water demand are water supply interruptions that are amplified due to the aging infrastructure. The infrastructure, being 50 years old, is nearing the end of its useful life. Due to the condition of the pipelines, the full design capacity can no longer be supplied through this infrastructure. Total collapse in water supply will probably happen in the next 5 years if the infrastructure is not replaced/rehabilitated.

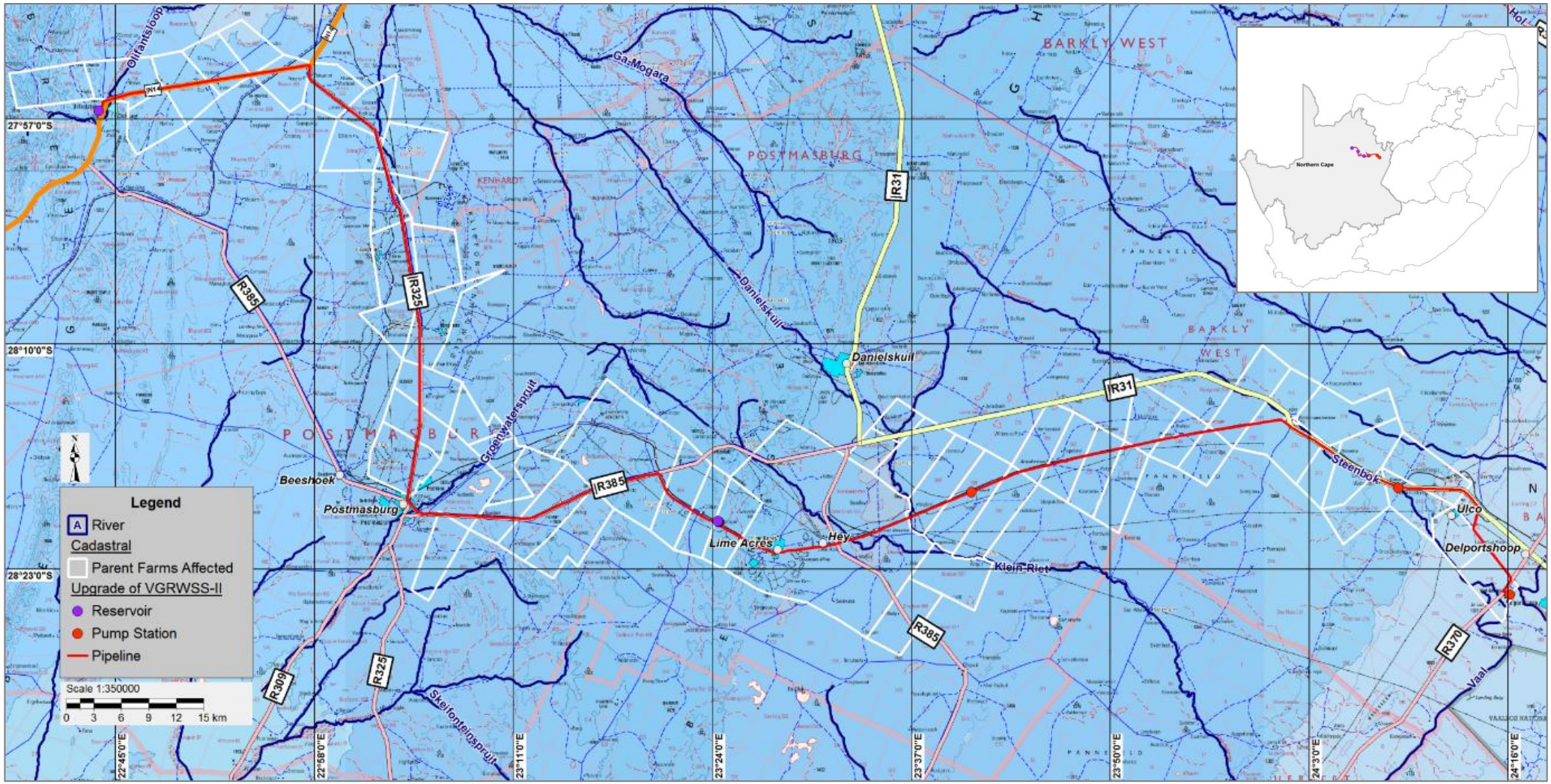
Feasibility studies were undertaken to determine the best option to rehabilitate and increase the capacity of the scheme to cater for increased water demands. Sedibeng Water subsequently proposed the upgrading of the VGRWSS via the following two phases:

- Phase I – upgrading the scheme from the Roscoe Reservoir to Blackrock (already in construction phase); and
- **Phase II – upgrading the scheme from Delportshoop to Olifantshoek**.

This Basic Assessment Report (BAR) specifically deals with the VGRWSS Phase II: Upgrade of the Existing Scheme

B. PROJECT LOCATION

The VGRWSS-II starts at the Delportshoop Water Treatment Works (WTW) and runs past the towns of Ulco, Lime Acres and Postmasburg before ending at Olifantshoek, in the Northern Cape. The project infrastructure is mostly located inside the existing VGRWSS pipeline servitude, which is situated along privately-owned properties that are primarily used for mining and agricultural practices.



Locality Map

C. PROJECT DESCRIPTION

The following project components associated with the proposed upgrading of the VGRWSS- II are described in the BAR:

- Delportshoop abstraction works and WTW;
- Pipeline from Beeshoek Connection to Roscoe;
- Pipeline between Clifton and Beeshoek Connection;
- Rising Main from Delportshoop to Kneukel;
- Rising Main from Kneukel to Trewill;
- Rising Main from Trewill to Clifton;
- Gravity Main from Roscoe to Olifantshoek;
- Delportshoop, Kneukel and Trewill Pump Stations;
- Clifton, Gloucester Reservoirs;
- Trewill Sump and Kneukel Sump; and
- Ancillary infrastructure (access roads, fibre optics).

The Reconciliation Strategy and Water Master Plan study for the VGRWSS highlighted the potential for available groundwater resources in the general area served or proposed to be served by the pipeline to augment the bulk water supply. Areas were identified as possessing enhanced groundwater development potential, these areas were designated Source Development (SD) Areas. **Note that a separate application will be submitted to the Department of Environment, Forestry and Fisheries (DEFF) to seek authorisation for the proposed groundwater abstraction, and this will be assessed in a separate BAR**.

D. LEGISLATION AND GUIDELINES CONSIDERED

The pertinent environmental legislation that has bearing on the proposed development is considered in the Basic Assessment Report. The project requires authorisation in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), and the Basic Assessment Process is being undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended). A description of the policy and legislative context within which the development is proposed includes an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.

E. BASIC ASSESSMENT PROCESS

The process for seeking authorisation is undertaken in accordance with the EIA Regulations (Government Notice No. R. 982, R. 983, R. 984 and R. 985 of 04 December 2014, as amended), promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved, which include activities listed in Government Notice No. R. 983 and R. 985 of 04 December 2014 (as amended), the requisite environmental assessment for the project is a Basic Assessment.

F. ENVIRONMENTAL ATTRIBUTES

The environmental features and attributes that may potentially be affected by the proposed project include the geographical, physical, biological, social, economic and cultural environment.

The following significant environmental attributes are focused on in this report:

- Land Use and Land Cover;
- Climate;
- Geology;
- Soils;
- Geohydrology;
- Topography;
- Surface Water;
- Flora;
- Fauna;
- Socio-Economic Environment;
- Agriculture;
- Air quality;
- Noise;
- Historical and Cultural Features;
- Planning;
- Existing Structures and Infrastructure;
- Transportation;
- Waste Disposal Facilities; and
- Aesthetic Qualities.

G. SPECIALIST STUDIES

An overview is provided of the following specialist studies that were undertaken to address the key issues and compliance with legal obligations:

1) Wetland and Aquatic Assessment;
2) Terrestrial Ecological Impact Assessment;
3) Heritage Impact Assessment;
4) Palaeontological Impact Assessment;
5) Agricultural Impact Assessment; and
6) Socio-Economic Impact Assessment.

A short summary of the above-mentioned specialist studies is provided in the table below:

Specialist Study	Summary of Specialist Report
Wetland and Aquatic Assessment	Six hydrogeomorphic (HGM) types were identified in the study area during the April 2019 field survey, which were classified to Level 5 to distinguish them in terms of saturation levels (a highly important distinction in such arid settings). These included intermittent and seasonal channelled valley bottoms, intermittent and seasonal unchanneled valley bottoms and intermittent exorheic and endorheic depressions. Based on these HGM types, a total of 61 individual HGM units were identified within the study area. To facilitate practical assessment and meaningful interpretation these systems were grouped into 12 wetland groups which involved grouping HGM units by the main systems with which they were associated. These systems were rated in terms of their respective Present Ecological Status (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services. In summary

Specialist Study	Summary of Specialist Report
	Wetland Groups 3, 4, 9, 11 and 12 are the most intact and are in a largely natural state while Wetland Groups 4, 5, 6, 10, 11 and 12 are considered to be the most ecologically important and sensitive while at the same time providing the most important ecosystem services. Although most of the risks associated with the pipeline upgrade were considered low, certain activities and their impacts (mainly associated with site clearing and trench excavation) are likely to take place within the delineated boundary of some wetlands (prompting the mandatory assignment of a severity rating of 5) and thus a moderate post mitigation risk. However, the impacts associated with this critical service development are unlikely to negatively impact wetland systems to any appreciable level, provided that the suggested mitigations measures are effectively implemented, and it is the opinion of The Biodiversity Company that the project be considered for general authorisation in terms with regards to water use licencing. Aquatic habitat is limited on site and the risks posed to aquatic ecosystems considered low.
Terrestrial Ecological Impact Assessment	According to SANBI (2018) and National Biodiversity Assessment (2018), the following vegetation types were recorded within the study area, namely: Southern Kalahari Mekgacha; Schmidtsdrif Thornveld; Postmasburg Thornveld; Olifantshoek Plains Thornveld; Kuruman Thornveld; Kuruman Mountain Bushveld; Koranna-Langeberg Mountain Bushveld; Kathu Bushveld and Ghaap Plateau Vaalbosveld. No threatened terrestrial ecosystems are located in the vicinity of the project area with the nearest, the Schweizer-Reneke Bushveld ecosystem, situated approximately 110 km to the east of the project area. The proposed development traverses the Northern Cape Critical Biodiversity Area (CBA) One regions, CBA Two regions, Ecological Support Area (ESA) regions, and other natural areas. During the field survey, no threatened plant species were observed within the study area, however only two (2) species of conservation concern were noted, namely *Vachellia erioloba* (= *Acacia erioloba*) (Camel thorn) and *Boophone disticha* (Century plant), listed as *Declining.* Protected trees found within the study area are *Boscia albitrunca* (Shepherd's tree) and *Vachellia (Acacia) erioloba* (Camel thorn). The following plant species are listed as “protected plants” in terms of Schedule 2 of Northern Cape Nature Conservation Act (Act 9 of 2009): *Boscia albitrunca* (Shepherd's tree); *Olea europaea* subsp*. Africana*; all species of families Amaryllidaceae (*Ammocharis coranica*, *Boophone disticha* and *Nerine laticoma*), Asphodelaceae (*Aloe grandidentata*, *Aloe hereroensis*, *Bulbine narcissifolia*, *Kniphofia cf. ensifolia*), Hyacinthaceae (*Ornithogalum* sp.), and Iridaceae (*Babiana* sp.) were recorded within the study area. Data

Specialist Study	Summary of Specialist Report
	supplied by DAFF indicates that protected plant species such as *Lithops* spp*., Vachellia haematoxylon* (Grey Camel thorn) and *Nymania capensis* (Chinese lanterns) have been recorded in the study area. According to the information provided by the local farm owners, only three Red Data mammal species have been sighted within the region, namely Black-footed cat, Southern African Hedgehog and Southern Tree Hyrax. Most bird species found in Northern Cape are either classified by the Northern Cape Nature Conservation Act (Act 9 of 2009as *Schedule 1 Specially Protected species* or *Schedule 2 Protected species* or *Schedule 3 Common indigenous species*. Anecdotal evidence from local land-users indicate that Red Data bird species such as Lanner falcon, Lesser kestrel (even though this species has been down listed from Vulnerable to Least concern) and Kori Bustard have been observed along the project area and also bird species such as Flamingos and Stocks are said to be found in very wet years but for short periods. Reptile species found within the project area such as Mole snake, Rock Monitor, Leopard Tortoise and Cape Cobra are classified as *protected species* under Schedule 1 of Northern Cape Nature Conservation Act (Act 9 of 2009). All land tortoises and all lizards are listed as *Protected species* under Schedule 2 of the Northern Cape Nature Conservation Act (Act 9 of 2009) whereas *all species of Chamaeleon* are classified as *Schedule 1 Specially Protected species* of Northern Cape Nature Conservation Act (Act 9 of 2009). Only Five frog species were recorded within the study area. Anecdotal evidence from local land-users indicate the presence Bullfrog species. The Bullfrogs are listed as *specially protected species* under Schedule 1 of the Northern Cape Nature Conservation Act (Act 9 of 2009). An impact significance rating was assessed and all impacts were found to be significantly reduced through the implementation of mitigation measures. Impacts were noted to be rated between “medium to low” prior to mitigation, and as “low” after mitigation.
Heritage Impact Assessment	During site visits in the week 15-17 May 2019 several portions of the landscape in question were visited and archaeological observations made. Most of the area traversed during the survey, was found to have minimal traces of in-situ archaeological materials. Graves were found at two localities close to the proposed route, the first at 28^0 23’ 35.8”S 24^0 16’ 13.2” E which is approximately 45 meters from the new proposed route, at a turn pipe near an open valve. The second was at 28^0 17’ 34.0” S $23^0$20’ 26.3” E, an old cemetery, which lies beyond the proposed route, but noted here for precautionary measures to be put in place. The report indicated that the

Specialist Study	Summary of Specialist Report
	significance of impact on archaeological and cultural heritage features was found to be low. It would remain possible that material of significance may occur, which is not identified and such chance finds, if encountered, should be brought to the attention of heritage authorities for further assessment and mitigation if necessary.
Palaeontological Impact Assessment	The proposed Vaal Gamagara Regional Water Supply Scheme upgrading is completely underlain by the following sediments: • Kalahari Group (High Sensitivity); • Dwyka Group, Karoo Supergroup. (Low Sensitivity); • Matsap Subgroup, Volop Group, Olifantshoek Supergroup (Low Sensitivity); • Gamagara Fm, Olifantshoek Supergroup (Low Sensitivity); • Ongeluk Fm, Postmasburg Group Transvaal Supergroup (Moderate Sensitivity); • Asbestos Hills, and Campbell Rand Subgroup, Ghaap Group, Transvaal Supergroup (Moderate Sensitivity); and • Vryburg Fm, Transvaal Supergroup (Moderate to high Sensitivity). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Kalahari Group is High; Dwyka Group is Low; Gamagara Fm is Low, Ongeluks FM is Moderate, the Campbel Rand and Asbestos Hills is Moderate while the Vryburg Fm has a (Moderate to high Sensitivity). A 2-day site specific field survey of the development footprint was conducted on foot and by motor vehicle on 26 and 27 October 2019. No visible evidence of fossiliferous outcrops was found. For this reason, an overall medium palaeontological sensitivity is allocated to the development footprint.
Agricultural Impact Assessment	Grazing is the dominant land use with approximately 1 044 that will be affected for the duration of construction followed by the time it takes for the land to recover from it being disturbed. Infrastructure and mining combined is 153,03 hectares or 12,7% of the land. The irrigated land at Ulco is a maximum of 1,3 hectares. It appears from the satellite images that there is an uncultivated strip of 25m between the pipeline and the lands. If construction vehicles can remain in this strip, then no impact is foreseen. The assessment found that there will be no permanent loss of high potential land. The significance and magnitude of the loss of grazing land is low and of a temporary nature – it will be for one rainy season. Entrances to some farms will be affected and needs to be managed in consultation with the farmers. Some farm infrastructure will be lost and has to be replaced. Fencing of farms needs to be maintained where construction is taking place. This is to ensure that animals do not escape and/or fall into the trench at the construction site.

Specialist Study	Summary of Specialist Report
Socio-Economic Impact Assessment	The predominant land use is agricultural: either commercial or subsistence farming. In the towns and settlements along the route, residential and commercial land uses are found. The pipeline travels along existing infrastructure in a design effort to reduce social-economic impacts. The study area has a population of 25 874, with education and income levels typical for rural South Africa. The majority of population in the study area have piped water supplied inside homes and flush toilets. There are areas where there are no sanitation services, notably the rural areas of Postdene and Postmasburg. The study assessed the social and economic impacts of the proposed project. As expected of any construction project, there were several positive and negative socio-economic impacts identified. No socio-economic fatal flaws were identified for the project mainly owing to the fact that the existing pipeline follows existing infrastructure to achieve this. The identified negative impacts can be successfully mitigated and the positive impacts will bring economic and social benefit to the area.

H. IMPACT ASSESSMENT

This BAR assessed the pertinent environmental impacts that could potentially be caused by the proposed project during the pre-construction, construction and operational phases.

Impacts were identified as follows:

- An appraisal of the project activities and components;
- Impacts associated with listed activities contained in Government Notice No. R. 983 and R. 985 of 4 December 2014 (as amended), for which authorisation has been applied for;
- An assessment of the receiving biophysical, social, economic and built environment;
- Findings from specialist studies;
- Issues highlighted by environmental authorities; and
- Comments received during public participation.

The potential significant environmental impacts identified for the construction phase of the proposed development, are tabulated below:

Feature	Impact
Land Use	• Temporary loss of land used for agriculture. • Servitude restrictions. • Reduced access to land/structures – all structures located in the servitude. Structures identified as part of this study are: Postmasburg dwelling, The Ranch, Langeberg Stene and Olifantshoek Cemetery. • Construction related disturbances (dust and noise generation).

Feature	Impact
Geology and Soil	• Impacts associated with the sourcing of construction material and loss of topsoil • Soil erosion (land clearance and construction activities) • Soil pollution e.g. hydrocarbon and cement spillages • Compaction and erosion of removed and stockpiled soils • Soil contamination from incorrect storage/handling/disposal of hazardous waste • Soil contamination through spillages and leakages • Soil contamination due to mismanagement and/or incorrect storage of hazardous chemicals • Poor stormwater management during construction
Topography	• Visual impacts during construction • Crossing topographic features (watercourses) • Erosion of affected areas
Geohydrology	• Groundwater pollution due to spillages and poor construction practices
Flora	• Loss of sensitive vegetation and habitat • Damage and loss of vegetation of conservation significance • Proliferation of exotic vegetation in disturbed areas • Damage to vegetation in surrounding areas • Destruction of potential Red Data Listed and protected flora species during site clearing and construction • Disturbance of sensitive plant species if relocated
Fauna	• Loss of habitat through site clearing and construction • Illegal killing or hunting of mammals • Killing of snakes during construction phase due to poor environmental education procedures • Potential harm to and/or death of fauna due to pollution, littering and/or vehicle movement on site. • Damage / clearance of habitat of conservation importance • Loss of fauna species of conservation significance • Obstruction to animal movement corridors
Air Quality	• Excessive dust levels. • Greenhouse gas emissions (use of construction vehicles, machinery/equipment, and diesel generators)
Transportation	• Construction-related traffic • Increase in traffic on the local road network • Damage to roads by heavy construction vehicles • Risks to road users
Noise	• Localised noise increase • Noise nuisance
Agriculture	• Disruptions to farming entrances and operations as a result of construction-related use of existing access roads. • Temporary loss of grazing land within construction domain. • Loss of existing farm infrastructure within construction domain.
Existing Structures and Infrastructure	• Risk of damaging existing services, infrastructure and structures during construction. • Disruptions to traffic on local road network during construction. This is associated with road crossings, where the pipeline route follows existing road alignments and as a result of general use of the roads by construction vehicles.

Feature	Impact
Aesthetics	• Reduction in visual quality of area.
Safety and Security	• Safety risk to landowners and surrounding communities.
Waste Management	• Waste generated from site preparations (e.g. plant material) • Domestic waste • Surplus and used building material • Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags) • Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks • Land, air and water pollution through poor waste management practices
Socio – Economic	• Generation of employment opportunities for local people and SMME's (positive). • Contribution to local economy (positive). • Conflicted land uses. • Nuisance from noise, dust and increased traffic. • Safety and security. • Damage to property or equipment
Historical and Cultural Resources	• Damage to heritage resources.
Watercourses	• Damage to the structure and functioning of watercourses due to construction activities • Direct loss, disturbance and degradation of wetlands • Increased bare surfaces, runoff and potential for erosion • Degradation of wetland and riparian zone vegetation and the introduction and spread of alien and invasive vegetation • Increased sediment loads to downstream reaches • Contamination of watercourses with hydrocarbons due to leaks and spillages from machinery, equipment & vehicles • Disruption of wetland soil profile and alteration of hydrological regime

The potential significant environmental impacts identified for the operational phase of the proposed development, are tabulated below:

Feature	Impact
Land Use	• Servitude restrictions and inspections. • Operation and maintenance functions.
Topography	• Visual impacts from disturbed areas and permanent infrastructure • Crossing topographic features (watercourse crossings) • Erosion of affected areas
Flora	• Encroachment by exotic species through inadequate eradication programme
Aesthetics	• Visibility of pipeline servitude and associated infrastructure • Inadequate reinstatement and rehabilitation of construction footprint

Feature	Impact
Socio – Economic	• Improved water supply to local towns and communities (positive) • Generation of employment opportunities for local community (positive) • Safety and security issues through improper access control during inspections and maintenance activities • Use of local road network for operation and maintenance purposes
Existing Structures & Infrastructure	• Servitude restrictions.

The impacts and the proposed management measures are discussed on a qualitative level and thereafter quantitatively assessed to ultimately determine the significance of the impacts. The assessment considered impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated. The proposed mitigation of the impacts associated with the project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices.

I. PUBLIC PARTICIPATION

This BAR provides a full account of the public participation process that is being followed for the proposed project. The public review period of the Draft BAR took place for a 30-day review period from **27 August – 30 September 2019**.

During the review period, the Department of Environment, Forestry and Fisheries (DEFF) indicated that the Terrestrial Ecological and Socio-Economic Impact Assessment needed to be peer reviewed as they were conducted by in-house specialists. DEFF indicated that the peer reviewed studies would constitute new information and must be provided to authorities and registered Interested and Affected Parties (IAPs) for a second public review period. Thus the 30-day review period will take place from **05 December 2019 – 27 January 2020**.

The Final Basic Assessment Report, inclusive of all comments received during the review periods, was submitted to the DEFF for review and decision making. All authorities and registered IAPs will be notified after having received written notice from the aforementioned Department on the final decision for the project. An advertisement will also be placed as notification of the Department's decision. These notifications will include the appeal procedure to the decision and key reasons for the decision.

J. ENVIRONMENTAL CONCLUSIONS AND RECOMMENDATIONS

Attention is drawn to specific sensitive environmental features (with accompanying sensitivity maps) for which mitigation measures are included in this BAR.

An Environmental Impact Statement is provided and critical environmental activities that need to be executed during the project lifecycle are also presented. The report concludes that with

the adoption of the mitigation measures included in this report and specialist studies, and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated.

The report provides the following key recommendations, along with pertinent recommendations provided by the environmental specialists, which may also influence the conditions of the Environmental Authorisation (if granted):

1) Conduct environmental sensitivity walk through survey of entire project footprint prior to construction. Survey team to include the following specialists –
   a. Terrestrial ecologist;
   b. Aquatic ecologist; and
   c. Heritage specialist.
2) Specific attention will need to be paid to managing impacts to road users for all public roads and private roads. Traffic monitoring programme to be implemented and roads to be maintained. Safety of road users to be ensured at all times through appropriate safety and traffic calming measures.
3) Properties may not be accessed for construction purposes unless a construction servitude has been registered.
4) The land acquisition and compensation process needs to adhere to all legal requirements, in negotiation with the affected landowners, and the process must be undertaken fairly and must commence timeously prior to the construction phase.
5) As discussed in the EMPr, various forms of monitoring are required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.

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LIST OF ABBREVIATIONS

BAR	Basic Assessment Report
BID	Background Information Document
BIF	Banded Ironstone Formation
BPEO	Best Practicable Environmental Option
CBA	Critical Biodiversity Areas
DALRRD	Department of Agriculture, Land Reform and Rural Development
DEFF	Department of Environment, Forestry and Fisheries
DENC	Department of Environment and Nature Conservation
DHSWS	Department of Human Settlements, Water and Sanitation
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecologically Support Areas
FEPA	Freshwater Ecosystem Priority Areas
GA	General Authorisation
GIS	Geographical Information System
GN	Government Notice
HGM	Hydrogeomorphic
IAPs	Interested and Affected Parties
IBBA	Important Bird and Biodiversity Areas
IDP	Integrated Development Plan
IRS	Implementation Ready Study
LM	Local Municipality
MPRDA	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)

NEM:PAA	National Environmental Management: Protected Areas Act (No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)
NFA	National Forest Act (No. 84 of 1998)
NHRA	National Heritage Resources Act (No. 25 of 1999)
NWA	National Water Act (No. 36 of 1998)
OHS	Occupational Health and Safety
PES	Present Ecological Status
PIA	Palaeontological Impact Assessment
PS	Pump Station
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SD	Source Development
SDF	Spatial Development Framework
SIP	Strategic Infrastructure Project
SMME	Small Medium and Micro-sized Enterprises
URV	Unit Reference Value
VGRWSS	Vaal Gamagara Regional Water Supply Scheme
VGRWSS-II	Vaal Gamagara Regional Water Supply Scheme Phase 2
WMA	Water Management Area
WML	Waste Management Licence
WTW	Water Treatment Works
WULA	Water Use Licence Application

UNITS OF MEASUREMENT

°C	Degrees Celsius
ha	Hectare
km	Kilometre
km²	Square kilometre
kV	Kilovolt
l	Litres
l/s	Litres per second
m	Metre
m³	Cubic metre
m³/a	Cubic metre per annum
mg/l	Milligram per litre
Ml	Megalitre
mm	Millimetre
Mm³	Million m^3
Mm³/a	Million m^3/a
mS/m	Millisiemens per meter
MVA	Megavolt-ampere
%	Percentage

1 PURPOSE OF THE DOCUMENT

Nemai Consulting was appointed by Sedibeng Water to undertake the Basic Assessment Process for the proposed **Vaal Gamagara Regional Water Supply Scheme Phase 2 (VGRWSS-II): Upgrading of the Existing Scheme** in the Northern Cape in accordance with the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended).

The document serves as the **Final Basic Assessment Report (BAR)** for the proposed development. According to Government Notice (GN) No. R. 982 of 4 December 2014 (as amended), the objective of the Basic Assessment process is, through a consultative process, to:

(a) Determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
(b) Identify the alternatives considered, including the activity, location, and technology alternatives;
(c) Describe the need and desirability of the proposed alternatives;
(d) Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine−
    (i) The nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
    (ii) The degree to which these impacts−
        (aa) can be reversed;
        (bb) may cause irreplaceable loss of resources; and
        (cc) can be avoided, managed or mitigated; and
(e) Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to−
    (i) Identify and motivate a preferred site, activity and technology alternative;
    (ii) Identify suitable measures to avoid, manage or mitigate identified impacts; and
    (iii) Identify residual risks that need to be managed and monitored.

The Draft BAR was made available to Interested and Affected Parties (IAPs) for an initial 30-day review period from **27 August to 30 September 2019**. All comments that were received have been included in the Comments and Response Report. The Draft BAR was made available to IAPs for a second 30-day review period from **05 December 2019 to 27 January 2020**. The Final BAR was submitted to the Department of Environment, Forestry and Fisheries (DEFF), previously known as the Department of Environmental Affairs, who is the Competent Authority in respect to this proposed development in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA).

2 DOCUMENT ROADMAP

As a minimum, the BAR aims to satisfy the requirements stipulated in Appendix 1 of GN No. R 982 of 4 December 2014 (as amended). **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: Document Roadmap

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
1.	Purpose of the Document	–	–
2.	Document Roadmap	–	–
3.	Project Background and Motivation	3(1)(b, c and d)	(b) the location of the activity, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties; (c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is - (i) 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; (d) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for; and a description of the activities to be undertaken including associated structures and infrastructure;
4.	Project Location		
5.	Project Description		
6.	Alternatives		
7.	Environmental Assessment Practitioner	3(1)(a)	(a) Details of – (i) the Environmental Assessment Practitioner (EAP) who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including curriculum vitae.
8.	Legislation and Guidelines Considered	3(1)(e)	(e) a description of the policy and legislative context within which the development is proposed including- (i) 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 (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
9.	Basic Assessment Process	–	–
10.	Assumptions and Limitations	3(1)(o)	(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;
11.	Need and Desirability	3(1)(f)	(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;
12.	Timeframes	3(1)(q)	(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;
13.	Financial Provisions	3(1)(s)	(s) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;
14.	Resource Use and Process Details	-	-
15.	Public Participation Process	3(1)(h)	(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;
16.	Environmental Attributes	3(1)(h)	(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
17.	Summary of Specialist Studies	3(1)(k and m)	(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; (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;

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
18.	Impact Assessment	3(1)(h, i and j)	(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (v) 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 these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) 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 geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity; (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- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) 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; (j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;
19.	Impact Management		

Chapter	Title	Correlation with GN No. 982 – Appendix 1	
20.	Analysis of Alternatives	3(1)(g, k, l, m, n, and p)	(g) a motivation for the preferred site, activity and technology alternative; (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; (l) an environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (ii) 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 (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives; (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; (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;
21.	Conclusions and Recommendations		
22.	Oath of Environmental Assessment Practitioner	3(1)(r)	(r) an undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) 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;
N/A		3(1)(t)	Where applicable, any specific information required by the Competent Authority.
N/A		3(1)(u)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.

3 PROJECT BACKGROUND AND MOTIVATION

The Vaal Gamagara Regional Water Supply Scheme (VGRWSS) is a water supply scheme located in the Northern Cape Province that was completed in 1968 by the Department of Water Affairs, now Department of Human Settlements, Water and Sanitation (DHSWS), and transferred to Sedibeng Water in 2008.

Sedibeng Water is a water board established as an organ of state in terms of the Water Service Act (Act No. 108 of 1997). Sedibeng Water was established in 1979 mainly to serve to the Free State Goldfields and parts of the former Western Transvaal. Sedibeng Water also obtained managerial responsibility regarding the provision of essential services in certain districts of the Northern Cape of which the VGRWSS forms a part thereof.

The Scheme currently supplies approximately 22 million m^3/a to domestic consumers, mines and farmers. The Scheme transfers water from Delportshoop on the Vaal River (60km to the north west of Kimberley) via Postmasburg to the iron ore mines at Kathu. From Kathu, a pipeline continues to the manganese mines at Hotazel and finally terminates at Black Rock (see **Figure 1** below).

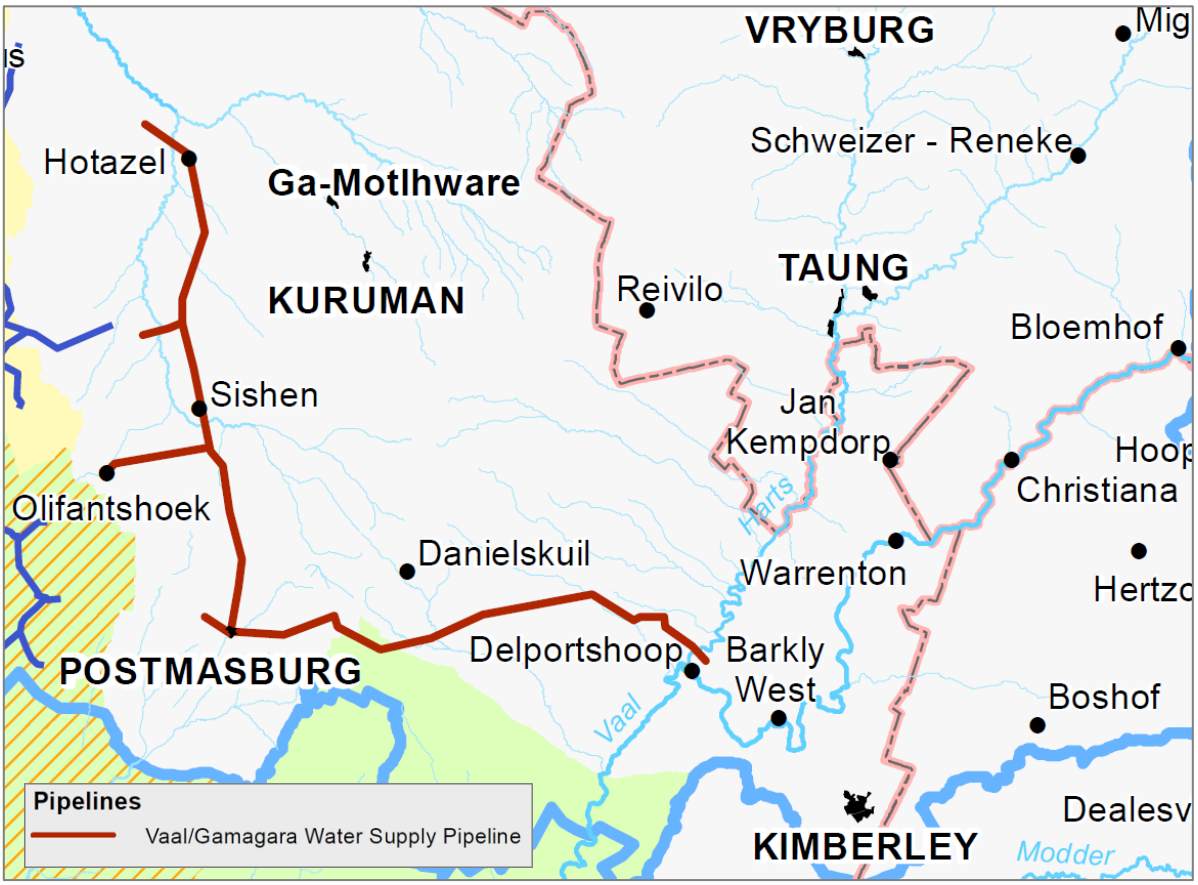


Figure 1: The current Vaal Gamagara water supply pipeline (extract from DWAF, 2009)

The existing VGRWSS consists of a water treatment works (WTW) that can treat 13.27 million m³/a (36 MLD) water, pumps, 11 reservoirs and 370km of pipes that deliver potable water to users. The pipeline has the capacity to convey approximately 15 million m³/a into the D41J and D41K catchments. The 13.27 million m³/a water is augmented to 28 million m^3/annum by dewatering activities of the Kolomela, Beeshoek and Sishen mines to lower the groundwater table to ensure safe mining conditions.

The current scheme is operating at capacity and is not able to supply the increasing future water demands, and deal with the increasing water supply interruptions. The major driving force of the increased water demand is the iron ore and manganese mining operations. These mines of the Northern Cape produce 84% of South Africa's iron ore and 92% of the world's high-grade manganese deposits are in the Kalahari basin. Diamond and lime mining operations also contribute to the water demand, but to a lesser degree.

Secondary to the expected increased water demand are water supply interruptions that are amplified due to the aging infrastructure. The infrastructure, being 50 years old, is nearing the end of its useful life. Due to the condition of the pipelines, the full design capacity can no longer be supplied through this infrastructure. Total collapse in water supply will probably happen in the next 5 years if the infrastructure is not replaced/rehabilitated.

Feasibility studies were undertaken to determine the best option to rehabilitate and increase the capacity of the scheme to cater for increased water demands. Sedibeng Water subsequently proposed the upgrading of the VGRWSS via the following two phases:

- Phase I – upgrading the scheme from the Roscoe Reservoir to Blackrock (already in construction phase); and
- **Phase II – upgrading the scheme from Delportshoop to Olifantshoek** (focus of this BAR).

The Reconciliation Strategy and Water Master Plan study for the VGRWSS highlighted the potential for available groundwater resources in the general area served or proposed to be served by the pipeline to augment the bulk water supply. Areas were identified as possessing enhanced groundwater development potential, these areas were designated Source Development (SD) Areas.

Note that a separate application will be submitted to DEFF to seek authorisation for the proposed groundwater abstraction, and this will be assessed in a separate BAR.

4 PROJECT LOCATION

The VGRWSS-II starts at the Delportshoop WTW and runs past the towns of Ulco, Lime Acres and Postmasburg before ending at Olifantshoek, in the Northern Cape. The municipalities within which the project footprint is located are listed in **Table 2** and shown in **Figure 2** below. The locality map is provided in **Figure 3**.

Table 2: Municipalities

District Municipality (DM)	Local Municipality (LM)	Wards*
Frances Baard DM	Dikgatlong LM	6
ZF Mgcawu DM	Kgatelopele LM	2 & 4
	Tsantsabane LM	1, 3, 5 & 6
John Taolo Gaetsewe DM	Gamagara LM	3, 4 & 5

** Based on the Ward Delimitation of 2016 by the Municipal Demarcation Board*

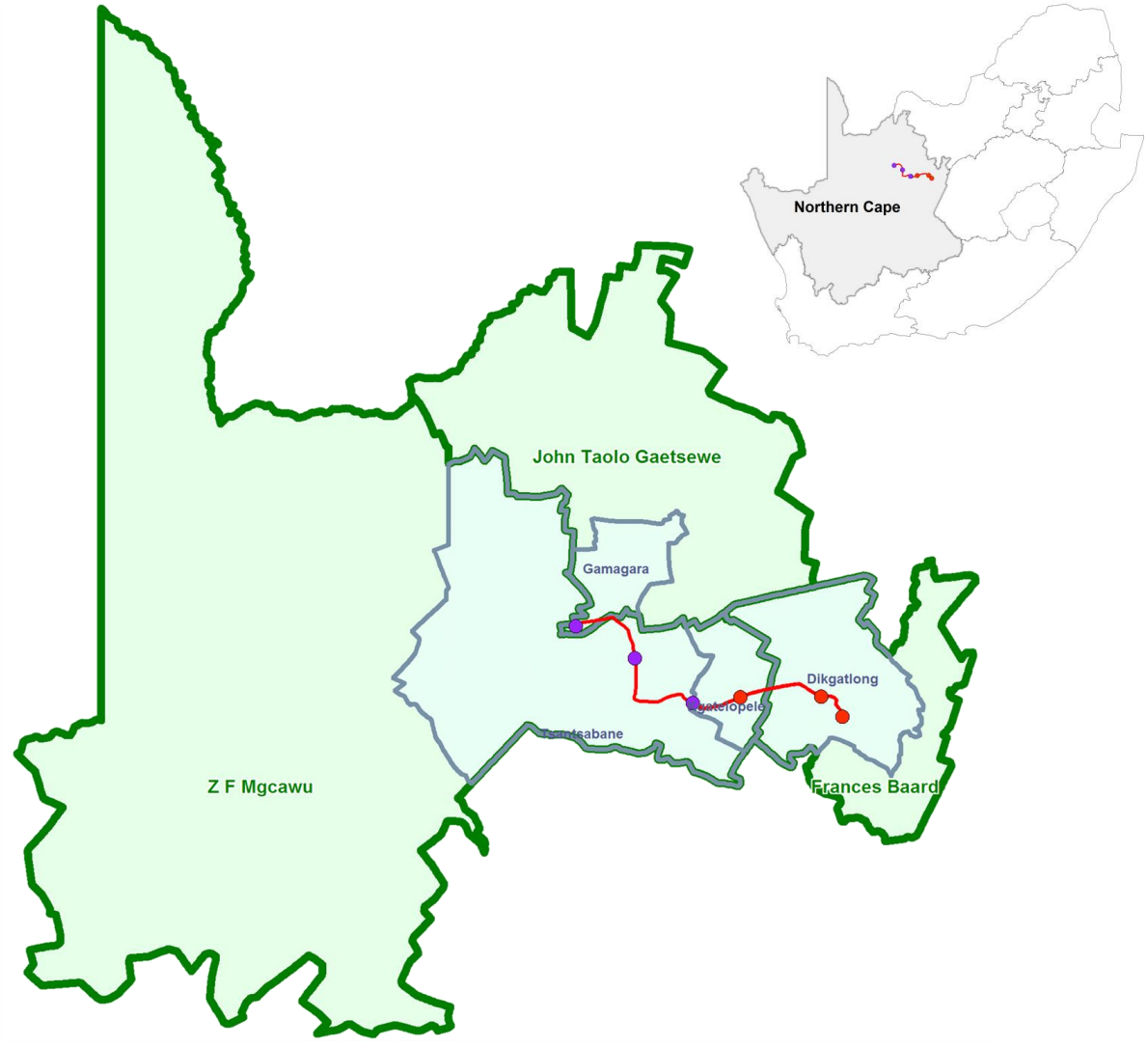


Figure 2: National, provincial and municipal maps

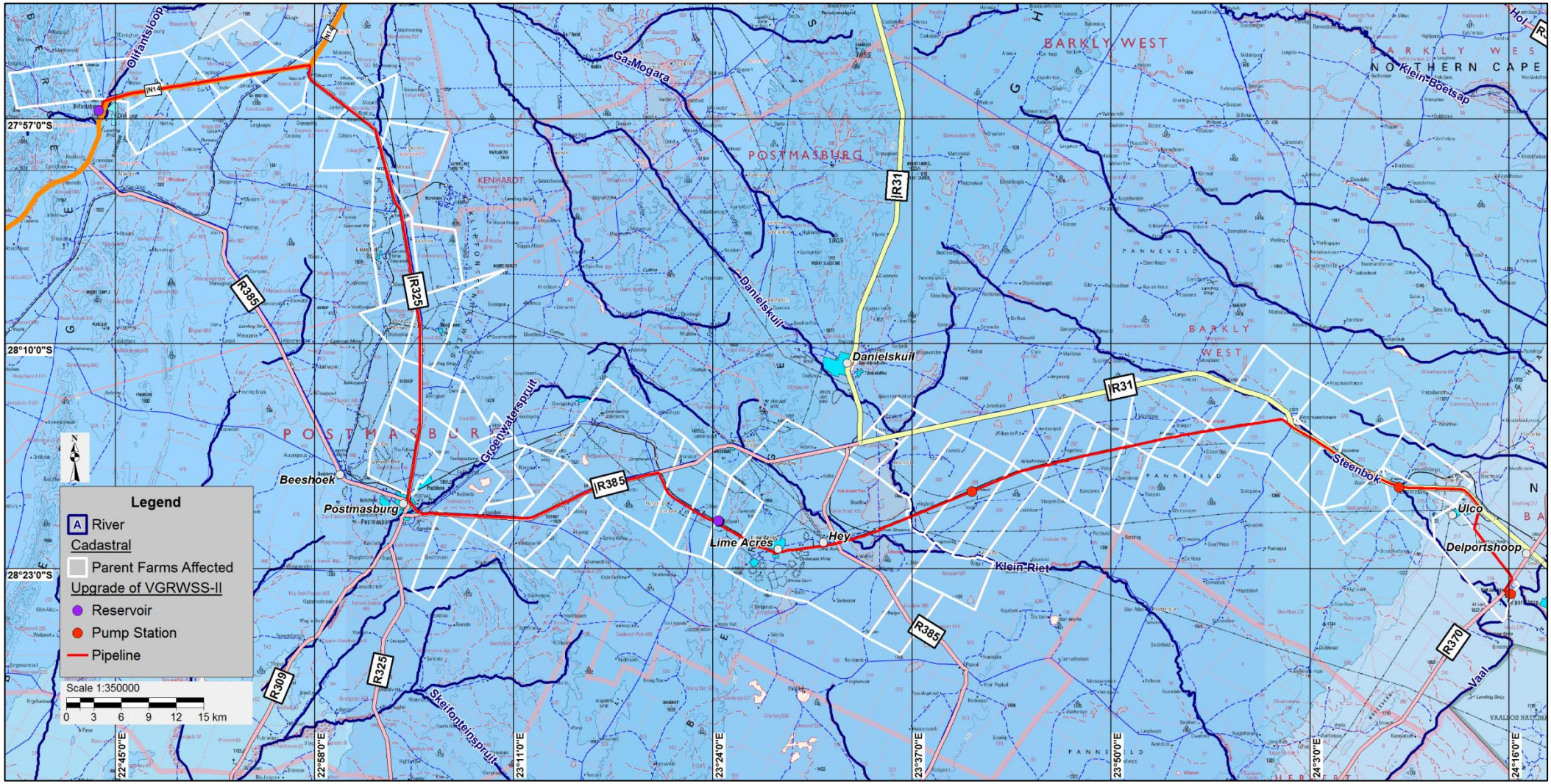


Figure 3: VGRWSS-II: Upgrade of Existing Scheme Locality Map

The project infrastructure is mostly located inside the existing VGRWSS pipeline servitude, which is situated along privately-owned properties that are primarily used for mining and agricultural practices.

Details of the properties that are directly affected by and adjacent to the proposed development, including the farm name and portion number / erf number, and coordinates of the proposed infrastructure, is contained in **Appendix D**.

5 PROJECT DESCRIPTION

5.1 Water Demand & Water Balance

The VGWSS supplies water to the following sectors (iX engineers, 2019):

- Local municipalities: Dikgatlong, Kgatelopele, Tsantsabane, Gamagara and Joe Morolong;
- Mines and industries: Petra Diamonds, Mokala Manganese, Huatian SA Mining, Bishop Mine PMG Mining, Assmang Beeshoek & Khumani Iron Ore Mines, Kolomela Mine, Lehating Mining, Mineral Explore Mining Solutions, COZA Mining, Tshipi e Ntlw Manganese, Assmang Nchwaning & Gloria Mines, Kalagadi Manganese, Kudumane Manganese Recourses, United Manganese of Kalahari, South32 Wessels & Mamatwan Mines, Diro Manganese/Diro Iron Ore and Morokwa Manganese Mine Pty Ltd;
- Solar projects: Redstone, Lesedi, Jasper, Adams and Kathu Solar Park;
- Water supply schemes: Kalahari East water supply scheme;
- Government and parastatal institutions: Lohatla Military Base, Transnet and Eskom; and
- Agriculture: mainly stock watering along the scheme, and domestic use.

A Feasibility Study and an Implementation Ready Study (IRS) for the Regional Bulk Infrastructure Grant (RBIG) programme for the refurbishment/upgrading of the VGRWSS project was drafted in 2011 and 2015 respectively. The Feasibility Study indicated that the then current water demand of 13.7 million m³/a should increase to approximately 40.06 million m³/a by the year 2030.

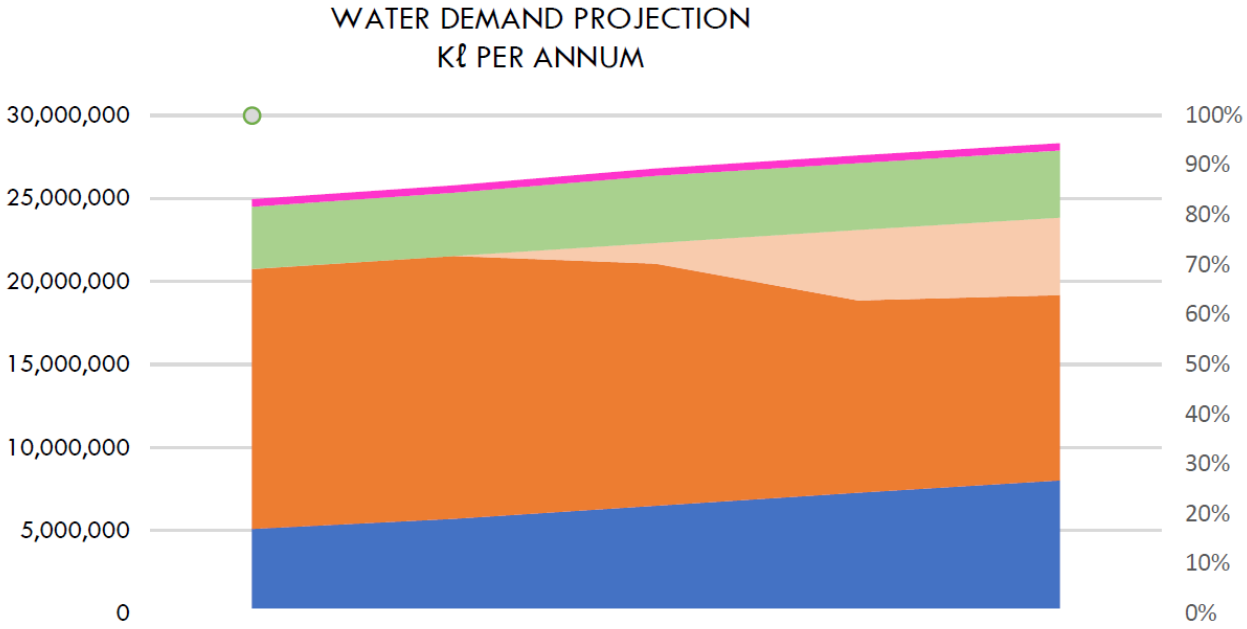
In 2016, Phase I of the project commenced which is currently under construction. With the commencement of Phase II, a recalculation of the water needs and infrastructure options to meet the water demand in 2043 was undertaken. This was based on the future water demand according to demographic and economic growth scenarios, as well as the updated water balance.

Some towns supplement water from the VGRWSS with own boreholes and taking this into account, it is estimated that the municipalities will require 8.02 million m³/a from the scheme by 2038. Estimates for other users are: mines 15.8 million m³/a, solar plants 0.5 million m³/a, and Kalahari East Water User Association, government, parastatal entities another 4 million m³/a. Thus, the scheme's current water supply of 20 million m³/a is estimated to increase to approximately 28,4 million m³/a (refer to **Table 3** and **Figure 4**). This excludes distribution losses, peak factors and new users.

Table 3: Future water demand projections 2038-2043 by user group (iX engineers, 2019)

	Water use sectors	2038-2043 in kℓ/a	% distribution
Economic	Mine and Industry	15 822 578	55.8%
	Solar Plants	448 500	1.6%
	Subtotal	***16 271 078***	***57.4%***
Social	Municipality	8 020 030	28.3%
	Gov & parastatals	4 034 396	14.2%
	Agriculture	37 080	0.1%
	Subtotal	***12 091 506***	***42.6%***
TOTAL		**28 362 584**	**100.0%**

According to iX engineers (2019), the water balance for VGRWSS analysed the availability and sustainability of the water sources and a quantification of the future water demand projections. **Figure 5** shows the VGRWSS layout, including the proposed SD1, SD2 and SD4.



	2018-2023	2023-2028	2028-2033	2033-2038	2038-2043
Solar Plants	448,500	448,500	448,500	448,500	448,500
Gov&para	3,744,396	3,794,396	4,034,396	4,034,396	4,034,396
Mines - no decline	0	0	1,246,954	4,229,179	4,660,836
Mine and Indistry	15,659,492	15,822,578	14,575,623	11,593,398	11,161,741
Municipality	5,096,659	5,719,399	6,496,027	7,272,655	8,020,030
% use	100%				

Figure 4: Total water demand projections for the VGWSS (iX engineers, 2019)

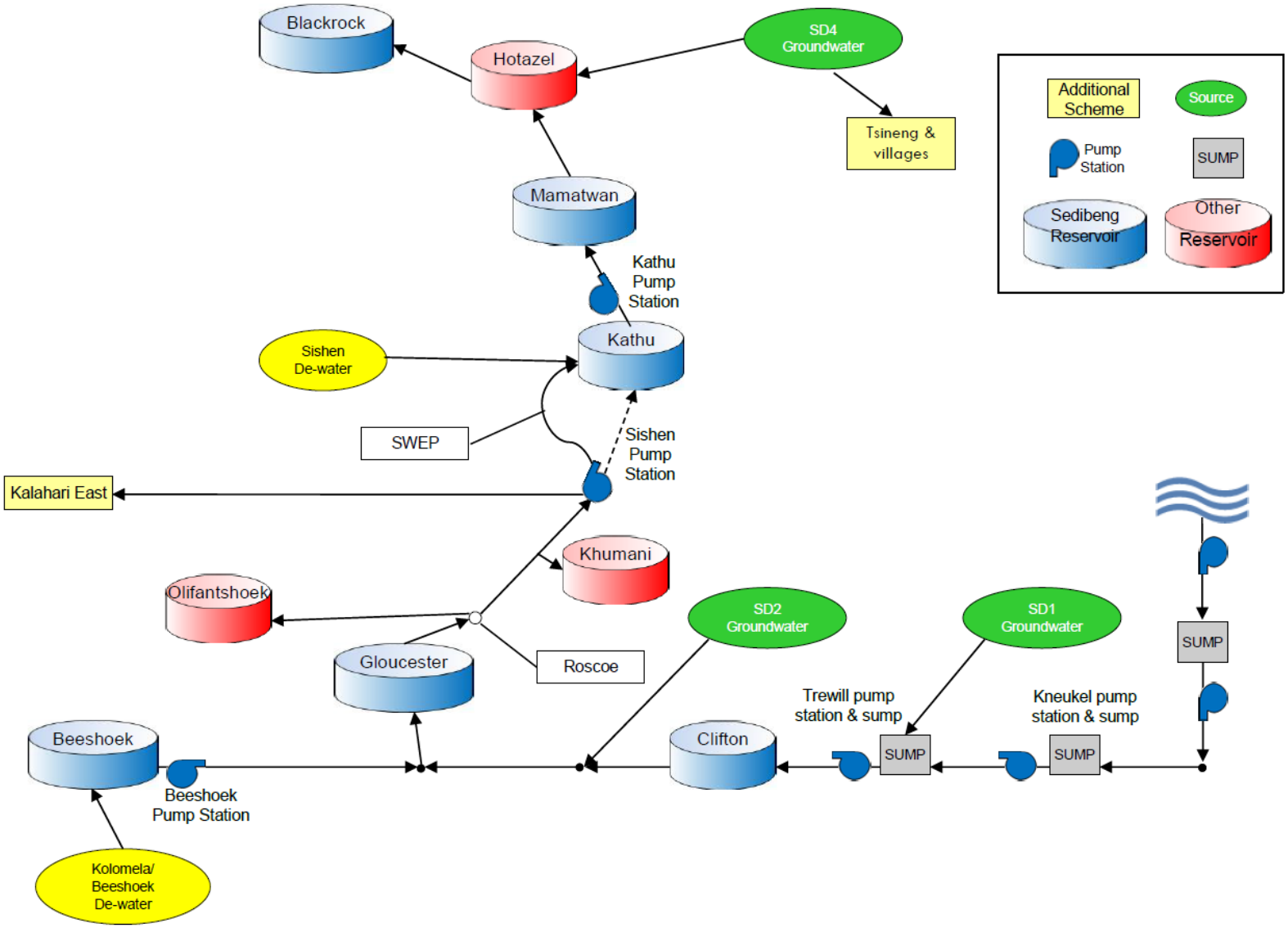


Figure 5: VGWSS layout (iX engineers, 2019)

According to the holistic water balance overview, the scheme should be able to meet, on average per annum, the future water demand provided dewatering water is obtainable on a similar manner as in the past, the SD groundwater sources are developed, and the WTW is able to be operated at current capacity in the future.

Since the probability of supply of the dewatering sources is relatively low, the development and utilization of the SD groundwater sources is required to increase the total reliability of the scheme. In the unlikely event that the dewatering supply ceases (zero), the scheme should still be able to supply 92% of the 2043 demand with the SD groundwater and the Vaal River as sources.

5.2 Project Components & Activities

5.2.1 General

An overview of the project components associated with the proposed VGRWSS-II: Upgrading of the Existing Scheme, follows.

5.2.2 Water Abstraction Works

The abstraction works at Delportshoop (shown in **Figure 6** below) will require mechanical and electrical upgrading.

Figure 6: Delportshoop Abstraction works on the Vaal River

5.2.3 Water Treatment Works

It is currently envisaged that the Delportshoop WTW (shown in **Figure 7**) will not undergo any major upgrades to the infrastructure. Provision was made to do refurbishment on pipework and repairs to buildings. The footprint of the WTW will remain the same.

Figure 7: Delportshoop WTW

5.2.4 Pipelines

Water is currently pumped from the water treatment works via a 20.8 km long 687 mm diameter pipeline to Kneukel sump and pump station, from where it is pumped via a 47.8 km long 687 mm diameter pipeline to Trewill sump and pump station. From Trewill pump station water is pumped via a 30.3 km long 508 mm diameter pipeline to Clifton reservoirs. Water is then conveyed from Clifton reservoirs in a 37.1 km long 762 mm diameter and 23.5 km long 660 mm diameter pipeline to Gloucester reservoir under gravity. Gloucester reservoir serves as a pressure break tank. From Gloucester water is conveyed under gravity to the rest of the system, initially through a 27.1 km long 900 mm pipeline up to the Olifantshoek branch and then a 23.4 km long 254 mm diameter pipeline towards Olifantshoek.

A second decommissioned pipeline runs parallel to the existing pipeline between Delportshoop and Clifton. This pipe will be removed and the new pipe will be installed in the same trench. A summary of the pipeline information is provided in **Table 4** below.

Table 4: Pipeline Information

Location		Existing Pipe		Decommissioned Pipe		New Pipe	
		Length (km)	Dia (mm)	Length (km)	Dia (mm)	Length (km)	Dia (mm)
Rising Mains	Delportshoop-Kneukel	20.8	687	20.8	508 & 381	20.8	813
	Kneukel-Trewill	47.8	687	47.8		47.8	813
	Trewill-Clifton	30.3	508	22.4		30.3	1016
Gravity Mains	Clifton-Postmasburg	37.1	762	-	-	37.1	813
	Postmasburg-Gloucester	23.5	660	-	-	23.5	914
	Gloucester-Roscoe	27.1	900	-	-	27.1	914
	Roscoe-Olifantshoek	23.4	254	-	-	23.4	273

The proposed scope of work for VGRWSS-II with regards to the abovementioned pipelines includes the following:

- Replacing of Pipeline from Beeshoek Connection to Roscoe;
- Replacing of Pipeline between Clifton and Beeshoek Connection;
- Replacing of the Rising Main from Delportshoop to Kneukel;
- Replacing of the Rising Main from Kneukel to Trewill;
- Replacing of the Rising Main from Trewill to Clifton; and
- Refurbishment/Replacement of Gravity Main from Roscoe to Olifantshoek.

Note that the replacement of the above sections of pipelines will take place within the existing servitude (approximately 10 m – 15 m wide). It is anticipated that the construction servitude will be 40 m wide (refer to **Figure 9**), and the permanent servitude will thus need to be widened temporarily. The existing pipeline will remain operational during the upgrading of the scheme and will then be decommissioned thereafter.

The existing pipeline mostly follows existing linear infrastructure (including roads and a railway line) as well as boundaries between properties. Various views along the existing pipeline servitude are provided in **Figure 8** below, and **Appendix B**.

Figure 8: Views along the existing pipeline servitude

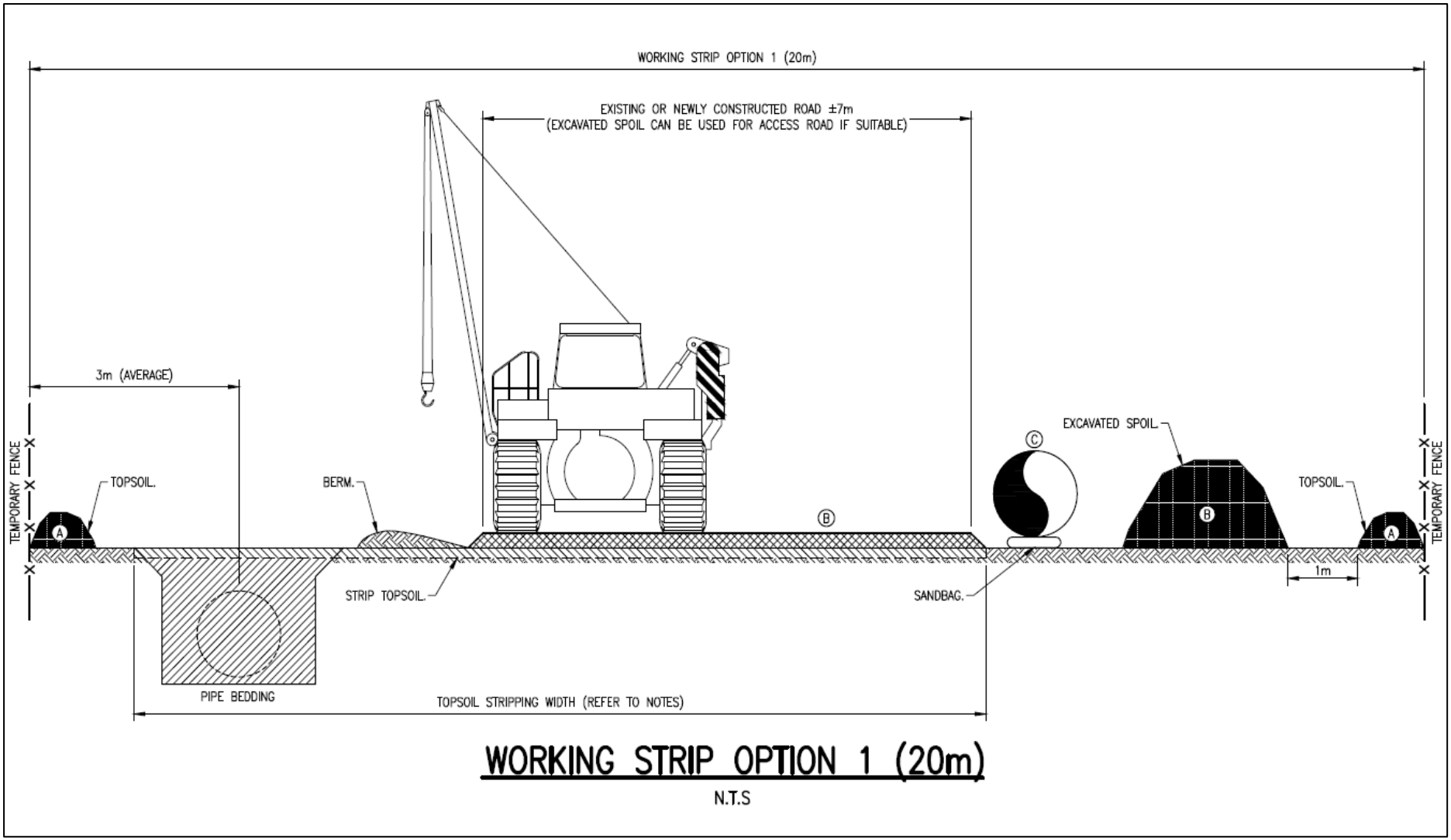


Figure 9: Typical construction servitude cross-section (Note: not specific to VGRWSS-II – merely indicative)

The study area for the EIA included at least an 80 m corridor (i.e. 40m on either side of the centre line) for the pipeline, which allows for possible deviations from the proposed alignment within this corridor during the design phase (e.g. avoidance of sensitive features, if possible). Note that it is not possible to locate the pipeline within servitudes or reserves of existing infrastructure, and it will thus need to be constructed on the adjoining private properties. Refer to **Appendix D** for detailed maps on the pipeline route.

5.2.5 Pump Station

The pump stations at Delportshoop, Kneukel and Trewill (shown in **Figure 10** below) have capacity to upgrade mechanical and electrical components without major upgrades to the civil works. The footprint of the pump stations will remain the same.

Figure 10: Kneukel (top) and Trewill (bottom) Pump Stations and Sumps

The following were identified in order to prioritise the pump station components for VGRWSS-II:

- Upgrading of Trewill Pump Station and Sump;
- Upgrading of Kneukel Pump Station and Sump; and
- The Refurbishment of Delportshoop Pump Stations.

5.2.6 Reservoirs

A 10 Mℓ reservoir serves as a sump for the Delportshoop pump station and is located on the WTW site (shown in **Figure 11** below). Two identical 0.9 Mℓ sumps are located at Kneukel and at Trewill pump stations (shown in **Figure 10**). The main reservoir cluster is at Clifton (shown in **Figure 12** below), located 98 km from Delportshoop along the pipeline, where four identical structures provide a total storage of 27 Mℓ. The Gloucester reservoir (shown in **Figure 13)** with a capacity of 6.75 Mℓ, is located 60 km from the Clifton reservoirs. Olifantshoek reservoir (shown in **Figure 14**) is located 23 km from Roscoe and has a capacity of 3 Mℓ.

Figure 11: Delportshoop Sump

Figure 12: Clifton Reservoirs

Figure 13: Gloucester Reservoir

Figure 14: Olifantshoek Reservoir

The following were identified in order to prioritise the reservoir components for the project:

- Upgrading of Clifton and Gloucester Reservoirs; and
- Upgrading of Kneukel and Trewill Sump.

The proposed upgrading of the Trewill Sump will entail the following:

- The current Trewill pump sump is a square reservoir with a capacity of 900kl. The existing sump will be duplicated and will fit within the existing site boundary (refer to **Figure 15**).

The proposed upgrading of the Clifton Reservoir will entail the following:

- It is proposed that a single 6.7 Mℓ reservoir be added to satisfy the requirements of 2043. The existing site boundary already provides space for the addition of a new reservoir without purchasing any additional land portions (refer to **Figure 16**).

Figure 15: Trewill Pump Station and Sump

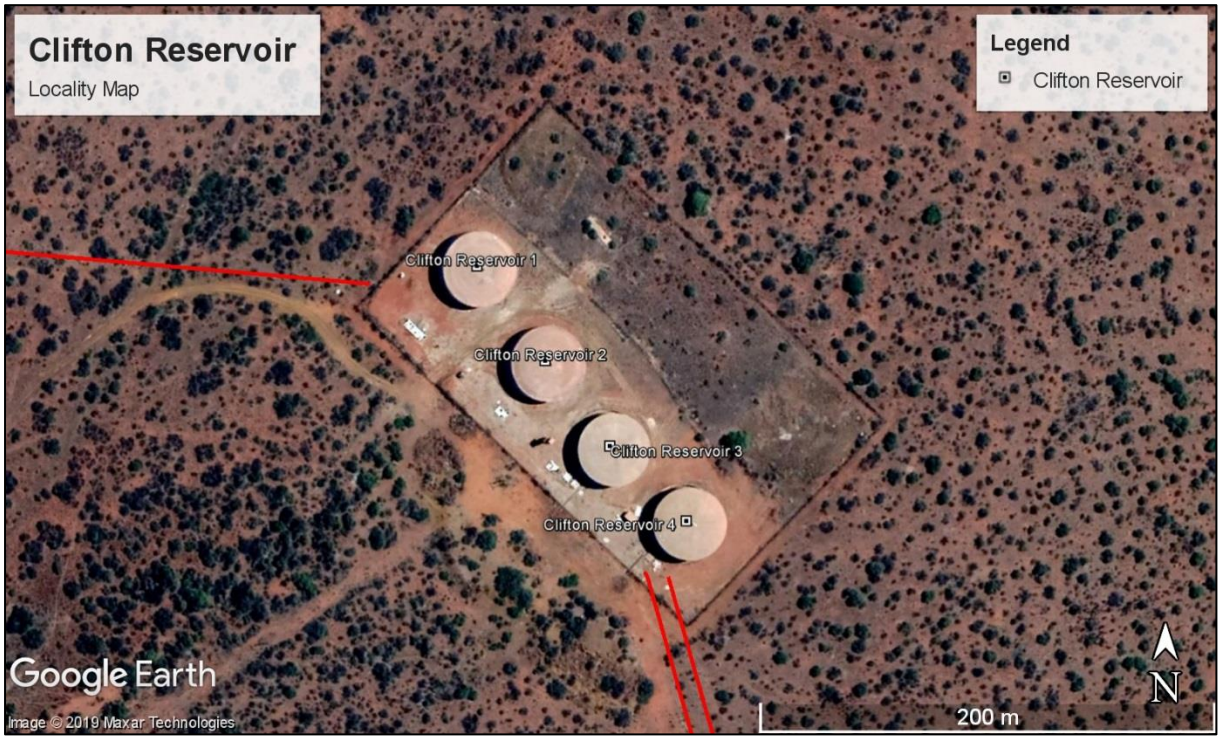


Figure 16: Clifton Reservoir

The proposed upgrading of the Gloucester Reservoir will entail the following:

- The existing site boundary is not able to accommodate an additional reservoir and must be extended towards the north. A new area measuring 5800m² will be required to accommodate an additional 7.2 Mℓ reservoir (refer to **Figure 17**).

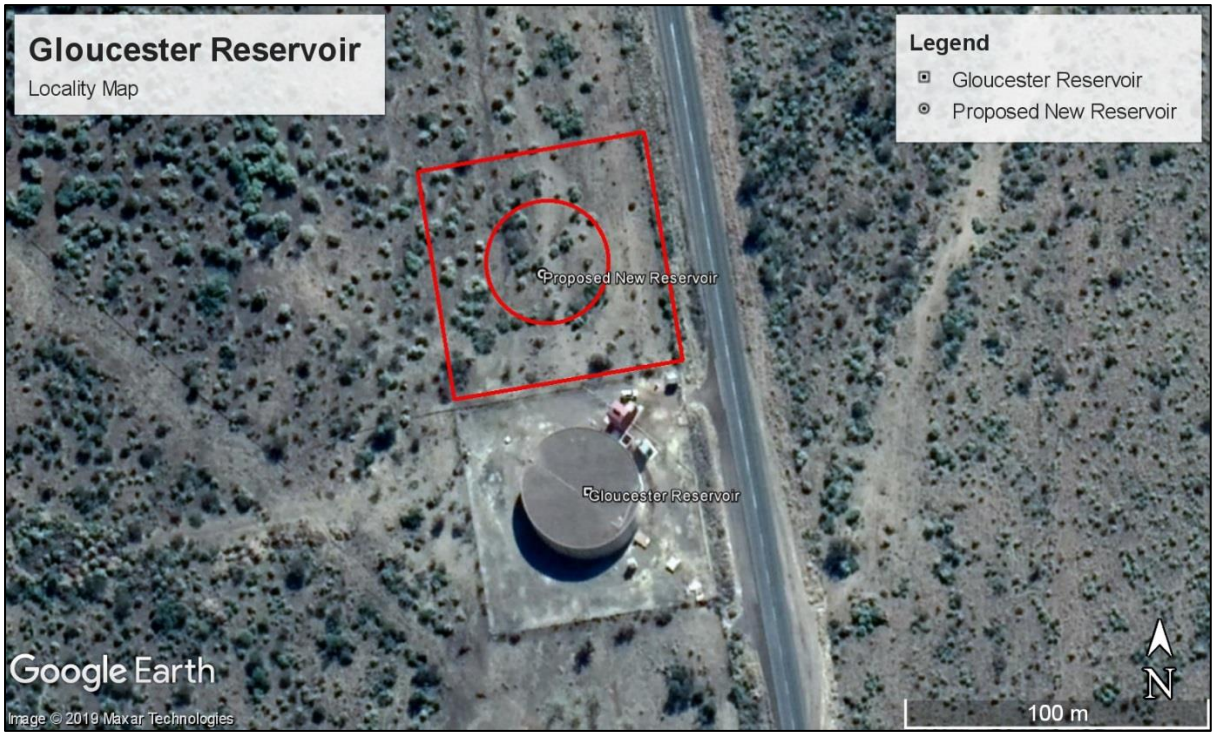


Figure 17: Gloucester Reservoir

5.2.7 Access Roads

Permanent as well as temporary (construction period) access roads are required for the project. A permanent access road will be required along the 210 km on the main pipeline (within the permanent servitude), which will typically be an all-weather road, not wider than 3 m. Where possible, the temporary access roads attempt to follow existing tracks and farms roads.

Key activities associated with the crossing of watercourses include –

- Clearing of construction footprint for access road;
- Construction of the road with gravel surfacing;
- Stormwater management with daylighting channels and/or culverts, as required; and
- Reinstatement and rehabilitation, as required.

5.2.8 Fibre-Optic Cable

Communication between the pump stations and reservoirs can be done via fibre optic cables, which will be laid with the pipeline in the same trench.

5.2.9 Managing Spoil Material

Excess spoil material (soil and rock) will be generated as part of the bulk earthworks associated with the construction phase of the project. This spoil material will be hauled and dumped at the following sites (to be assessed separately):

- Old borrow sites that were created during the construction of the railway line and roads;

- New spoil sites that will be created; and
- Existing approved spoil sites at surrounding mines.

5.2.10 First Order Cathodic Protection & AC Mitigation

Cathodic protection and AC mitigation will be necessary where the proposed pipeline route runs parallel to and crosses (a) existing and proposed future high voltage power line routes, and (b) electrified railway lines.

Mutual interference effects between the pipeline and a high voltage power line could result in danger to safety of personnel under normal operation and fault conditions, risk to the pipeline integrity under fault conditions, risk of AC-enhanced corrosion under normal operation and risk of damage to the coating from electrical stress under fault conditions. Hence, AC mitigation is necessary.

5.2.11 Land Acquisition Process

The proposed replacement of the sections of pipelines will take place within the existing servitude (approximately 10 m – 15 m wide). It is anticipated that the construction servitude will be 40 m wide and the permanent servitude will thus need to be widened temporarily.

Negotiations with the landowners to acquire and register the relevant land rights (servitudes and purchases) will be undertaken by Sedibeng Water. Sedibeng Water's land rights acquisition strategy will adhere to all statutory requirements prevailing at the time, as per the Promotion of Administrative Justice Act (No. 99 of 2000), the Expropriation Act (No. 63 of 1975).

Determination of compensation will be done in terms of the prevailing Expropriation Act when the acquisition is done (currently Section 12 of the Expropriation Act (No. 63 of 1975)), which in case of the servitude right will include an amount to make good actual financial losses caused by the acquisition of the right. In case of the servitude-of-aqueduct along the new pipeline rights, in principle, compensation is payable for both temporary (during construction and rehabilitation) and permanent servitude rights, as may be required. In the case of existing permanent servitudes (where applicable), the available rights will need to be investigated and confirmed. Although the Right of Use to the land will belong to the infrastructure custodian, the landowner will still be permitted access to and certain use of the servitude area (depending on the limitations specified in the servitude conditions).

5.3 Project Lifecycle

An overview of the project lifecycle for the proposed development, follows below.

5.3.1 Pre-feasibility and Feasibility Phases

Major activities that were undertaken as part of the Feasibility Phase include the following (amongst others):

- Assessment of base conditions;
- Technical, economic and environmental screening of alternatives; and
- Sizing and costing of infrastructure.

5.3.2 Pre-Construction Phase

General activities associated with the pre-construction phase include the following (amongst others):

- Negotiations and agreements with the affected landowners, stakeholders and authorities;
- Detailed engineering design;
- Detailed geotechnical investigations;
- Survey and mark construction servitude;
- Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary);
- Possible removal of trees within construction servitude;
- Possible further phases of heritage/palaeontological site investigation and fencing of sensitive heritage and/or palaeontological sites;
- Procurement process for Contractors;
- Selective improvements of access roads to facilitate the delivery of construction plant and materials;
- Arrangements for accommodation of construction workers;
- The building of a site office(s) and ablution facilities;
- Permits if protected trees are to be cut, disturbed, damaged, destroyed or removed;
- Permits if heritage resources are to be impacted on and for the relocation of graves;
- Confirmation of arrangements with individual landowners and/or land users for managing and mitigating issues such as fencing and gate dimensions for traversing servitude, traversing patterns of livestock over servitude, access to livestock drinking points, security, opening and closing of gates and access to private property;
- Confirmation of the location and condition of all buildings, assets and structures within the servitude; and
- Determining and documenting the road conditions for all identified haul roads.

5.3.3 Construction Phase

General activities associated with the construction phase include the following (amongst others):

- Site establishment;
- Relocation of infrastructure;

- Prepare access roads;
- Establish construction camp(s);
- Bulk fuel storage;
- Storage and handling of material;
- Construction employment;
- Site clearing;
- Excavation;
- Blasting (as required);
- Establishment of and operations at crusher;
- Establishment of and operations at batching plant;
- Establishment of and operations at materials testing laboratory;
- Create haul roads;
- Concrete works;
- Steel works;
- Mechanical and Electrical Works;
- Electrical supply;
- Construction of pipeline;
- Cut and cover activities;
- Stockpiling (sand, crushed stone, aggregate, etc.);
- Waste and wastewater management;
- Relocation of graves, protected species, etc.; and
- Reinstatement and rehabilitation of construction domain (as necessary).

The methodology for the installation of the pipeline is as follows:

- Pegging of route;
- Marking of protected trees;
- Remove topsoil in the area where construction will take place and stockpile separately for later re-instatement;
- Excavate pipe trench (refer to the construction servitude diagram contained in **Figure 9** for an illustration of the typical trench geometry);
- Install and compact pipe bedding;
- Install pipe sections by means of side booms (special cranes) and weld joints (see **Figure 18** below);



Figure 18: Typical trench excavation and pipe installation activities

- Repair field joints and backfill and compact pipe trench in layers;
- Construct air and scour valves. Air valves, which are generally positioned at high points along the route, release air from the pipeline as it fills, allow air into the pipeline when it is draining and 'bleed' off air during normal operations. The scour valves serve to drain water from the pipeline (typically during maintenance), and are located at low points along the route for drainage purposes. A detailed hydraulic analysis for the positioning of the valves will be performed as part of the detail design;
- Construct access chambers (see **Figure 19** below);
- Re-shape the impacted area to its original topography and replace stripped topsoil (see **Figure 20** below);
- Install final Cathodic Protection;
- Install AC mitigation measures;
- Install pipeline markers at changes in direction and at regular intervals along the route; and
- Undertake reinstatement and rehabilitation.

Figure 19: Typical examples of chambers (left - during construction; right – completed)

Figure 20: Typical views of reinstated (left) and rehabilitated (right) pipeline routes

Watercourse crossings will generally consist of pipe sections encased in concrete in accordance with the relevant DHSWS and Sedibeng Water criteria. The typical construction methodology for a river crossing is as follows (see **Figure 21**):

- An earthen berm (coffer dam) and temporary bypass canal is constructed to divert the water around the construction site;
- The trench is excavated across the dry river channel;
- A concrete bedding is constructed first, followed by the installation and restraining of the pipe to prevent flotation. Encasement is completed by the construction of further concrete lifts;
- Once the concrete has set, the temporary coffer dam is removed and the bypass canal backfilled to re-instate the flow;
- The impacted area is re-shaped to its original topography;
- The disturbed area is rehabilitated; and
- If erosion of the disturbed river banks is a concern, suitable measures will be implemented to ensure the stabilisation of the river structure.

Figure 21: Examples of typical river crossings

5.3.4 Operation Phase

Key activities to be undertaken as part of the operation and maintenance include the following:

- Pipeline –
  - Create access track along pipeline servitude;
  - Conduct routine maintenance inspections of the project infrastructure;
  - Scouring of pipeline, where the water conveyed and stored within this system will be released into the receiving watercourses along the alignment from scour valves. A detail hydraulic analysis will be conducted to determine the optimum positioning of the scour valves;
  - Undertake maintenance and repair works, where necessary; and
  - Ongoing consultation with directly affected parties.

5.3.5 Decommissioning Phase

The scheme currently has two parallel pipes between Delportshoop WTW and Clifton reservoirs. The oldest of the two pipes was decommissioned a long time ago and will be removed. The new pipe will then be installed in the same trench. The pipe that is currently delivering water cannot be decommissioned before the new pipeline is live. The pipe will then be decommissioned but not removed from the ground. It can be used as part of the design to protect the new pipeline.

5.4 Preliminary Implementation Programme

Phase 2 of the VGRWSS-II will be divided into ten sub-projects, with difference commencement and completion dates. Implementation of the respective projects are highly dependent on funding from various stakeholders. Expected completion dates shown in **Table 5** below are according to the project programme and cannot be guaranteed.

Table 5: Expected completion dates

Project	Component	Expected completion date
	Review of Feasibility study	End November 2018
	EIA and WULA	End October 2020
	Topographical Survey	End August 2019
	Geotechnical investigation	End April 2020
	Land matters	End February 2022
Project 1	Replacement of Pipeline from Beeshoek Connection to Roscoe	November 2021
Project 2	Development of Well Sites SD1 and SD2, Export Pump Station & Pipeline and Sump	January 2022
Project 3	Replacing of the Rising Main from Trewill to Clifton	April 2022
Project 4	Upgrading of Trewill Pump Station and Sump	April 2022
Project 5	Replacing of Pipeline between Clifton and Beeshoek Connection	March 2023
Project 6	Replacing of the Rising Main from Delportshoop to Kneukel	November 2023
Project 7	Replacing of the Rising Main from Kneukel to Trewill	May 2024
Project 8	Upgrading of Kneukel Pump Station and Sump	November 2023

Project	Component	Expected completion date
Project 9	Refurbishment of Olifantshoek Gravity Main	May 2024
Project 10	The Refurbishment of Delportshoop Water Treatment Works and Pumps Stations	February 2025
	Upgrading of substations at Delportshoop, Kneukel and Trewill: 2x10MVA transformers each	
	6,6kV switch gear at Delportshoop, Kneukel and Trewill	
	Abstraction pumps at Delportshoop with motor control panel	
	Pumps, starters and PLC/HMI equipment at Delportshoop, Kneukel and Trewill	
	SCADA/Telemetry equipment	
	Fibre-optic cable laid with pipeline	

5.5 Services & Resources Required for Construction & Operation

This section briefly outlines the resources and services that will be required to execute the project. The Environmental Management Programme (EMPr) contained in **Appendix I**, includes management measures that address the resources and services associated with the project.

5.5.1 Water

During the construction stage, water will be required for various purposes, such as concrete batching, washing of plant and equipment in dedicated areas, dust suppression, potable use by construction workers, etc.

Water for construction purposes will be sourced directly from water sources on site and from the existing pipeline. Water tankers will also supply water to the site.

All water use triggered in terms of Section 21 of the National Water Act (Act No. 36 of 1998) must comply with DHSWS's requirements.

5.5.2 Sanitation

Sanitation services along the pipeline route will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier.

A temporary septic field / tank system will be provided at the site camps and site offices.

5.5.3 Waste

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at construction camps) and will be removed at regular intervals and disposed of at appropriately permitted waste disposal sites within each of the local municipalities that are affected by the project. All the waste disposed of will be recorded.

Construction-related wastewater, which refers to any water adversely affected in quality through construction activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g. equipment, staff); and
- Drainage over contaminated areas (e.g. cement batching / mixing areas, workshop, equipment storage areas).

Specific measures for the containment and disposal of construction-related wastewater on site are provided in the EMPr, contained in **Appendix I.**

5.5.4 Electricity

Electricity will be obtained from diesel generators or temporary electricity connections during the construction phase.

Power is already supplied by Eskom for the current scheme, which will be used during the operational phase. The substations at Delportshoop, Kneukel and Trewill will be upgraded.

5.5.5 Construction Workers

The appointed Contractor will make use of skilled labour where necessary. In those instances where casual labour is required, Sedibeng Water will request that such persons are sourced from local communities, as far as possible.

5.5.6 Construction Site Camps

It is anticipated that provision will be made for the following facilities at the construction camps:

- Concrete batching plant;
- Site offices;
- Parking;
- Materials testing laboratory;
- Workshops and stores;
- Reinforcing steel bending yard;
- Weather station;
- Sand and crushed stone stockpile areas;
- Areas for the handling of hazardous substances;
- An explosives storage magazine;

- Wash bays for construction plant;
- Radio communication infrastructure;
- Facilities for the bulk storage and dispensing of fuel for construction vehicles;
- Ablution facilities; and
- A solid waste disposal facility.

The location and number of the construction camps will in part depend on the number of construction packages.

The following preliminary locations for construction camp sites have been identified:

- Delportshoop;
- Kneukel/Koopmansfontein;
- Trewill/Lime Acres;
- Postmasburg;
- Glosam; and
- Olifantshoek.

The construction camp locations will need to be reviewed and assessed further during the detailed design phase. Any additional environmental approvals associated with the construction camps will also need to be identified during the design phase. Provision is made in the EMPr for managing potential impacts associated with the construction camps.

6 ALTERNATIVES

6.1 Introduction

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project.

6.2 Screened Alternatives

According to Sedibeng Water (2011), reconciliation strategies were developed for the bulk water users and municipalities served/interacting by/with the Vaal Gamagara Scheme, in order to identify measures that are necessary to ensure that the current and future water requirements of the water users can be supplied from the available water resources on a sustainable basis. The various reconciliation strategies were used to develop a Water Master Plan for the Vaal Gamagara Scheme.

The development of these strategies involved the following components:

- Establish water demand and use;
- Investigate the potential water savings achievable through water conservation and water demand management (WC/WDM);
- Investigate the quality and quantity of available water sources i.e. ground water and/or the Vaal Gamagara scheme;
- Investigate the capacity and condition of existing infrastructure and the need for upgrading, as well as the economic viability thereof;
- Investigate possible augmentation options; and
- Determine the economic viability of possible conveyance options.

The three options that were investigated and planned as part of the Reconciliation Strategy and Water Master Plan for the upgrading of the current scheme included the following (Sedibeng Water, 2011):

- Option 1: Replace the existing scheme with a single pipeline with sufficient capacity to supply the anticipated demand;
- Option 2: Add capacity to the existing scheme to supply the anticipated demand by an additional pipeline; and
- Option 3: Replace the existing scheme with a double pipeline with sufficient capacity to supply the anticipated demand.

A costing and engineering economic analysis was conducted by means of a Unit Reference Value (URV) for each technical alternative and comparing the cost. From the calculations it was evident that Option 1 has the lowest URV and thus from an engineering economic point of view, Option 1 was recommended.

6.3 Alternatives to Project Components

The proposed project entails the upgrading of an existing scheme and the only alternatives that were thus considered were the preferred option (discussed in **Section 5.2**) and the no-go/do nothing option. This was discussed and agreed upon with DEFF during the Pre-Application Consultation Meeting (copy of the minutes included in the Application Form contained in **Appendix J**.

6.4 No-Go Alternative

The no-go option is the alternative of not implementing the project. It also provides the baseline against which the impacts of other alternatives are compared. The implications of the no-go option are discussed in **Section 19.17**.

7 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed as the Independent Environmental Assessment Practitioner (EAP) to compile the BAR for the proposed VGRWSS-II: upgrade of existing scheme.

In accordance with Appendix 1, Section 3(1)(a) of GN No. R 982 of 4 December 2014 (as amended), this section provides an overview of the EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng) and Durban (KZN).

The core members of Nemai Consulting that are involved with the Basic Assessment process for the project are captured in **Table 6** below, and their respective Curricula Vitae are contained in **Appendix J**.

Table 6: EIA Core Team Members

Name	Qualifications	Experience	Duties
Ms D. Naidoo	BSc Eng (Chem)	21 years	• Project Manager • Quality Control • EIA Process
Mr D. Henning	MSc (River Ecology)	18 years	• Project Leader • EIA Process
Mr C. Chidley	• BSc Eng (Civil); • BA (Economics, Philosophy) • MBA	25 years	• Quality Review • Technical Input • EMPr
Mr C. v. d. Hoven	BSc (Hons) (Environmental Studies)	3 years	• Public Participation • EIA Process

8 LEGISLATION AND GUIDELINES CONSIDERED

8.1 Legislation

8.1.1 Environmental Statutory Framework

The legislation that has a possible bearing on the proposed project from an environmental perspective is captured in **Table 7** below. **Note:** *this list does not attempt to provide an exhaustive explanation, but rather represents an identification of the most appropriate sections from pertinent pieces of legislation*.

Table 7: Environmental Statutory Framework

Legislation	Description and Relevance	
Constitution of the Republic of South Africa, (No. 108 of 1996)	• Chapter 2 – Bill of Rights; and • Section 24 – Environmental Rights.	
National Environmental Management Act (No. 107 of 1998) (NEMA)	• Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment); • Section 28 – Duty of care and remediation of environmental damage; • Environmental management principles; and • Authorities – DEFF (national) and Northern Cape Department of Environment and Nature Conservation (DENC) (provincial).	
GN No. R 982 of 4 December 2014 (as amended)	• Purpose - regulate the procedure and criteria as contemplated in Chapter 5 of NEMA relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.	
GN No. R. 983 of 4 December 2014 (as amended) – Listing Notice 1	• Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA; • The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014 (as amended). • Activities under Listing Notice 1 that are relevant to this project follow.	
	GN No. R. 983 – Activity no. 9(i): *The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water-* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where-* *(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or* *(b) where such development will occur within an urban area.*	*The project entails the transportation of water in pipelines exceeding 1000 m in length and 0.36 m in internal diameter.*
	GN No. R. 983 – Activity no. 12(ii)(a)(c): *The development of -* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or*	*Various infrastructure and structures with a physical footprint of 100 square metres or more within watercourse(s) / within 32 m from watercourse(s), including:* • *Pipeline crossings;*

Legislation	Description and Relevance	
	(ii) infrastructure or structures with a physical footprint of 100 square metres or more; *where such development occurs -* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; -* *Excluding -* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.*	• *Access roads' crossings; and* • *Encroachments by other project infrastructure.*
	GN No. R.983 – Activity no. 19: *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	*Various infrastructure within watercourse(s), including:* • *Pipeline crossings; and* • *Access roads' crossings.*
	GN No. R.983 – Activity no. 27: *The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	*Clearance of areas associated with the construction footprint, such as laydown areas, general site establishment and spoil sites.*
	GN No. R.983 – Activity no. 30: *Any process or activity identified in terms of section 53(1) of the National Environmental*	*Potential occurrence of sensitive biodiversity features at affected areas.*

Legislation	Description and Relevance	
	Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	
	GN No. R.983 – Activity no. 31(i): *The decommissioning of existing facilities, structures or infrastructure for -* *(i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014;* *(ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014;* *(iii) …….* *(iv) any phased activity or activities for development and related operation activity or expansion or related operation activities listed in this Notice or Listing Notice 3 of 2014; or* *(v) any activity regardless the time the activity was commenced with, where such activity:* *(a) is similarly listed to an activity in (i) or (ii) above; and* *(b) is still in operation or development is still in progress;* *excluding where -* *(aa) activity 22 of this notice applies; or* *(bb) the decommissioning is covered by part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies.*	*The replacement of the existing sections of pipeline will take place within the existing servitude. The intention is for the existing pipelines to be decommissioned. These pipelines will remain in situ.* *Decommissioning of fuel storage areas after construction.*
	GN No. R.983 – Activity no. 45(i)(a) & (b): *The expansion of infrastructure for the bulk transportation of <u>water</u> or storm water where the existing infrastructure -* *(i) has an internal diameter of 0,36 metres or more; or* *(ii) has a peak throughput of 120 litres per second or more; and* *(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or* *(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;* *excluding where such expansion -* *(aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or* *(bb) will occur within an urban area.*	*The project entails the replacement of existing sections of pipeline that have internal diameters exceeding 0.36 m.*
	GN No. R.983 – Activity no. 48(i)(a)(c): *The expansion of—* *(i) <u>infrastructure or structures where the physical footprint is expanded by 100 square metres or more</u>; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) <u>within a watercourse;</u>* *(b) in front of a development setback; or* *(c) <u>if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</u>*	*Sections where the existing pipelines traverse watercourses will be replaced.*

Legislation	Description and Relevance	
	excluding— *(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such expansion occurs within an urban area; or* *(ee) where such expansion occurs within existing roads, road reserves or railway line reserves.*	
GN No. R. 985 of 4 December 2014 (as amended) – Listing Notice 3	• Purpose - list activities and identify competent authorities under sections 24(2), 24(5) and 24D of NEMA, where environmental authorisation is required prior to commencement of that activity in specific identified geographical areas only; • The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014 (as amended). • Activities under Listing Notice 3 that are relevant to this project follow.	
	GN No. R.985 – Activity no. 2(g)(ii)(bb)(dd): *The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres.* *(g. Northern Cape* *ii. Outside urban areas:* *(bb) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.* *(dd) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*	*Possibility to develop new storage at, Trewill, Clifton and Gloucester with capacity of 0.9+6.7+7.2 = 14.8 Ml.*
	GN No. R.985 – Activity no. 10(g)(iii)(cc)(ee): *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.* *g. Northern Cape* *iii. Outside urban areas:* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*	*"Dangerous goods" that are likely to be associated with the greater project, are fuel stores, as well as any dangerous goods to be used during the construction phase.* *Estimated quantity of the storage of diesel should not exceed 30 000 litres ($30m^3$).* *Refer to **Table 8** for sensitive geographical areas that are affected.*
	GN No. R.985 – Activity no. 12(g)(ii): *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*	*Clearance of large areas associated with the construction footprint.* *Refer to **Table 8** for sensitive geographical areas that are affected.*

Legislation	Description and Relevance	
	in accordance with a maintenance management plan. *g. Northern Cape* *ii. Within critical biodiversity areas identified in bioregional plans.*	
	GN No. R.985 – Activity no. 14(ii)(a)(c)(g)(ii)(dd)(ff): *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *g. Northern Cape* *ii. Outside urban areas:* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*	*Various infrastructure within watercourse(s) / within 32 m from watercourse(s), including:* • *Pipeline crossings; and* • *Access roads' crossings.* *Refer to **Table 8** for sensitive geographical areas that are affected.*
	GN No. R.985 – Activity no. 23(ii)(a)(c)(g)(ii)(cc)(ee): *The expansion of -* *(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs -* *(a) within a watercourse;* *(b) in front of a development setback adopted in the prescribed manner; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *g. Northern Cape* *ii. Outside urban areas:* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.*	*Upgrade of existing watercourse crossings along pipeline and access road(s).* *Refer to **Table 8** for sensitive geographical areas that are affected.*

Legislation	Description and Relevance	
	(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	
	GN No. R.985 – Activity no. 26: *Phased activities for all activities -* *i. listed in this Notice and as it applies to a specific geographical area, which commenced on or after the effective date of this Notice; or* *ii. similarly listed in any of the previous NEMA notices, and as it applies to a specific geographical area, which commenced on or after the effective date of such previous NEMA Notices -* *where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; -* *excluding the following activities listed in this Notice—* *7; 8; 11; 13; 20; 21; and 24.*	*Possible phased activities that may collectively trigger this listed activity.* *Refer to **Table 8** for sensitive geographical areas that are affected.*
National Water Act (Act No. 36 of 1998)	• Chapter 3 – Protection of water resources. • Section 19 – Prevention and remedying effects of pollution. • Section 20 – Control of emergency incidents. • Chapter 4 – Water use. • Authority – DHSWS.	
National Environmental Management Air Quality Act (Act No. 39 of 2004)	• Air quality management • Section 32 – Dust control. • Section 34 – Noise control. • Authority – DEFF, DENC and DMs	
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	• Management and conservation of the country's biodiversity. • Protection of species and ecosystems. • Authority – DEFF and DENC.	
National Environmental Management: Protected Areas Act (NEM:PAA) (Act No. 57 of 2003)	• Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes. • Note that no protected areas are affected by the project footprint.	
National Environmental Management: Waste Act (Act No. 59 of 2008)	• Chapter 5 – licensing requirements for listed waste activities - GN No. R. 921 of 29 November 2013. • Authority – Minister (DEFF) or MEC (provincial authority)	
National Forests Act (No. 84 of 1998)	• Section 15 – Authorisation required for impacts to protected trees. • Authority – DEFF	
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	• Permit required for borrow pits. • Authority – Department of Mineral Resources and Energy (DMRE).	
Occupational Health & Safety Act (Act No. 85 of 1993)	• Provisions for Occupational Health & Safety • Authority – Department of Employment and Labour (DEL).	

Legislation	Description and Relevance
National Heritage Resources Act (Act No. 25 of 1999)	• Section 34 – protection of structure older than 60 years. • Section 35 – protection of heritage resources. • Section 36 – protection of graves and burial grounds. • Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m^2 in extent, etc. • Authority – South African Heritage Resources Agency (SAHRA) and Northern Cape Provincial Heritage Resources Authority (Ngwao-Boswa Jwa Kapa Bokone)
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	• Control measures for erosion. • Control measures for alien and invasive plant species. • Authority – Department of Agriculture.
Northern Cape Conservation Act (Act No. 9 of 2009)	• Protected and Specially Protected Species. • DENC.

The relationship between the project and certain key pieces of environmental legislation is discussed in the subsections to follow.

8.1.2 National Environmental Management Act

According to Section 2(3) of NEMA, "*development must be socially, environmentally and economically sustainable*", which means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The proposed VGRWSS-II: upgrade of existing scheme requires authorisation in terms of NEMA and the Basic Assessment is being undertaken in accordance the EIA Regulations of 2014 (as amended).

The proposed project triggers activities under Listing Notices 1 and 3, and thus needs to be subjected to a Basic Assessment process. The listed activities are explained in the context of the project in **Table 7** and **Table 8**.

Table 8: Listed Activates Triggered by VGRWSS-II: Upgrade of Existing Scheme

Project Components	Relevant Listed Activities	Description of relevance
Pipeline	*GN No. R.983 –*	
	Activity no. 9(i)	Replacement of existing sections of pipeline.
	Activity no. 12(ii)(a)(c)	Pipeline traverses / closer than 32 m from watercourses.
	Activity no. 19	Construction activities within a watercourse.
	Activity no. 31(i)	Decommissioning of existing pipelines.
	Activity no. 45(i)(a)(b)	Replacement of existing sections of pipeline.
	Activity no. 48(i)(a)(c)	Replacement of existing sections of pipeline within / closer than 32 m from watercourses.
	GN No. R.985 –	
	Activity no. 12(g)(ii)	Clearance of indigenous vegetation in CBA 1, CBA 2 and ESA areas.
	Activity no. 14(ii)(a)(c)(g)(ii)(dd)(ff))	Infrastructure within watercourses / 32 m from watercourses in CBA 1, CBA 2 and ESA areas.

Project Components	Relevant Listed Activities	Description of relevance
	Activity no. 23(ii)(a)(c)(g)(ii)(cc)(ee)	Upgrade of existing watercourse crossings along pipeline situated in watercourses / 32 m from watercourses in CBA 1, CBA 2 and ESA areas.
Reservoirs & Sumps	*GN No. R.983 –*	
	Activity no. 27	Clearance of indigenous vegetation associated with the construction footprint.
	GN No. R.985 –	
	Activity no. 2(g)(ii)(bb)(dd)	Develop new storage at Trewill, Clifton and Gloucester within CBA 1, CBA 2 and ESA areas.
	Activity no. 12(g)(ii)	Clearance of indigenous vegetation in CBA 2.
Access Roads	*GN No. R.983 –*	
	Activity no. 12	Access roads traverse / closer than 32 m from watercourse(s).
	Activity no. 19	Construction activities within a watercourse.
	Activity no. 56	Widening of existing roads for access to the various sites (construction and operational phases).
	GN No. R.985 –	
	Activity no. 12(g)(ii)	Clearance of indigenous vegetation in CBA 1, CBA 2 and ESAs.
	Activity no. 14(ii)(a)(c)(g)(ii)(dd)(ff))	Watercourse crossings along access roads / within 32 m from watercourses inside CBA 1 and CBA 2
	Activity no. 23(ii)(a)(c)(g)(ii)(cc)(ee)	Expanding watercourse crossings along existing roads inside CBA 1 and CBA 2.
Construction Camps & Laydown Areas	*GN No. R.983 –*	
	Activity no. 27	Clearance of more than 1 ha of indigenous vegetation associated with the camp sites and laydown areas.
	Activity no. 31(i)	Decommissioning of fuel storage areas after construction.
	GN No. R.985 –	
	Activity no. 10(g)(iii)(cc)(ee)	Dangerous goods stored in CBA 1 and CBA 2.
	Activity no. 12(g)(ii)	Clearance of indigenous vegetation in CBA 1 and CBA 2.

Note that the dimensions of the project infrastructure and components should be regarded as approximates due to the dynamic nature of the planning and design process. As a conservative approach, all possible activities that could possibly be triggered by the project were included in the Application Form (copy contained in **Appendix K**). A refinement of these activities took place as the EIA process unfolded.

8.1.3 National Environmental Management: Waste Act

Amongst others, the purpose of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA) includes the following:

1. To reform the law regulating waste management in the country by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development;
2. To provide for institutional arrangements and planning matters;
3. To provide for specific waste management measures;
4. To provide for the licensing and control of waste management activities;
5. To provide for the remediation of contaminated land; and
6. To provide for compliance and enforcement.

The following is noted with regards to waste management for the project during the construction phase:

- Excess spoil material (soil and rock) generated as part of the bulk earthworks associated with the construction phase of the project, will be used to fill and rehabilitate borrow pits required as part of the project, or spoil sites will be created;
- Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM:WA;
- The storage of general or hazardous waste in a waste storage facility will comply with the norms and standards in GN No. R. 926 of 29 November 2013; and
- The EMPr makes suitable provisions for waste management, including the storage, handling and disposal of waste.

8.1.4 Mineral and Petroleum Resources Development Act

The purpose of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. This Act defines mining as "any operation or activity for the purposes of winning any mineral on, in or under the earth, water or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto".

In terms of the MPRDA, as amended, a mining permit applies when the mineral in question can be mined in 2 years and the area does not exceed 5 ha. For larger areas a mining right will need to be applied for.

Borrow areas will be identified to source construction material for the project. Sources of material suitable for use as bedding or soft backfill to the pipe were sought at a nominal spacing of 10 km along the pipeline. An application to seek authorisation for the proposed borrow pits will be submitted to DMRE.

8.1.5 National Water Act

The project entails the following activities that constitute water uses in terms of Section 21 of the National Water Act (Act No. 36 of 1998) (NWA):

- Existing -
  - Abstraction from the Vaal River - Section 21(a) (taking water from a water resource);
  - Storage of water within existing reservoirs - Section 21(b) (storing water);
  - Dewatering at the mines - Section 21(j) (removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people); and

- Watercourse crossings of the existing pipeline - Section 21(c) (impeding or diverting the flow of water in a watercourse) and Section 21(i) (altering the bed, banks, course or characteristics of a watercourse).

❖ New -

- Instream works for all project components - Section 21(c) (impeding or diverting the flow of water in a watercourse) and Section 21(i) (altering the bed, banks, course or characteristics of a watercourse).

A Technical Report in support of a General Authorisation (GA) will be submitted to the DHSWS Northern Cape Regional Office.

8.2 Guidelines

The following guidelines were considered during the preparation of the BAR:

❖ Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010a);
❖ Guideline on Need and Desirability (DEA&DP, 2010b);
❖ Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010); and
❖ Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005).

8.3 National & Regional Plans

The following regional plans were considered during the execution of the Basic Assessment process (amongst others):

❖ Municipal Spatial Development Frameworks (SDFs) (where available);
❖ Municipal Integrated Development Plans (IDPs);
❖ Relevant national, provincial, district and local policies, strategies, plans and programmes;
❖ Environmental Management Framework (EMF) for the Frances Baard DM (2010);
❖ EMF for the Siyanda DM (now known as ZF Mgcawu DM) (2008);
❖ Northern Cape Critical Biodiversity Areas (CBA) Map; and
❖ Reconciliation Strategy and Water Master Plan study for the VGRWSS (2011).

9 BASIC ASSESSMENT PROCESS

9.1 Environmental Assessment Triggers

As mentioned in **Section 8.1.2**, the proposed VGRWSS-II: Upgrade of Existing Scheme triggers activities under Listing Notices 1 and 3 (refer to **Table 7** and **Table 8**), and thus needs to be subjected to a Basic Assessment process.

The **Basic Assessment Process** is undertaken in accordance with GN No. R. 982 of 4 December 2014, as amended.

9.2 Environmental Assessment Authorities

The lead decision-making authority for the environmental assessment is DEFF, as the project proponent (Sedibeng Water) is a statutory body in terms of Section 24C of NEMA.

Due to the geographic location of the project the DENC is regarded as one of the key commenting authorities and all documentation will thus be copied to this Department (amongst others).

Various other authorities with jurisdiction over elements of the receiving environment or project activities (refer to **Section 8.1**) were also consulted during the course of the Basic Assessment A. Refer to the database contained in **Appendix F8** for a list of the government departments.

9.3 DEFF Pre-application Consultation

A Pre-application Consultation Meeting was convened with DEFF on 15 March 2019 (minutes of meeting attached to the Application Form). The purpose of the meeting included the following:

- To introduce the project to DEFF;
- To seek clarification regarding certain matters that pertain to the EIA process;
- To determine DEFF's requirements; and
- To confirm the process and timeframes.

Key outcomes of above pre-application consultation with DEFF include the following:

- Separate applications will be submitted for the following project components -
  - VGRWSS-II: Upgrade of Existing Scheme (focus of this BAR); and
  - SD1 and SD2 groundwater abstraction.
- Due to the nature of the project, only the preferred alternative and the no-go option would be assessed in the Basic Assessment under each application.
- The Groundwater Assessment that was undertaken during the Feasibility Study would be used for the purposes of the EIA for SD1 and SD2 groundwater abstraction.

- The Application Form and Draft BAR will be submitted to DEFF at the same time to avoid potential problems associated with the strict timeframes under the EIA Regulations of 2014 (as amended).

9.4 Basic Assessment Process

9.4.1 Overview of Basic Assessment Process

As mentioned, separate applications will be submitted for the VGRWSS-II: Upgrade of Existing Scheme and for the SD1 and SD2 groundwater abstraction.

An outline of the Basic Assessment process for the proposed VGRWSS-II: Upgrade of Existing Scheme is provided in **Figure 22** below.

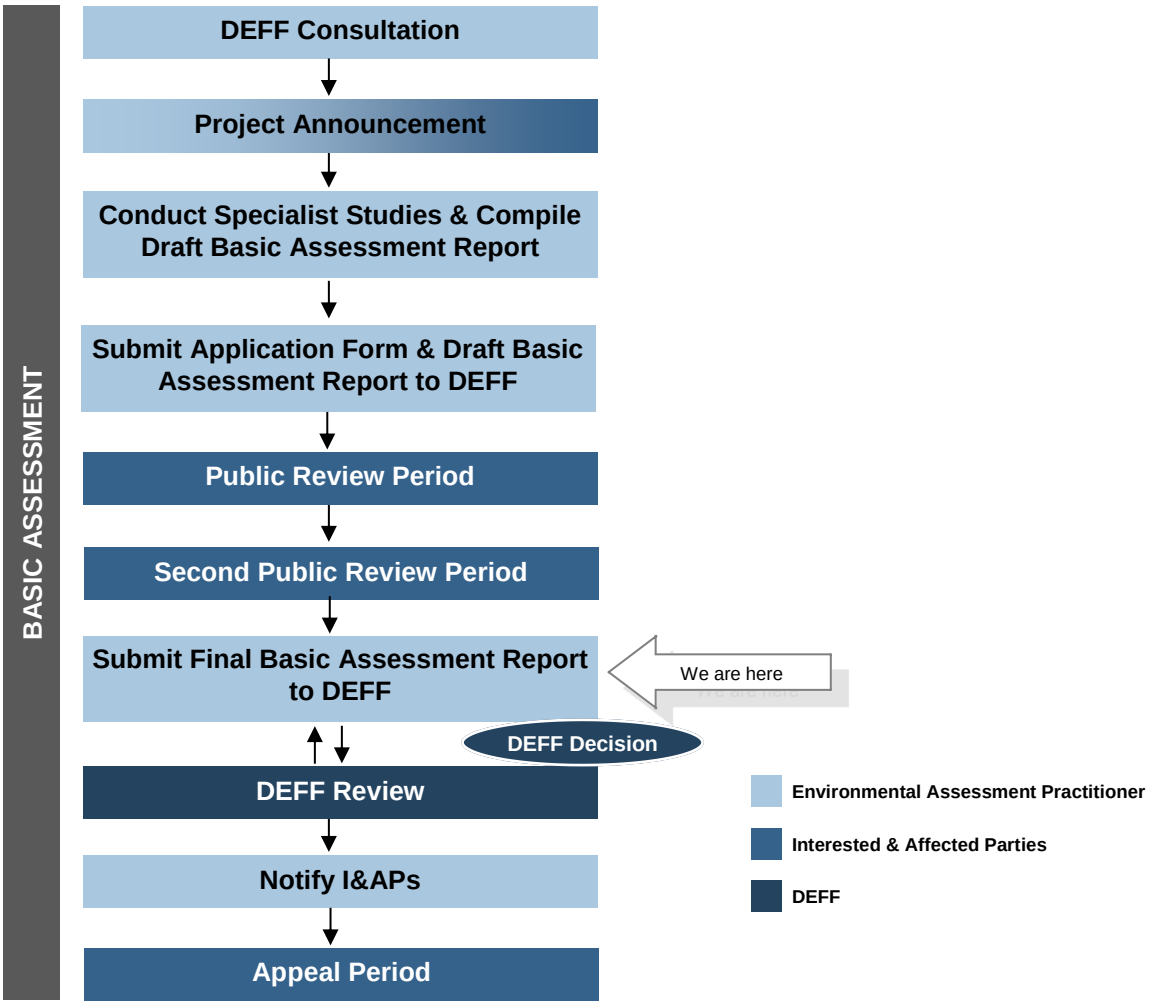


Figure 22: Basic Assessment Process

9.4.2 Landowner Consent

According to Regulation 39(1) of GN No. R 982 of 4 December 2014 (as amended), if the proponent is not the owner or person in control of the land on which the activity is to be

undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.

This requirement does not apply inter alia for linear developments (e.g. pipelines) or if it is a Strategic Infrastructure Project (SIP) as contemplated in the Infrastructure Development Act, 2014. Landowner consent is not required for the project for the following reasons:

- The pipeline component of the project is classified as a linear development;
- The project is classified as a SIP in terms of the following categories –
    - SIP 5: Saldanha-Northern Cape development corridor; and
    - SIP 18: Water and sanitation infrastructure.

10 ASSUMPTIONS AND LIMITATIONS

The following assumptions were made during the BA process:

- As the design of the project components is still in preliminary design stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change as the project life-cycle advances. It is assumed that the layout will however not fall outside of the assessed 80 m study area.
- Regardless of the analytical and predictive method employed to determine the potential impacts associated with the project, the impacts are only predicted on a probability basis. The accuracy of the predictions is largely dependent on the availability of environmental data and the degree of understanding of the environmental features and their related attributes.

The Terrestrial Ecological Impact Assessment (Nemai Consulting, 2019a) indicated the following limitations:

- Surveys were undertaken from 15-19 April 2019, which fall within an optimal time of the season to find sensitive plant and animal species of high conservation priority. Weather conditions during the surveys were favourable for recording both fauna and flora. The timing and duration of the site visit are not seen to pose a significant constraint on the results of the study and it is unlikely that any significant features or species would be revealed by additional site visits. Northern Cape Province normally received the most rains in January, February and March so end of March/April is seen as a good time for biodiversity surveys.
- This report has been prepared on the strengths of the information available at the time of the assessment.
- Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage and Nemai Consulting can thus not accept responsibility for conclusions and mitigation measures made in good faith based on information gathered or databases consulted at the time of the investigation.

The Agricultural Impact Assessment (Index, 2019) noted the following assumptions:

- The project entails upgrading existing infrastructure. The impact will, therefore be of a temporary nature and will last for the duration of construction or the time the land takes to recover to state prior to construction. Pending rainfall patterns, the period for the land to recover is expected to be less than two years. The fenced area of pumping and storage infrastructure will remain the same and is now not used for farming purposes. There will, therefore be no impact on farming.

The Wetland and Aquatic Assessment (The Biodiversity Company, 2019) indicated the following limitations:

- The use of two of the main wetland indicators namely hydromorphic soils and hydrophytic vegetation was somewhat limited and classification of the systems was challenging due to their unique characteristics.

- Due to the very large scale of the study area in field delineations were restricted to within a 50 m corridor on either side of the proposed pipeline route. As such the delineations end abruptly outside this corridor. Wetlands within the 500 m regulated area were considered but not explicitly mapped or assessed, wetland delineations within these areas should be considered desktop.
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.

The Heritage Impact Assessment (McGregor Museum, 2019) indicated the following:

- The areas for proposed impacts stretch from the railway to farms, mines and various previously zoned areas, which made some areas inaccessible due to stringent and strenuous access policies.
- It was assumed that, by and large in this landscape, with its shallow soil profiles, and erosional regime over much of the terrain that some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion or past excavations that expose erstwhile below-surface features). It was not considered necessary to conduct excavations as part of the EIA to establish the potential of sub-surface archaeology.
- A proviso is routinely given, that should sites or features of significance be encountered during construction (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (cease work, report to heritage authority).
- With regard to fossils, a preliminary assessment of the likelihood of their occurring here should be obtained from a palaeontologist, this report does not address palaeontology.

The Palaeontological Impact Assessment (Banzai Environmental, 2019) indicated the following assumptions and limitations:

- The accuracy of Desktop Palaeontological Assessment is reduced by several factors which may include the following: the databases of institutions are not always up to date and relevant locality and geological information were not accurately documented in the past. Various remote areas of South Africa have not been assessed by palaeontologists and data is based on aerial photographs alone. Geological maps concentre on the geology of an area and the sheet explanations were never intended to focus on palaeontological heritage.
- Similar Assemblage Zones, but in different areas is used to provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations and Assemblage Zones generally assume that exposed fossil heritage is present within the development area. The accuracy of the Palaeontological Impact Assessment is thus improved considerably by conducting a field-assessment.

The following assumptions and limitations underlie the Socio-economic Impact Assessment (Nemai Consulting, 2019b):

- It is assumed that information obtained during the public participation phase provides a comprehensive account of the community structure and community concerns for the project;

- The study was done with information available to the specialist at the time of executing the study, within the available time frames and budget. The sources consulted are not exhaustive and additional information which might strengthen arguments, contradict information in this report and/ or identify additional information which might exist. However, the specialist did take an evidence-based approach in the compilation of this report and did not intentionally exclude information relevant to the assessment;
- The study was completed using the Statistics South Africa Census 2011 data and Statistics South Africa Community Survey 2016. The data might be somewhat outdated, however it is the most comprehensive primary data available;
- It is assumed that no relocation of families or people will take place for this project; and
- This project presents a single route which consists of the existing pipeline, the upgrade will be along this route and follow existing infrastructure to reduce the impacts and effects on the locality. The assumed impacts and effects may later change during the detailed design phase of the project.

11 NEED AND DESIRABILITY

This section serves to expand on the motivation / need and desirability for the proposed development that is provided in **Section 3** and **Section 5**.

The format contained in the Guideline on Need and Desirability (DEA&DP, 2010b) was used in **Table 9**. Need (time) and desirability (place) relate to, amongst others, the nature, scale and location of development being proposed, as well as the wise use of land.

Table 9: Need and Desirability

No.	Question	Response
NEED ('timing')		
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	The Dikgatlong LM's IDP (2019) acknowledges the need for improved water supply, with several service delivery and infrastructure investments being put in place in order to improve the LM's water management, including the improvement of the Delportshoop Water Purification Plant. The Kgatelopele LM's SDF (2010) indicates that bulk water for residential purposes is supplied directly from the Vaal Gamagara line into the Clifton and Lime Acres Reservoirs, and from there the metered water is supplied to each residential unit. The IDP (2018) acknowledges the need for efficient water supply and refurbishment of water service infrastructure. The Tsantsabane LM's IDP (2018) indicates that the majority of municipal residents obtain water from the Vaal Gamagara water scheme. The Gamagara LM's IDP (2017) indicates that the municipality is reliant on Sedibeng Water and Kumba Mine for water supply. The IDP notes that Sedibeng Water has been experiencing some challenges in providing water consistently to areas that are 100% reliant to its supply like in Olifantshoek. This is due to lack of secondary water sources in the Olifantshoek area. The IDP also indicates that all areas in the Gamagara LM have limited water storage facilities to cater for the growth of the towns, and that the Olifantshoek reservoir is not complaint to the norm due to the rapid growth of the population in the area, thus highlighting the need for the improvement of water supply infrastructure in the Olifantshoek region.
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	The current VGRWSS is operating at capacity and is not able to supply the increasing future water demands, and deal with the increasing water supply interruptions. The major driving force of the increased water demand is the iron ore and manganese mining

No.	Question	Response
		operations. These mines of the Northern Cape produce 84% of South Africa's iron ore and 92% of the world's high-grade manganese deposits are in the Kalahari basin. Diamond and lime mining operations also contribute to the water demand, but to a lesser degree. Secondary to the expected increased water demand are water supply interruptions that are amplified due to the aging infrastructure. The infrastructure, being almost 50 years old, is nearing the end of its useful life. Due to the condition of the pipelines, the full design capacity can no longer be supplied through this infrastructure. Total collapse in water supply expected within the next five years.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate)	Future water demand was based on demographic and economic growth scenarios. This entailed updating, extending and refining water demand volumes based on future economic, and population growth expectations for the local municipalities (mainly household, business and institutional use) (iX engineers, 2019). The mines and solar plants' water demands were also included in the analysis. According to iX engineers (2019), meetings were held with each of the Local Municipalities who supply water to towns and settlements along the pipeline route. The outcomes of the following discussion points were factored into the water balance: • Population estimates; • Key developments; and • Water resources and demand.
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	The services required for the development are explained in **Section 5.5**.
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 services)?	Refer to responses to no. 1 – 3 above.
6.	Is this project part of a national programme to address an issue of national concern or importance?	The project is classified as a SIP in terms of the following categories – • SIP 5: Saldanha-Northern Cape development corridor; and • SIP 18: Water and sanitation infrastructure.
DESIRABILITY ('placing')		
7.	Is the development the Best Practicable Environmental Option (BPEO) for this land/site?	Refer to **Section 6.2** for the options that were investigated and planned as part of the Reconciliation Strategy and Water Master Plan.

No.	Question	Response
		The proposed project entails the upgrading of an existing scheme and the only alternatives that were thus considered were the preferred option (discussed in **Section 5.2**) and the "no-go"/do nothing option.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and SDF as agreed to by the relevant authorities?	It is not anticipated that the proposed project will contradict or be in conflict with the municipal IDPs and SDFs. Refer to responses to no. 1 – 3 above.
9.	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?	EMFs are available for the Frances Baard DM and Siyanda DM (now known as ZF Mgcawu DM). As the project proposes the upgrading of an existing scheme, no immediate conflicts were identified with the management requirements contained in the aforementioned EMFs. However, the construction servitude will be temporarily extended beyond the permanent servitude. Mitigation measures identified by the environmental specialists to address the related impacts have been included in the EMPr.
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	The project proposes the upgrade of existing infrastructure associated with the VGRWSS. The permanent servitude of the pipeline will remain the same.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	See compilation of significant environmental issues associated with the proposed project contained in **Section 19**. The construction servitude will be temporarily extended beyond the permanent servitude. Mitigation measures identified by the environmental specialists to address the related impacts have been included in the EMPr.
12.	How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	See compilation of significant environmental issues associated with the proposed project contained in **Section 19**. These impacts will be managed through the EMPr contained in **Appendix I**.
13.	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	Opportunity costs are associated with the net benefits forgone for the development alternative. As the project proposes the upgrade of existing infrastructure, it is not expected that there will be unacceptable opportunity costs.
14.	Will the proposed land use result in unacceptable cumulative impacts?	There will be no change in land use for the proposed project. The possible cumulative impacts associated with the proposed project, are discussed in **Section 19.18**.

12 TIMEFRAMES

In terms of 3(1)(q) of Appendix 1 of GN No. R. 982 of 4 December 2014 (as amended), this section discusses 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.

Based on the current EIA programme, it is anticipated that the Environmental Authorisation (if granted) will be issued by 20 May 2020.

These proposed timeframes are provided in **Table 10**.

Table 10: Timeframes

Project Phase	Proposed Timeframe
Pre-Construction	May 2018 – October 2020
Construction	November 2020 – February 2028
Post Construction Monitoring	December 2021 – February 2029

The project is currently in its preliminary design phase. It is noted that timeframes for the implementation of a project are normally finalised during the pending design phase, which is reliant on whether DEFF decides to grant the Environmental Authorisation.

It must be highlighted that the timeframes in **Table 10** above are highly dependent on funding from various sources. The project can be delayed and construction activities can easily take up to or more than 10 years to complete.

13 FINANCIAL PROVISIONS

In terms of section 3(1)(s) of Appendix 1 of GN No. R. 982 of 4 December 2014 (as amended), this section discusses details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.

Due to the sensitive nature of financial provisions, Sedibeng Water cannot detail the exact amounts but can confirm that there will be sufficient funds available to ensure that the project can be successfully completed and for subsequent maintenance. Provision will be made in the bill of quantities for the Contractor for the implementation of mitigation measures included in the EMPr, including requirements for reinstatement and rehabilitation.

14 RESOURCE USE AND PROCESS DETAILS

14.1 Waste, Effluent, Emission and Noise Management

14.1.1 Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	**YES X**
If yes, what estimated quantity will be produced per month?	4 skips per month

How will the construction solid waste be disposed of (describe)?

The types of solid waste associated with the construction phase include the following:

- Waste generated from site preparations (e.g. plant material);
- Domestic waste;
- Surplus and used building material; and
- Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags).

Solid waste generated during the construction phase will be temporarily stored at a suitable location (e.g. at construction camp) and will be removed at regular intervals and disposed of at approved waste disposal sites. All the waste disposed of will be recorded.

Where will the construction solid waste be disposed of (describe)?

General waste will be disposed of at registered municipal landfills.

Hazardous waste will be disposed of at registered site(s), such as licenced disposal sites on surrounding mines. This site(s) will be identified by the waste service provider.

Will the activity produce solid waste during its operational phase?

If yes, what estimated quantity will be produced per month?

How will the solid waste be disposed of (describe)?

Has the municipality or relevant service provider confirmed that sufficient air space exists for treating/disposing of the solid waste to be generated by this activity? **NO X**

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?

Note: If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?	**YES** **X**	

If yes, inform the competent authority and request a change to an application for scoping and EIA. *Based on a screening against NEM:WA it is understood that a Scoping and EIA process will not be required.*

Is the activity that is being applied for a solid waste handling or treatment facility?		**NO** **X**

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Describe the measures, if any, that will be taken to ensure the optimal reuse or recycling of materials:

One of the objectives established in the EMPr is that waste management principles be implemented to prevent, minimise, recycle or re-use material, with disposal as a last option. The EMPr also stipulates that waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes), where possible.

14.1.2 Liquid effluent (other than domestic sewage)

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?		**NO** **X**
If yes, what estimated quantity will be produced per month?		
If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the liquid effluent to be generated by this activity(ies)?		
Will the activity produce any effluent that will be treated and/or disposed of on site?		
If yes, what estimated quantity will be produced per month?		
If yes describe the nature of the effluent and how it will be disposed.		

Note that if effluent is to be treated or disposed on site the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?		**NO** **X**

If yes, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		Cell:	
E-mail:		Fax:	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

14.1.3 Liquid effluent (domestic sewage)

Will the activity produce domestic effluent that will be disposed of in a municipal sewage system?		**NO X**
If yes, what estimated quantity will be produced per month?		
If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the domestic effluent to be generated by this activity(ies)?		**NO X**
Will the activity produce any effluent that will be treated and/or disposed of on site?		

If yes describe how it will be treated and disposed off.

14.1.4 Emissions into the atmosphere

Will the activity release emissions into the atmosphere?		**NO X**
If yes, is it controlled by any legislation of any sphere of government?		

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If no, describe the emissions in terms of type and concentration:

Only construction related emissions are anticipated.

14.2 Water Use

Indicate the source(s) of water that will be used for the activity:

Municipal	**Directly from water board X**	Groundwater	River, stream, dam or lake	Other	the activity will not use water

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate

the volume that will be extracted per month:

If Yes, please attach proof of assurance of water supply, e.g. yield of borehole, in the appropriate Appendix

Does the activity require a water use permit from DHSWS? **YES X**

If yes, list the permits required

Entitlements are required for the water uses associated with the upgrading of the existing VGRWSS. A General Authorisation (GA) will be applied for and submitted to the DHSWS.

If yes, have you applied for the water use permit(s)? **NO X**

If yes, have you received approval(s)? (attached in appropriate appendix) **NO X**

14.3 Power Supply

Please indicate the source of power supply e.g. Municipality / Eskom / Renewable energy source

Eskom.

If power supply is not available, where will power be sourced from?

Generators to be used during the construction phase.

14.4 Energy Efficiency

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

N/A

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

N/A

15 PUBLIC PARTICIPATION PROCESS

15.1 Public Participation

The purpose of the public participation process for the proposed development includes:

1. Providing IAPs with an opportunity to obtain information about the project;
2. Allowing IAPs to express their views, issues and concerns with regard to the project;
3. Granting IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
4. Enabling Sedibeng Water, Pro-Plan and the project team to incorporate the needs, concerns and recommendations of IAPs into the project, where feasible.

The public participation process that was followed for the proposed project is governed by NEMA and GN No. R. 982 of the EIA Regulations of 2014 (as amended). All Public Participation material, as part of the project announcement phase, is contained in **Appendix E**.

15.2 Pre-Application Consultation

A Pre-Application Consultation Meeting was held with DEFF on 15 March 2019. A copy of the minutes of the pre-application meeting are included in the Application Form, contained in **Appendix K**.

15.3 Database of IAPs

A database of IAPs, which includes authorities, different spheres of government (national, provincial and local), parastatals, ward councillors, stakeholders, landowners, interest groups and members of the general public, was prepared for the project and the latest database is contained in **Appendix G5**. This database has been maintained and updated as necessary during the course of the BA Process.

15.4 Landowner Notification

Details of the properties that are directly and adjacently affected by the proposed development are provided in **Appendix D**. The details of the affected landowners are included in the IAP database (refer to **Appendix G5**).

According to Regulation 39(1) of GN No. R 982 of 4 December 2014 (as amended), if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land. This requirement does not apply *inter alia* for linear

developments (e.g. pipelines, power lines, roads) or if it is a SIP as contemplated in the Infrastructure Development Act, 2014.

The VGRWSS-II: Upgrade of the Existing Scheme qualifies under SIP 5 and 18 and thus landowner consent is not required. Please refer to **Appendix E2** for the proof of written notification to all direct and adjacent landowners.

15.5 Project Announcement

The tasks listed in the sub-sections to follow were undertaken during the project announcement phase.

15.5.1 Background Information Document (BID)

A Background Information Document (BID) and Reply Form (refer to **Appendix E2**) were forwarded to each of the IAPs contained in the database.

The BID provided the following information in a succinct format:

- Project background and overview;
- EIA process; and
- Details of the public participation process and where more information could be obtained.

The BID included a Reply Form, which granted the opportunity to register as an IAP and to raise queries or concerns regarding the project. Copies of the completed Reply Forms and other correspondence received from IAPs, are contained in **Appendix E4**.

15.5.2 Onsite Notices

Onsite notices were placed at strategic points within the study area (listed in **Table 11** and shown in **Figure 23**). Notification of the proposed development was provided on the site notice. Details of the locations of the onsite notices and accompanying photographs are contained in **Appendix E1**.

Table 11: Locations of onsite notices

No.	Coordinates	Location Description
1.	28°24'21.64"S; 24°15'47.64"E	Delportshoop WTW
2.	28°24'17.04"S; 24°15'40.99"E	Gravel Road (opposite Delportshoop WTW) (servitude gate)
3.	28°23'33.98"S; 24°16'14.14"E	Gravel roads intersection
4.	28°19'22.17"S; 24°14'1.24"E	Intersection – R31 & gravel road (servitude gate)
5.	28°18'23.32"S; 24°12'10.88"E	Intersection – R31 & gravel road (servitude gate)
6.	28°18'14.92"S; 24° 8'46.31"E	Kneukel PS
7.	28°17'21.72"S; 24° 6'36.59"E	Intersection – R31 & gravel road at access to farm (servitude gate)
8.	28°14'44.47"S; 24° 1'45.37"E	Koopmansfontein Store

No.	Coordinates	Location Description
9.	28°16'48.81"S; 23°46'3.69"E	D3393 – gravel road - Store
10.	28°16'53.86"S; 23°46'15.35"E	D3393 – gravel road crossing
11.	28°15'44.62"S; 23°33'34.89"E	R31 & R385 intersection
12.	28°12'1.38"S; 23°32'55.03"E	Idwala Lime access
13.	28°21'31.46"S; 23°32'7.70"E	R385 crossing
14.	28°22'7.80"S; 23°28'0.87"E	Road crossing (Lime Acres)
15.	28°19'47.42"S; 23°23'1.71"E	T-junction of two gravel roads
16.	28°17'28.79"S; 23°20'15.55"E	T-junction – R385 and gravel road
17.	28°17'46.21"S; 23°18'54.86"E	Access to Metsimatala
18.	28°20'5.18"S; 23°11'15.60"E	T-junction – R385 and gravel road
19.	28°19'49.24"S; 23° 5'21.73"E	T-junction – R385 and gravel road to Jenn-Haven
20.	28°19'23.00"S; 23° 4'25.45"E	Nicholson St, Postmasburg
21.	28°19'16.71"S; 23° 4'20.49"E	C/O Brown St, Postmasburg
22.	28°19'6.54"S; 23° 4'10.69"E	CAM St
23.	28°19'3.79"S; 23° 4'2.87"E	C/O R385 & R325
24.	28°18'35.09"S; 23° 4'8.32"E	Intersection of R325 and Plein St
25.	28°17'1.89"S; 23° 4'25.95"E	Along R325 - access to farm (servitude gate)
26.	28°14'51.02"S; 23° 4'50.52"E	Along R325 - access to mine
27.	28°12'42.16"S; 23° 4'52.70"E	Along R325 - access to farm
28.	28°10'11.14"S; 23° 4'52.68"E	Along R325 - access to farm
29.	28° 8'49.80"S; 23° 4'51.60"E	Along R325 - access to farm
30.	28° 8'19.15"S; 23° 4'45.80"E	Along R325 - access to farm
31.	28° 6'25.53"S; 23° 4'24.07"E	Gloucester Reservoir
32.	28° 5'21.24"S; 23° 4'11.52"E	Along R325 - access to farm
33.	28° 4'9.39"S; 23° 3'57.70"E	Along R325 – T-junction with gravel road
34.	28° 2'53.49"S; 23° 3'43.33"E	Along R325 – T-junction with gravel road
35.	28° 1'46.81"S; 23° 3'14.52"E	Along R325 – T-junction with gravel road (D3409)
36.	28° 0'31.77"S; 23° 2'50.49"E	Along R325 - access to mine
37.	27°59'46.51"S; 23° 2'36.96"E	Along R325 - access to mine
38.	27°58'23.44"S; 23° 2'11.52"E	Along R325 - access to mine
39.	27°57'8.69"S; 23° 1'16.56"E	Along R325 - access to farm
40.	27°56'32.76"S; 23° 0'24.24"E	Along R325 - access to farm
41.	27°56'21.83"S; 23° 0'7.36"E	Along R325 - access to farm
42.	27°56'16.10"S; 22°59'59.35"E	Along R325 - access to farm
43.	27°54'32.59"S; 22°57'39.45"E	Along R325 - access to farm
44.	27°54'7.19"S; 22°56'1.29"E	Along N14 – T-junction with gravel road
45.	27°54'25.52"S; 22°53'52.55"E	Along N14 – access to farm
46.	27°55'8.97"S; 22°48'43.27"E	Along N14 – access to Langeberg Stene
47.	27°55'42.01"S; 22°45'19.07"E	Along N14 – access
48.	27°55'58.09"S; 22°44'15.76"E	Gravel road, Olifantshoek
49.	27°56'1.73"S; 22°44'10.84"E	Tarred road, Olifantshoek

No.	Coordinates	Location Description
50.	27°56'9.28"S; 22°44'8.70"E	Tarred road, Olifantshoek
51.	27°56'23.73"S; 22°44'4.30"E	Tarred road, Olifantshoek

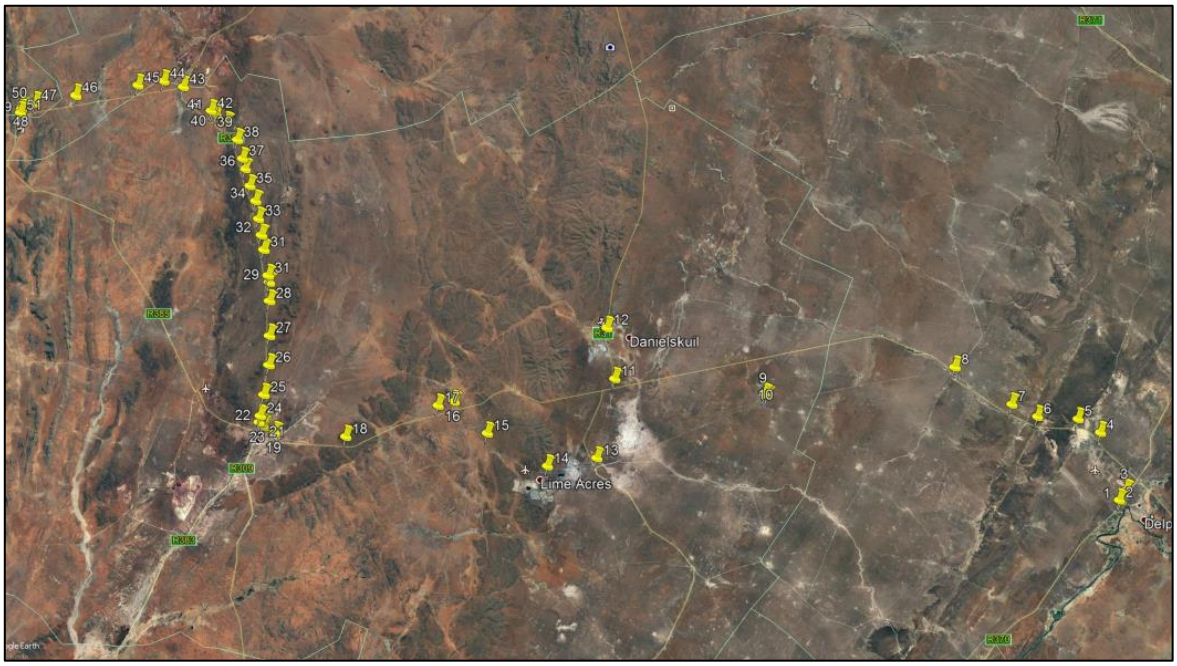


Figure 23: Site Notice Locations

15.5.3 Newspaper Notices

Newspaper advertisements were placed in the following newspapers in March 2019 as notification of the proposed project. The notices were placed in the following newspapers:

- The Kathu Gazette;
- The Diamond Fields Advertiser (DFA); and
- The Noordkaap.

Refer to copies of the newspaper notices contained in **Appendix E3**.

15.5.4 Public Meetings

The details of the public meetings held during the project announcement phase are provided in **Table 12** (see photographs in **Figures 24 - 26**). The minutes of these meetings are contained in **Appendix E5**.

Table 12: Details of Public Meetings - Announcement Phase

Date	9 April 2019		10 April 2019	
Area	**Delportshoop**	**Lime Acres**	**Postmasburg**	**Olifantshoek**
Time	09h30 – 12h00	14h30 – 17h00	09h00 - 11h30	14h00 - 16h30
Venue	Tsholofelo Hall, Tidimalo, Delportshoop	Kgatelopele Municipal Town Hall, 222 Barker Street, Danielskuil	Postmasburg NG Kerk Church Centre, 12 Duiker Street, Postmasburg	Diepkloof Community Hall, Kagiso Street/Toto Street, Olifantshoek

Figure 24: Picture of public meeting held on 9 April 2019 (Danielskuil)

Figure 25: Picture of public meeting held on 10 April 2019 (Postmasburg)

Figure 26: Picture of public meeting held on 10 April 2019 (Olifantshoek)

15.6 Review of the Draft BAR

15.6.1 Notification of Review of Draft BAR

In accordance with Regulation 43 of GN No. R. 982 of 4 December 2014 (as amended), registered IAPs are granted an opportunity to review and comment on the Draft BAR.

The following notifications were provided with regards to the review of the Draft BAR:

- Landowners, authorities and registered IAPs were notified via email and bulk SMS. Proof of notification is provided in **Appendix F2**;
- Notices were placed in the following newspapers (refer to **Appendix F3**):
  - The Kathu Gazette;
  - The DFA; and
  - The Noordkaap.
- Onsite notices were placed at the same locations as listed **Table 11**. Proof of site notices is provided in **Appendix F1**.

15.6.2 Public Access to the Draft BAR

The 30-day review period for the Draft BAR commenced from **27 August to 30 September 2019**. Copies of the documents were placed at the locations provided in **Table 13** below**.**

Table 13: Location of Draft BAR for Review

Venue	Address	Contact Details
Delportshoop Library	7 Hanekom Street, Delportshoop, 8377	079 985 6533
Kgatelopele Library	222 Du Plooy Street, Danielskuil, 8405	053 384 0008
Postmasburg Public Library	13 Springbok Street, Postmasburg, 8420	053 313 7300
Olifantshoek Public Library	Cnr of Van Riebeeck and Lanham Street, Olifantshoek, 8450	053 331 0002
Lime Acres Public Library	2 Adams Avenue, Lime acres, 8410	053 385 0602

15.6.3 Copies of Reports to Authorities

Hardcopies of the Draft BAR were also provided to the key regulatory and commenting authorities, which include the following:

- DEFF;
- DENC;
- DALRRD;
- DHSWS Northern Cape Regional Offices;
- Northern Cape Provincial Heritage Resources Authority (Ngwao-Boswa Jwa Kapa Bokone);
- Northern Cape Department of Roads & Public Works; and

- DMs and LMs.

Proof of notification to commenting authorities of the review period of the Draft BAR are contained in **Appendix F2**. Proof of deliveries of the Draft BAR to all organs of state and public libraries, are contained in **Appendix F5**.

15.6.4 Public Meetings to Present the Draft BAR

The details of the public meetings held during the review period to present the Draft BAR, are provided in **Table 14** below (see photographs in **Figures 27 – 29**). The minutes of the public meetings are included in **Appendix F6**.

Table 14: Locations of public meetings held during the review of the Draft BAR

Date	3 September 2019 (Wednesday)		4 September 2019 (Thursday)	
Area	**Ulco (Dikgatlong LM)**	**Postmasburg (Tsantsabane LM)**	**Olifantshoek (Gamagara LM)**	**Danielskuil (Kgatelopele LM)**
Time	09h30 – 12h00	14h30 - 17h00	09h30 - 11h30	14h30 – 17h00
Venue	Richetts Hall (Boere Saal), Club Circle, Ulco	Postmasburg NG Church 22 Duiker Street, Postmasburg	Diepkloof Community Hall, Kagiso Street/Toto Street, Olifantshoek	Kgatelopele Municipal Town Hall, 222 Barker Street, Danielskuil

Figure 27: Picture of public meeting held on 03 September 2019 (Ulco)

Figure 28: Picture of public meeting held on 03 September 2019 (Postmasburg)

Figure 29: Picture of public meeting held on 04 September 2019 (Olifantshoek)

15.6.5 Authority Meeting to Present the Draft BAR

Authorities are regarded as government departments with jurisdiction pertaining to the activities associated with the proposed project or the receiving environment. The details of the authority meeting held during the review period to present the Draft BAR are provided in **Table 15** below (see **Figure 30**). The minutes of the authorities meeting is provided in **Appendix F6**.

Table 15: Location of the authority meeting held during the review of the Draft BAR

Date	**5 September 2019 (Friday)**
Area	**Danielskuil (Kgatelopele LM)**
Time	10h00 - 12h30
Venue	Kgatelopele Municipal Town Hall, 222 Barker Street, Danielskuil

Figure 30: Picture of the authority meeting held on 05 September 2019 (Danielskuil)

15.6.6 Comments and Responses Report

The Comments and Responses Report (CRR), which summarises the salient issues raised by IAPs on the VGRWSS-II: Upgrade of the Existing Scheme, and the project team's response to these matters, is contained in **Appendix G4**. The issues listed in the CRR were identified

from completed Reply Forms, emails, public meetings and other correspondence received to date. All comments received during the review period of the Draft BAR for the Upgrade of the Existing Scheme, were incorporated into this CRR.

15.7 Second Review Period of the Draft BAR

Based on comments received during the initial review period of the Draft BAR (see **Appendix F4**), DEFF requested that the Terrestrial and Socio-Economic Impact Assessment Specialist Studies be peer reviewed, as they were conducted by in-house specialists. DEFF further indicated that the peer reviewed studies would constitute new information and would therefore have to be provided to IAPs as part of the consultation for the BAR. DEFF thus requested that Regulation 19(1)(b) of the EIA Regulations of 2014, as amended, be complied with.

15.7.1 Notification of Second Review of Draft BAR

In accordance with Regulation 43 of GN No. R. 982 of 4 December 2014 (as amended), registered IAPs were granted an additional opportunity to review and comment on the Draft BAR. All landowners, authorities and registered IAPs were notified via email and bulk SMS of the second review period. Refer to **Appendix G1** for proof of notification of the second review period.

15.7.2 Public Access to the Draft BAR

The second review period commenced from **05 December 2019 to 27 January 2020.** The Draft BAR and appendices were uploaded onto the following website: https://nemai.co.za/proposed-vaal-gamagara-regional-water-supply-scheme-phase-2-vgrwss-ii/ where a copy of the Draft BAR can be downloaded.

For remarks on the Draft BAR, the reviewer can complete a Comment Sheet, which is included in **Appendix L**. These completed Comment Sheets needed to be forwarded to Nemai Consulting by **27 January 2020**. Refer to **Appendix G3** for all comments and reply forms received during the second review period.

15.7.3 Comments and Responses Report

In accordance with Regulation 44 of GN No. R. 982 of 4 December 2014 (as amended), the CRR was continuously updated, and the comments received from IAPs (including reply forms, emails, comment sheets and any other correspondence) during the second review period of the Draft BAR, were incorporated into the latest Comments and Responses Report (contained in **Appendix G4**).

16 ENVIRONMENTAL ATTRIBUTES

16.1 General

The environmental features and attributes that may potentially be affected by the proposed project include the geographical, physical, biological, social, economic and cultural environment.

The following significant environmental attributes are focused on in this report:

- Land use and land cover;
- Climate;
- Geology;
- Soils;
- Geohydrology;
- Topography;
- Surface Water;
- Flora;
- Fauna;
- Socio-Economic Environment;
- Agriculture;
- Air Quality;
- Noise;
- Historical and Cultural Features;
- Planning;
- Existing Structures and Infrastructure;
- Transportation;
- Waste Disposal Facilities; and
- Aesthetic Qualities.

The potential impacts to the receiving environment are discussed further in **Section 19**.

16.2 Land Use & Land Cover

According to the 2013-14 South African National Land-cover dataset, produced by GEOTERRAIMAGE, the dominant land cover in the study area is classified as low shrubland (**Figure 31**).

According to the Agricultural Impact Assessment (Index, 2019) (contained in **Appendix H1**) the dominant agricultural land use along the proposed pipeline route is animal grazing. Irrigation takes place in isolated instances where water is available, and then only to produce supplement animal feed.

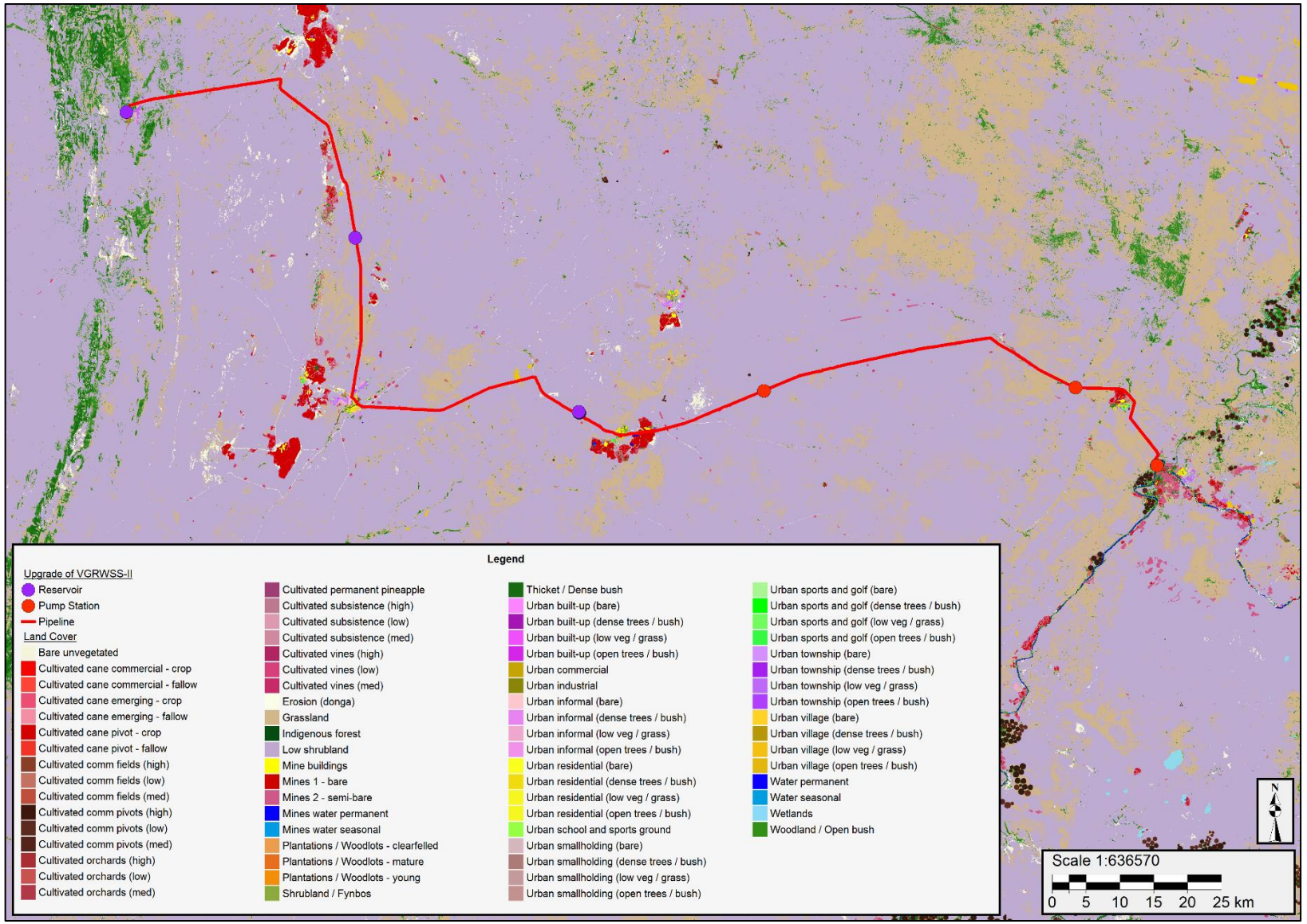


Figure 31: Land Cover Map

The land uses affected by the proposed pipeline infrastructure are listed in the **Table 16** below.

Table 16: Directly affected land uses (Index, 2019)

Line	Area
Grazing	1044,40
Infrastructure	40,53
Irrigated land	1,34
Mines	112,50
TOTAL	**1 197,77**

According to the Socio-Economic Impact Assessment (**Appendix H6**) the southern and central sections of the project study area are characterised by agriculture (commercial and subsistence farming) and densely populated commercial and mining land use towards the central section. The northern section of the project study area passes through areas that include populated areas (high and low density), commercial and mining land uses.

16.3 Climate

The information to follow was obtained from the Reconciliation Strategy and Water Master Plan study for the VGRWSS (2011). Note that further details pertaining to the climate in the project area are provided in the Agricultural Impact Assessment (contained in **Appendix H1**).

16.3.1 Temperature

The mean annual temperature ranges between 18.3ºC in the east to 17.4ºC in the west. Maximum temperatures are experienced in January and minimum temperatures usually occur in July. Mean daily temperature varies from 25ºC in January to 11ºC in July with a mean daily maximum of 33ºC and a mean daily minimum of 20 ºC. Extremes of 40ºC and -7 ºC have been recorded.

16.3.2 Precipitation

The study area lies in a summer rainfall region, with precipitation in the form of thunderstorms during January, February and March when moist tropical air from the north reach the area due to frontal systems.

The annual precipitation is erratic with wet and dry cycles evident. An extreme wet cycle that peaked 1974 to 1976 (3 years) was followed by a dry cycle from 1978 to 1987 (9 years). This was followed by a wet cycle 1988 to 1991 (4 years) with an extreme dry year in 1992 with a dry period lasting till 1998 (6 years). From 1999 to 2002 (3 years) above average precipitation prevailed. From 2002 below average precipitation indicate a dry cycle.

The annual precipitation in the study area varies from 493 mm in the southern central mountains, to 233 mm at Van Zylsrus in the northwest. Annual precipitation generally

decreases westwards and northwards from the dolomite plateau. In the south-eastern parts average rainfall varies between 340 and 380 mm per annum.

16.4 Geology

16.4.1 General Geological Setting

The information provided below was sourced from the Palaeontological Impact Assessment (Banzai Environmental, 2019), contained in **Appendix H4**.

Refer to the regional geological map of the study area in **Figure 32**. The project infrastructure is underlain by the following geology:

- Kalahari Group;
- Dwyka Group, Karoo Supergroup;
- Matsap Subgroup, Volop Group, Olifantshoek Supergroup;
- Gamagara Fm, Olifantshoek Supergroup;
- Ongeluk Fm, Postmasburg Group Transvaal Supergroup;
- Asbestos Hills Subgroup, Ghaap Group, Transvaal Supergroup;
- Campbell Rand Subgroup, Ghaap Group, Transvaal Supergroup; and
- Vryburg Fm, Transvaal Supergroup.

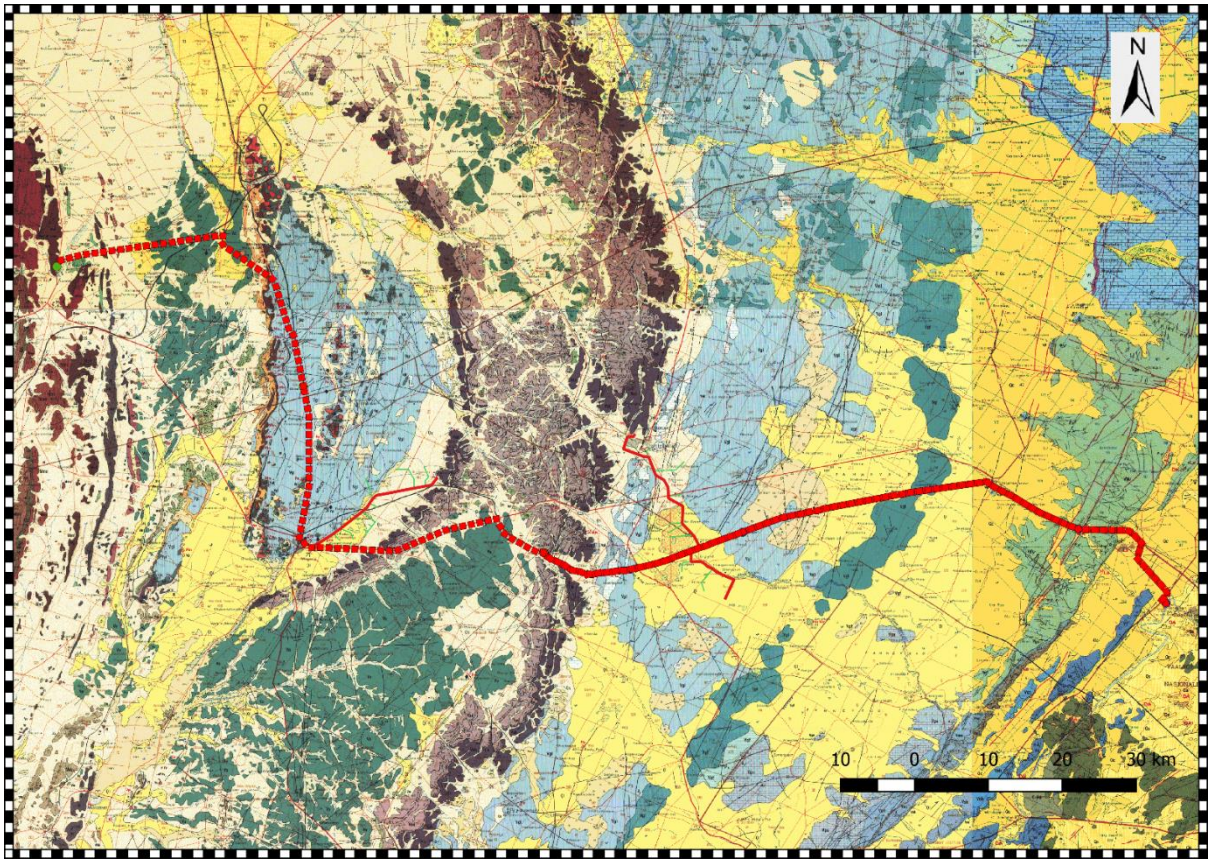


Figure 32: Surface Geology Map (Banzai Environmental, 2019)

The first section of the project infrastructure, starting in Delportshoop, is underlain by Vryburg Fm (Transvaal Supergroup), and Dwyka Group (Karoo Supergroup). The middle section is

underlain predominantly by Campbell Rand and Asbestos Hills, whereas the last section ending in Olifantshoek, is underlain by Kalahari, Matsap, Olifantshoek, Ongeluk and Gamagara. Refer to the Palaeontological Assessment contained in **Appendix H4** for a description of the geology and lithology found within the study area.

16.5 Soils

The soil classes encountered in the study area are shown in **Figure 33**. The majority of the proposed project infrastructure falls within areas classified as freely drained, structureless soils and lithosols, which are shallow soils situated on hard or weathering rock. A small section of the pipeline beginning at the Delportshoop pump station is situated on soils with a pedocutanic horizon.

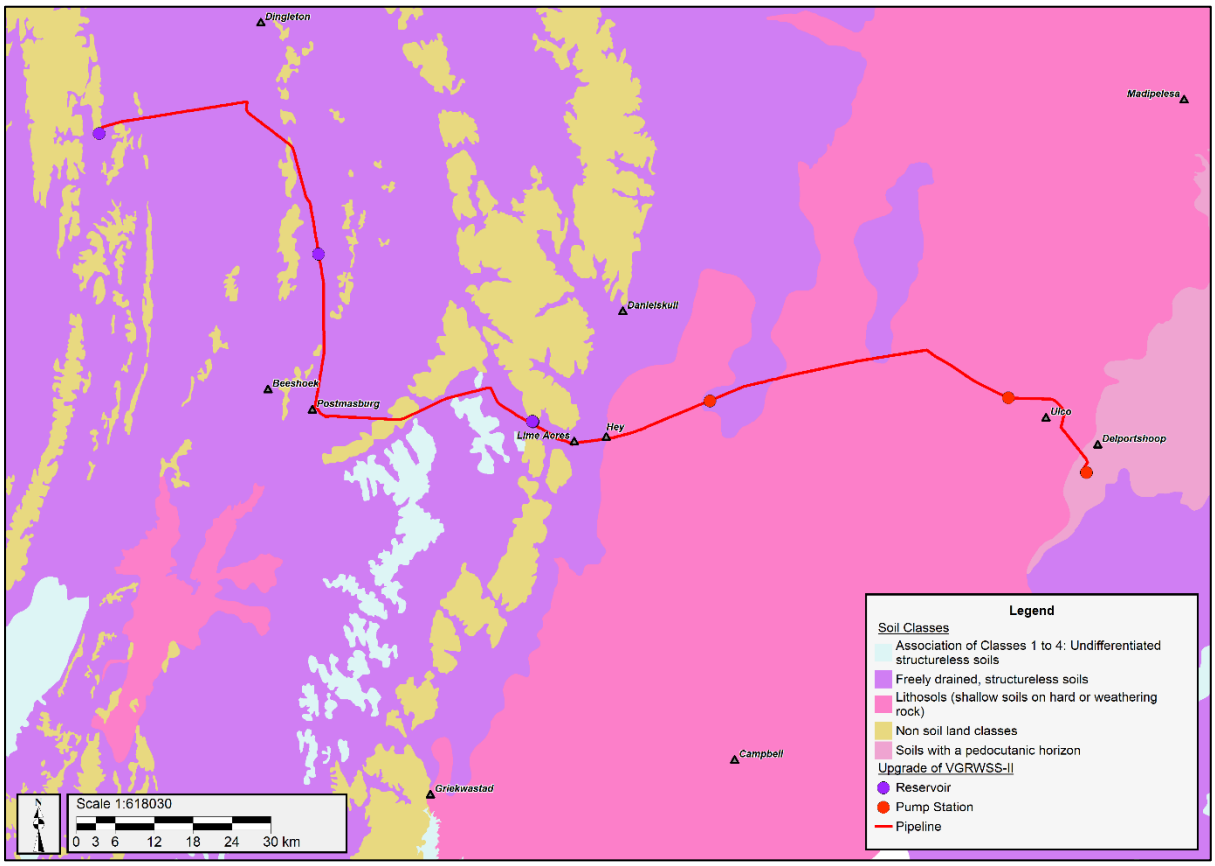


Figure 33: Soil Classes Map

Further details on soil types and soil potential are contained in the Agricultural Impact Assessment (**Appendix H1**).

16.6 Geohydrology

The Reconciliation Strategy and Water Master Plan study for the VGRWSS (2011) indicated that groundwater resources are available throughout the study area, and the significant aquifers present in the study area comprise of the following:

- Dolomite karst aquifers, compartmentalised by dolerite dykes;

- Banded Ironstone Formation (BIF) fractured aquifers; and
- Kalahari Sandstone, Gravel & Calcrete, intergranular aquifer of lesser importance in the area.

Groundwater sources are utilized and accessed through the use of boreholes, springs and dewatering of mine workings.

Weathered and fractured BIF as well as karst dolomite bedrock and to a lesser extent the intergranular Kalahari Sediments represent the main aquifers in the area. The BIF and karst aquifers associated with the Ghaap Plateau dolomite formations are quite productive and support borehole yields in excess of 40 l/s, in use at Kuruman, Sishen, Kathu, and Beeshoek. The intergranular aquifers are presented by the upper (Eden Formation) as well as basal sand and gravel beds (Wessel Formation) of the Kalahari sediments. These aquifers are characterised by borehole yields generally less than 2 l/s, but with the ability to store large volumes of water. They are separated by the red clays of the Budin Formation acting as a confining layer. The basal sand and gravel formation and underlying bedrock can be regarded as one aquifer. In the absence of red clays the upper sand and gravel aquifer of the Eden Formation are in hydraulic conductivity with the bedrock aquifers. In the Dibeng and Kathu area boreholes abstract water from the Kalahari Group Sediments.

Further information on geohydrology and the proposed VGRWSS-II groundwater abstraction at SD1 and SD2, will be provided in a separate BAR.

16.7 Topography

The terrain of the study area mainly comprises of a flat and undulating topography. Refer to **Figure 34** for the contours in the greater area.

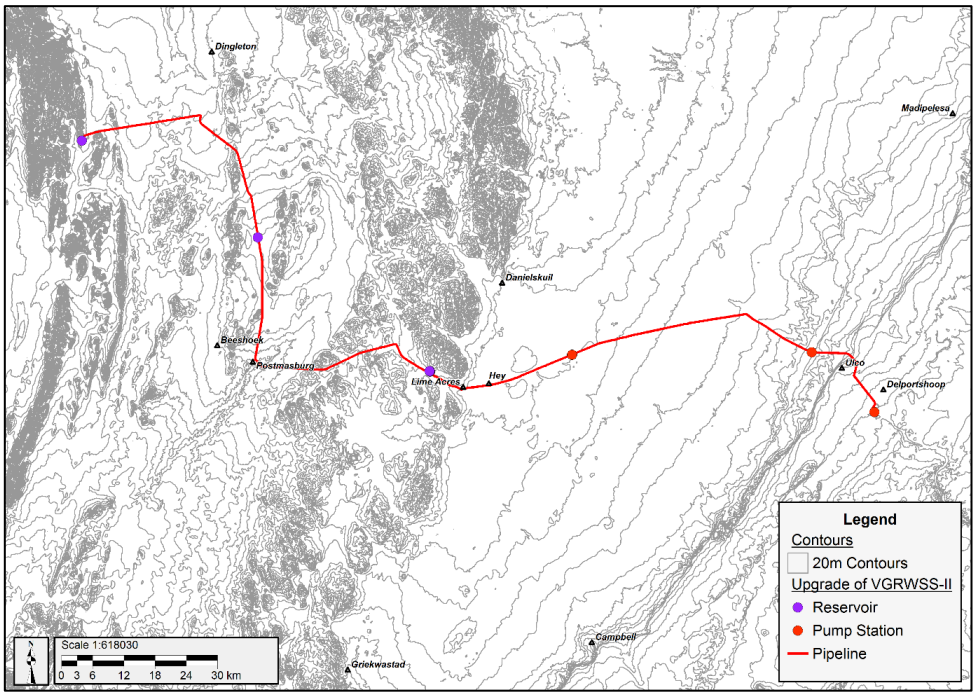


Figure 34: 20m Contours

The last section of the project infrastructure ending at the Olifantshoek Reservoir, is situated on top of a low mountain, as shown in **Figure 35** below.

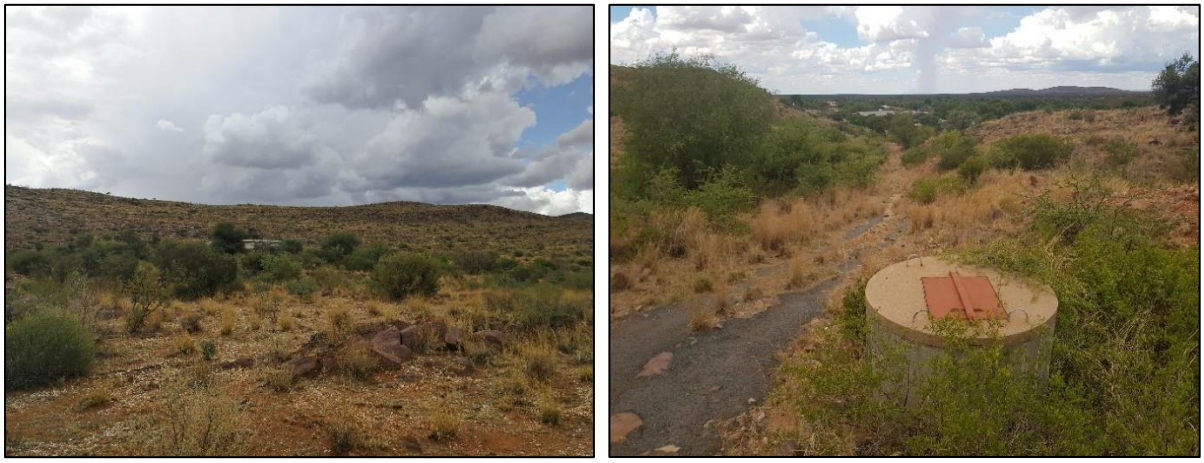


Figure 35: View of the Olifantshoek Reservoir site

16.8 Surface Water

A Wetland and Aquatic Assessment (contained in **Appendix H2**) was conducted for the project, and information provided below was sourced from this study. Refer to **Section 17.2** and **Section 19.7** for a synopsis of the study and a related impact assessment, respectively.

16.8.1 Hydrology

The proposed upgrading of the VGRWSS-II is situated within the Vaal Water Management Area (WMA), and traverses several quaternary catchments as shown in **Figure 36**.

The first section of the pipeline, which starts at the Delportshoop Pump Station up to the Kneukel Pump Station, traverse the quaternary catchments C92A, C91E and C33C. The middle section of the study area, from the Kneukel Pump Station up to the Clifton Reservoirs close to Lime Acres, is situated within the quaternary catchments C92A, C92C and D71B. The last section of the study area, from the Clifton Reservoirs, through the town of Postmasburg up to the Gloucester Reservoir, and from the Gloucester Reservoir all the way up to the Olifantshoek Reservoir in Olifantshoek, is situated within the quaternary catchments D73A and D41J.

Surface water drainage largely mirrors groundwater flow directions (Golder, 2014), which is driven primarily by the prevailing terrain aspect. The drainage from the area occurs in three main directions namely south-east towards the Vaal River (some via the Harts) for systems between Delportshoop and Lime Acres, south-west towards the Orange River for systems between Lime Acres and Postmasburg and north-west towards the Ga-Mogara (and ultimately to the Orange via the Kuruman and Molopo Rivers) for systems between Delportshoop and Olifantshoek.

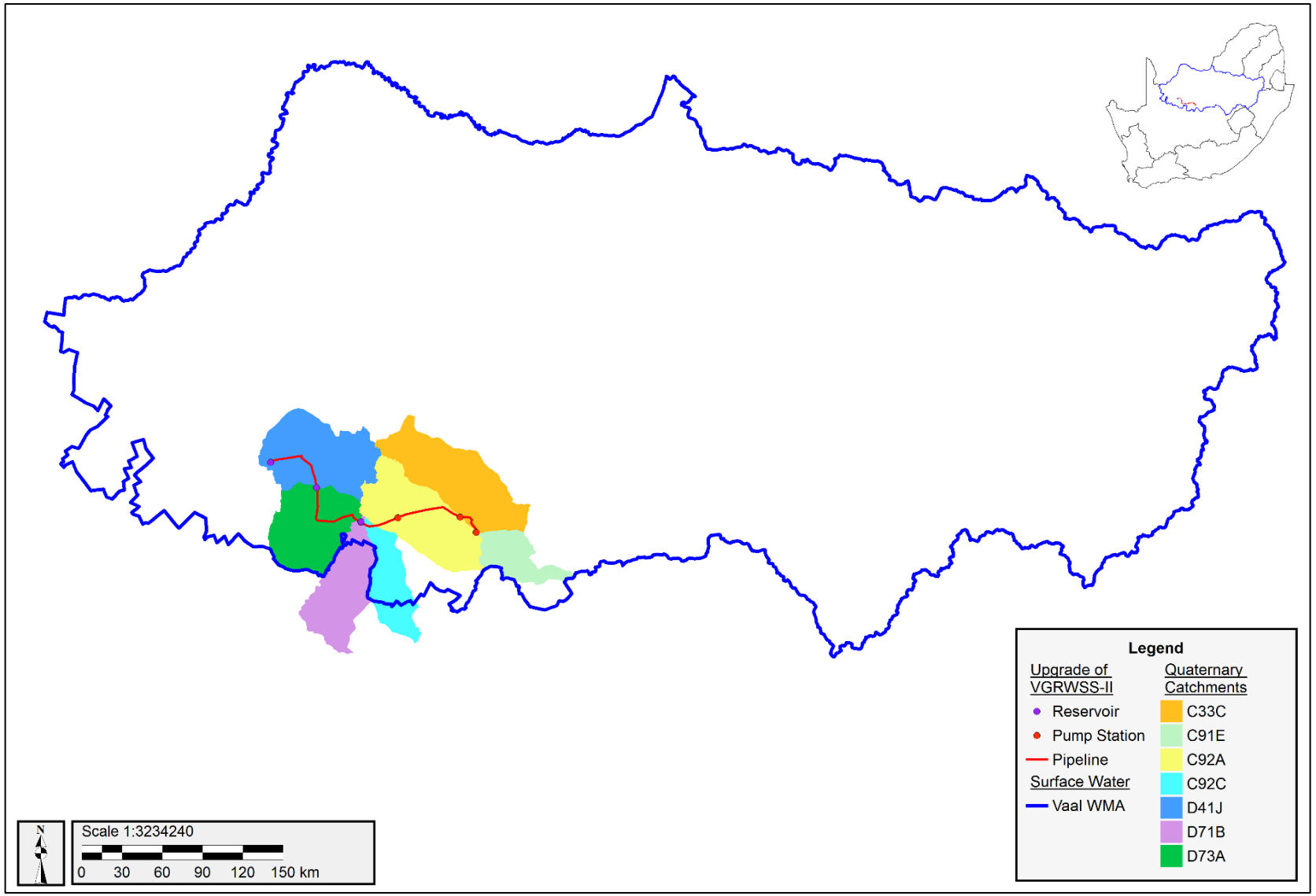


Figure 36: Vaal WMA and quaternary catchments

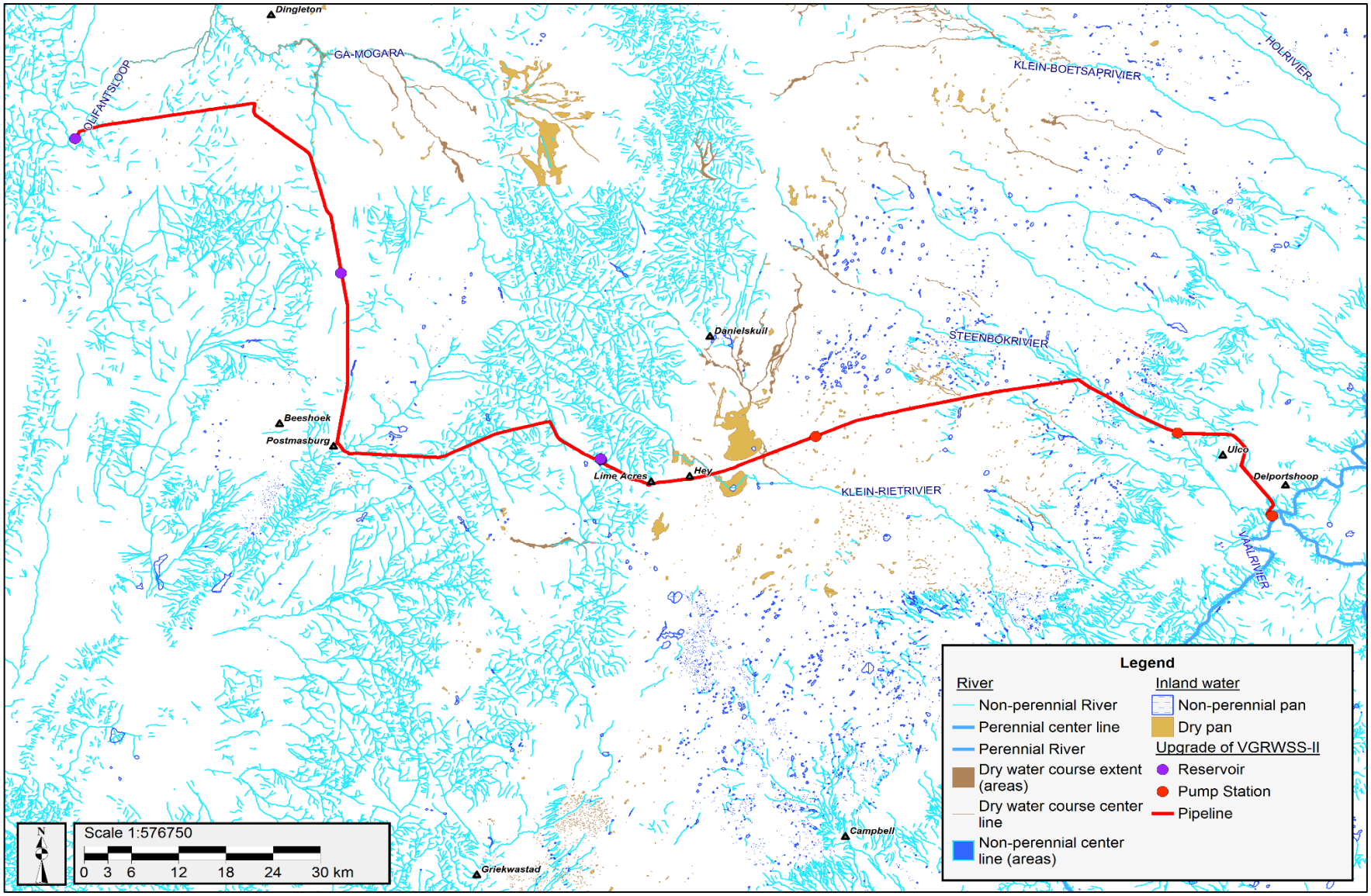


Figure 37: Rivers and streams within the study area

16.8.2 Affected Watercourses

16.8.2.1 Rivers and Streams

The major watercourses within the study area are shown in **Figure 37**. The following rivers and streams are directly affected by the project infrastructure:

- The Vaal River - water is abstracted at the Delportshoop abstraction works and used for water conveyance for the VGRWSS-II (refer to **Figure 38** below).
- Steenbok River – traversed by the pipeline between Kneukel and Trewill Pump Stations;
- Klein Riet River – traversed by the pipeline between Trewill Pump Station and the Clifton Reservoirs;
- Groenwaterspruit – traversed by a section of pipeline near Postmasburg; and
- Olifantsloop – traversed by the pipeline ending at the Olifantshoek reservoir (refer to **Figure 38** below).

Figure 38: Vaal River (left) and Olifantsloop (right)

According to the Wetland and Aquatic Assessment, the study area traverses three Phase 1 Freshwater Ecosystem Priority Areas (FEPAs) Rivers, namely the Steenbok (crosses the proposed pipeline route near Delportshoop), the Klein Riet (near Lime Acres) and the Groenwaterspruit (near Postmasburg). Additionally, three Phase 4 FEPAs cross the pipeline route namely the Klein Riet (western tributary), the un-named tributary (near Lime Acres) of the Ga-Mogara (near Kathu) and the Olifantsloop (near Olifantshoek).

16.8.2.2 Water Quality

In situ water quality analysis was conducted at two (2) sites which had water. The results of the assessment indicated poor water quality for the sites assessed, as they are bellow recommended limits for pH and dissolved oxygen and being above recommended limits for electrical conductivity.

Refer to **Section 17.2.4** for a summary of the *in-situ* water quality.

16.8.2.3 Macroinvertebrates

Macroinvertebrate assemblages are good indicators of localised conditions because many benthic macroinvertebrates have limited migration patterns or a sessile mode of life. They are particularly well-suited for assessing site-specific impacts (upstream and downstream studies) (Barbour *et al*., 1999). Refer to **Section 17.2.4** for a summary of the invertebrate habitat and biotope assessments.

16.8.2.4 Pans and Wetlands

The major pans and depressions within the study area are shown in **Figure 37**. According to the Wetland and Aquatic Assessment, the study area traverses a multitude of FEPA listed wetlands. The vast majority of these systems occur in the east of the study area between Lime Acres and Delportshoop in a very flat pan-veld type habitat. The majority of these wetlands are pans, with the most noteworthy being Great Pan (see **Figure 39** below), although some do include linear systems (e.g. the Steenbok, Klein Riet).

Figure 39: Great pan near the town Lime Acres

According to the Wetland and Aquatic Assessment, there are a total of 61 individual hydrogeomorphic (HGM) units identified along the proposed pipeline route (17 valley bottom systems and 44 depressions), which were placed into 12 wetland groups.

Refer to the individual wetland group maps in the Wetland and Aquatic Assessment contained in **Appendix H2**, as well as **Section 17.2.4** for a summary of the wetland groups and their associated ecological importance and sensitivity ratings.

16.9 Flora

The information to follow was sourced from the Terrestrial Ecological Impact Assessment (contained in **Appendix H5**). Refer to **Sections 17.1** and **19.8** for a synopsis of the study and a related impact assessment, respectively.

16.9.1 Regional Vegetation

The proposed project infrastructure falls within the Azonal vegetation and Savanna biomes (SANBI, 2012).

Azonal vegetation responds more readily to localized edaphic factors such as the amount and periodicity of water and salts, rather than to macroclimatic and geological patterns across the landscape that dictates vegetation formation elsewhere. The stresses and problems that vegetation encounter in the azonal vegetation environment are so peculiar and, in some cases, so extreme that only highly specialized species that are sufficiently equipped to deal with those stresses and problems can be found there, forming their own typical vegetation composition (Keddy, 2004).

The Savanna Biome is the largest Biome in South Africa and occupies over one third of the whole area. It is characterized by a grassy ground layers and distinct upper layers of woody plants (Low and Rebelo, 1996).

SANBI (2012) classified the study area as falling within the following vegetation types: Southern Kalahari Mekgacha (Azonal vegetation), Southern Kalahari Salt Pans (Azonal vegetation), Kuruman Mountain Bushveld (Savanna biome), Kathu Bushveld (Savanna biome), Olifantshoek Plains Thornveld (Savanna biome), Postmasburg Thornveld (Savanna biome), Koranna-Langeberg Mountain Bushveld (Savanna biome), Schmidtsdrif Thornveld (Savanna biome), Ghaap Plateau Vaalbosveld (Savanna biome) and Kuruman Thornveld (Savanna biome)

However, according to SANBI (2018) and National Biodiversity Assessment (2018), the following vegetation types were recorded within the study area, namely: Southern Kalahari Mekgacha; Schmidtsdrif Thornveld; Postmasburg Thornveld; Olifantshoek Plains Thornveld; Kuruman Thornveld; Kuruman Mountain Bushveld; Koranna-Langeberg Mountain Bushveld; Kathu Bushveld and Ghaap Plateau Vaalbosveld (**Figure 40**).

A description of the vegetation types recorded within the study area is provided in the sections to follow.

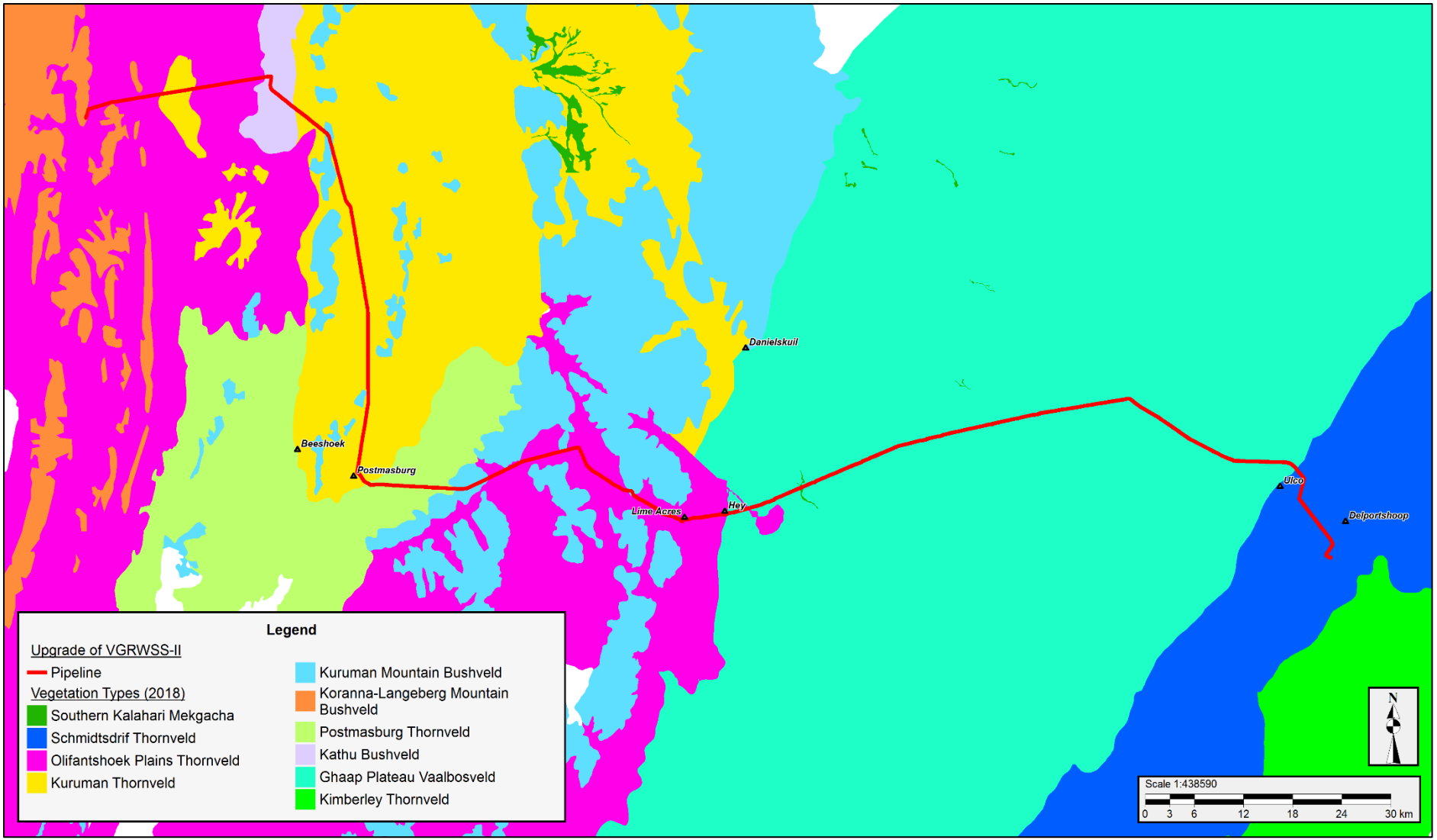


Figure 40: Vegetation Types (SANBI, 2018)

16.9.1.1 Southern Kalahari Mekgacha

This vegetation type is found in Northern Cape and North-West Provinces. It occurs in valleys (including beds and adjacent slopes) of the intermittent rivers draining the dry savanna south of the Bakalahari Schwelle (broad interfluve at 1 000–1 100 m altitude) in the South African part of the Kalahari region. The major mekgacha of the region include the Nossob, Auob, Molopo and Kuruman Rivers. A more extensive (endorheic) system of mekgacha is found north of the Bakalahari Schwelle in central Botswana (Mucina and Rutherford, 2006).

The vegetation type is considered as *Least threatened* with a national conservation target of 24%. Already 18% is statutorily conserved in the Kgalagadi Transfrontier Park and Molopo Nature Reserve. About 2% has been transformed by road building. The mekgacha are under strong utilisation pressure, both from wildlife (to graze and for salt licks) and domestic animals (grazing, browsing and animal penning). Alien woody Prosopis species occur as invasive plants in places (Mucina and Rutherford, 2006).

16.9.1.2 Kuruman Mountain Bushveld

This vegetation type is distributed in Northern Cape and North-West Provinces. It occurs from the Asbestos Mountains southwest and northwest of Griekwastad, along the Kuruman Hills north of Danielskuil, passing west of Kuruman town and re-emerging as isolated hills, i.e. Makhubung and the hills around Pomfret in the north (Mucina and Rutherford, 2006).

This vegetation type is considered as *Least threatened* with a national conservation target of 16%. This vegetation type is not conserved in statutory conservation areas. Very little is transformed. Erosion varies from low to very low. Some parts in the north are heavily utilised for grazing (Mucina and Rutherford, 2006).

16.9.1.3 Kathu Bushveld

This vegetation type is mainly distributed in Northern Cape Province. It occurs on plains from Kathu and Dibeng in the south, through Hotazel, vicinity of Frylinckspan to the Botswana border roughly between Van Zylsrus and McCarthysrus (Mucina and Rutherford, 2006).

The vegetation type is considered as *Least threatened* with a national conservation target of 16%. This vegetation is not conserved in statutory conservation areas. More than 1% is already transformed, including the iron ore mining locality at Sishen, one of the biggest open-cast mines in the world (Mucina and Rutherford, 2006).

16.9.1.4 Olifantshoek Plains Thornveld

This vegetation type is mainly distributed in Northern Cape Province. It occurs on plains including most of the pediment areas of the Korannaberg, Langeberg and Asbestos Mountains as well as some ridges to the west of the Langeberg. From the vicinity of Sonstraal in the north, past Olifantshoek to areas north of Niekerkshoop between Volop and Griekwastad in the south. Also from Griekwastad northwards to the flats west of the Lime Acres area (Mucina and Rutherford, 2006).

This vegetation type is considered as *Least threatened* with a national conservation target of 16%. Only 0.3% is statutorily conserved in the Witsand Nature Reserve. Only about 1% of the area has been transformed and erosion is very low (Mucina and Rutherford, 2006).

16.9.1.5 Postmasburg Thornveld

This vegetation type is restricted to the Northern Cape Province. It is found in limited area around Postmasburg along the short valley of the Groenwaterspruit to the northeast and southwest, west to Bermolli and around Heuningkrans (Mucina and Rutherford, 2006).

This vegetation type is considered as *Least threatened* with a national conservation target of 16%. This vegetation type is not conserved in statutory conservation areas but very little has been transformed (Mucina and Rutherford, 2006).

16.9.1.6 Koranna-Langeberg Mountain Bushveld

This vegetation type is restricted to Northern Cape Province. From the Tswalu Kalahari Reserve at the northern tip of the Korannaberg southwards in the form of multiple ridges to the Langeberg west of Olifantshoek and southwards along the Langeberg and some parallel ridges, to ridges in the vicinity of Volop. Also some ridges to the west of the Langeberg (Mucina and Rutherford, 2006).

This vegetation type is considered as *Least threatened* with a national conservation target of 16%. This vegetation is not conserved in statutory conservation areas but partly conserved in private reserves such as the Tswalu Kalahari Reserve. Virtually none of the area is transformed (Mucina and Rutherford, 2006).

16.9.1.7 Schmidtsdrif Thornveld

This vegetation type is found in Northern Cape, Free State and North-West Provinces. It occurs on footslopes and midslopes to the southeast and below the Ghaap Plateau, from around Douglas in the southwest via Schmidtsdrif towards Taung in the northeast. A small, less typical section is found east of the Ghaap Plateau from Warrenton towards Hertzogville (Mucina and Rutherford, 2006).

This vegetation type is considered as *Least threatened* with a national conservation target of 16%. Only 0.2% is statutorily conserved in the Vaalbos National Park. Some 13% of this vegetation is already transformed, mainly by cultivation. Of alien plant taxa, *Prosopis* deserves attention (Mucina and Rutherford, 2006).

16.9.1.8 Ghaap Plateau Vaalbosveld

This vegetation type is found in Northern Cape and North-West Provinces. It occurs in flat plateaus from around Campbell in the south, east of Danielskuil through Reivilo to around Vryburg in the north (Mucina and Rutherford, 2006).

This vegetation type is considered as *Least threatened* with a national conservation target of 16%. This vegetation is not conserved in statutory conservation areas. Only about 1% is already transformed (Mucina and Rutherford, 2006).

16.9.1.9 Kuruman Thornveld

This vegetation type is found in North-West and Northern Cape Provinces. It occurs on flats from the vicinity of Postmasburg and Danielskuil (here west of the Kuruman Hills) in the south, extending via Kuruman to Tsineng and Dewar in the north (Mucina and Rutherford, 2006).

This vegetation type is considered as *Least threatened* with a national conservation target of 16%. This vegetation type is not conserved in statutory conservation areas. Only 2% is already transformed (Mucina and Rutherford, 2006).

16.9.2 Threatened Terrestrial Ecosystems

According to the data sourced from SANBI, no terrestrial threatened ecosystems were recorded in the project area. The nearest terrestrial threatened ecosystem is the Schweizer-Reneke Bushveld ecosystem, which is situated approximately 110 km to the east of the project area.

16.9.3 Northern Cape Conservation Plan

The Northern Cape Critical Biodiversity Areas (CBA) map (Oosthuysen and Holness, 2016) identifies biodiversity priority areas, called CBAs and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species to ensure the long-term ecological functioning of the landscape as a whole.

The identification of CBAs and ESAs for the Northern Cape was undertaken using a Systematic Conservation Planning approach. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives.

Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated.

The project infrastructure traverses CBA 1, CBA 2, ESA regions and Other Natural Areas (**Figure 41**).

Although sections of the study area fall within CBA1 and CBA 2 regions, the specialist indicated that based on the findings from the site visits and the fact that the proposed project infrastructure is mostly located inside the existing VGRWSS pipeline servitude, the CBA and ESA regions within the servitude have been previously disturbed and transformed, and thus no longer retain the ecosystem functioning nor meet the national biodiversity objectives of these regions (Nemai Consulting, 2019a).

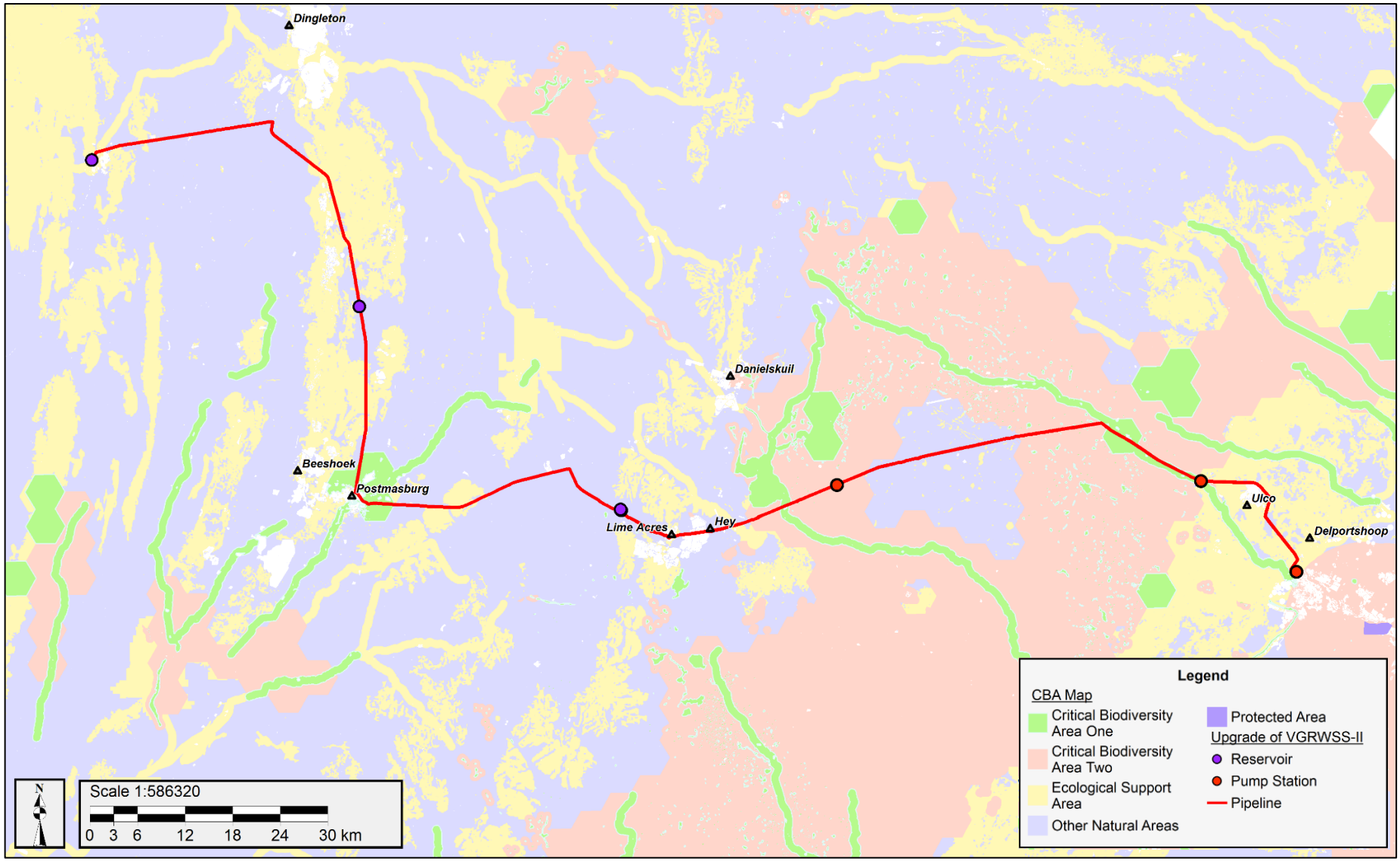


Figure 41: CBA Map

16.9.4 Protected Areas

The nearest protected areas, with a formal status in terms of the NEM:PAA, to the project footprint include the following (see **Figure 42**):

- Mokala National Park – located approximately 28 km to the suite-east of the Delportshoop WTW; and
- Witsand Nature Reserve – located approximately 60 km to the south-west of Postmasburg.

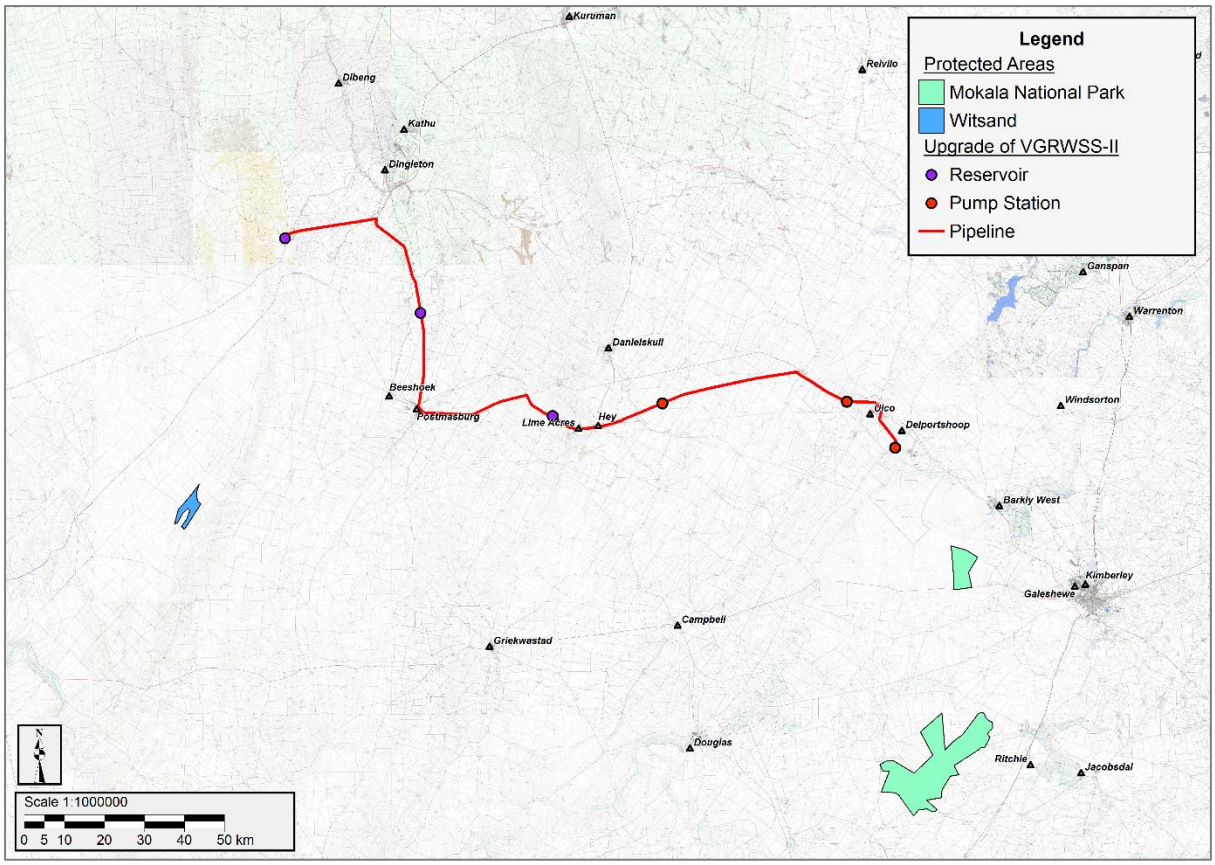


Figure 42: Protected Areas

16.9.5 Griqualand West Centre of Endemism

According to White (1983), a Centre of Plant Endemism (CPE) is considered to be an area of relatively small size which harbours a unique assemblage of species and intraspecific taxa, some of which are endemic species or near-endemics (a species with a restricted range also marginally present in an adjacent area of smaller size than the area in which it is most numerous).

The Griqualand West Centre of Endemism (GWC) (**Figure 43**) was identified as one of 18 centres of endemism in southern Africa (Van Wyk and Smith, 2001) and supports approximately 18000 species of plants (40 regarded as endemic or near endemic). Kalahari Plateau bushveld and Kalahari Mountain Bushveld are endemic to GWC. GWC endemic species includes *Blepharis marginata, Chorchorus pinnatipartitus, Digitaria polyphylla,*

Gnaphalium englerianum, Amphiglossa tecta, Calobota cuspidosa, Justicia puberula, Putterlickia saxatilis, Sutera griquensis and *Tarchonanthus obovatus.*

The proposed pipeline upgrade falls within the Griqualand West Centre of Endemism. The GWC is considered a priority in the Northern Cape, as the number of threats to the area is increasing rapidly and it has been little researched and is poorly understood (Van Wyk and Smith, 2001).

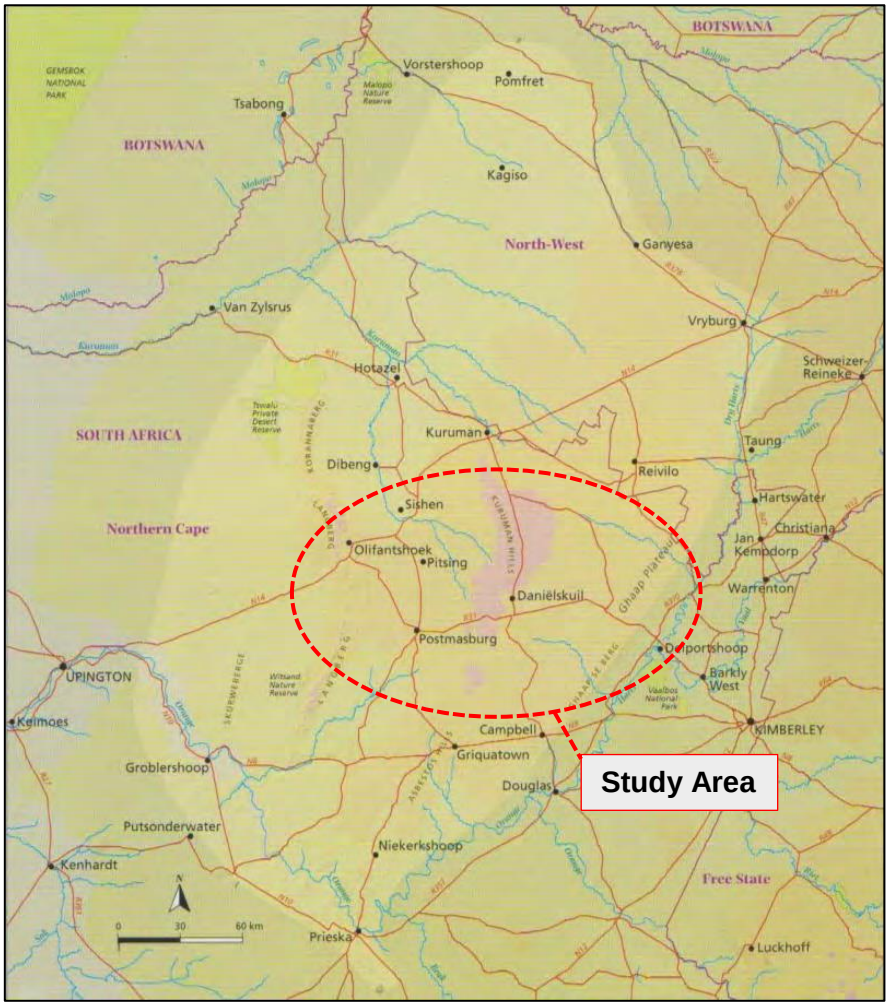


Figure 43: The GWC (light shaded area) as proposed by van Wyk & Smith (2001)

The specialist indicated that although the proposed development is situated within GWC, it must be noted that based on the findings from the site visits and the fact that the proposed project infrastructure is mostly located within the existing VGRWSS pipeline servitude, the GWC within the servitude have been previously disturbed and transformed.

16.9.6 Flora Species

The study area is located within the following quarter degree squares in terms of the 1:20 000 grid of South Africa 2824AD, 2824AC, 2824AA, 2823BB, 2823BD, 2823BC, 2823AD, 2823AC, 2823AA, 2723CC, 2722DD and 2722DC.

SANBI uses this grid system as a point of reference to determine any Red Data plant species or any species of conservation importance occurring in South Africa. This can be used to determine the list of species which could potentially occur within an area. **Table 17** indicates the plants that are known to occur on or around the project area recorded in the quarter degree squares. The definitions of the conservation status are provided in **Table 18**.

Table 17: Red Data Plant species which could potential occur in the study area (SANBI)

Family	Species	Status
Amaryllidaceae	*Boophone disticha*	Declining
Asparagaceae	*Asparagus stipulaceus*	Near Threatened
Asteraceae	*Gnaphalium declinatum*	Near Threatened
Asteraceae	*Pentzia stellata*	Near Threatened
Fabaceae	*Acacia erioloba*	Declining
Mesembryanthemaceae	*Antimima lawsonii*	Rare

Table 18: Definitions of Red Data status (Raimondo et al.1999)

Symbol	Status	Description
NT	Near Threatened	A taxon is Near Threatened when available evidence indicates that it is close to meeting any of the five International Union for Conservation of Nature (IUCN) criteria for Vulnerable and it is therefore likely to qualify for a threatened category in the near future.
	Declining	A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.
N/A	Rare	A taxon is rare when it meets any of the four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to the five IUCN.

In terms of the National Forests Act (Act No. 84 of 1998), certain tree species can be identified and declared as protected. Protected trees occurring in the study area are *Boscia albitrunca* (Shepherd's tree) and *Vachellia (Acacia) erioloba* (Camel thorn)***.***

The flora species recorded in the study area, are listed in the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2019a), which is contained in **Appendix H5**. Refer to **Section 17.1.4** for key findings from the study.

16.10 Fauna

The information to follow was sourced from the Terrestrial Ecological Impact Assessment (see **Appendix H5**). Refer to **Sections 17.1** and **19.8** for a synopsis of the study and a related impact assessment, respectively.

16.10.1 Mammals

The potential Red Data mammal species that could be found within the study area are those which have been recorded in the grid cells (ADU, 2019) (**Table 19**). The Red List category

follows the Child *et al*. (2016). Mammal species such as Leopard and Brown Hyena are mostly restricted to protected or conservation areas and the study area does not traverse any protected area.

Table 19: Red Data mammal species that could potentially occur within the study area

Family	Scientific name	Common name	Red list category
Bovidae	*Hippotragus equinus*	Roan Antelope	Endangered (2016)
Bovidae	*Hippotragus niger niger*	Sable Antelope	Vulnerable
Bovidae	*Damaliscus pygargus pygargus*	Bontebok	Vulnerable (2016)
Canidae	*Lycaon pictus*	African wild dog	Endangered (2016)
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	Near Threatened (2016)
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable (2016)
Felidae	*Panthera pardus*	Leopard	Vulnerable (2016)
Hyaenidae	*Hyaena brunnea*	Brown Hyena	Near Threatened (2015)
Manidae	*Smutsia temminckii*	Ground Pangolin	Vulnerable (2016)
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016)
Rhinolophidae	*Rhinolophus denti*	Dent's Horseshoe Bat	Near Threatened (2016)

Refer to **Section 17.1.4** for a list of mammal species, including mammal species of conservation importance recorded during the field survey as part of the study.

16.10.2 Avifauna

The Important Bird and Biodiversity Areas (IBBA) Programme is a BirdLife International initiative to conserve important bird species and their habitats. It also identifies and works to conserve a network of sites critical for the long-term survival of bird species that are globally threatened, have a restricted range and are restricted to specific biomes/vegetation types. As previously mentioned, the study area falls within the Grassland biome and this biome is considered as a home to 52 of the 122 IBBA in South Africa (O' Connor and Bredenkamp, 1997).

Several conservation and planning tools were consulted for relevancy of the project and the study area does not fall within any of the IBBAs (**Figure 44**). An assessment of Coordinated Avifaunal Road-count (CAR) and Coordinated Waterbird Count (CWAC) areas data revealed that there are no CAR routes or CWAC areas in the study area.

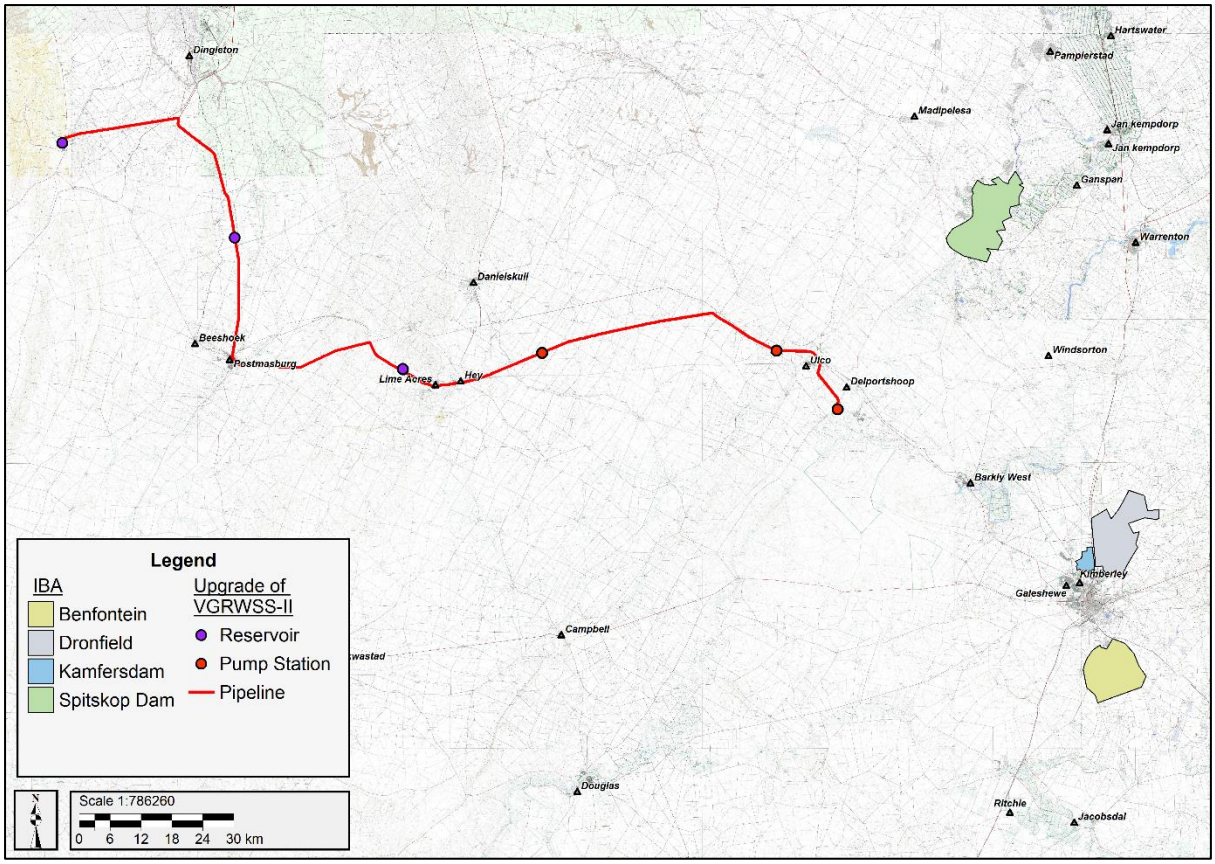


Figure 44: IBA Map

According to the Southern African Bird Atlas Project 2 (SABAP 2), a list of threatened bird species occur in the grid cells 2824AD, 2824AC, 2824AA, 2823BB, 2823BD, 2823BC, 2823AD, 2823AC, 2823AA, 2723CC, 2722DD and 2722DC (**Table 20**).

Table 20: Red Data Bird species recorded in grid cells which could potentially occur in the study area (Taylor et al. 2015)

Species	Scientific name	Conservation status
Tawny Eagle	*Aquila rapax*	Endangered
Martial Eagle	*Polemaetus bellicosus*	Endangered
Kori Bustard	*Ardeotis kori*	Near Threatened
Ludwig's Bustard	*Neotis ludwigii*	Endangered
Blue Crane	*Anthropoides paradiseus*	Near Threatened
African Marsh Harrier	*Circus ranivorus*	Endangered
Black Harrier	*Circus maurus*	Endangered
African White-backed Vulture	*Gyps africanus*	Critically endangered
Lappet-faced vulture	*Torgos tracheliotos*	Endangered
Lanner Falcon	*Falco biarmicus*	Vulnerable
Black Stork	*Ciconia nigra*	Vulnerable
Abdim's Stork	*Ciconia abdimii*	Near Threatened
Yellow-billed Stork	*Mycteria ibis*	Endangered
Marabou Stork	*Leptoptilos crumenife*	Near Threatened
Secretarybird	*Sagittarius serpentarius*	Vulnerable

Species	Scientific name	Conservation status
Greater Flamingo	*Phoenicopterus roseus*	Near Threatened
Lesser Flamingo	*Phoeniconaias minor*	Near Threatened
Chestnut-banded Plover	*Charadrius pallidus*	Near Threatened
Greater painted snipe	*Rostratula benghalensis*	Near Threatened
European Roller	*Coracias garrulus*	Near Threatened
Burchell's Courser	*Cursorius rufus*	Vulnerable

A list of the bird species that were recorded during the field survey is contained in the Terrestrial Ecological Impact Assessment (**Appendix H5**).

16.10.3 Reptiles

According to South African Reptile Conservation Assessment (ADU, 2019), no reptile species of conservation importance are known to occur in the vicinity of the study area.

These are indigenous species of high conservation value or national importance that require protection. Reptile species such as Mole snake, Rock Monitor, Leopard Tortoise and Cape Cobra are classified as *protected species* under Schedule 1 of Northern Cape Nature Conservation Act (Act 9 of 2009). All land tortoises and all lizards are listed as *protected species* under Schedule 2 of the Northern Cape Nature Conservation Act (Act 9 of 2009). All species of Chamaeleon are classified as *Schedule 1 specially protected species* of Northern Cape Nature Conservation Act (Act 9 of 2009).

A list of the reptile species that were recorded during the field survey is contained in the Terrestrial Ecological Impact Assessment (**Appendix H5**).

16.10.4 Amphibians

Amphibians are an essential part of South Africa's exceptional biodiversity and are such worthy of both research and conservation effort. This is furthermore made relevant by international concern over globally declining amphibian populations, a phenomenon currently undergoing intensive investigation but is still poorly understood (Wyman, 1990 and Wake, 1991). This decline seems to have worsened over the past years and amphibians are now more threatened than either mammals or birds, though comparisons with other taxa are confounded by a shortage of reliable data. Amphibians are an important component of South Africa's exceptional biodiversity (Siegfried, 1989) and are worthy of both research and conservation effort.

Frogs and tadpoles are good species indicator on water quality, because they have permeable, exposed skins that readily absorb toxic substances. Tadpoles are aquatic and greatly exposed to aquatic pollutants (Blaustein, 2003). The presence of amphibians is also generally regarded as an indication of intact ecological functionality and therefore construction activities within these habitat units should be undertaken in an ecologically-sensitive manner.

According to Frog Atlas of Southern Africa (ADU, 2019), no frog species of conservation concern are likely to be found within the study area.

A list of the amphibian species that were recorded during the field survey is contained in the Terrestrial Ecological Impact Assessment (**Appendix H5**).

16.11 Socio-Economic Environment

16.11.1 District and Local Municipalities within the Study Area

The existing scheme is located within three DMs (Frances Baard DM, ZF Mgcawu DM and the John Taolo Gaetsewe DM) and four LMs (Dikgatlong LM, Kgatelopele LM, Tsantsabane LM and Gamagara LM). A short description of each of the aforementioned DMs and LMs, as well as the socio-economic status of each, is provided below.

Francis Baard DM

The FBDM is the smallest district in the Northern Cape Province (covering a total area of approximately 12 384 km^2). Currently, FBDM has a total population of 387 741 people, which represents 32.5% of the Northern Cape population. Sol Plaatje LM consists of the largest population in the district of 66%, followed by Phokwane LM (16%); Dikgatlong LM (12%); and Magareng LM has the least population at 6% (FBDM IDP, 2017). The FBDM is characterised by a mixture of land uses of which agriculture and mining are dominant.

Dikgatlong LM

The Dikgatlong LM is the largest of the four LMs in the district, covering an area of 7 315km^2. The LM has seen an increase in total population of 46 841 to 48 473 with a total 3.5 increase in population over the last five years (Dikgatlong IDP, 2019). The proposed project infrastructure is located in Ward 6 of this LM.

Currently 10% of the Dikgatlong LM population that is older than 20 years in 2016 have 'no schooling'. Only 23% of the 2016 population that is older than 20 years of age have Gr.12. These low levels of education place certain limitations on employment creation.

The number of those who are not economically active is very high, which means a large portion of the population is highly dependent on social grants or on those that work. The number of employed people has increased from 5 924 people (2001) to 7 841 (2011). Thus the unemployment rate has decreased from 45.3% (2001) to 39.7% (2011). The majority of people in Dikgatlong LM don't have an income, followed by those who get below R400 per month. Approximately 63% of the population live below the poverty line of R500 per month.

There has not been a significant change in the dwellings' indicators of Dikgatlong LM. Those living in formal structure constitute 78.5% compared to the 73.2% of 2001. Those living in informal settlements constitute 11.5% of the total households.

ZF Mgcawu DM

ZF Mgcawu DM forms the mid-northern section of the Northern Cape Province on the frontier with Botswana. It covers an area of more than 100 000 km^2 (almost 30% of the entire Province) out of which 65 000 km^2 compromise the vast Kalahari Desert, Kgalagadi Trans Frontier Park and the former Bushman Land. The majority of the population is located in the Khara Hais Municipality (42%), followed by the Kai! Garib Municipality (24%) and the Tsantsabane Municipality (12%). The main settlements in the aforementioned municipalities are Upington, Keimoes, and Postmasburg (ZF Mgcawu DM IDP, 2019).

Kgatelopele LM

The Kgatelopele LM has a total population of 20 691, and the municipal area is divided into 4 wards and has 2 towns which are Danielskuil and Lime Acres (Kgatelopele IDP, 2018). The proposed project infrastructure is located in Wards 2 and 4 of the LM.

The majority of people in the municipal area have some secondary education and have completed their secondary schooling. There are those that have no schooling, some primary and others have completed primary schooling. This means that these people did not receive their senior certificate, which limits their chances of getting a decent job or employment opportunities. The numbers of those who completed secondary school and received higher education are high and there is thus a large capacitated workforce to contribute to the economy of the municipality or the region.

The number of those economically active is slightly greater than those not economically active, hence the dependency ratio of 50.6% which is very high. Stats SA (2011) indicates that the unemployment rate is at 22.3% while 29.1% of the total unemployed people are young people. There is need to address the challenges of those not employed particularly the youth.

A large number of people in the municipal area receive income above the poverty line (large capacitated workforce). It is of great concern from a municipal perspective for those who have no income at all. This income group may most likely be highly depended on government grants and are thus not able to spend money in the municipal area or pay their rates.

Tsantsabane LM

The Tsantsabane LM covers an area of 5 887km^2. The municipal area falls in the Gamagara Corridor, which comprises of the mining belt of the John Taolo Gaetsewe and ZF Mgcawu districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese (Tsantsabane IDP, 2018). The proposed project infrastructure is located in Wards 1, 3, 5 and 6 of this LM.

According to Census 2011, the population figures for Tsantsabane LM is 35 093, which indicates a population growth 4 079 from population size of 31 014 (Census 2001). The municipality has 9 839 households.

From a statistical analysis it is clear that there has been an increase of people obtaining Matric since 2001. There has also been an increase in the number of people with higher education. The statistics indicate that although a high number of students enrol for primary school, a very

low number of students complete grade 12. This has resulted in a very low probability for employment. Less than 15% of the population has a tertiary qualification or have completed Grade 12. According to the STATSA (2011), unemployment has drastically reduced from 4 466 in 2001, to 3 795 in 2011, which indicates a decrease of 15%. Employment has increased by 69% in 2011. Almost half of the population has no income, while more than 10% of the population earns less than R14 00 pm, indicating high levels of poverty.

John Taolo Gaetsewe DM

The John Taolo Gaetsewe DM is the second smallest district in the Northern Cape, only occupying 6% of the province (27 293 km^2). The district comprises of 186 towns and settlements, of which majority (80%) are villages situated in the Joe Morolong LM. The districts population in 2016 was 242 264 people, where an increase of population is evident in the Gamagara LM.

Gamagara LM

The Gamagara LM covers an area of approximately 261 942 ha, which is approximately 10% of the total district area (Gamagara IDP, 2017). Statistics from the South Africa Community Survey (2016) indicate that Gamagara LM has a total population of 53 656. The municipal area of Gamagara consists of 4 towns (Kathu, Sesheng, Dibeng, and Olifantshoek) and the area is demarcated into 7 Wards. The proposed project infrastructure is situated in Wards 3, 4 and 5 of this LM. A high number of people have a secondary school education, followed by those who have matric. The number of those with no schooling has increased from the 2007 survey to 2011. The majority of people in the Gamagara LM have no monthly income. STATSSA (2011) indicates that 17,7% of the population of Gamagara LM were not employed and 65% of those constitute youth. There were 833 informal households in Gamagara LM, which constituted 15,7% of the total number of households.

The information to follow was obtained from the Socio-Economic Impact Assessment (refer to **Appendix H6**). The status quo is described using data obtained from Statistics South Africa's Census 2011 and Community Survey 2016, as well as by observations made during site visits to the project area.

16.11.2 Population

The population of the study area, as determined during Statistics South Africa's Census 2011, is presented in the pie chart (refer to **Figure 45**). Postdene, located outside Postmasburg, has the highest population, at 6 934, Postmasburg Sub Place (SP), is the next most populated, at 4 669 people. The Delportshoop SP is the least populated, at 606 people. Note that Danielskuil SP cover the Source Development area, but has been included in the discussion for the sake of completeness.

During the community survey of the region in 2016, the total population was recorded to be at 162 164. The total population of the region in 2011 was 142 238, the number has increased by 19 926 (12.3%) in a period of 5 years, equivalent to an annual growth rate of 2.65%.

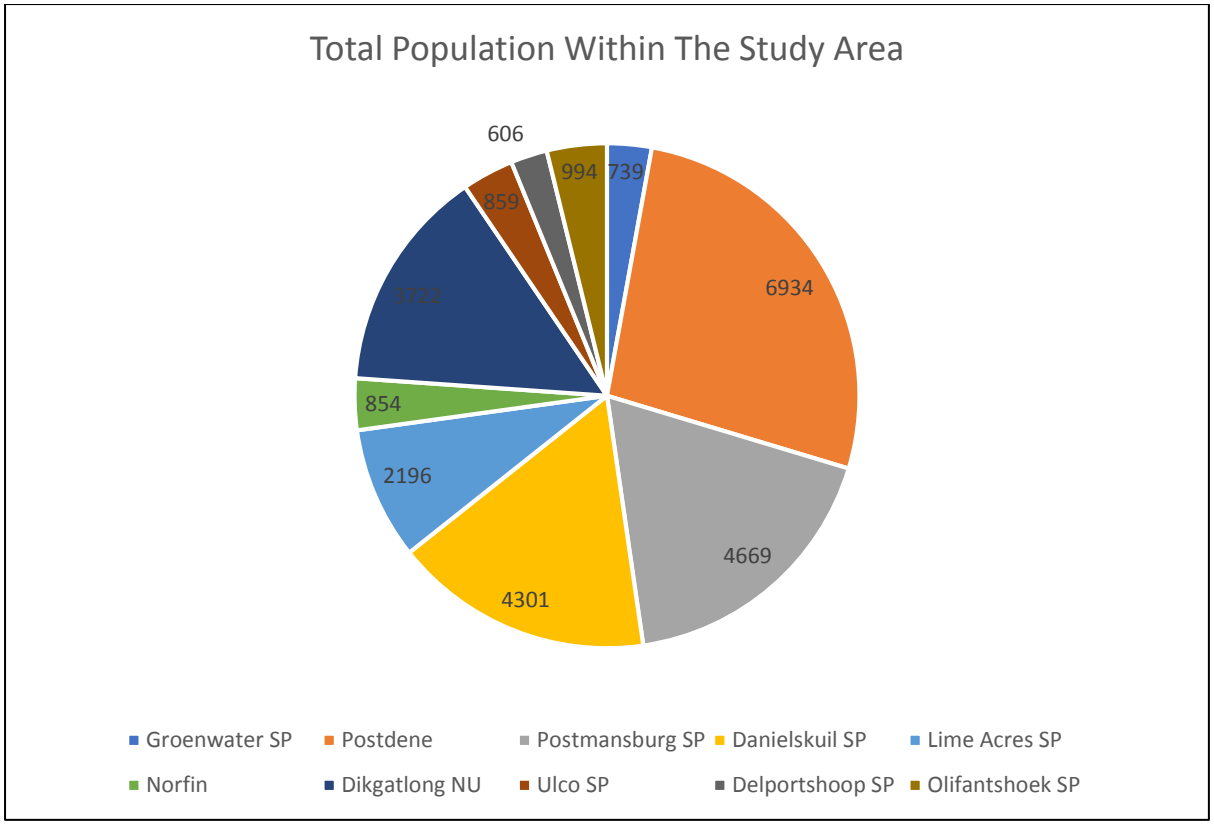


Figure 45: Population Data in the Study Area

16.11.3 Dwelling Type

The characteristics of the dwellings in which households live and their access to various services and facilities provide an important indication of the well-being of household members. It is widely recognised that shelter satisfies a basic human need for physical security and comfort.

According to the Statistics South Africa household classification the following definitions apply to formal and informal housing:

- **Formal dwelling** refers to a structure built according to approved plans, i.e. house on a separate stand, flat or apartment, townhouse, room in backyard, rooms or flatlet elsewhere. Contrasted with informal dwelling and traditional dwelling; and
- **Informal dwelling** is a makeshift structure not erected according to approved architectural plans, for example shacks or shanties in informal settlements or in backyards.

The chart (refer to **Figure 46**) shows the dwelling types located within the study area.

The vast majority of the inhabitants of the study area live in formal, brick dwellings. There are areas where informal dwellings exist, notably Postdene, where there are 339 informal dwellings in the sub-place. The standards of living are high and the relative lack of informal dwellings indicate a population that is not transient.

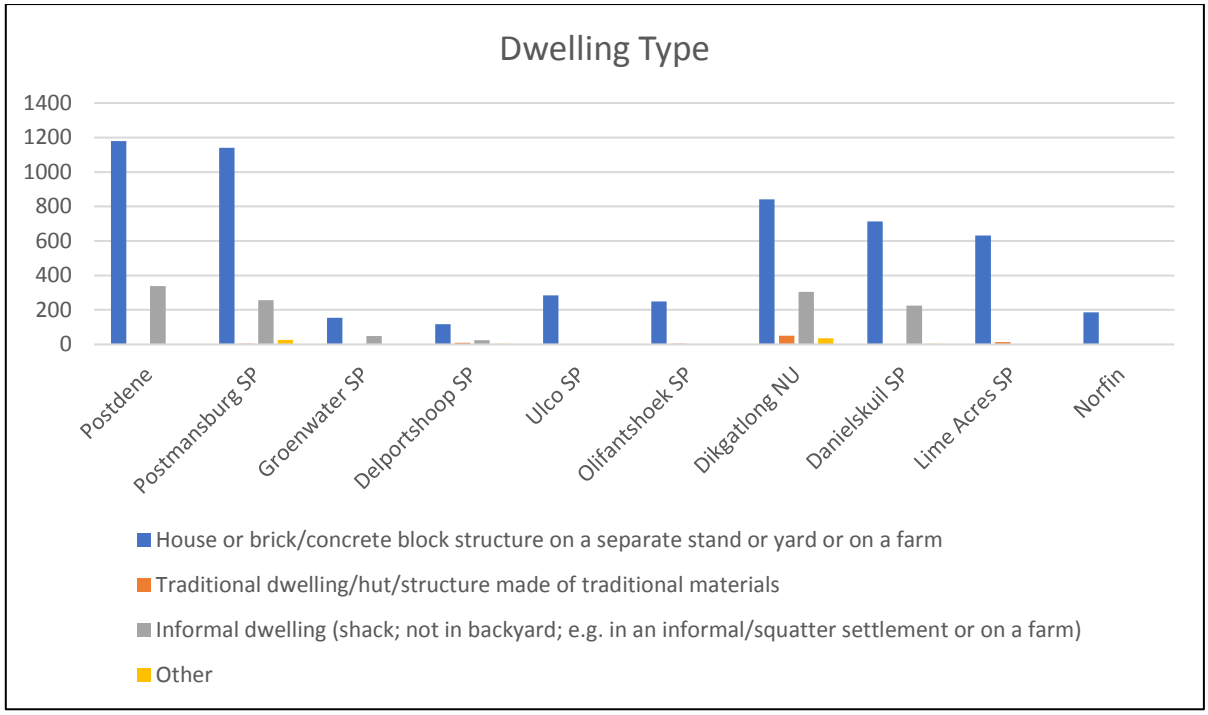


Figure 46: Type of Dwelling

16.11.4 Access to Piped Water

Understanding the water supply at a household level provides insight into the municipal level of service of a community as well on the standard of living. The graph (refer to **Figure 47**), which summarises Statistics South Africa's Census 2011 data, shows the use of various water supply standards within each of the sub-places.

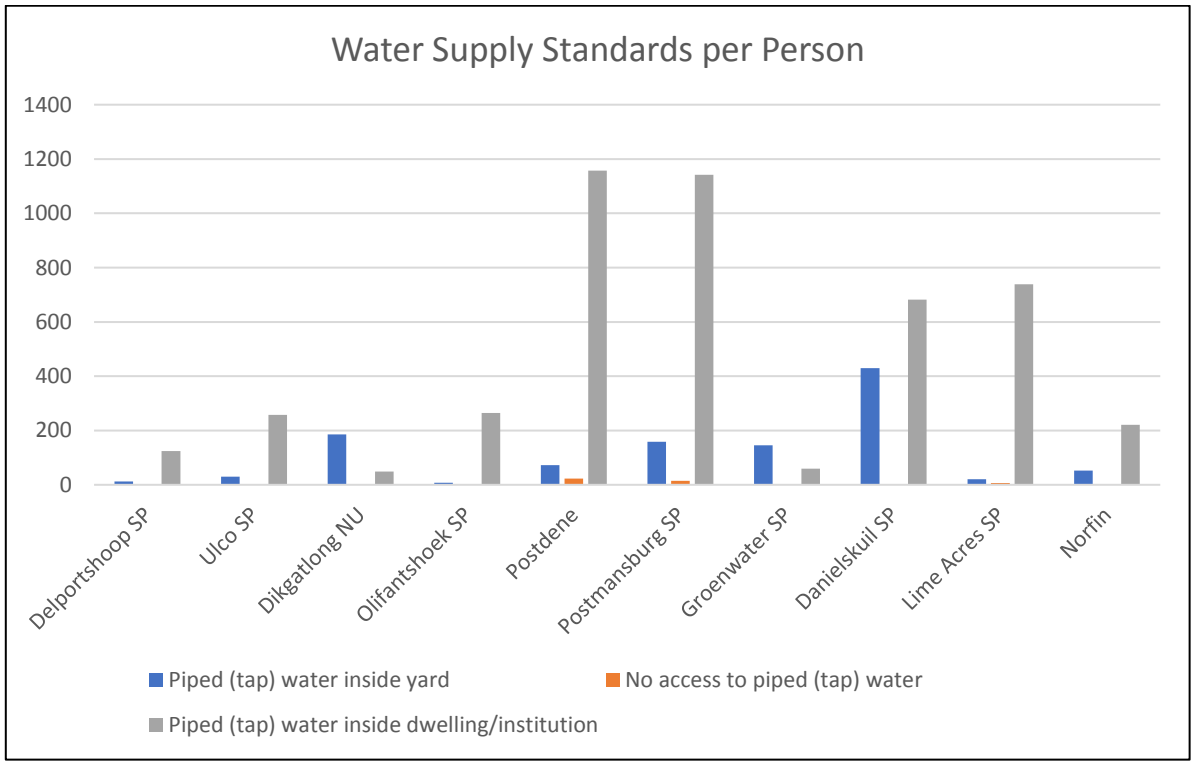


Figure 47: Access to piped water

The majority of the study area is dominated by piped water which is supplied inside homes. The exception to this rule is Groenwater SP and Dikgatlong NU, where informal settlements are most common and thus there are households with a water supply point outside the house, in the yard.

16.11.5 Sanitation

Access to sanitation services is also an indicator of the standard of living amongst the population in the sub-places. The graph (refer to **Figure 48**) which summarises Statistics South Africa's Census 2011 data, shows the use of the various sanitation standards within each of the sub-places.

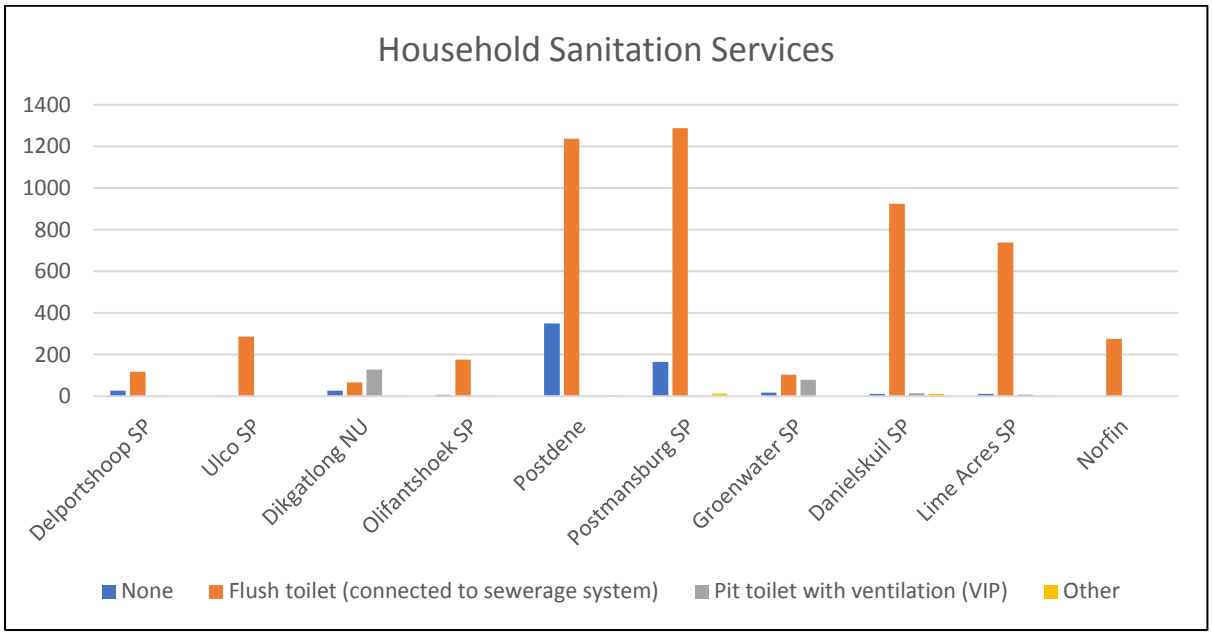


Figure 48: Access to Sanitation

Majority of the households in the sub-places use flush toilets. There are areas where there are no sanitation services, notably the rural areas of Tsantsabane and Postdene where there are up to 370 people living without any toilet facilities.

16.11.6 Education

Education levels are assessed in order to understand the potential grade or level of employment as well as livelihood of the community. Furthermore, it indicates the functional literacy and skill level of a community. The graph on the next page provides detail on the education levels within the study area. The information provided in the table and figure was obtained from Statistics South Africa's Census 2011.

The graph (refer to **Figure 49**) shows that sixty one percent of the inhabitants of the study area have not achieved matric. The remaining thirty-nine percent have achieved matric or a post matric qualification. The table below provides more detail on the levels of education within the study area.

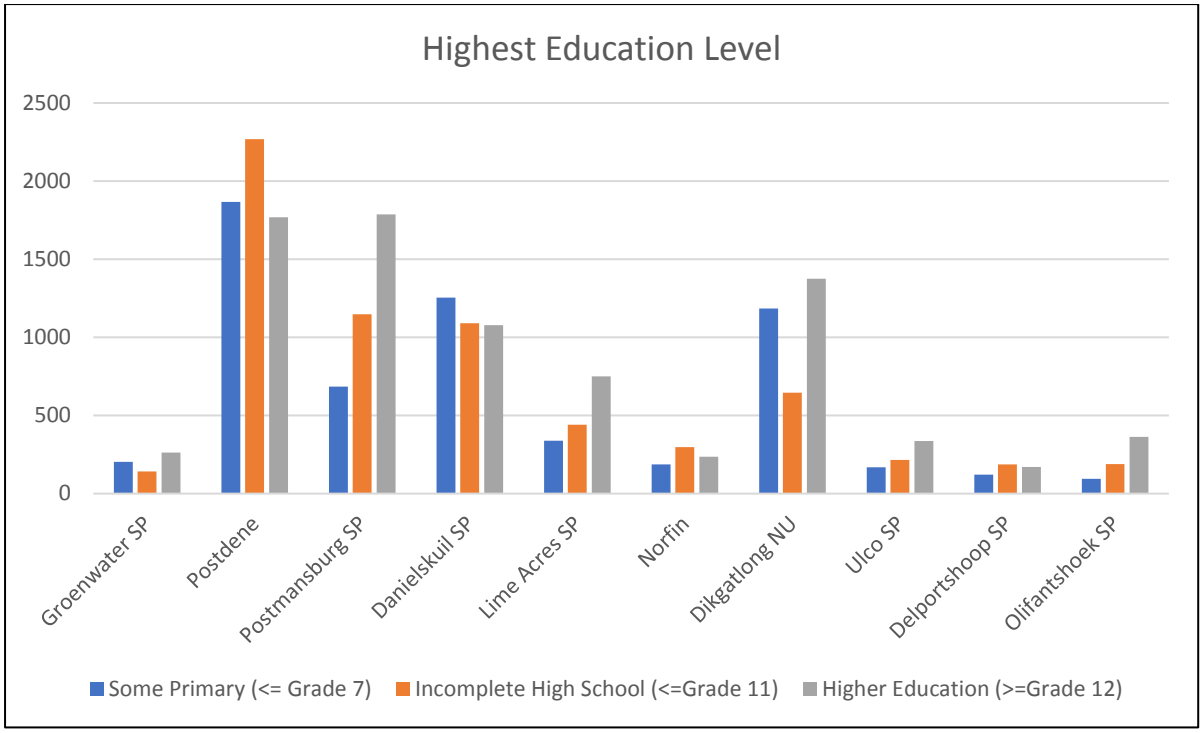


Figure 49: Highest Education Level

According to **Table 21**, Postmasburg and Lime Acres are the two sub-places with the highest levels of education within the study area, where 49% of the population have achieved a matric pass or higher level of education. Ulco, Dikgatlong NU and Groenwater follow with 47% and 43% of the population above 20 years old achieving matric or higher, Postdene and Danielskuil have the least educated population with matric and higher being at 30% and 31% respectively.

Table 21: Education levels within the study area

Sub-Place	Some Primary (<=Grade 7)	Incomplete High School (<=Grade 11)	Higher Education (>=Grade 12)
Groenwater	34%	23%	43%
Postdene	32%	38%	30%
Postmasburg	19%	32%	49%
Danielskuil	37%	32%	31%
Lime Acres	22%	29%	49%
Norfin	26%	41%	33%
Dikgatlong NU	37%	20%	43%
Ulco	23%	30%	47%
Delportshoop	25%	39%	36%
Olifantshoek	15%	29%	56%

The statistics presented in the figure and table above, suggest that the communities are dependent on the thirty-nine percent of the population who have completed high school or received a higher education. In Postdene and Danielskuil, 70% and 69% of the population have incomplete high school education and some primary education. The structural problem

in these two areas requires intervention of an external entity to improve current education levels. A generation of youth with some form of higher education is required to break the poverty cycle in this area.

16.11.7 Annual Household Income

Annual household income is important to assess as it provides information on the poverty level of a community. Development of unskilled rural households is much slower than that of skilled households, this is due to the unskilled communities tending to generate low incomes per household than higher skilled communities.

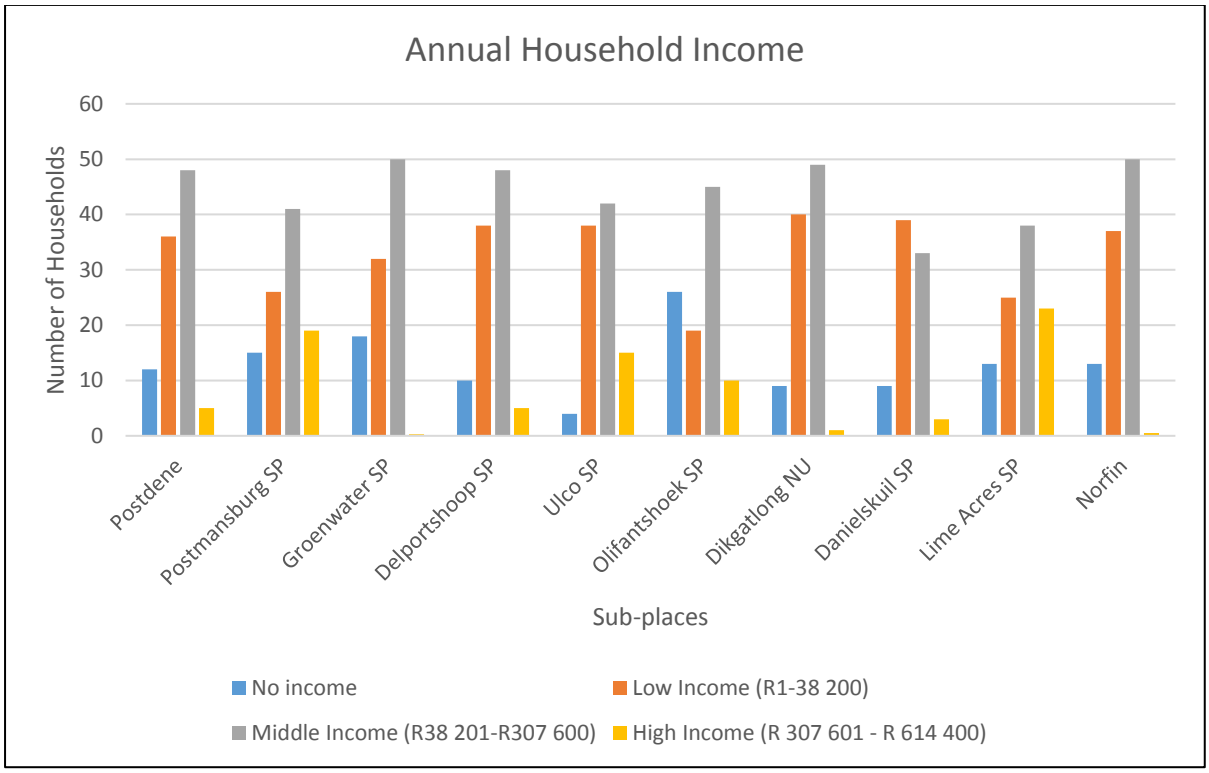


Figure 50: Annual Household Income

Figure 50 above demonstrates that a substantial percentage of the population of Groenwater, Postdene, Delportshoop, Olifantshoek, Dikgatlong and Danielskuil have no or low income. This is combined with relatively fewer higher income individuals, which indicates that these communities are most vulnerable to economic shocks with little buffer against dips in income levels,

Table 22: Household Income within the Study Area

Sub-Place	No income	Low Income (R1-38 200)	Middle Income (R38 201-R307 600)	High Income (R307 601 – R614 400)
Postdene	12%	36%	48%	5%
Postmansburg SP	15%	26%	41%	19%
Groenwater SP	18%	32%	50%	0.3%
Delportshoop SP	10%	38%	48%	5%

Sub-Place	No income	Low Income (R1-38 200)	Middle Income (R38 201-R307 600)	High Income (R307 601 – R614 400)
Ulco SP	4%	38%	42%	15%
Olifantshoek SP	26%	19%	45%	10%
Dikgatlong NU	9%	40%	79%	1%
Danielskuil SP	9%	39%	33%	3%
Lime Acres SP	13%	25%	38%	23%
Norfin	13%	37%	50%	0.5%

According to **Table 22**, a cluster of communities: Postdene, Groenwater, Delportshoop, Dikgatlong, Lime Acres and Norfin have no or low-income levels at 48-50% of the communities. Lime Acres and Norfin has a higher percentage than the other communities of higher income individuals, which buffers against economic shocks and provides in-built resilience to period of low income. The poverty levels in the remaining areas: Postdene, Groenwater, Delportshoop and Dikgatlong are the most severe in the study area. These communities would most benefit from additional employment opportunities and skills development programmes for both short- and long-term durations.

16.11.8 Employment

Census 2011 uses the following definitions applicable to employment that are useful for reference purposes:

- **Employed** - Those who performed work for pay, profit or family gain for at least one hour in the seven days prior to the interview or who were absent from work during these seven days, but did have some form of paid work to return to;
- **Economically Active Person** - A person of working age who is available for work, and is either employed, or is unemployed but has taken active steps to find work in the reference period". These are the sum of the employed and unemployed persons;
- **Unemployed** – Those people within the economically active population who: (a) did not work during the seven days preceding the census; (b) want to work and are available to start work within two weeks of the interview; and (c) have taken active steps to look for work or start some form of self-employment in the four weeks preceding the census night; and
- **Other Not Economically Active** – People who are not available for work such as fulltime scholars and students, full-time homemakers, those who are retired and those who are unable or unwilling to work; and

The statistics of employed and unemployed persons in the study area is reported in the graph below by using the Statistics South Africa's Census 2011 data. These figures use the official definition for unemployment. The sum of the employed persons and the unemployed persons is the actual labour force at the time of the census.

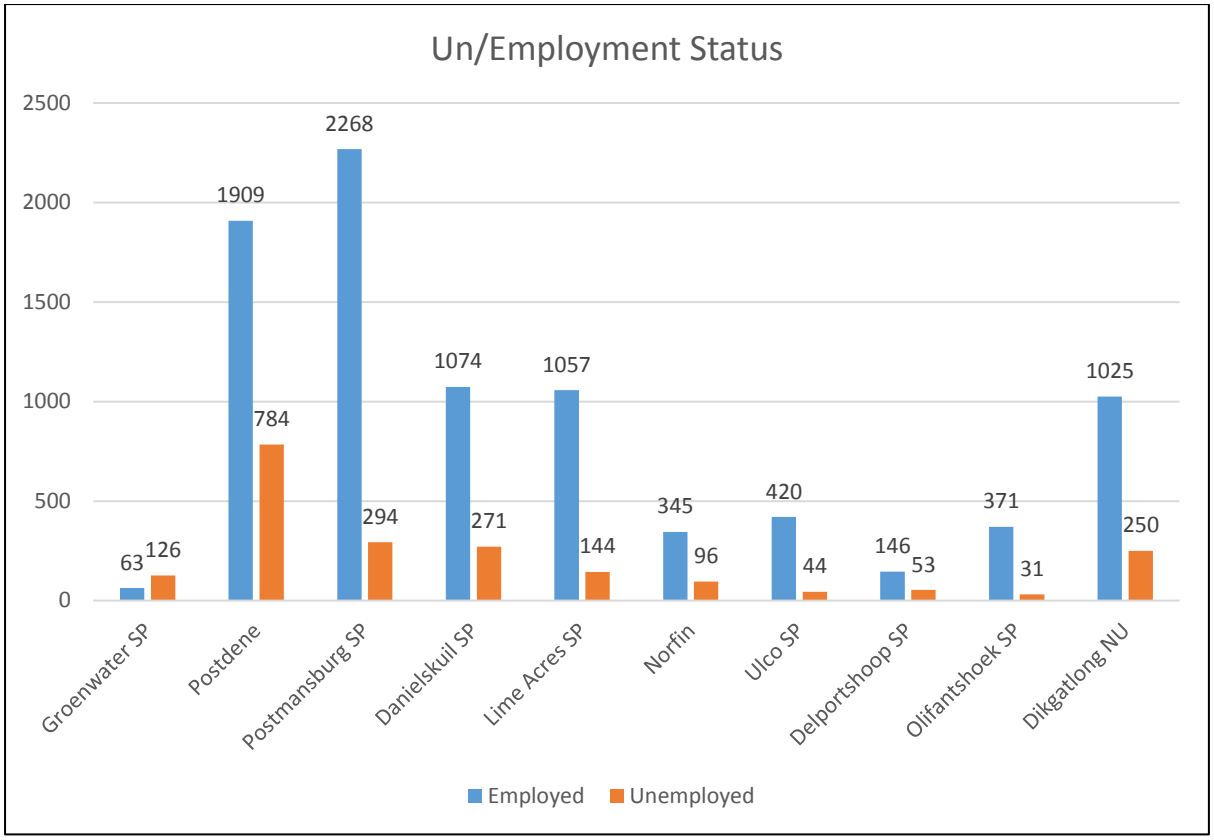


Figure 51: 2011 Employment Status

Figure 51 shows that unemployment in the study area is lowest in Olifantshoek (at 8%) and highest in Groenwater (at 67%) and Postdene at (29%). The data corresponds with that on education levels, for example in Olifantshoek, 56% of the population have achieved a matric pass or higher level of education, the highest level in the study area. This conclusion reinforces the estimate of the communities which would most benefit from job opportunities and skills development, including Groenwater and Postdene.

16.11.9 Child Headed Households

An understanding of child headed households in the project area is crucial as it may assist in identifying challenges facing these households. The KwaZulu Natal Human Settlements (2010:04), defines a Child-headed Household as a household wherein the head child is younger than 18 years old i.e. a household consisting only of children.

Figure 52 provides statistics of the Child-headed Households within the study area. The figures are taken from Statistics South Africa's Census 2011. Dikgatlong NU and Postdene have the highest number of chid-headed households at ten households, followed by Postmasburg with four child-headed households. The vast majority of the households in the project area are not child-headed however, most child-headed households tend to be of informal dwellings with lack of access to adequate sanitation and water. Existing child-headed households in the project area should be considered as primary beneficiaries when identifying beneficiaries of the project. It recommended that should the project come into contact with

child-headed households they be brought to the attention of the Northern Cape Department: Social Development in Kimberley.

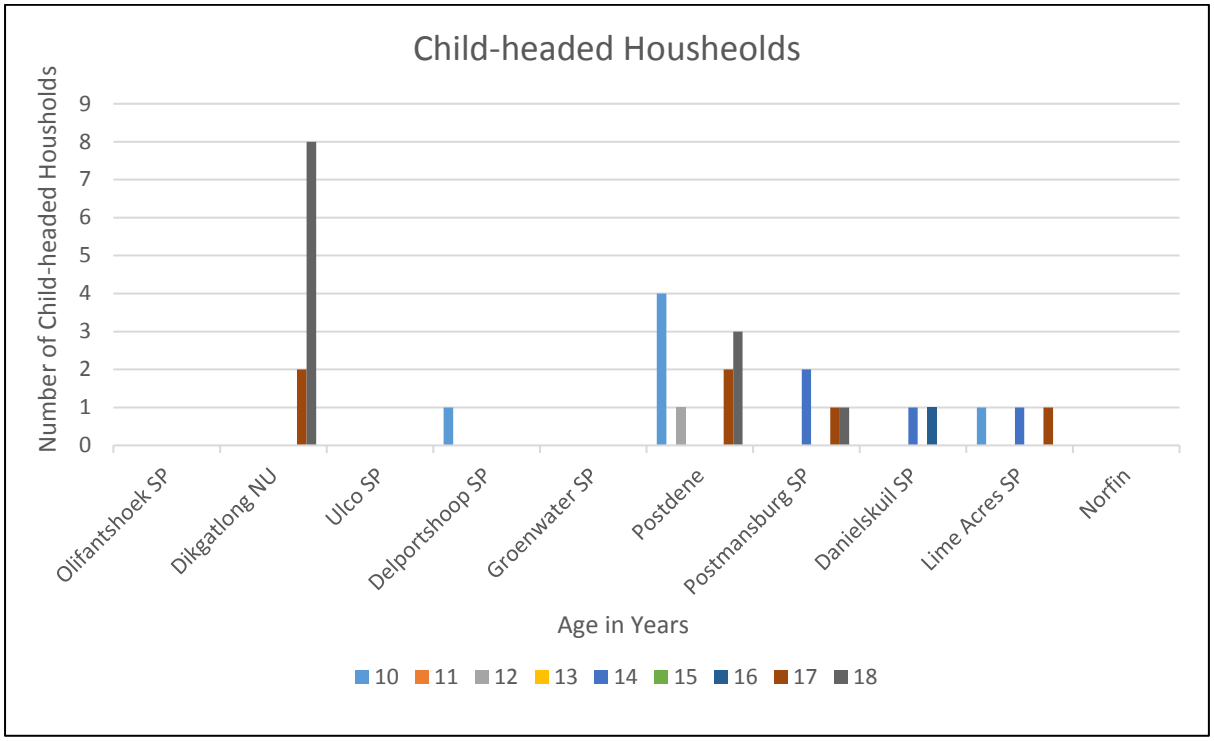


Figure 52: Child Headed Households

16.12 Agriculture

Information provided in this section was sourced from the Agricultural Impact Assessment (**Appendix H1**). Refer to the synopsis and impact assessment of this study contained in **Sections 17.5** and **19.10**, respectively.

16.12.1 Agricultural Land Use

The dominant land use for the entire length of the line is grazing. Irrigation takes place in isolated instances where water is available, and then only to produce supplement animal feed.

Refer to **Section 17.5.4**, **Table 27** for the area per land use in the affected area.

16.12.2 Agricultural Infrastructure

The farming infrastructure impacted by the proposed development includes mainly buildings in proximity to the route, cattle watering facilities and poultry housing (refer to **Section 17.5.4**, **Figure 60**).

16.12.3 Land Capability

According to the Land Capability Map (see **Figure 53** below), the project infrastructure mainly affects land classified as non-arable (grazing, woodland or wildlife), with small sections of the pipeline traversing land classified as wilderness.

The Agricultural Impact Assessment (Index, 2019) indicated that the area is arid with insufficient rainfall for rainfed cropping. The soil potential is, therefore, classified as low, and the agricultural capability of the land is low, as defined in the land use capability classification used by DALRRD.

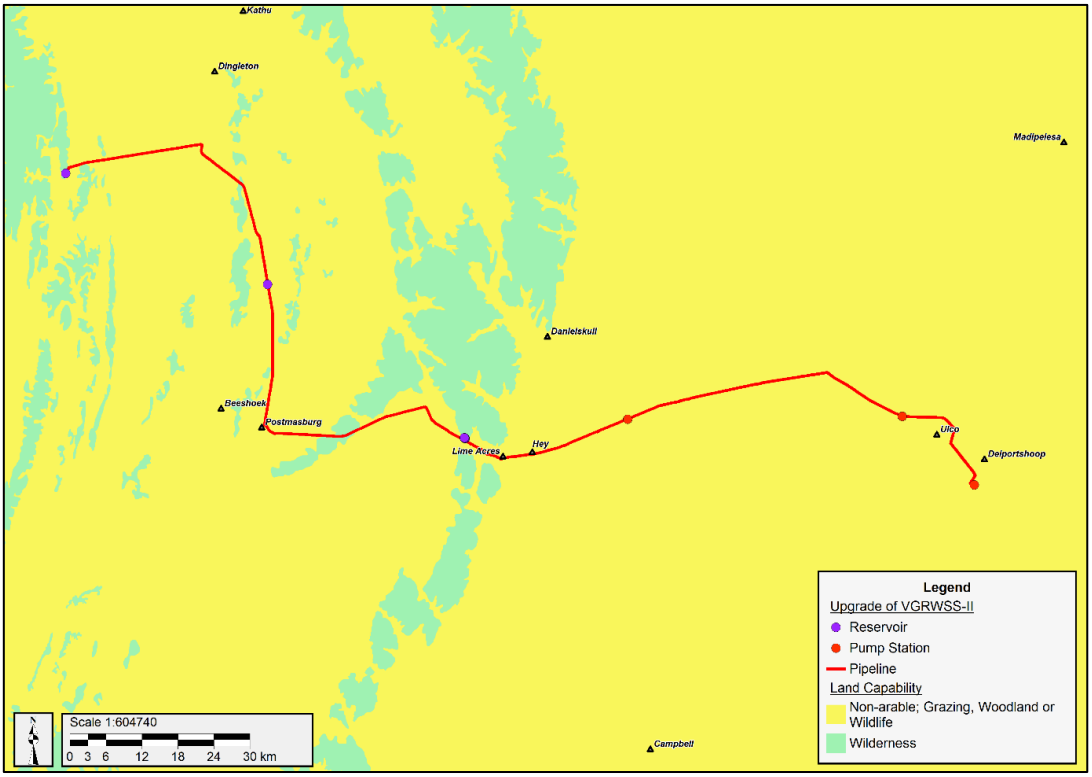


Figure 53: Land Capability

16.13 Air Quality

Due to the predominantly rural nature of the study area, the air quality is regarded to be good. Obvious sources of air pollution in the greater region include the following:

- Emissions from surrounding mining operations;
- Urban-related emissions from towns (notably Danielskuil, Postmasburg and Olifantshoek);
- Dust from large agricultural lands, bare areas and use of dirt roads;
- Tailpipe emissions from vehicles travelling along the main road network between towns;
- Burning of wood for household purposes in areas without electricity;
- Waste treatment works and waste disposal sites; and
- Burning of biomass (veld fires).

16.14 Noise

The rural state of the study area affords it tranquillity. Noise in the region emanates primarily from the following sources:

- Mining operations;
- Human settlements;
- Farming operations (e.g. use of farming equipment);
- Vehicles on the main road network;
- Trains utilising the railway line and
- Occasional overflying aircrafts.

16.15 Historical and Cultural Features

A Phase 1 Heritage Impact Assessment (see **Appendix H3**), as well as a Phase 1 Paleontological Impact Assessment (see **Appendix H4**) were undertaken for the project, in accordance with the National Heritage Resources Act (Act No. 25 of 1999) (NHRA).

Refer to **Sections 17.3** and **17.4** for a synopsis of the Heritage Impact Assessment and Palaeontological Impact Assessment, respectively.

16.15.1 Historical Features

According to the Heritage Impact Assessment (McGregor Museum, 2019), the archaeology of the Northern Cape is rich and varied, covering long spans of human history. Stone Age material found in this area spans the Earlier, Middle and Later Stone Ages through Pleistocene and Holocene times. Late Iron Age inhabitation is not as yet well documented (Morris & Seliane 2008). Of note in the area near Lime Acres rock engraving sites on dolomite exposures outside the town and at Danielskuil. Known rock engraving sites are recorded on the properties Ouplaas, Boplaas, Klipvlei and Carter Block (Wilman 1933; Morris 2009; Morris 2014; McGregor Museum records).

Further afield are the major sites Wonderwerk Cave, Tsantsabane (Blinkklipkop) at Postmasburg, a suite of sites around sink-hole depressions and raw material sources at Kathu (Wilman 1933; Humphreys & Thackeray 1983; Beaumont & Morris 1990; Morris & Beaumont 2004; Wilkins & Chazan 2012; McGregor Museum records). The Ghaap Escarpment south-east of the study site contains shelters rich in archaeological traces (Humphreys & Thackeray 1984) but is perhaps most notable for its fossil sites such as that at which the Taung Skull was found, at Buxton (Beaumont & Morris 1990).

Historical events relating to the conquest of the Southern Tswana unfolded mainly to the east and north-east, e.g. at Phokwane, Koning, Dithakong, and to the north-west, e.g. Langeberg and the Kathu region (Shillington 1985). Colonial settlement followed conquest, while mining has burgeoned since the mid-twentieth century.

Refer to **Section 17.3.4** for the findings from the field survey undertaken as part of the Heritage Impact Assessment.

16.15.2 Palaeontology

According to the Palaeontological sensitivity map on the South African Heritage Resources Information System (SAHRIS) (see **Table 23** and **Figure 54**), the following is noted in terms of the project infrastructure in relations to areas of palaeontological sensitivity:

- Very High Sensitivity – sections affected by pipeline from Delportshoop to Lime Acres, and pipeline from Postmasburg to N14;
- High – small sections affected by pipeline from Delportshoop to Lime Acres;
- Moderate – affected by pipeline between Lime Acres and Postmasburg, as well as along the N14 to Olifantshoek; and
- Low – affected by pipeline section near Kneukel Pump Station.

Table 23: Palaeontological Sensitivity Index

Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

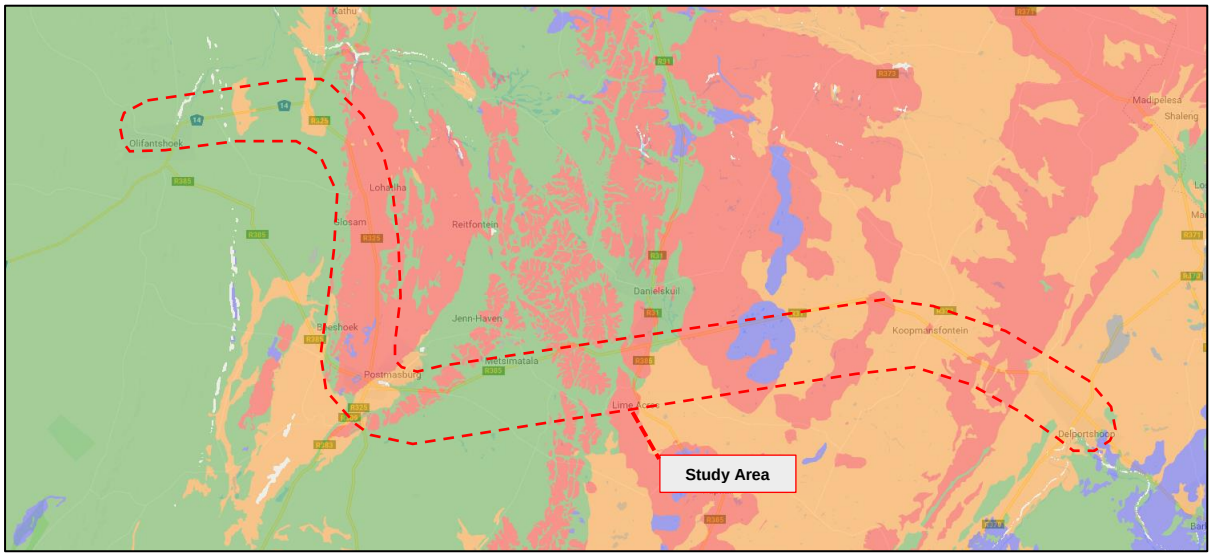


Figure 54: Palaeontological Sensitivity Map (SAHRIS, 2019)

Refer to **Section 17.4** for a synopsis of the palaeontological study.

16.16 Planning

The Dikgatlong LM's IDP (2019) acknowledges the need for improved water supply, with several service delivery and infrastructure investments being put in place in order to improve the LM's water management, including the improvement of the Delportshoop Water Purification Plant. The Kgatelopele LM's SDF (2010) indicates that bulk water for residential purposes is supplied directly from the Vaal Gamagara line into the Clifton and Lime Acres Reservoirs, and from there the metered water is supplied to each residential unit. The Kgatelopele IDP (2018) acknowledges the need for efficient water supply and refurbishment of water service infrastructure.

The Tsantsabane LM's IDP (2018) indicates that the majority of municipal residents obtain water from the Vaal Gamagara water scheme. The Gamagara LM's IDP (2017) indicates that the municipality is reliant on Sedibeng Water and Kumba Mine for water supply. The IDP notes that Sedibeng Water has been experiencing some challenges in providing water consistently to areas that are 100% reliant to its supply like in Olifantshoek. This is due to lack of secondary water sources in the Olifantshoek area. The IDP also indicates that all areas in the Gamagara LM have limited water storage facilities to cater for the growth of the towns. The Olifantshoek reservoir is not compliant to the norm due to the rapid growth of the population in the area, thus highlighting the need for the improvement of water supply infrastructure in the Olifantshoek region.

16.16.1 Environmental Management Framework (EMF)

An EMF is a framework of spatially represented information connected to significant environmental (i.e. ecological, social and economic) parameters. The main purpose of an EMF is to proactively identify areas of potential conflict between development proposals and critical/sensitive environments (DEAT, 1998).

Frances Baard DM EMF

The EMF developed for the Frances Baard DM, is provided in **Figure 55**. According to the Frances Baard DM EMF, the proposed project footprint is situated within the following Environmental Management Zones (EMZs):

- Agricultural Zone;
- Urban Zone; and
- Conservation Zone.

The management objectives and requirements of the abovementioned EMZs were considered in the selection of the requisite specialist studies, assisted in determining the impacts and mitigation measures of the proposed development, and measures provided were incorporated in the EMPr.

The relevant laws, policies, strategies, plans and programmes provided for each of the EMZs were also considered in **Section 8**.

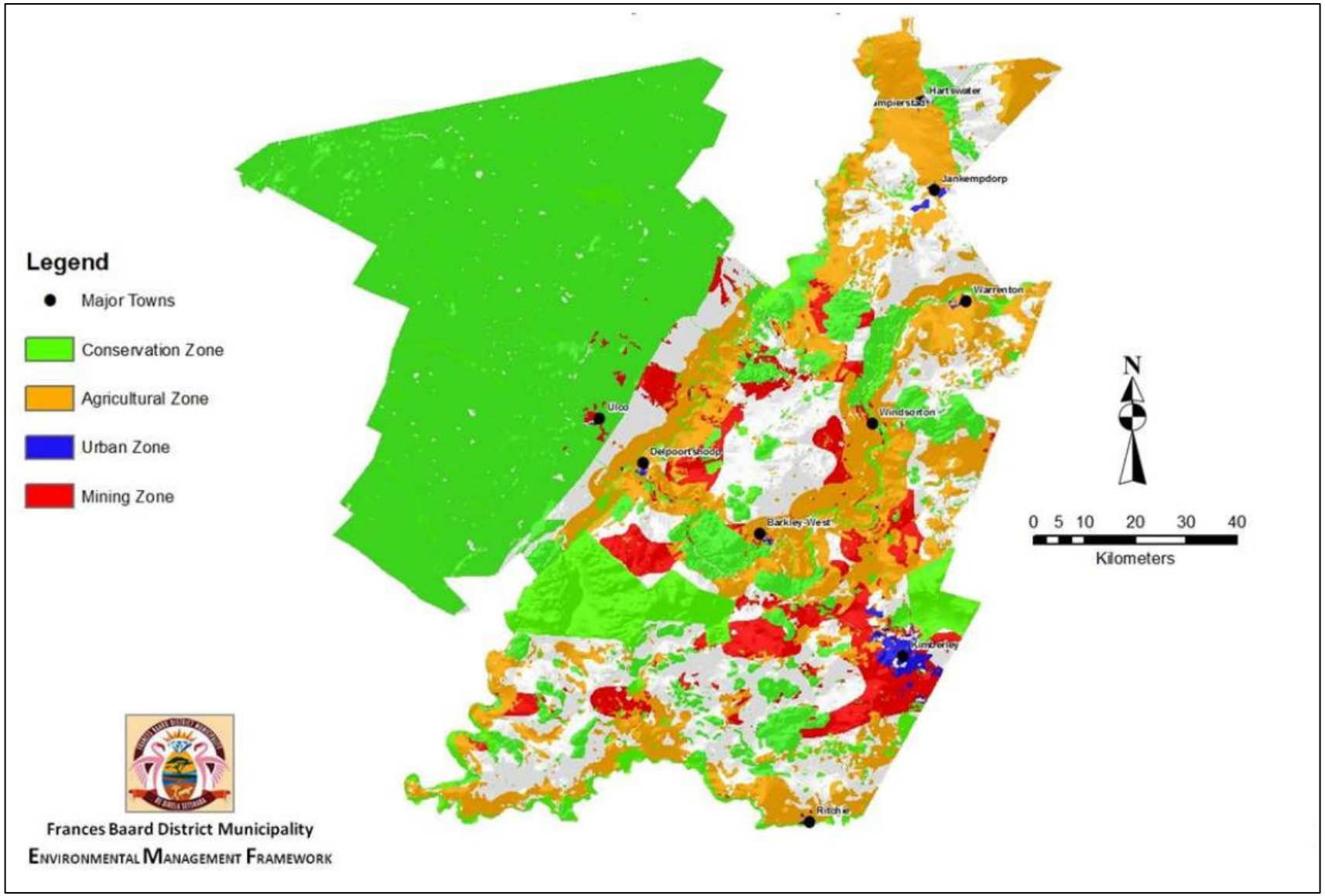


Figure 55: Environmental Management Zones (FBDM EMF, 2010)

ZF Mgcawu DM EMF

The EMF developed for the ZF Mgcawu DM, is provided in **Figure 56** below. According to the ZF Mgcawu DM EMF, the proposed project footprint is located in the following Environmental Control Zones:

- Zone 1: Potential sensitive groundwater resources;
- Zone 2: Potential wind erosion areas;
- Zone 3: Potential high to very high vegetation conservation areas; and
- Zone 7: Low control zones.

The management parameters provided for each of the abovementioned environmental control zones were considered when determining the impacts and mitigation measures of the proposed development, and general measures provided were incorporated into the EMPr.

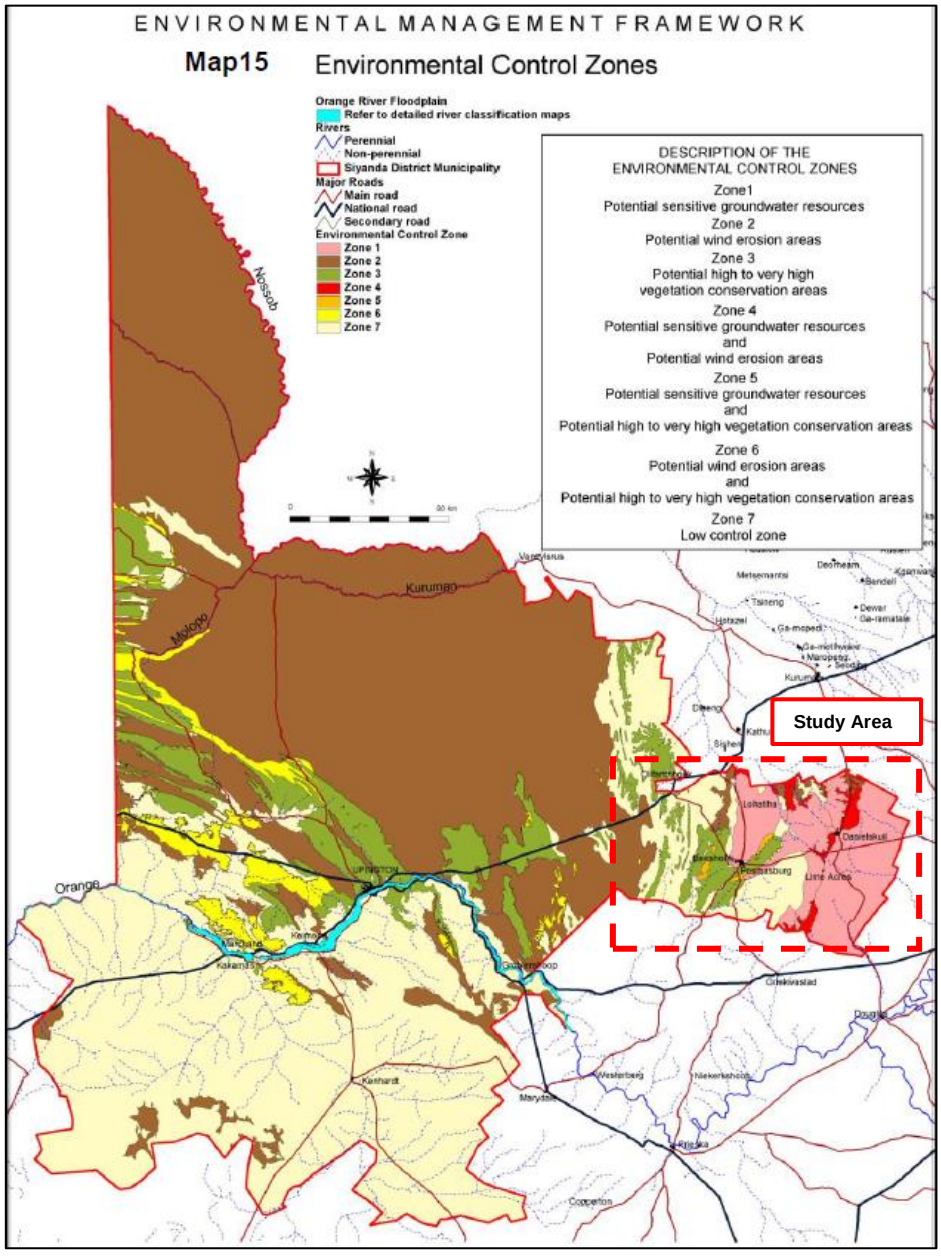


Figure 56: Environmental Control Zones (Siyanda DM EMF, 2008)

16.17 Existing Structures and Infrastructure

The existing VGRWSS pipeline mostly follows existing linear infrastructure (including roads and a railway line) as well as boundaries between properties.

The proposed pipeline route may affect the following physical features located near the pipeline servitude:

- Power lines (transmission, distribution and reticulation);
- Railway line (including bridges);
- Public and private roads (including bridges);
- Telephone lines;
- Access roads and entrances to properties, plots and private farms;
- Private dams, reservoirs and boreholes;
- Fencing erected on the boundaries of private farms and game farms; and
- Formal structures (hospitals and cemeteries).

The proposed project footprint may also affect infrastructure associated with agricultural practices, such as irrigation pipelines, workshops, sheds, livestock enclosures, cattle watering facilities, poultry houses, etc. Refer to **Section 17.5.3.2** for a description and map of existing agricultural infrastructure situated within the study area.

16.18 Transportation

The majority of the movement in the region occurs along the main road networks between the towns of Delportshoop, Danielskuil, Postmasburg and Olifantshoek. The proposed pipeline route alignment tries to follow existing transportation networks.

The main provincial and secondary roads within the study area are as follows (see **Figure 57**):

- Provincial Roads –
  - R370 (Delportshoop)
  - R31 (From Delportshoop – Koopmansfontein);
  - R385 (From D3381 – Postmasburg);
  - R325 (From Postmasburg – N14); and
  - N14 (From R325 – Olifantshoek).
- Secondary Road –
  - D3381 (From Lime Acres – R385)

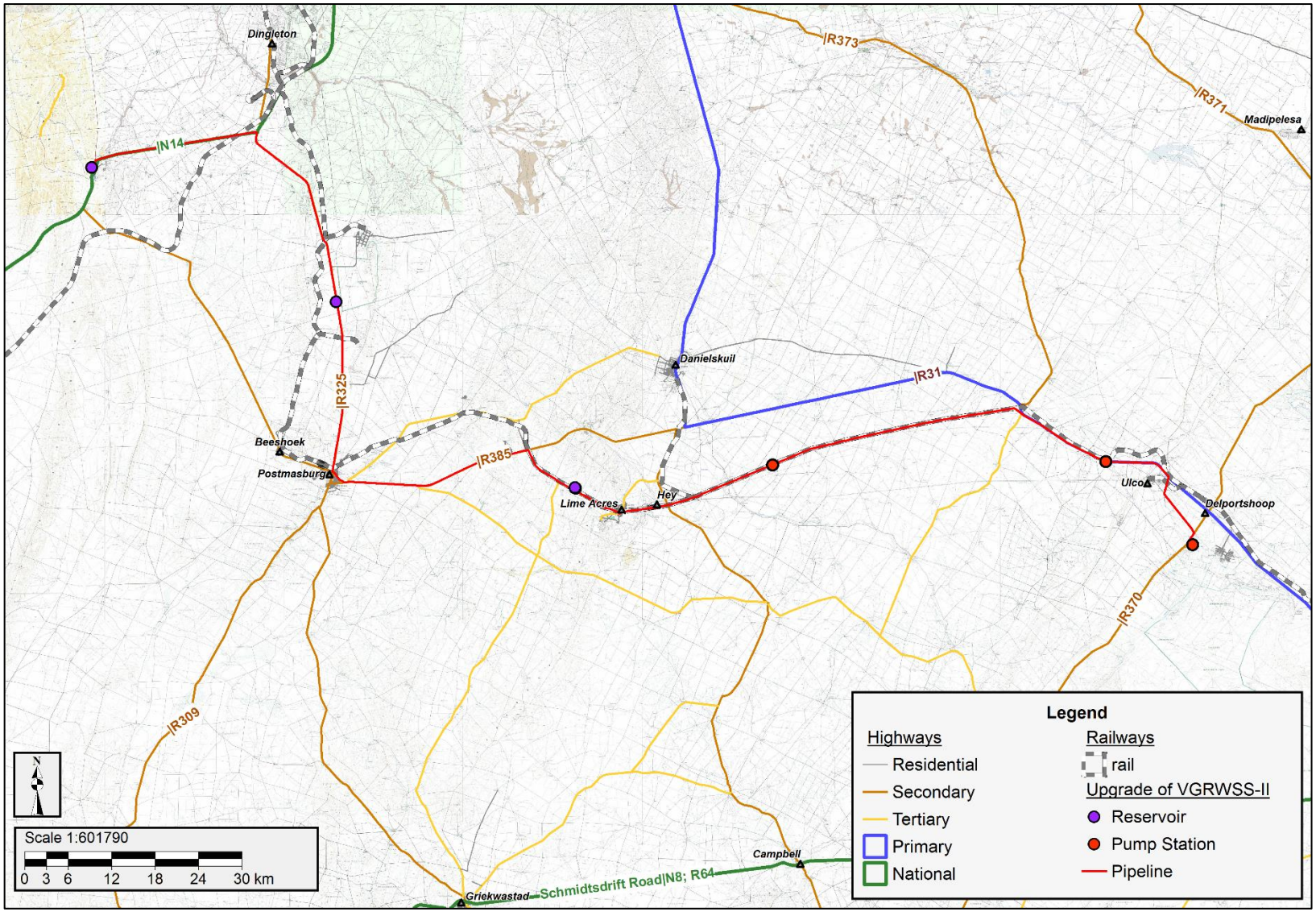


Figure 57: Major transportation network within study area

16.19 Waste Disposal Facilities

According to the Kgatelopele IDP (2018), the LM has one disposal facility which is located approximately 4 km north-east of Danielskuil and north of Tlhakalatlou. It is located in close proximity to the Danielskuil graveyard. The site is not licensed, however the LM has started the process of closing it and establishing a new landfill site. According to the Tsantsabane IDP (2017), the municipality is experiencing difficulties with regards to its landfill site. The current landfill site is not licenced. According to the Gamagara IDP (2017), waste removal from Kathu, Dingleton and Dibeng is disposed of at the Dibeng landfill site (unlicensed), which is 27km away from Kathu. Plans are however underway by the LM to establish a registered landfill site. According to the Dikgatlong IDP (2019), none of their landfill sites are licensed.

The Northern Cape DENC however confirmed that appropriately permitted waste disposal facilities are situated within the study area, namely:

- Delportshoop Waste Disposal Site (Licence No: NC/FBD/DIK/DEL/06/2016);
- Koopmansfontein Waste Disposal Site (Licence No: NC/FBD/DIK/KOO/17/2016);
- Danielskuil Waste Disposal Sites (Licence No: NC/SIY/KGAT/DANIELS/02/2012);
- Postmasburg Waste Disposal Sites (Licence No: NC/ZFM/PMB1/2018); and
- Olifantshoek Landfill (Licence No: NC/JTG/GAM/OLI/01/2016).

16.20 Aesthetic Qualities

The visual character of the landscape where the proposed project is planned consists mainly of large private farms, agricultural practices, and mining activities. The visual quality of the area is enhanced by non-perennial rivers, wetlands and pans. The aesthetic quality of most areas in close proximity to the proposed pipeline route is degraded due to the existence of linear infrastructure, such as the existing pipeline servitude, main/secondary roads, railway line and transmission lines (see **Figure 58**).

Figure 58: View along railway line (existing pipeline on left-hand side)

17 SUMMARY OF SPECIALIST STUDIES

The following Specialist Studies were undertaken as part of the BA process:

1. Terrestrial Ecological Impact Assessment;
2. Wetland and Aquatic Impact Assessment;
3. Heritage Impact Assessment;
4. Palaeontological Impact Assessment; and
5. Agricultural Impact Assessment.

17.1 Terrestrial Ecological Impact Assessment

A summary of the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2019a), as contained in **Appendix H5**, follows. Refer to **Section 19.8** for an assessment of the associated impacts.

17.1.1 Details of the Specialist

The details of the specialist that undertook the Terrestrial Ecological Impact Assessment follow.

Organisation:	Nemai Consulting
Name:	Mr Avhafarei Phamphe
Qualifications:	MSc (Botany)
Affiliation (if applicable):	• Professional Natural Scientist-Ecological Science (Reg No. 400349/12) with South African council for Natural Scientific Professions (SACNASP) • Professional member of South African Institute of Ecologists and Environmental Scientists (SAIEES) • Professional member of South African Association of Botanists (SAAB)

17.1.2 Objectives of the Study

The objectives of the Terrestrial Ecological Impact Assessment include the following:

- To apply relevant literature to determine the diversity and eco-status of the plants, mammals, birds, reptiles and amphibians in the study area;
- To carry out field surveys to gain an understanding of the diversity of taxa and eco-status of ecosystems which these species inhabit, as well as to determine the presence of unique habitats that might require further investigation or protection;
- To assess the current conservation status of plant and animal species within the study area;
- To comment on ecological sensitive species/areas;
- To assess the possible impact of the proposed project on these taxa and/or habitats;
- To list the species on site and to recommend necessary actions in case of occurrence of endangered, vulnerable or rare species or any species of conservation importance; and

- To provide management recommendations to mitigate negative and enhance positive impacts associated with the proposed project.

17.1.3 Methodology

Survey methodology included a comprehensive desktop review, utilising available provincial and national ecological data, relevant literature, GIS databases, topographical maps and aerial photography. This was then supplemented through a ground-truthing phase, where pertinent areas associated with the project area were visited during field surveys undertaken from 15 to 19 April 2019. The survey focused on flora (vegetation) and fauna (mammals, avifauna, reptiles and amphibians). Several Orange/Red Listed floral and Red Data faunal species pertaining to the project area were identified during the desktop review and their habitat suitability were assessed through the ground-truthing phase of the surveys.

17.1.4 Key Findings of the Study

17.1.4.1 Regional Vegetation

SANBI (2012) classified the study area as falling within the following vegetation types: Southern Kalahari Mekgacha (Azonal vegetation), Southern Kalahari Salt Pans (Azonal vegetation), Kuruman Mountain Bushveld (Savanna biome), Kathu Bushveld (Savanna biome), Olifantshoek Plains Thornveld (Savanna biome), Postmasburg Thornveld (Savanna biome), Koranna-Langeberg Mountain Bushveld (Savanna biome), Schmidtsdrif Thornveld (Savanna biome), Ghaap Plateau Vaalbosveld (Savanna biome) and Kuruman Thornveld (Savanna biome).

However, according to SANBI (2018) and National Biodiversity Assessment (2018), the following vegetation types were recorded within the study area, namely: Southern Kalahari Mekgacha; Schmidtsdrif Thornveld; Postmasburg Thornveld; Olifantshoek Plains Thornveld; Kuruman Thornveld; Kuruman Mountain Bushveld; Koranna-Langeberg Mountain Bushveld; Kathu Bushveld and Ghaap Plateau Vaalbosveld.

17.1.4.2 Threatened Ecosystems

No threatened terrestrial ecosystems are located in the vicinity of the project area, with the nearest one being the Schweizer-Reneke Bushveld ecosystem that is situated approximately 110 km to the east of the project area.

17.1.4.3 Northern Cape Conservation Plan

A map indicating the Northern Cape Conservation Plan categories in relation to the project footprint is shown in **Figure 41**. The proposed development traverses CBA 1, CBA 2, ESAs and other natural areas.

17.1.4.4 Flora

During the field survey, no threatened plant species were observed within the study area, however only two (2) species of conservation concern were noted, namely *Vachellia erioloba*

(= *Acacia erioloba*) (Camel thorn) and *Boophone disticha* (Century plant). Raimondo *et al.* (2009) has listed these species as *Declining.* These plant species were recorded within the study area.

Protected trees found within the study area are *Boscia albitrunca* (Shepherd's tree) and *Vachellia (Acacia) erioloba* (Camel thorn). According to Section 51(1) of the National Forests Act (Act No. 84 of 1998), no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by DAFF.

The following plant species are listed as “protected plants” in terms of Schedule 2 of Northern Cape Nature Conservation Act (Act 9 of 2009); *Boscia albitrunca* (Shepherd's tree), *Olea europaea* subsp*. africana*, all species of families Amaryllidaceae (*Ammocharis coranica*, *Boophone disticha* and *Nerine laticoma);* Asphodelaceae (*Aloe grandidentata*, *Aloe hereroensis*, *Bulbine narcissifolia*, *Kniphofia cf. ensifolia*); Hyacinthaceae (*Ornithogalum* sp.); and Iridaceae (*Babiana* sp.) were recorded within the study area. In terms of restricted activities involving protected plants, no person may, without a permit—(a) pick; (b) import; (c) export; (d) transport; (e) cultivate; or (f) trade in, a specimen of a protected plant. Data supplied by DAFF indicates that protected plant species such as *Lithops* spp*., Vachellia haematoxylon* (Grey Camel thorn) and *Nymania capensis* (Chinese lanterns) have been recorded in the study area. In terms of restricted activities involving protected plants, no person may, without a permit—(a) pick; (b) import; (c) export; (d) transport; (e) cultivate; or (f) trade in a specimen of a protected plant. The distribution of all the protected trees and provincially protected plants species recorded within the study area are provided in the Terrestrial Ecological Study.

17.1.4.5 Fauna

The agricultural fields were largely devoid of mammal species; however meerkat dens were present on the edges of agricultural fields. According to the information provided by the local farm owners, three Red Data mammal species have been sighted within the region, namely Black-footed cat and Southern African Hedgehog.

Most bird species found in Northern Cape are either classified by the Northern Cape Nature Conservation Act (Act 9 of 2009) as *Schedule 1 Specially Protected species*, *Schedule 2 Protected species* or *Schedule 3 Common indigenous species*. Anecdotal evidence from local landowners indicate that Red Data bird species such as Lanner falcon, Lesser kestrel (even though this species has been down listed from Vulnerable to Least concern) and Kori Bustard have been observed in the study area, as well as other bird species such as Flamingos and Storks are said to be found in very wet years but for short periods.

Reptile species found within the study area included species such as Mole Snake, Rock Monitor, Leopard Tortoise and Cape Cobra, which are classified as *protected species* under Schedule 1 of Northern Cape Nature Conservation Act (Act 9 of 2009). All land tortoises and all lizards are listed as *Protected species* under Schedule 2 of the Northern Cape Nature Conservation Act (Act 9 of 2009). All species of Chamaeleon are classified as *Schedule 1 Specially Protected species* of Northern Cape Nature Conservation Act (Act 9 of 2009). Prior

to construction and vegetation clearance a suitably qualified environmental officer / herpetologist should undertake a walk-through survey and relocate any affected animals to appropriate habitat away from the servitude. Any lizards, geckoes, agamids, monitors or snakes encountered should be allowed to escape to suitable habitat away from the areas to be disturbed by construction activities. No reptiles should be intentionally killed, caught or collected during any phase of the project.

Watercourses in the study area hold water on a permanent or temporary basis and are probably important breeding habitat for most of the frog species encountered. Only five frog species were recorded within the study area. Anecdotal evidence from local landowners indicates the presence Bullfrog species. Bullfrogs are listed as *specially protected species* under Schedule 1 of the Northern Cape Nature Conservation Act (Act 9 of 2009). A permit is required from Northern Cape Nature Conservation in order to hunt, import, export, transport, keep, possess, breed or trade a specimen of a specially protected animal. All frogs are listed as *protected wild animals* under Schedule 2 of the Northern Cape Nature Conservation Act (Act 9 of 2009).

17.1.5 Impact Assessment

Refer to **Section 19.8** for the impact assessment from this study.

17.1.6 Conclusions

Biodiversity offsets are not deemed to be necessary, however, it is recommended that a suitably qualified Ecologist (or a similarly qualified individual) should be appointed prior to the start of the construction activities to undertake a pre-construction walk-down to identify plant species of conservation concern and protected species (such as *Boophone disticha)* and oversee the rescue and relocation of these species. The walk-down survey should preferably be undertaken during summer season in order to have a higher probability of detecting species of special concern. This is relevant in the areas that have been labelled as ecologically sensitive. In order to conserve the faunal species community structures within the region, habitat destruction should be limited to an absolute minimum as intact habitat would result in higher faunal and floral species diversity. It is therefore critical that operations are limited to the required footprint only.

During the field surveys, it was found that the impacts of the proposed development on flora and fauna can be mitigated to a satisfactory level and as such, the development is deemed acceptable from the ecological perspective and as such should not be prevented from proceeding based on the ecological considerations. Once the proposed development has been constructed, rehabilitation process needs to take place and should also ensure that alien plant emergence and erosion do not occur.

17.2 Wetland and Aquatic Impact Assessment

A summary of the Wetland and Aquatic Impact Assessment (The Biodiversity Company, 2019), as contained in **Appendix H2**, follows. Refer to **Section 19.7** for an assessment of the associated impacts.

17.2.1 Details of the Specialist

The details of the specialist that undertook the Wetland and Aquatic Impact Assessment follow.

Organisation:	The Biodiversity Company
Name:	Mr Andrew Husted
Qualifications:	MSc Aquatic Health
Affiliation (if applicable):	Pr. Sci. Nat. 400213/11

17.2.2 Objectives of the Study

The objectives of the Wetland and Aquatic Impact Assessment are as follows:

- Delineate and assess the water resources within the study area;
- Conduct an ecological integrity (health) assessment of water resources;
- Conduct an ecosystem services assessment of water resources;
- Undertake a risk assessment for the proposed development; and
- Provide mitigation measures for the identified impacts.

17.2.3 Methodology

The following methodology was employed:

- Wetland identification and mapping –
    - The wetland areas were delineated in accordance with the DWAF (2005) guidelines; and
    - The outer edges of the wetland areas were identified by considering four specific indicators.
- Wetland Delineation –
    - The wetland indicators were used to determine the boundaries of the wetlands within the study area. These delineations were then illustrated by means of maps accompanied by descriptions.
- Wetland Functional Assessment –
    - The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al*. 2009). An assessment was undertaken that examined and rated the services

according to their degree of importance and the degree to which the services are provided.

- Determining the Present Ecological Status (PES) of wetlands –
  - The overall approach was to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a PES score. This took the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity were then combined to determine an overall magnitude of impact.
- Determining the Ecological Importance and Sensitivity (EIS) of Wetlands –
  - The method used for the EIS determination was adapted from the method as provided by DHSWS (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed. A series of determinants for EIS were assessed on a scale of 0 to 4, where 0 indicated no importance and 4 indicated very high importance. The mean of the determinants was used to assign the EIS category.
- Ecological Classification and Description –
  - The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) were considered for this study. This system comprised a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also included structural features at the lower levels of classification (Ollis et al. 2013).
- Aquatic Ecosystems Scan –
  - Standard River Ecosystem Monitoring Programme (REMP) methodologies were applied at each of the sampling points. This included water quality analysis, habitat, macroinvertebrate and fish community assessments.
- Determining Buffer Requirements –
  - The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane et al. 2014) was used to determine the appropriate buffer zone for the proposed activity.

17.2.4 Key Findings of the Study

17.2.4.1 Wetlands

A total of 61 individual HGM units were identified along the proposed pipeline route (17 valley bottom systems and 44 depressions). These HGM units were numbered from east to west

and coded according to their HGM type. They were then divided into wetland groups to facilitate the practical assessment of these systems. All linear systems (excluding depressions) were grouped according to the main watercourse into which they drain namely the Harts, Vaal, Steenbok, Klein Riet, Groenwaterspruit and Ga-Mogara. Results of the level 1-5 wetland classification for the wetland systems within the study area indicated that there are 12 wetland groups within the study area. Refer to the Wetland and Aquatic Impact Assessment Report for a summary of the key findings for each of the 12 wetland groups identified within the study area.

As shown in **Table 24**, the Wetland Groups 3, 4, 9, 11 and 12 are the most intact and are in a largely natural state. Wetland Groups 4, 5, 6, 10, 11 and 12 are considered to be the most ecologically important and sensitive while at the same time providing the most important ecosystem services.

Table 24: Summary of PES, EIS and Ecosystem services (The Biodiversity Company, 2019)

Wetland Group	PES	EIS	Eco service
1	C: Moderately Modified	Moderate	Intermediate
2	C: Moderately Modified	High	Intermediate
3	B: Largely Natural	Moderate	Intermediate
4	B: Largely Natural	Very High	High
5	C: Moderately Modified	High	Moderately High
6	C: Moderately Modified	High	Moderately High
7	C: Moderately Modified	Moderate	Intermediate
8	C: Moderately Modified	Moderate	Intermediate
9	B: Largely Natural	Moderate	Intermediate
10	C: Moderately Modified	High	Intermediate
11	B: Largely Natural	Very High	Moderately High
12	B: Largely Natural	High	Intermediate

17.2.4.2 Aquatic Ecosystems

A total of nine (9) aquatic sampling points were selected in the study area, at each point where a Sub Quaternary Reach (SQR) would be physically crossed by the proposed pipeline. The Sub Quaternary Reach's (SQR's) considered in the assessment included the C92A-02988 (Vaal), C92A-02964 (Steenbokspruit), C92A-02679 (Danielskuil), C92A-02823 (Klien-Ruit) C92A-02837 (unnamed), C92A-02839 (Klien-Ruit), D73A-02705 (Groenwaterspruit), D41J-02554 (unnamed), D41J-02511 (Olifantsloop) from east to west. Refer to the Wetland and Aquatic Impact Assessment Report for the locations and photos of the survey sites considered for the study.

In situ water quality

In situ water quality analysis was conducted at two sites with water. Depressions with water were considered if forming part of an ephemeral channel. The Target Water Quality Range

(TWQR) presented in the table below was obtained from the Target Water Quality Guidelines for Aquatic Ecosystems (DWAF, 1996).

Table 25: In situ water quality results (April 2019)

Site	pH	Conductivity (mS/m)	DO (mg/l)	Temperature (°C)
TWQR*	**5.5-9.5****	**(<700)**	**>5.00***	**5-30***
Steenbok Depression (C92A-02964)	4.37	1904	1.56	14,8
Groenwaterspruit (D73A-02705)	4.73	866	1.47	22
***TWQR – Target Water Quality Range **: Water Use License Condition Limit**				

The results of the water quality assessment indicated poor water quality for the sites assessed as they are bellow recommended limits for pH and dissolved oxygen and being above recommended limits for electrical conductivity. This is however expected for standing water such as at the Steenbok Depression (C92A-02964). The Groenwaterspruit (D73A-02705) conforms to the prescribed limits to a greater degree, however, isn't considered significant as it was artificially fed by a burst pipe.

Invertebrate Habitat and Biotope Assessments

The invertebrate habitat at each site was assessed using the more reliable South African Scoring System version 5 (SASS5) biotope rating assessment as applied in Tate and Husted (2015). The results of the SASS5 assessment for the April 2019 survey are presented in **Table 26**, below.

Table 26: Macroinvertebrate assessment results recorded during the April 2019 survey

Site	SASS5	Taxa	ASPT	*Class (Dallas, 2007)
Groenwaterspruit (D73A-02705)	58	15	3,866667	Class D
*** Southern Kalahari ecoregion ASPT: Average Scope Per Taxon**				

The results of the SASS5 assessment derived scores would be classed as a **Largely Modified**, or **Class D**. While some species have established themselves, this data should however be heavily scrutinised as this artificial system doesn't allow for the establishment of natural biotopes or ecosystems. It is therefore presented but not considered further.

17.2.4.3 Buffer Requirements

The size of the pre-mitigation buffer zones for the wetlands delineated within the study area is 32 m and 15 m for the construction and operational phases, respectively. These buffer requirements are however expected to decrease given the successful application of recommended mitigation measures. The post mitigation buffer requirements are 18 m and 15 m for the construction and operational phases, respectively. However, it is recommended that

a conservative approach be opted for and that the pre mitigation buffer width of 32 m be adopted.

17.2.5 Impact Assessment

Refer to **Section 19.7** for the results from the impact assessment from this study.

17.2.6 Conclusions

Considering the status and functioning of the wetland ecosystems, and furthermore the nature and requirements of the project, the proposed VGRWSS pipeline upgrade will result in minimal disturbance to wetlands (local to regional scale influence). Aquatic habitat is limited on site and the risks posed to aquatic ecosystems are considered to be **Low**. Consequently, the construction and operation of the pipeline is not anticipated to pose significant threats to the receiving wetlands and aquatic ecosystems, provided the mitigation measures stipulated in this report are effectively implemented.

17.3 Heritage Impact Assessment

A summary of the Heritage Impact Assessment (McGregor Museum, 2019), as contained in **Appendix H3**, follows.

17.3.1 Details of the Specialist

The details of the specialist that undertook the Heritage Impact Assessment follow:

Organisation:	McGregor Museum Department of Archaeology
Name:	Mr David Morris
Qualifications:	PhD - Archaeology
Affiliation (if applicable):	• Member of Association of South African Professional Archaeologists • Chairman of the Historical Society of Kimberley and the Northern Cape.

17.3.2 Objectives of the Study

The aim of the study was to identify possible heritage and cultural sites and finds that may occur in the proposed project footprint.

17.3.3 Methodology

The study area was partially inspected on foot in May 2019. Access could not be gained to some of the properties due to gates being locked, overgrown vegetation, mines and no entry signs. Where possible an assessment was made of the significance of heritage traces present.

17.3.4 Key Findings of the Study

Most of the area within the servitude during the survey, was found to have minimal traces of in-situ archaeological materials. The observations that are presented indicate specific instances that provide a sense of the range of heritage resources along the servitude, with a limited number of medium and high significance occurrences. By and large generally low density and poor integrity heritage traces were found in the development footprint areas, comprising usually jaspilite flakes and cores as isolated surface occurrences in densities less, and often significantly less, than 1/m^2. The higher density end of the spectrum occurs in areas where banded ironstone rubble is exposed at the surface. The artefact scatters and observations made during the field survey are present in **Figure 59** below.

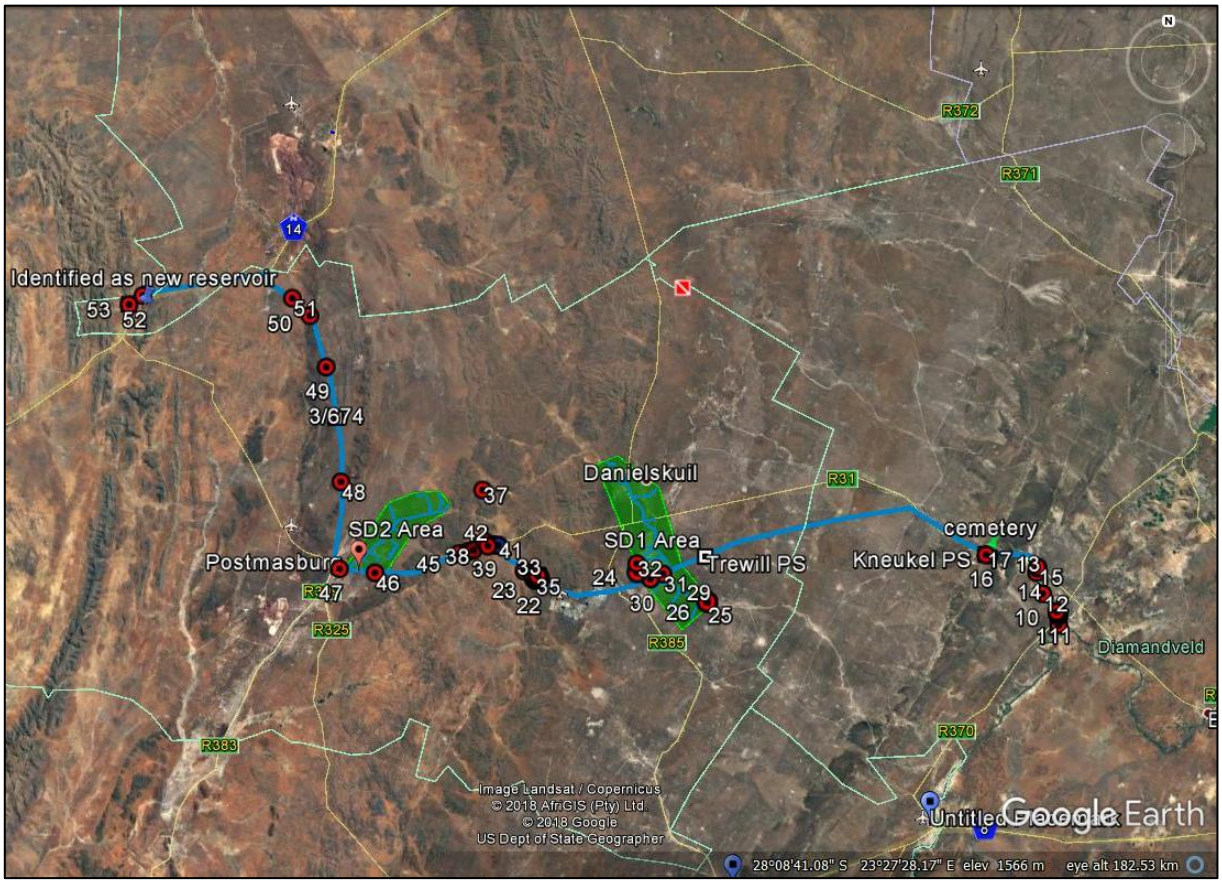


Figure 59: Plotting of archaeological observations (McGregor Museum, 2019)

Refer to **Table 1** in the Heritage Impact Assessment Report, contained in **Appendix H3,** for a list and description of all plotted artefact scatters and observations within the study area.

Graves were found at two localities close to the proposed route, the first at 28^0 23’ 35.8”S; 24^0 16’ 13.2” E which is approximately 45 meters from the new proposed route, at a turn pipe near an open valve. The second was at 28^0 17’ 34.0” S; 23^{0}20’ 26.3” E, an old cemetery, which lies beyond the proposed route, but noted here for precautionary measures to be put in place. Under NHRA 25 (1999) a permit is required to remove or destroy a grave or headstone marker outside a formal cemetery. A buffer of at least 30 m is recommended, with fencing to protect such graves.

17.3.5 Impact Assessment

Refer to **Section 19.13.2.1** for the results from the impact assessment from this study.

17.3.6 Conclusions

The impact significance on archaeological and cultural heritage features was found to be low. It would remain possible that material of significance may occur, which is not identified and such chance finds, if encountered, should be brought to the attention of heritage authorities for further assessment and mitigation, if necessary.

17.4 Palaeontological Impact Assessment

A summary of the Paleontological Impact Assessment (Banzai Environmental, 2019), as contained in **Appendix H4**, follows.

17.4.1 Details of the Specialist

The details of the specialist that undertook the Palaeontological Impact Assessment follow.

Organisation:	Banzai Environmental (Pty) Ltd.
Name:	Ms Elize Butler
Qualifications:	MSc - Palaeontology
Affiliation (if applicable):	Member of the Palaeontological Society of South Africa

17.4.2 Objectives of the Study

The objective of a Palaeontological Impact Assessment (PIA) is to determine the impact of the development on potential palaeontological material at the site. According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the aims of the Palaeontological Impact Assessment included the following:

1) To identify the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint;
2) To estimate the palaeontological importance of the formations;
3) To determine the impact on fossil heritage; and
4) To recommend how the developer ought to protect or mitigate damage to fossil heritage.

17.4.3 Methodology

A desktop study was undertaken to evaluate the possible risk to palaeontological heritage (this includes fossils as well as trace fossils) in the proposed development area. In compiling the desktop report aerial photos, Google Earth 2018, topographical and geological maps and

other reports from the same area as well as the author's experience were used to assess the proposed development footprint.

17.4.4 Key Findings of the Study

Refer to the Palaeontological Impact Assessment Report, for a description and summary of the geology, lithology, palaeontological sensitivity and fossil heritage within the study area.

The Palaeontological Impact Assessment found that the proposed project area is completely underlain by the following sedimentations (sensitivity also indicated in terms of the PalaeoMap of SAHRIS) (refer to **Figure 54**):

- Kalahari Group (High Sensitivity);
- Dwyka Group, Karoo Supergroup. (Low Sensitivity);
- Matsap Subgroup, Volop Group, Olifantshoek Supergroup (Low Sensitivity);
- Gamagara Fm, Olifantshoek Supergroup (Low Sensitivity);
- Ongeluk Fm, Postmasburg Group Transvaal Supergroup (Moderate Sensitivity);
- Asbestos Hills Subgroup, Ghaap Group, Transvaal Supergroup (Moderate Sensitivity);
- Campbell Rand Subgroup, Ghaap Group, Transvaal Supergroup (Moderate Sensitivity); and
- Vryburg Fm, Transvaal Supergroup (Moderate to high Sensitivity).

A 2-day site specific field survey of the development footprint was conducted on foot and by motor vehicle on 26 and 27 October 2019. No visible evidence of fossiliferous outcrops was found. For this reason, an overall medium palaeontological sensitivity is allocated to the development footprint.

17.4.5 Impact Assessment

Refer to **Section 19.13.2.2** for the results from the impact assessment from this study.

17.4.6 Conclusions and Recommendations

The scarcity of fossil heritage at the proposed development footprint indicates that the impact of VGRWSS-II will be of a medium significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations the **Chance Find Protocol** must be implemented by the ECO in charge of these developments. These discoveries ought to be protected (*in situ* if possible) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462

4509. Web: www.sahra.org.za) so that suitable mitigation (recording and collection) can be carry out by a paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

Recommendations:

- The EAP and ECO for this project must be informed that High Palaeontological Sensitivity is allocated to the Kalahari Formation and a moderate to High to the Vryburg Formation.
- If fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations the Chance Find Protocol must be implemented by the ECO in charge of these developments. These discoveries ought to be secured (if possible, in situ) and the ECO ought to alert SAHRA so that appropriate mitigation (documented and collection) can be undertaken by a palaeontologist.
- These recommendations must be incorporated in the EMPr of this project.

17.5 Agricultural Impact Assessment

A summary of the Agricultural Impact Assessment (Index, 2019), as contained in **Appendix H1**, follows.

17.5.1 Details of the Specialist

Details of the specialist that undertook the Agricultural Impact Assessment follow.

Organisation:	Index
Name:	Dr Andries Gouws
Qualifications:	PhD Integrated Land Use Modelling
Affiliation (if applicable):	• Council of Natural Sciences.No:400036/93, Category: Agricultural sciences. • Member of the Soil Science Society of South Africa

17.5.2 Objectives of the Study

The objectives of the Agricultural Impact Assessment were to assess the following:

- Loss of high potential agricultural land;
- Loss of cultivated areas;
- Loss of grazing land;
- Disruptions to farming practices during construction;
- Determine impacts of project from an agricultural perspective; and
- Suggest suitable mitigation measures to address the identified impacts.

17.5.3 Methodology

The present land use was identified from various satellite images sources, dated from 2010 to 2018. These are available on the internet. The land uses were delineated as four categories:

1) Irrigated land;
2) Mining land;
3) Land with social infrastructure (housing and landing strip); and
4) Grazing (open veld or pastures).

The impact assessment will assign values to each category in a matrix to indicate significance of loss.

- It is accepted that the permanent loss in the case of grazing and arable land will be only the footprint of reservoirs and pump station sites. There are all already fenced;
- The irrigated land will temporary be lost for a strip of not more than 50 metres on each side of construction, and will last for one season, which is the time allowed for the vegetation to recover;
- A temporary loss for arable or grazing land will be for a strip of 50 metres wide (to allow for vehicle movement) and will last for one season, which is the time allowed for the vegetation to recover.

The width of the impact during upgrading of the pipeline was assumed as follows:

1) In general, a distance of 50 metres from the centre line of the pipe is assumed (100 metres width in total);
2) Where the pipeline runs along a line feature like roads or the railway line, the width is only 50 metres, and will consist of the portion away from the road or rail line.

17.5.4 Key Findings of the Study

17.5.4.1 Agricultural Land Use

Land use in agriculture is dynamic and constantly changes, depending on the climate and socio-economic conditions of the farmer and of the region. The dominant land use for the entire length of the line is animal grazing, while irrigation takes place in isolated instances where water is available and then only to produce supplement animal feed. The land uses along the pipelines within the strip that could be affected by construction are indicated in **Table 27**.

As shown in **Table 27**, grazing is the dominant land use with approximately 1 044 ha that will be affected for the duration of construction followed by the time it takes for the land to recover from it being disturbed. Infrastructure and mining combined is 153,03 hectares or 12,7% of the land. The irrigated land at Ulco is a maximum of 1,3 hectares. It appears from the satellite images that there is an uncultivated strip of 25m between the pipeline and the lands. If construction vehicles can remain in this strip, then no impact is foreseen.

Refer to the Agricultural Impact Assessment Report in **Appendix H1** for detailed land use maps. The footprint of pumping and storage infrastructure will also not change. It is now not used for farming purposes. Therefore, there will not be any impact on farming resources.

Table 27: Land uses along pipelines in the study area

Line	Area per land use in the affected area (ha)
Clifton - Gloucestor	**308,03**
Grazing	288,17
Infrastructure	19,87
Delportshoop - Kneukel	**149,73**
Grazing	141,28
Mines	8,45
Gloucester - Roscoe	**137,53**
Grazing	137,53
Kneukel - Trewill	**245,30**
Grazing	243,96
Irrigated	1,34
Roscoe - Olifantshoek	**126,27**
Grazing	110,61
Infrastructure	12,33
Mines	3,33
Trewill - Clifton	**231,91**
Grazing	122,86
Infrastructure	8,34
Mines	100,71
TOTAL area	**1 198,77**

17.5.4.2 Agricultural Infrastructure

The farm infrastructure impacted by the proposed development is mainly buildings in the proximity of the route, cattle watering facilities and poultry housing (refer to **Figure 60**).

17.5.4.3 Carrying Capacity

The region is classified as arid, where plant growth only occurs following rain. The grazing capacity of natural veld, according to the Department of Agriculture, is estimated at between 13 and 18 hectares per large stock unit (LSU) under natural veld conditions (Department of Agriculture, 2019). Game and goats rely on the leaves of trees and shrubs for feed. The total carrying capacity of the land that will be disturbed by construction is 66 LSUs (**Table 28**).

Table 28: Animal carrying capacity of land affected by the proposed infrastructure

Line	Area	Average ha/LSU	Total LSUs
Clifton - Gloucestor	308,03	17,0	16,95
Delportshoop - Kneukel	149,73	17,0	8,31
Gloucester - Roscoe	137,53	17,0	8,09
Kneukel - Trewill	245,30	14,5	16,83
Roscoe - Olifantshoek	126,27	17,0	6,51
Trewill - Clifton	231,91	12,0	10,24
TOTAL	**1 198,77**	**14,3**	**66,93**

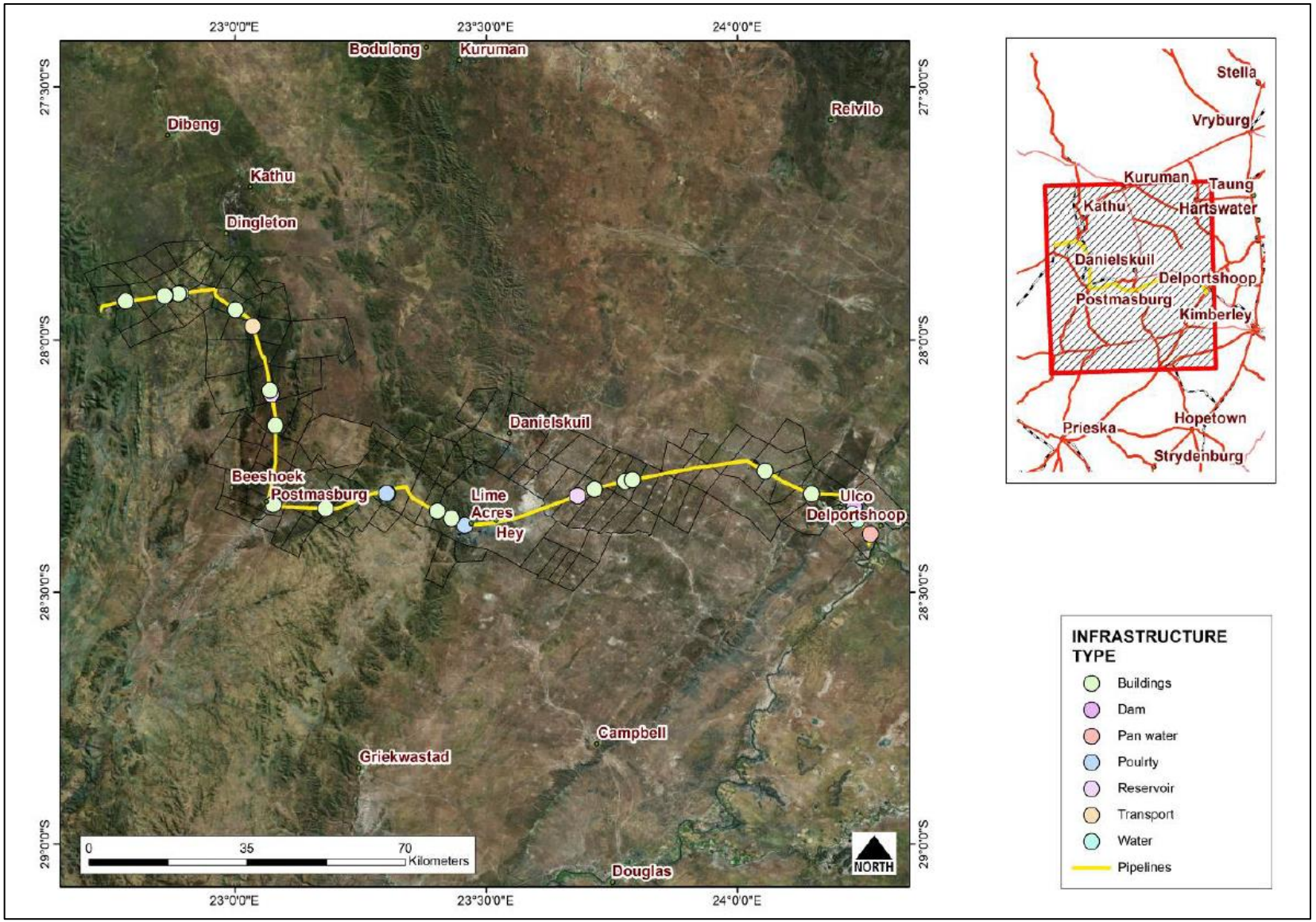


Figure 60: Farm infrastructure along the pipeline route (Index, 2019)

17.5.5 Impact Assessment

Refer to **Section 19.10** for the results from the Agricultural Impact Assessment from this study.

17.5.6 Conclusions and Recommendations

The Agricultural Impact Assessment concluded that the assessment found that there will be no permanent loss of high potential land. The significance and magnitude of the loss of grazing land is low and of a temporary nature (it will be for one rainy season). Entrances to some farms will be affected and need to be managed in consultation with the farmers. Some farm infrastructure will be lost and has to be replaced. Fencing of farms needs to be maintained where construction is taking place. This is to ensure that animals do not escape and/or fall into the trench at the construction site.

17.6 Socio-Economic Impact Assessment

A summary of the Socio-Economic Impact Assessment (Nemai Consulting, 2019b), as contained in **Appendix H6**, follows.

17.6.1 Details of the Specialist

The details of the specialist that undertook the Socio-Economic Impact Assessment follow.

Organisation:	Nemai Consulting
Name:	Ciaran Chidley
Qualifications:	BA (Economics); BSc Eng (Civil); MBA
Affiliation (if applicable):	N/A

17.6.2 Objectives of the Study

The objectives of the Socio-Economic Impact Assessment include the following:

- To determine the specific social, land utilisation and acquisition implications of the project;
- To collect baseline data on the current social environment;
- To develop an understanding of the social and economic landscape of the project area;
- To conduct a public engagement campaign in the project area to determine perceptions and impacts with regards the project;
- To assess the social impacts of the project, both positive and negative; and
- To suggest suitable mitigation measures to address the identified impacts.

17.6.3 Methodology

The following activities were conducted as part of the SEIA: defining the study area; detailing the project scope; a situational analysis describing the socio-economic status of the study area, engagement with stakeholders through a public engagement process; and developing

impacts and recommended mitigation measures to reduce the identified impacts. The report concludes with an alternative analysis from a socio-economic perspective.

17.6.4 Situational Analysis

The predominant land use is agricultural: either commercial or subsistence farming. In the towns and settlements along the route, residential and commercial land uses are found. The pipeline travels along existing infrastructure in a design effort to reduce social-economic impacts.

The study area has a population of 25 874, with education and income levels typical for rural South Africa. The majority of population in the study area have piped water supplied inside homes and flush toilets. There are areas where there are no sanitation services, notably the rural areas of Postdene and Postmasburg.

Refer to **Section 16.11** for the socio-economic status quo of the study area.

17.6.5 Impact Assessment

Stakeholder engagement was carried out using two approaches. First using public participation process during the EIA and later as part of this SEA during site visits to the affected locations. The primary data was collected directly from the community members, community leaders, Ward Councillors and private landowners.

During this engagement the following socio-economic issues were identified: dust; land acquisition; security issues; traffic; land use and direct economic benefits from the project.

Refer to **Section 19.9** for the results from the impact assessment from this study.

17.6.6 Conclusions and Recommendations

The study assessed the social and economic impacts of the proposed project. As expected of any construction project, there were several positive and negative socio-economic impacts identified.

No socio-economic fatal flaws were identified for the project mainly owing to the fact that the existing pipeline follows existing infrastructure to achieve this. The identified negative impacts can be successfully mitigated and the positive impacts will bring economic and social benefit to the area.

18 IMPACT ASSESSMENT

18.1 Overview

This section focuses on the pertinent environmental impacts that could potentially be caused by the proposed VGRSWW-II: Upgrading of the Existing Scheme, from Delportshoop to Olifantshoek, during the pre-construction, construction and operational phases of the project.

Please note that an "impact" refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

The impacts to the environmental features are linked to the project activities, which in broad terms relate to the proposed development and its associated services and infrastructure.

Impacts were identified as follows:

- Impacts associated with listed activities contained in GN No. R. 983 and R. 985 of 4 December 2014 (as amended), for which authorisation has been applied for;
- Issues highlighted by environmental authorities;
- Comments received during public participation;
- An appraisal of the project description and the receiving environment; and
- Findings from specialist studies.

18.2 Project Activities

For the purposes of effective and efficient monitoring, the aspects of construction are outlined separately for pre-construction, construction and operational phases. In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life-cycle, as shown in **Tables 29**, **30** and **31** to follow.

Table 29: Activities associated with the Pre-construction Phase

PRE-CONSTRUCTION PHASE
Project Activities
1. Applicant to appoint ECO
2. Negotiations and agreements with the individual affected landowners and stakeholders
3. Detailed engineering design
4. Detailed geotechnical design
5. Site survey
6. Procurement of contractors
7. Mark construction servitude
8. Registration of the servitude
9. Pre-construction photographic records

PRE-CONSTRUCTION PHASE
10. Development and approval of method statements
11. Development and approval of construction plans
12. Development of employment strategy
13. Construction site planning, access and layout
Environmental Activities
1. Undertake a walk down survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features
2. Develop Search, Rescue and Relocation Plan
3. Demarcation of buffers around sensitive areas
4. Diligent compliance monitoring of the EA, EMPr and other relevant environmental legislation
5. Barricading and installing barriers around buffer areas identified in specialist studies
6. Ongoing consultation with landowners and affected parties

Table 30: Activities associated with the Construction Phase

CONSTRUCTION PHASE
Project Activities
1. Site establishment (including site camp and labour camp)
2. Fencing of the construction area
3. Pegging of central line and overall footprint
4. Site clearing
5. Delivery of construction material
6. Transportation of equipment, materials and personnel
7. Storage and handling of material
8. Cut and cover activities
9. Stockpiling (sand, crushed stone, aggregate, etc.)
10. Stormwater control mechanisms
11. Management of topsoil and spoil
12. Waste and wastewater management
13. Traffic control measures
14. Bulk earthworks
15. Site security
16. Electrical supply
17. Construction of the proposed infrastructure
18. Install final Cathodic Protection measures and AC mitigation measures, as required
19. Road surface finishes
20. Concrete works
21. Temporary river diversions for pipeline crossings
22. Landscaping
Environmental Activities

CONSTRUCTION PHASE
1. Reinstatement and rehabilitation of construction domain
2. Control of invasive plant species
3. Diligent compliance monitoring of the EA, EMPr and other relevant environmental legislation
4. Conduct environmental awareness training
5. Implement EMPr
6. Ongoing consultation with landowners and affected parties

Table 31: Activities associated with Operational Phase

OPERATIONAL PHASE
Project Activities
1. Servitude access arrangements and requirements
2. Routine maintenance inspections of the VGRWSS-II
3. Repair and maintenance works of the water pipeline
Environmental Activities
1. Ongoing consultation with landowners and affected parties
2. Erosion monitoring programme
3. Management of sensitive areas or buffered areas
4. Management of vegetation clearance
5. Stormwater management
6. Pollution control measures
7. Control of invasive plant species

18.3 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact. **Tables 32, 33** and **34** provide the environmental aspects that have been identified for the proposed project, which are linked to the project activities (note that only high level aspects are provided).

Table 32: Environmental aspects associated with the Pre-Construction Phase

ENVIRONMENTAL ASPECTS
Pre-construction Phase
1. Insufficient construction site planning and layout
2. Poor consultation with landowners, affected parties, stakeholders and authorities
3. Site-specific environmental issues not fully understood
4. Inadequate environmental and compliance monitoring
5. Absence of relevant permits
6. Lack of barricading of sensitive environmental features

ENVIRONMENTAL ASPECTS
Pre-construction Phase
7. Poor waste management
8. Absence of ablution facilities

Table 33: Environmental aspects associated with the Construction Phase

ENVIRONMENTAL ASPECTS
Construction Phase
1. Poor consultation with landowners and affected parties
2. Inaccurate walk-down survey
3. Inadequate environmental and compliance monitoring
4. Lack of environmental awareness creation
5. Construction starting without or inadequate search and rescue
6. Indiscriminate site clearing
7. Poor site establishment
8. Poor management of access and use of access roads
9. Inadequate provisions for working on steep slopes
10. Poor transportation practices
11. Poor traffic management
12. Disturbance of topsoil
13. Disruptions to existing services
14. Inadequate storage and handling of material
15. Inadequate storage and handling of hazardous material
16. Erosion
17. Poor maintenance of equipment and plant
18. Poor management of labour force
19. Pollution from ablution facilities
20. Inadequate management of construction camp
21. Poor waste management practices – hazardous and general (solid and liquid)
22. Poor management of pollution generation potential
23. Poor management of water
24. Damage to significant fauna and flora
25. Environmental damage of sensitive areas
26. Disruption of archaeological and culturally significant features (if encountered)
27. Dust and emissions
28. Noise nuisance due to construction activities
29. Influence to resource quality of the affected rivers from river diversions
30. Poor reinstatement and rehabilitation

Table 34: Environmental aspects associated with the Operational Phase

ENVIRONMENTAL ASPECTS
Operational Phase
1. Poor consultation with landowners, affected parties, stakeholders and authorities
2. Inadequate environmental and compliance monitoring
3. Inadequate management of access, routine maintenance and maintenance works
4. Inadequate management of vegetation
5. Inadequate management of offtakes

18.4 Potential Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. Refer to **Tables 35** and **36** for the potential significant impacts associated with the preceding activities and environmental aspects for the pre-construction, construction and operational phases, respectively.

Table 35: Potential significant environmental impacts during Construction Phase

Feature	Impact
Land Use	• Temporary loss of land used for agriculture. • Servitude restrictions. • Reduced access to land/structures – all structures located in the servitude. Structures identified as part of this study are: Postmasburg dwelling, The Ranch, Langeberg Stene and Olifantshoek Cemetery. • Construction related disturbances (dust and noise generation).
Geology and Soil	• Impacts associated with the sourcing of construction material and loss of topsoil • Soil erosion (land clearance and construction activities) • Soil pollution e.g. hydrocarbon and cement spillages • Compaction and erosion of removed and stockpiled soils • Soil contamination from incorrect storage/handling/disposal of hazardous waste • Soil contamination through spillages and leakages • Soil contamination due to mismanagement and/or incorrect storage of hazardous chemicals • Poor stormwater management during construction
Topography	• Visual impacts during construction • Crossing topographic features (watercourses) • Erosion of affected areas
Geohydrology	• Groundwater pollution due to spillages and poor construction practices
Flora	• Loss of sensitive vegetation and habitat • Damage and loss of vegetation of conservation significance • Proliferation of exotic vegetation in disturbed areas • Damage to vegetation in surrounding areas • Destruction of potential Red Data Listed and protected flora species during site clearing and construction

Feature	Impact
	• Disturbance of sensitive plant species if relocated
Fauna	• Loss of habitat through site clearing and construction • Illegal killing or hunting of mammals • Killing of snakes during construction phase due to poor environmental education procedures • Potential harm to and/or death of fauna due to pollution, littering and/or vehicle movement on site. • Damage / clearance of habitat of conservation importance • Loss of fauna species of conservation significance • Obstruction to animal movement corridors
Air Quality	• Excessive dust levels. • Greenhouse gas emissions (use of construction vehicles, machinery/equipment, and diesel generators)
Transportation	• Construction-related traffic • Increase in traffic on the local road network • Damage to roads by heavy construction vehicles • Risks to road users
Noise	• Localised noise increase • Noise nuisance
Agriculture	• Disruptions to farming entrances and operations as a result of construction-related use of existing access roads. • Temporary loss of grazing land within construction domain. • Loss of existing farm infrastructure within construction domain.
Existing Structures and Infrastructure	• Risk of damaging existing services, infrastructure and structures during construction. • Disruptions to traffic on local road network during construction. This is associated with road crossings, where the pipeline route follows existing road alignments and as a result of general use of the roads by construction vehicles.
Aesthetics	• Reduction in visual quality of area.
Safety and Security	• Safety risk to landowners and surrounding communities.
Waste Management	• Waste generated from site preparations (e.g. plant material) • Domestic waste • Surplus and used building material • Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags) • Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks • Land, air and water pollution through poor waste management practices
Socio – Economic	• Generation of employment opportunities for local people and SMME's (positive). • Contribution to local economy (positive). • Conflicted land uses. • Nuisance from noise, dust and increased traffic. • Safety and security. • Damage to property or equipment
Historical and Cultural Resources	• Damage to heritage resources.

Feature	Impact
Watercourses	• Damage to the structure and functioning of watercourses due to construction activities • Direct loss, disturbance and degradation of wetlands • Increased bare surfaces, runoff and potential for erosion • Degradation of wetland and riparian zone vegetation and the introduction and spread of alien and invasive vegetation • Increased sediment loads to downstream reaches • Contamination of watercourses with hydrocarbons due to leaks and spillages from machinery, equipment & vehicles • Disruption of wetland soil profile and alteration of hydrological regime

Table 36: Potential significant environmental impacts for Operational Phase

Feature	Impact
Land Use	• Servitude restrictions and inspections. • Operation and maintenance functions.
Topography	• Visual impacts from disturbed areas and permanent infrastructure • Crossing topographic features (watercourse crossings) • Erosion of affected areas
Flora	• Encroachment by exotic species through inadequate eradication programme
Aesthetics	• Visibility of pipeline servitude and associated infrastructure • Inadequate reinstatement and rehabilitation of construction footprint
Socio – Economic	• Improved water supply to local towns and communities (positive) • Generation of employment opportunities for local community (positive) • Safety and security issues through improper access control during inspections and maintenance activities • Use of local road network for operation and maintenance purposes
Existing Structures & Infrastructure	• Servitude restrictions.

18.5 Impact Assessment Methodology

Impacts are to be managed by assigning suitable mitigation measures. According to DEAT (2006) the objectives of mitigation are to:

- ❖ Find more environmentally sound ways of executing an activity;
- ❖ Enhance the environmental benefits of a proposed activity;
- ❖ Avoid, minimise or remedy negative impacts; and
- ❖ Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy (1) prevent; (2) reduce; (3) rehabilitate; and/or (4) compensate for the environmental impacts (see **Figure 61**).

Figure 61: Mitigation hierarchy

In order to establish best management practices and prescribe mitigation measures, the following project-related information needs to be adequately understood:

- **Activities** associated with the proposed project;
- **Environmental aspects** associated with the project activities;
- **Environmental impacts** resulting from the environmental aspects; and
- The nature of the surrounding **receiving environment**.

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts (refer to methodology provided in **Table 37**). Where applicable, the impact assessments and significance ratings provided by the respective specialists are included.

The assessment considers impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

Table 37: Quantitative Impact Assessment Methodology

Nature	The project could have the following impacts to the environment: • **Positive**; • **Negative**; or • **Neutral**.
Extent	• **Local** - extend to the site and its immediate surroundings. • **Regional** - impact on the region but within the province. • **National** - impact on an interprovincial scale. • **International** - impact outside of South Africa.
Magnitude	Degree to which impact may cause irreplaceable loss of resources. • **Low** - natural and social functions and processes are not affected or minimally affected. • **Medium** - affected environment is notably altered; natural and social functions and processes continue albeit in a modified way. • **High** - natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration	• **Short term** - 0-5 years. • **Medium term** - 5-11 years. • **Long term** - impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention. • **Permanent** - mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability	• **Almost certain** - the event is expected to occur in most circumstances. • **Likely** - the event will probably occur in most circumstances. • **Moderate** - the event should occur at some time. • **Unlikely** - the event could occur at some time. • **Rare/Remote** - the event may occur only in exceptional circumstances.
Significance	Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows- **0** - Impact will not affect the environment. No mitigation necessary. **1** - No impact after mitigation. **2** - Residual impact after mitigation / some loss of populations and habitats of non-threatened species. **3** - Impact cannot be mitigated / exceeds legal or regulatory standard / increases level of risk to public health / extinction of biological species, loss of genetic diversity, rare or endangered species, and critical habitat.

19 IMPACT MANAGEMENT

This section determines the management requirements for the potential impacts during the pre-construction, construction and operational phases of the proposed project.

19.1 Land Use & Land Cover

19.1.1 Potential Impacts

The dominant land use and land cover in the areas earmarked for the project infrastructure is presented in **Section 16.2**. The proposed infrastructure is mostly located within the existing pipeline servitude, which is situated on large privately-owned properties that are primarily used for agricultural and mining practices.

To minimise impacts to the receiving environment and current land uses, the pipeline route mostly follows existing linear infrastructure (including roads and a railway line) as well as boundaries between properties.

The land acquisition process is explained in **Section 5.2.11**. Negotiations with the landowners to acquire and register the relevant land rights will be undertaken by Sedibeng Water. Sedibeng Water's land rights acquisition strategy will adhere to all statutory requirements prevailing at the time.

It is noted that some encroachments occur into the existing pipeline servitude, such as accesses to properties. The appropriate process to deal with encroachments into the existing servitude will need to be followed by Sedibeng Water.

Impacts associated with land use were also assessed as part of the Socio-Economic Impact Assessment (refer to **Section 19.9**) and Agricultural Impact Assessment (refer to **Section 19.10**).

19.1.2 Impact Assessment

Environmental Feature	**Land Use**
Relevant Alternatives & Activities	**All physical infrastructure and ancillary structures that form part of the VGRWSS-II: upgrading of existing scheme**
Project life-cycle	**Construction & Operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
Land acquisition and servitude restrictions.	• Land acquisition process to abide by the prevailing legislation. • Servitude restrictions to be explained to the affected landowners. • Sedibeng Water to regularly inspect the permanent servitude to identify encroachments.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	high	permanent	almost certain	2
After Mitigation	-	local	low	permanent	almost certain	1

Potential Aspects & Impacts	Proposed Management Objectives / Mitigation Measures
Disruptions to existing land use.	• Construction will only commence following completion of the land acquisition process. • Construction activities to be restricted to construction servitude. • Construction servitude to be fenced off in areas where construction is taking place. • Compensation based on legitimate claims for losses as a result of project-related activities.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium	short-term	almost certain	3
After Mitigation	-	local	low	short-term	moderate	1

19.2 Climate

19.2.1 Potential Impacts

The EMPr includes measures to control and minimize greenhouse gas (GHG) emissions by optimizing the utilisation of construction resources.

19.2.2 Impact Assessment

Environmental Feature	**Climate**
Relevant Alternatives & Activities	**All construction activities that emit GHG**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
GHG emissions. Contributions to global warming.	• Materials with a high recycled content should be used where possible and the re-use of site materials should be considered. • Suitable training should be provided to operators to ensure that they maximise the efficiency of the plant and idling is reduced. • In terms of transportation of workers and staff, collective transportation arrangements should be made to reduce individual car journeys. • All vehicles used during the project should be properly maintained and in good working order.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	regional	unknown	short-term	likely	unknown
After Mitigation	-	regional	unknown	short-term	unlikely	unknown

19.3 Geology

19.3.1 Potential Impacts

Construction material will need to be sourced from borrow pits that will be located at 10 km intervals along the project footprint. Such extraction could result in a variety of environmental impacts including visual impacts, loss of habitat, noise and dust to local communities and wildlife. As mentioned, a separate application will be submitted to DMRE to seek approval for the borrow pits.

Other important considerations from a geological perspective include inter alia blasting and spoil material that will need to be disposed of during the installation of the pipeline through filling of borrow pits or other suitable environmental practices. The spoil sites will only be operational for the construction period of VGRWSS-II and will be rehabilitated afterwards through shaping, application of topsoil and planting of indigenous vegetation.

19.3.2 Impact Assessment

Consider findings from geotechnical investigations during project design phase and incorporate mitigation measures (as relevant).

19.4 Soils

19.4.1 Potential Impacts

During the construction phase, the 40m wide construction servitude will be cleared of vegetation, which may lead to soil erosion. Where construction activities will take place in terrain that is characterised by steeper gradient (i.e. at Olifantshoek Reservoir) as well as at instream works, erosion could take place in the absence of suitable storm water management and stabilisation of the cut and fill areas. The EMPr includes suitable stormwater management measures to prevent the occurrence of erosion.

Soil may be polluted by poor storage of construction material, spillages and inadequate housekeeping practices. Specific mitigation measures are contained in the EMPr, where the primary objective is the effective and safe management of materials on site, in order to minimise the impact of these materials on the biophysical environment. The same objective applies to the correct management and handling of hazardous substances (e.g. fuel).

19.4.2 Impact Assessment

Consider findings from geotechnical investigations during project design phase and incorporate mitigation measures (as relevant).

Environmental Feature	**Soils**
Relevant Alternatives & Activities	**All construction activities on steep slopes**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
Soil erosion on steep slopes.	• Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site-specific conditions. Drainage management should also be implemented to ensure the minimization of potential erosion. • Acceptable reinstatement and rehabilitation of disturbed areas to prevent erosion during operation phase. • Install suitable buttressing to prevent future erosion of the structures of the watercourses affected by construction, if required. • Monitoring to be conducted to detect erosion (e.g. steep sections along pipeline, crossing of drainage lines etc.).
Contamination of groundwater from poor construction practices.	*Refer to mitigation measures for preventing groundwater contamination under Section 19.5.2.*

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	short-long	likely	2
After Mitigation	-	local	low	short-term	unlikely	1

19.5 Geohydrology

19.5.1 Potential Impacts

Groundwater may be impacted by the project as follows:

- Possible influence to groundwater flow as a result of trenching during construction;
- Potential contamination of groundwater during the construction phase; and
- Appropriate management required of shallow groundwater at river crossings and waterlogged areas, which will include the suitable dewatering of excavations.

The sourcing of underground water from boreholes will be required for the associated SD1 and SD2 developments, which will tie in to the main pipeline. The potential impacts of these developments on groundwater in the study area, will be assessed in a separate application and BAR for SD1 and SD2.

19.5.2 Impact Assessment

Consider findings from geotechnical investigations during project design phase and incorporate mitigation measures (as relevant).

Environmental Feature	**Geohydrology**
Relevant Alternatives & Activities	**Pipeline infrastructure and activities that may affect groundwater**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
Contamination of groundwater from poor construction practices.	• Suitable protection of groundwater during excavations. • All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material. • Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales). • Suitable protection of groundwater during excavations. Implement mitigation measures suggested as part of the geotechnical investigations for managing groundwater.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	short-long	likely	2
After Mitigation	-	local	low	short-term	unlikely	1

19.6 Topography

19.6.1 Potential Impacts

Significant topographical features in the project area include, amongst others, the following:

- Koppie situated at the Olifantshoek reservoir (refer to **Figure 62** below);
- Low mountains encountered along sections of the proposed pipeline route (R3381 to Postmasburg – refer to **Figure 63**); and
- Watercourses crossed by pipeline (refer to **Figure 64**).

Figure 62: Koppie at Olifantshoek Reservoir

Figure 63: Low mountains situated along R385 to Postmasburg

Figure 64: River crossing on N14 to Olifantshoek

19.6.2 Impact Assessment

Environmental Feature	Topography
Relevant Alternatives & Activities	All steep sections of the project footprint
Project life-cycle	Construction phase
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
Erosion on steep slopes.	• Suitable erosion protective measures are to be implemented where the pipeline traverses steep terrain. • Undertake rehabilitation of the construction area to minimise visual impacts. • Although the use of indigenous vegetation is promoted, where there is a risk of soil erosion (e.g. steep slopes) a suitable specialist must be consulted to determine the most appropriate stabilisation measures.
Damage to koppies.	• At Olifantshoek koppie, align the pipeline within the existing servitude in order to avoid clearance of vegetation situated adjacent to the servitude.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

Project life-cycle	Operational phase
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
Erosion on steep slopes.	• Pipeline inspections to include checking for any signs of erosion. Corrective measures to be implemented, as required.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium	long-term	likely	2
After Mitigation	-	local	low	long-term	unlikely	1

19.7 Watercourses

19.7.1 Potential Impacts

The new VGRWSS pipeline will be constructed alongside the existing pipeline infrastructure. The Wetland and Aquatic Impact Assessment (see **Appendix H2**) indicated that this inherently reduces the impacts to receiving wetlands. Nevertheless, the sheer scale of the project and number of wetlands crossings suggests that any potential impacts should not be undermined. Although most of the risks were considered low, certain activities and their impacts (mainly associated with site clearing and trench excavation) are likely to take place within the delineated boundary of some wetlands (prompting the mandatory assignment of a severity rating of 5) and thus a moderate post mitigation risk. No High post mitigation risks are anticipated to occur as a result of the upgrading of the pipeline. Overall, in spite of this, the impacts associated with this critical development are unlikely to negatively impact wetland systems to any appreciable level provided that the suggested mitigation measures are effectively implemented. Additionally, the pipeline will convey clean water, thus risks associated with leaks are considered low provided they are timeously fixed before erosion damage can occur.

19.7.2 Impact Assessment

19.7.2.1 Risk Matrix

The potential risks posed to wetlands as a result of the proposed project are detailed in **Table 38**. These ratings are based on the DHSWS Section 21 (c) and (i) Risk Assessment matrix. As per this matrix, all activities associated with construction, operation and decommissioning have been accounted for. Ratings are given for scenarios with mitigation. Mitigation is listed alongside each impact.

Table 38: DHSWS Risk Matrix (The Biodiversity Company, 2019)

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
Construction																			
Site clearing and preparation	Clearing of vegetation and stripping and stockpiling topsoil as well as storage of equipment.	Direct loss, disturbance and degradation of wetlands.	SVBs	2	2	2	2	5	2	2	9	2	1	5	1	9	81	M	• Restrict the disturbance footprint to within 25 m on either side of the proposed pipeline route. • Request the wetland spatial data from TBC, load it onto a GPS and use it to mark out the positions where the pipeline will enter and exit the 32 m buffer on the boundary of a wetland. Try to reduce the 25 m disturbance footprint and the unnecessary clearing of vegetation on either side of the trench as far as possible when traversing wetlands. • Demarcate with high visibility plastic fencing • Signpost the area beyond the construction footprint as an environmentally sensitive area and keep all excavation, soil stockpiling, general access and construction activities out of this area. • Undertake construction during winter when flow volumes are lowest. This will reduce impacts to wetlands due to soil poaching and vegetation trampling under peak saturation levels. Additionally, the risk of vehicles getting stuck and further degrading the vegetation integrity is lowest during this time.
			IVBs	1	1	1	1	5	2	2	9	3	1	5	1	10	90	M	
			ENDs	1	1	1	1	5	2	2	9	3	1	5	1	10	90	M	
			EXDs	1	1	1	1	5	2	2	9	3	1	5	1	10	90	M	
		Increased bare surfaces, runoff and potential for erosion	SVBs	2	2	2	2	2	2	2	6	3	3	1	1	8	48	L	• Apply the above-mentioned mitigation. • Keep trench excavation neat and tidy. Only stockpile on one side of the trench. •Limit construction activities to the dry season when storms are least likely to wash concrete and sand into wetlands. • Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash.
			IVBs	1	1	1	1	1	2	2	5	3	1	1	1	6	30	L	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
			ENDs	1	1	1	1	1	2	2	5	3	1	1	1	6	30	L	• Mixing of concrete must under no circumstances take place in any wetland or their buffers. Scrape the area where mixing and storage of sand and concrete occurred to clean once finished. • Do not situate any of the construction material laydown areas within any wetland. • No machinery should be allowed to be parked in any wetlands. • Ensure topsoil is spread back over trench area. • Landscape and lightly till (no deeper than 30 cm) denuded areas to encourage vegetation establishment as soon as possible.
			EXDs	1	1	1	1	1	2	2	5	3	3	1	1	8	40	L	
		Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	SVBs	1	1	3	1	1.5	1	2	4.5	3	3	5	1	12	54	L	• Promptly remove all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs). • The use of herbicides is not recommended in or near wetlands (opt for mechanical removal). • Appropriately stockpile topsoil cleared from the study area. • Clearly demarcate construction footprint, and limit all activities to within this area. • Minimize unnecessary clearing of vegetation. • Landscape and re-vegetate all denuded areas as soon as possible.
			IVBs	1	1	2	1	1.3	1	2	4.3	3	1	5	1	10	43	L	
			ENDs	1	1	2	1	1.3	1	2	4.3	3	1	5	1	10	43	L	
			EXDs	1	1	3	1	1.5	1	2	4.5	3	3	5	1	12	54	L	
Installation of infrastructure	Trench excavation	Increased sediment loads to downstream reaches	SVBs	2	2	2	2	5	2	2	9	3	3	1	1	8	72	M	• See mitigation for increased bare surfaces, runoff and potential for erosion • Re-instate topsoil and lightly till disturbance footprint. • At all crossings install sandbags on downstream side of the footprint to trap sediment until the site has been constructed and vegetation has re-established.
			IVBs	1	1	1	1	5	2	2	9	3	1	1	1	6	54	L	
			ENDs	3	3	3	3	5	2	2	9	3	1	1	1	6	54	L	
			EXDs	1	1	1	1	5	2	2	9	3	1	1	1	6	54	L	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
		Contamination of wetlands with hydrocarbons due to leaks and spillages from machinery, equipment & vehicles as well as Contamination and eutrophication of wetland systems with human sewerage and litter.	SVBs	2	2	2	3	2.3	2	2	6.3	3	2	5	1	11	69	M	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the north-western seep. • Mixing of concrete must under no circumstances take place within the permanent or seasonal zones of the wetland. • Regularly maintain stormwater infrastructure, pipes, pumps and machinery to minimise the potential for leaks. Check for oil leaks, keep a tidy operation, install bins and promptly clean up any spills or litter. • Provide appropriate sanitation facilities during construction and service them regularly. • Monitor water quality in significant springs and beneath the bridge along the Groenwaterspruit in Postmasburg.
			IVBs	1	2	1	2	1.5	2	2	5.5	3	1	5	1	10	55	L	
			ENDs	1	2	1	2	1.5	2	2	5.5	3	1	5	1	10	55	L	
			EXDs	2	3	2	2	2.3	2	2	6.3	3	2	5	1	11	69	M	
	Backfilling of trench	Disruption of wetland soil profile and alteration of hydrological regime	SVBs	3	2	2	2	5	2	3	10	3	3	5	3	14	140	M	• Document the soil profile on removal and check the order in which soil is replaced. • Ensure that topsoil is appropriately stored and re-applied during trench backfilling. • Make sure that the soil is backfilled and compacted to accepted geotechnical standards to avoid flow canalisation along the trench and the potential for sinkhole formation.
			IVBs	1	1	1	1	5	2	3	10	2	1	5	1	9	90	L	
			ENDs	1	1	1	1	5	2	3	10	2	1	5	1	9	54	L	
			EXDs	1	1	1	1	5	2	3	10	2	1	5	1	9	54	L	
Operation																			
	Pipeline leaks		SVBs	1	1	1	1	1	2	1	4	3	1	5	1	10	40	L	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
Routine operation and monitoring		Increased water inputs (clean) to downstream wetlands	IVBs	1	1	1	1	1	2	1	4	3	1	5	1	10	40	L	• Conduct regular inspections along the pipeline route and fix leaks timeously. • Monitor water quality regularly at pump stations.
			ENDs	1	1	1	1	1	2	1	4	3	1	5	1	10	40	L	
			EXDs	1	1	1	1	1	2	1	4	3	5	5	1	14	56	L	
Decommissioning																			
Removal of pipeline ad borehole infrastructure	Vehicle access	Degradation of wetland vegetation and proliferation of alien and invasive species	SVBs	2	2	2	2	2	1	2	5	3	2	5	1	11	55	L	• See mitigation for the impacts on direct loss, disturbance and degradation of wetlands and spread of alien and invasive plants.
			IVBs	2	2	2	2	2	1	2	5	3	1	5	1	10	50	L	
			ENDs	2	2	2	2	2	1	2	5	3	1	5	1	10	50	L	
			EXDs	2	2	2	2	2	1	2	5	3	2	5	1	11	55	L	
	Re-excavation of trench and backfilling of wetland soils	Disruption of wetland soil profile, hydrological regime and increased sediment loads	SVBs	3	2	2	2	2.3	2	1	5.3	3	2	5	2	12	63	M	• See mitigation for increased bare surfaces, runoff and potential for erosion and increased sediment loads during construction • See mitigation for Disruption of wetland soil profile and alteration of hydrological regime
			IVBs	1	1	1	1	1	2	1	4	3	1	5	2	11	44	L	
			ENDs	2	1	1	1	1.3	2	1	4.3	3	1	5	2	11	47	L	
			EXDs	3	2	2	2	2.3	2	1	5.3	3	2	5	2	12	63	M	

19.8 Terrestrial Ecology

19.8.1 Potential Impacts

Potential impacts to flora and fauna during the pre-construction and construction phase, include the following:

- Loss of plant Species of Conservation Concern (SCC) from vegetation clearance.
- Potential loss of topsoil from site preparation. Loss of topsoil on areas that will be compacted and/or covered with hardened surfaces (e.g. cement).
- Loss of vegetation from vegetation clearance during pre-construction and construction phases.
- Increased erosion due to clearance of vegetation and exposure of bare soil and incorrect storm water management measures.
- Ecosystem disruption may occur where clearing is undertaken to allow for the construction of the project infrastructure.
- Proliferation of alien invasive species on account of site disturbance. Introduction and spread of weeds and invasive alien plants in and around the site due to imported soil used during construction.
- Loss of vegetation due to fuel and chemical spills from the use of equipment (e.g. generators) and storage and use of hazardous substances.
- Temporary loss of functioning of CBAs and ESAs habitats, which are important in terms of biodiversity, ecosystem functionality and ecological processes; and
- Permanent loss of tree cover within the servitude since the establishment of trees within the pipeline servitude will not be allowed as roots may compromise the stability of the pipeline.

The construction phase of the proposed development is anticipated to have direct impacts on remaining floral habitat within the servitude and potential loss of plant SCC. Several plant SCC and provincially/national protected flora/trees were recorded on site. The potential loss of plant SCC is site specific and the search, rescue and relocation of these species before construction will result in the significance of the impact after mitigation to be considered low.

Based on the results of the field survey, it is evident that the project site provides habitat to a number of fauna species. Although it is assumed that the majority of fauna species will move to different areas as a result of disturbance, many animal SCC fauna species have a specific habitat requirements and the destruction of their habitats will result in displacement to less optimal habitats, or ultimately may result in their complete demise.

The upgrade of the pipeline is unlikely to significantly alter the overall functioning of the CBA and ESA, given that the physical extent of the disturbance footprint will be extremely small relative to the full extent of the CBA along the pipeline route.

Topsoil will be required during the rehabilitation of the proposed development area and should there be a loss of topsoil and proliferation of alien species on stored topsoil or during rehabilitation, this could ultimately lead to loss and/or degradation of floral habitat.

Soils on site are considered to be predisposed to potential contamination, as contamination sources are generally unpredictable for construction developments and often occur as incidental spills or leaks. The significance of soil contamination is considered to be low, largely dependent on the nature, volume and/or concentration of the contaminant of concern.

Potential impacts to flora and fauna during the operational phase, include the following:

- Loss of vegetation type, important species and ecological processes resulting from vegetation management measures e.g. manual vegetation removal along the road, brush cutting or application of herbicide within the servitude.
- Introduction and spread of weeds and invasive alien plants in and around the servitude due to disturbance caused during servitude or pipeline maintenance.
- Loss of topsoil due to erosion caused by inadequate/failing stormwater management measures/designs.
- Disturbance to ecological processes due to altered habitat and disturbance to natural movements/processes.
- Soil contamination from hazardous substance spillages outside their primary and secondary containment during maintenance work.
- Loss of vegetation type, important species and ecological processes from soil contamination or spillage onto vegetation from hazardous substance spillages outside their primary and secondary containment during maintenance work.
- Loss of habitat due to operational activities.

19.8.2 Impact Assessment

The findings from the Terrestrial Ecological Impact Assessment, contained in **Appendix H5**, are provided in the tables to follow.

PRE-CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Loss of plant species of conservation concern and protected trees due to clearing for the construction of associated infrastructures (e.g. site camps etc.).			• As far as possible, avoid disturbance to the *Olea europea* subsp*. africana* plant species along the pipeline servitude. • Permits from DAFF and Northern Cape Department of Environment and Nature Conservation (DENC) are required before construction commences in order to cut, disturb, destroy or remove the several protected trees (noted within the project area), namely *Boscia albitrunca* and *Vachellia* (*Acacia*) *erioloba* • It is recommended that a suitably qualified Ecologist (or a similarly qualified individual) should be appointed to undertake a pre-construction walk-down to identify plant species of conservation concern and protected species (such as *Boophone disticha, Lithops spp.* and *Nymania capensis* etc) and oversee the rescue and relocation of these species. For flora species, the following factors need to be considered amongst others) as part of this process: o Detailed plan of action (including timeframes, methodology and costs); o Site investigations; o Consultation with authorities and stakeholders; o Marking of species to be relocated; o Applying for permits (Northern Cape DENC); o Identification of suitable areas for relocation; o Aftercare; and o Monitoring (including targets and indicators to measure success).		
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Moderate	1

PRE-CONSTRUCTION & CONSTRUCTION PHASE	
Potential Impact	Mitigation
Loss of fauna under Schedule 1 *specially protected species* and Schedule 2 *protected species* of Northern Cape Nature Conservation Act (Act 9 of 2009).	• In order to protect animal species on or around the site, prior construction, these species should be removed and relocated to natural areas in the vicinity. This remedial action requires the engagement of a herpetologist/ ecologist or a suitably qualified environmental officer to oversee the removal of any fauna during the initial ground clearing phase of construction (i.e. initial ground-breaking by earthmoving equipment). • Any lizards, geckoes, agamids, monitors or snakes encountered should be allowed to escape to suitable habitat away from the disturbance. No reptile should be intentionally killed, caught or collected during any phase of the project. • Vegetation clearance should, ideally, start during the non-breeding season of fauna populations (i.e. winter).

PRE-CONSTRUCTION & CONSTRUCTION PHASE						
Potential Impact			Mitigation			
			• Prior and during vegetation clearance, any larger fauna species noted should be given the opportunity to move away from the construction machinery.			
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Regional	Medium	Short-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Regional	Low	Short-term	Unlikely	1

PRE-CONSTRUCTION PHASE						
Potential Impact			Mitigation			
Loss of animal species of conservation concern (Black-footed cat and Southern African Hedgehog)			• A walk down survey needs to be conducted prior to construction in order to identify possible burrowing animals. • All personnel working on the project must participate in an environmental awareness program and this program must include appropriate wildlife avoidance methodologies, such as impact minimisation procedures. Information about the importance and purpose of protecting wildlife mist be described in the program. • No animals should be intentionally killed or destroyed. Poaching and hunting should not be permitted in the project site or surrounding areas. • Vegetation clearance should, ideally, start during the non-breeding season of fauna populations (i.e. winter). • Any animals found within excavations must not be harmed, and a suitably qualified person should be called to assist in safely removing the animal from the excavation. • Any animals found on the servitude should be allowed to leave freely, or a suitably qualified person should be called to assist in moving the animal off-site safely.			
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

PRE-CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of CBA and ESAs habitats		• No stockpiling of topsoil, soil, construction material, or establishment of construction camps must be allowed within the sensitive ecological areas. • The most significant way to mitigate the loss of habitat is to limit the construction footprint within the natural habitat areas remaining. Disturbance of vegetation must be limited to the servitude area acquired for the project. • Where possible, sensitive habitats must not be cleared and encouraged to grow. • Disturbance of vegetation must be limited only to areas of construction. • Areas cleared of vegetation must be re-vegetated and re-established prior to contractor leaving the site. • Removal of alien and alien invasive plants must be continuous. Removal of plants must be undertaken before they flower or set seed. • All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. • Prevent contamination of natural areas by any pollution. • The presence and location of all CBAs and ESAs must be clearly communicated to all employees and visitors to the project site. • Although it is unavoidable that sections of the project infrastructure development will need to traverse areas of potential high sensitivity, the clearing of vegetation must be limited to the servitude area acquired for the project. • Topsoil stripped must be stored in such a way that it can be replaced at the same location to limit the mixing of plant species between habitats.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

CONSTRUCTION PHASE						
Potential Impact	Mitigation					
Destruction of indigenous flora during site establishment	• Indigenous plants naturally growing within the project area, but that would be otherwise destroyed during clearing for development purposes, such similar plant species should be incorporated into landscaped areas. • Vegetation clearing should be kept to a minimum, and this should only occur where it is absolutely necessary and the use of a brush-cutter is highly preferable to the use of earth-moving equipment. • Where possible, natural vegetation must not be cleared and encouraged to grow. • Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm and this can be achieved through provision of appropriate awareness to all personnel. • Disturbance of vegetation must be limited only to areas of construction. • Prevent contamination of natural vegetation by any pollution. • Areas cleared of vegetation must be re-vegetated and re-established prior to contractor leaving the site. • Any fauna (mammal and reptile) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be placed rescued and relocated by an experienced person. • Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent further spread. • No storage of building materials or rubble is allowed in the sensitive areas. • Areas showing dense natural vegetation can be avoided in order to reduce vegetation loss. • Avoid translocating stockpiles of topsoil from one place to another in order to avoid translocating soil seed banks of alien species. • Rehabilitation of all disturbed areas should be an ongoing process and areas should be rehabilitated as soon as construction is completed in that area (i.e. that rehabilitation of the whole pipeline route is not only undertaken once all construction is completed, but rather in incremental sections as construction progresses.					
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

PRE-CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of topsoil		• During site preparation, topsoil and subsoil are to be stripped separately from each other. • Topsoil should be stripped to at least 150mm depth, and stockpiles should not exceed 1.5m in height. • Topsoil must be stored separately from subsoil and spoil material for use in the rehabilitation phase. • Stockpiles should be protected from wind and rain related erosion, compaction, as well as contamination from diesel, cement, concrete, wastewater, or any other waste or hazardous substance. • Records of all environmental incidents must be maintained and a copy of these records must be made available to authorities on request throughout the project execution. • Topsoil stripped must be stored in such a way that it can be replaced at the same location to limit the mixing of plant species between habitats.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

PRE/CONSTRUCTION PHASE	
Potential Impact	Mitigation
Loss of faunal habitat	• Vegetation outside of the footprints is not to be cleared. Construction activities to be limited to the construction servitude only. • As far as possible, the existing road network should be utilised to access the construction sites. • Revegetation of disturbed areas should be carried out in order to restore habitat availability and minimise soil erosion and surface water runoff whilst re-instating faunal habitat. • A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist in order to ensure that species loss during pre-construction activities is kept to a minimum. • Spills and /or leaks from construction equipment must be immediately remedied and cleaned up so as to ensure that these chemicals/hydrocarbons do not contaminate the soils. • Should any smaller animals which are less mobile be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. • No hunting/trapping or collecting of faunal species is allowed. • No fires are allowed. • Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert.

PRE/CONSTRUCTION PHASE						
Potential Impact		Mitigation				
		• Any person found deliberately harassing any animal in any way should face disciplinary measures, following the possible dismissal from the site.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Regional	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

CONSTRUCTION PHASE	
Potential Impact	Mitigation
Loss and displacement of animals on site	• Regular training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily. • The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase. • All construction and maintenance vehicles must stick to properly demarcated and prepared roads. Off-road driving should be strictly prohibited. • Strict adherence to speed limits by construction vehicles on the public and private access roads. Appropriate speed limits need to be posted on all access roads according to the geometric design and limitations of heavy vehicles. • No fires should be allowed at the site. • No dogs or other domestic pets should be allowed at the site. • Fauna species such as frogs and reptiles that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by a suitable qualified personnel trained in the handling and relocation of animals. • It is recommended that, while trenches are open during the construction phase, an appropriately sloping section is made available to allow any trapped animals to escape. • Any fauna (mammal, reptile and amphibian) that becomes trapped in the trenches or in any construction related activity may not be harmed and must be rescued and relocated by an experienced person. • Inspect open trenches at least daily to ensure that animals have not become trapped. Such animals will be safely removed and released, where possible. Special equipment for handling of venomous snakes should be available on site to ensure safe removal.

CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Loss of habitat and habitat fragmentation		• The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining. • No structures should be built outside the area demarcated for the development. • Although it is unavoidable that sections of the project infrastructure development will need to traverse areas of potential high sensitivity, the clearing of vegetation must be limited to the servitude area acquired for the project. • Where possible, the proposed linear infrastructure should be aligned with existing linear infrastructure or routed through already transformed/degraded areas. • Any protected plants close to the site that will remain in place must be clearly marked and may not be defaced, disturbed, destroyed or removed. They must be cordoned off with construction tape or similar barriers and marked as a no-go areas. • During construction, the ECO must monitor vegetation clearing on site. Any deviations from the approved plans which will result in the removal of vegetation from additional areas should first be checked for protected species by the ECO. Any protected species present which are able to survive translocation should be translocated to a safe site. • The ECO must translocate any listed species observed within the development footprint which were missed during the pre-construction vegetation walk-through. • The timing between clearing of an area and subsequent development is to be minimised.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

CONSTRUCTION PHASE						
Potential Impact	Mitigation					
Loss of vegetation due to fuel and chemical spills	• Appropriate measures should be implemented in order to prevent potential soil pollution through fuel, oil leaks and spills and then compliance monitored by an appropriate person. • Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks. • An emergency response contingency plan will be implemented to address clean-up measures should a spill and/or a leak occur. • All plant and machinery should be inspected every day, serviced and maintained regularly, and any leaking plant/machinery should be removed from site for repair. • Measures to avoid leakages and spillages on to bare ground and leakages must be undertaken. • Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Safe disposal certificate must always be obtained from the registered waste disposal site, and proof of disposal kept on site. Drip-trays must be placed under vehicles and equipment when not in use. • Washing and cleaning of equipment should also be done within bunds, in order to trap any cement and prevent excessive soil erosion and these sites must be re-vegetated after construction has been completed. • Spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans will be implemented during the construction phase. • Spill kits will be made available on site for clean-up of spills and leaks of contaminants. • The site must have a suitable area for the safe cleaning of cement contaminated tools and equipment. Cleaning such tools/equipment results in water contaminated with cement, which is hazardous to the environment. Cement contaminated water must not be released or otherwise disposed of into the environment, including stormwater drains. The contaminated water should be kept in a bund, drum, or other suitable containment (which will be used to wash contaminated tools, and can be re-used to mix cement) and allowed to evaporate. The remaining residue can be disposed of as building rubble once dry. • Every plant and all machinery should be issued with a drip tray on site. The drip tray should be placed underneath the plant/machine when it has shutdown. Drip trays should be in good working order with no holes or cracks, and should be able to hold liquid adequately if/when needed. • The contents of drip trays, including rainwater, must not be disposed of into the environment, but decanted into suitable, sealable, containers. These containers should be labelled and the contents disposed of as hazardous waste. Proof of disposal at a licenced waste disposal site must be obtained.					
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Encroachment and proliferation of weeds and alien invasive plant species		• Invasive plants (listed in the Terrestrial Ecological Study) can be removed manually or with the help of simple tools. This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ring-barking or bark stripping. These control options are only really feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. It would be preferable to uproot alien vegetation to limit regrowth after cutting. • Topsoil stockpiles, in particular, should be kept free of alien and alien invasive vegetation. • Seedlings of many invasive plants appear all the time during construction and when they appear, they must be pulled out as soon as possible to eliminate costly removal at a later stage. It is easier to remove seedlings when the soil is moist. • A 'Tree Popper' can be used to remove shrubs and smaller trees or alternatively, the top growth can be cut off and then the stem and roots can be removed from the soil. • For large stands of trees on site should they are too large for physical removal, ring-barking the tree should be considered • To prevent unnecessary alien plant infestations, an alien plant monitoring and eradication programme needs to be developed by a suitable person with a botanical expertise of the region. • Promote awareness of all personnel. • Chemical control should only be used as a last resort, since it is hazardous for natural vegetation. It should not be necessary if regular monitoring is undertaken, which should be effective for controlling invasive alien plants.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Regional	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Unlikely	1

CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Increased soil erosion		• Program construction activities so that the area of exposed soil is minimised during times of the year when the potential for erosion is high, for example during the summer when intense rainstorms are common. • Site-specific plans for soil erosion and sediment control should be developed and implemented. This should include a determination of site erosion potential and the identification of water bodies at risk. • Sediment barriers or sediment traps such as silt fences, sandbags etc. must be established to curb erosion and sedimentation where necessary. • An ecologically-sound stormwater management plan must be implemented during construction and appropriate water diversion systems put in place. • Sediment barriers should be regularly maintained and cleaned to ensure effective drainage. • Stockpiles are not be used as stormwater control features. • Sediment control measures such as silt fences, concrete blocks and/or sandbags must be placed around stockpiles to limit runoff, where erosion of stockpiles is severe.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Damage to plant and animal life outside of the study area		• Construction activities should be limited to the authorised construction servitude only. • No trapping or any other method of catching of any animal may be performed. • Illegal hunting is prohibited. • No dumping of any form is permitted. • No damage and/or removal/trapping/snaring of indigenous plant or animal species for cooking and other purposes will be allowed. • All areas to be affected by the project activities will be rehabilitated by indigenous vegetation.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

CONSTRUCTION PHASE						
Potential Impact		Mitigation				
Disturbance to animals		• Animals residing within the designated area shall not be unnecessarily disturbed. • During construction, refresher training should be conducted to construction workers with regards to littering and poaching. • The Contractor and his/her employees shall not bring any domestic animals onto site. • Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding dangerous animals such as snakes. Information regarding snake handlers in the region should be displaced on construction camp walls.				
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

POST CONSTRUCTION PHASE	
Potential Impact	Mitigation
Loss of habitat due to construction activities	• Indigenous plants naturally growing within the project area, but that would be otherwise destroyed during clearing for development purposes, should be incorporated into rehabilitation areas. • All areas to be affected by the project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at an approved landfill site. All waste and construction material must be removed post construction prior to rehabilitation. • When rehabilitating the construction footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated or improved, so that faunal species that were displaced by vegetation clearing and construction activities are able to recolonize the rehabilitated area. • As much vegetation growth as possible should be promoted within the servitude in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use same species of indigenous plant species which were destroyed (in the same densities) during construction activities as the first choice during landscaping. In terms of the percentage of coverage required during rehab and also the grass mix to be used for rehab, the EMPr will be consulted for guidance. However, the plant material to be used for rehabilitation should be similar to what is found in the surrounding area. • Replace topsoil to the same location it was removed. Do not mix topsoil between different areas with different species composition. • Clear the area of all waste (including inert waste) and contaminated soil in preparation for rehabilitation.

POST CONSTRUCTION PHASE						
Potential Impact	Mitigation					
	• Scarify to loosen compacted soil.					
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

OPERATIONAL PHASE						
Potential Impact	Mitigation					
Disturbance of faunal species	• Animals residing within the designated area shall not be unnecessarily disturbed. • When accessing the pipeline servitude, vehicles are to utilise the existing roads. • Ensure that no unnecessary clearing of faunal habitat occurs. • No hunting/trapping/snaring or collecting of faunal species is allowed. • No fires by maintenance personnel are allowed. • Following heavy rains, access roads and areas of disturbance are to be inspected for signs of erosion, which, if found, must be immediately rectified through appropriate erosion control measures.					
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Medium-term	Almost certain	2
With Mitigation	Nature	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

<table>
<tr><th colspan="7">OPERATIONAL PHASE</th></tr>
<tr><td>Potential Impact</td><td colspan="6">Mitigation</td></tr>
<tr><td>Loss and/or degradation of floral habitat</td><td colspan="6">• All alien seedlings and saplings must be removed as they become evident for the duration of operational phase.
• Manual / mechanical removal is preferred to chemical control.
• Prevent contamination of natural vegetation by any pollution.
• All waste generated will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site.
• No waste may be left on site after maintenance visits have been completed.
• During maintenance works where excavations are made, the following must be undertaken:
o Topsoil must be stripped to depth of 150mm and stored separately to subsoil and spoil;
o Maintenance work footprint must be kept to a minimum;
o Soil should be returned in the same order it was removed, ending with topsoil;
o The affected areas must be monitored and alien vegetation removed and erosion remediated.
• As much vegetation growth as possible should be promoted post construction activities within the project area in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during rehabilitation. The plant material to be used for rehabilitation should be similar to what is found in the surrounding area.
• Entire footprint of area affected by operation and maintenance activities to be reinstated and rehabilitated.
• Incorporate findings of specialists from walk-down survey (if applicable).
• Seedling of many invasive plants appear all the time after construction and when they appear, they must be pulled out as soon as possible to eliminate costly tree felling at a later stage. It is easier to remove seedlings when the soil is moist.
• Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.</td></tr>
<tr><td>Without Mitigation</td><td>Status</td><td>Extent</td><td>Magnitude</td><td>Duration</td><td>Probability</td><td>Significance</td></tr>
<tr><td></td><td>Negative</td><td>Local</td><td>Medium</td><td>Medium-term</td><td>Almost certain</td><td>2</td></tr>
<tr><td>With Mitigation</td><td>Nature</td><td>Extent</td><td>Magnitude</td><td>Duration</td><td>Probability</td><td>Significance</td></tr>
<tr><td></td><td>Negative</td><td>Local</td><td>Low</td><td>Short-term</td><td>Likely</td><td>1</td></tr>
</table>

19.9 Socio-Economic Environment

19.9.1 Potential Impacts

The findings from the Socio-Economic Impact Assessment (refer to **Appendix H6**) follow.

Table 39 below presents an overview of the impacts associated with aspects during the various stages of the project.

Table 39: Table outlining activity, aspects and impacts of the project

Activity	Aspect	Potential Impact
Land Acquisition and Servitude Rights Acquisition	Land Acquisition	Partial loss of livelihood on the part of landowners Reduced access to healthcare services in Olifantshoek
	Servitude Rights	Reduced access to land/structures – all structures located in the servitude. Structures identified as part of this study are: Postmasburg dwelling, The Ranch, Langeberg Stene and Olifantshoek Cemetery
Construction Phase	Access into properties	Damage to property or equipment
		Damage or wear to access roads
		Improvement of access in the project area
		Security concerns
	Trenching and pipe laying	Proximity to construction work and associated
		Employment of local people and SMME's
		Sourcing of equipment, machinery and services locally
	Earthworks and roadworks	Noise
		Dust
	Concrete and civil works	Noise
		Influx of workers
		Employment of local labour and SMME's
		Sourcing of equipment, machinery and services locally
		Temporary road closures
		Increased traffic
		Temporary closures to affected some properties
	Transport of goods to site and employment of staff	Increased traffic
		Security concerns
		Improved access to amenities
	Mechanical and Electrical works	Noise
		Employment of local people
		Sourcing of equipment, machinery and services locally
	Rehabilitation	Damage or wear to access roads
		Security concerns

19.9.2 Impact Assessment

The findings from the Socio-Economic Impact Assessment (refer to **Appendix H6**) follow.

19.9.2.1 Providing Additional, Secured Water Supply

Environmental Feature	Impacts Created by Providing a Secure, Sufficient Water Supply					
Project life-cycle	Operational Phase					
Potential Impact	**Proposed Management Objectives / Mitigation Measures**					
Economic	• Increased productivity; • Increased education levels; • More flexible economy.					
Social Benefits	• Reduces disease burden; • Reduced food security challenges in affected community; • Reduced drought stress.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Likely	3
After Mitigation	Positive	Regional	High	Long Term	Likely	3
Significance of Impact and Preferred Alternatives	Mitigation is not necessary for this positive impact. This mitigation measure does not influence the alternatives considered in the study.					

19.9.2.2 Land Acquisition and Servitude Rights Acquisition

Environmental Feature	Impact owing to Land and Rights Acquisition					
Relevant Alternatives & Activities	Assertion of servitude rights					
Project life-cycle	Pre-construction					
Potential Impact	**Proposed Management Objectives / Mitigation Measures**					
Loss of value owing to assertion of servitude rights	• Where structures have been legally erected and are on the route of the pipeline, all negotiations and payments relating to compensating affected landowners should be conducted and concluded before construction begins. Structures so affected and identified in this report are: o Postmasburg dwelling; o The Ranch; o Langeberg Stene; and o possibly the Olifantshoek Cemetery					
Loss of Olifantshoek Health Care Centre	• The pipeline should be routed around this community facility					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Regional	Medium	Medium term	Likely	3
After Mitigation	Negative	Local	Medium	Medium term	Likely	1
Significance of Impact and Preferred Alternatives	The routing of the main pipeline is the primary mitigation measure for the Olifantshoek Health Care Centre. Legally erected structures impinging on the pipeline route should be compensated for.					

19.9.2.3 Impacts during the Construction Phase

Environmental Feature	Economic opportunities arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
SMME Creation	• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.
Job Creation and Skills Development	• The main contractor should employ non-core labour from the sub-places as far as possible during the construction phase. • The principles of Expanded Public Works Programme can be used during construction.
Indirect Employment Impacts	• Spaza shops may open next to the site as a consequence of construction. These should be controlled by the contractor to limit their footprint and to ensure that the Local Municipality – Informal Trading By-Laws, are complied with.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Local	Medium	Short Term	Likely	1
After Mitigation	Positive	Local	Low	Short Term	Likely	3
Significance of Impact and Preferred Alternatives	Those who will benefit during the construction is limited to those who actively participate in the construction activity through employment, sub-contracting or other economic opportunities. Active participation should be encouraged.					

Environmental Feature	Short-term disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Traffic	• Ensure that the necessary signage and traffic measures are implemented for safe and convenient access to the site. • The EMPr must include restrictions on the Contractor and its sub-contractors related to minimising impacts on the safety of road users. Restrictions should include appropriate speed limitations, restricting travel times to daylight hours, communication measures and the establishment of haul routes. • Measures must be put in place to prevent construction vehicles from entraining dirt onto public roads.
Local Road Condition	• A condition survey of the local roads to be used during the construction phase should be made prior to construction • Haul and delivery routes should be defined and adhered to during the construction phase. • Maintenance of local roads should take place during the construction phase to ensure that the local roads used by the contractor are left in the same or better condition than they were prior to the start of construction.
Increase in Dust	• Dust and disturbance can be mitigated through the use of appropriate dust suppression mechanisms. This is especially the case when working near the Maremane settlement, the poultry farm south west of Groenwater, the ULCO and Lime Acres Aerodromes • Mitigation measures management should be adhered to according to the relevant specialist studies.
Influx of workers	• All employment of locally sourced labour should be controlled on a contractual basis. If possible, and if the relevant Ward

Environmental Feature	Short-term disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
	Councillors deem it necessary, the employment process should include the affected Ward Councillors. • People in search of work may move into the area, however, the project will create a limited number of job opportunities. Locally based people should be given an opportunity. • No staff accommodation should be allowed on site.
Worker Health and Safety	• The provisions of the OHS Act 85 of 1993 and the Construction Regulations of 2014 should be implemented on all sites. • Account should be taken of the safety impacts on the local community when carrying out the longitudinal aspects of the project, such as the pipelines. • Contractors should establish HIV/AIDs awareness programmes at their site camps.
Security	• During construction, the working faces should be fenced to prevent trespassing and expansion of the working footprint. • In preparation for the operations phase, each landowner should be given the choice between having the stretch of pipeline within his/her property fenced. • All contractors' staff should be easily identifiable through their uniforms. • A security policy should be developed which amongst others requires that permission be obtained prior to entering any property and provisions controlling trespassing by contractor staff. • No staff, apart from security staff, should be allowed to reside at contractor camps. • Contractors should establish a crime awareness programmes at their site camps.
Noise impacts	• Prior notice should be given to surrounding communities of blasting events; • Construction work should take place during working hours – defined as 07h00 to 17h00 on weekdays and 07h00 to 14h00 on Saturdays. Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place.
Damage to property	• If a risk existing of damage taking place on a property as a result of construction, a condition survey should be undertaken prior to construction • The contractor is to make good any damage that occurs on any property as a result of construction work • Where livestock are lost/stolen and there is a reasonable apprehension that the contractor was responsible, compensation is to be paid to the farmer for the loss.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances during the construction phase can be successfully mitigated through contractor specifications issued at tender stage and through monitoring of contractor performance during the construction phase. Negative impacts owing to the construction will be experienced irrespective of the site.					

19.10 Agriculture

19.10.1 Potential Impacts

The impact on agriculture has three components, namely:

- The replacement of infrastructure;
- Loss of income in cases where the farming opportunity is lost or reduced in size; and
- The temporary loss of income during the period of construction.

The farm infrastructure impacted by the proposed development is mainly buildings in the proximity of the route, cattle watering facilities and poultry housing (refer to **Section 17.5.3**, **Figure 60**).

The project entails the upgrading of existing infrastructure within an existing servitude. The impact will, therefore, be of a temporary nature and will last for the duration of construction or the time the land takes to recover to its natural state. Pending rainfall patterns, the period for the land to recover is expected to be less than two years. The fenced area of pumping and storage infrastructure will remain the same and is now not used for farming purposes. There will, therefore be no impact on farming.

19.10.2 Impact Assessment

A summary of the impacts as provided in the Agricultural Impact Assessment (see **Appendix H1**) is presented in **Table 40**.

Table 40: Agricultural Impact Assessment (Index, 2019)

	Potential impact	Proposed Management Objectives / Mitigation Measures	Extent	Magnitude	Duration	Probability	Significance	Area lost (ha)
	1. PIPELINES (UPGRADING OF THE VAAL GAMAGARA REGIONAL WATER SUPPLY SCHEME PHASE 2)							
1.1	**Loss of high potential arable land**							
	Before mitigation	Temporary loss of irrigated land.	Local	Low	Temporary	Certain	Low	1,34ha
	After mitigation	Keep the area that is used by construction vehicles as small as possible, or use the side of the construction buffer that will lead to the least disturbance.	Local	Low	Temporary	Certain	Remote	1,34ha
1.2	**Loss of cultivated land**							
	Before mitigation	Temporary loss of irrigated land.	Local	Low	Temporary	Certain	Low	1,34ha
	After mitigation	Keep the area that is used by construction vehicles as small as possible, or use the side of the construction buffer that will lead to the least disturbance.	Local	Low	Temporary	Certain		1,34ha
1.3	**Loss of grazing land**							
	Before mitigation	Temporary loss of grazing land	Local	Low	Temporary	Certain	Low	1 044 ha
	After mitigation	Keep the construction period as short as possible.	Local	Low	Temporary	Certain	Low	1 044 ha
1.4	**Loss of agricultural production**							
	Before mitigation	Temporary loss of irrigated fodder on 1,3ha	Local	Low	Temporary	Certain	Low	<5t of feed
		Loss of grazing land. The loss will be for one production season.	Local	Low	Temporary	Certain	Low	67 LSU
	After mitigation	Loss of irrigated land Keep the area that is used by construction vehicles as small as possible, or use the side of the construction buffer that will lead to the least disturbance.	Local	Low	Temporary	Certain	Remote	Winter feed
		Grazing land Keep the construction period as short as possible. Employ dust-reducing practices to protect adjoining grazing land.	Local	Low	Temporary	Certain	Low	67 LSU

	Potential impact	Proposed Management Objectives / Mitigation Measures	Extent	Magnitude	Duration	Probability	Significance	Area lost (ha)
	2. PUMP AND STORAGE INFRASTRUCTURE							
2.1	**Loss of high potential arable land**	No impact						
2.2	**Loss of cultivated land**	No impact						
2.3	**Loss of grazing land**	No impact						
2.4	**Loss of agricultural production**	No impact						
	3. LOSS OF FARMING INFRASTRUCTURE							
4.1	**Loss of high potential arable land**	No impact						
4.2	**Loss of cultivated land**	No impact						
4.3	**Loss of grazing land**	No impact						
4.4	**Loss of agricultural production**	No impact						
4.5	**Loss of agricultural infrastructure**	No impact						
	5. INDIRECT IMPACT OF DEVELOPMENT							
5.1	**Loss of high potential arable land**	No impact						
5.2	**Loss of cultivated land**	No impact						
5.3	**Loss of grazing land**	No impact						
5.4	**Loss of agricultural production**							
	Before mitigation	Loss of poultry production due to noise during construction	Local	Low	Temporarily	Possible	Low	
	After mitigation	Coordinate all potential very noisy activities (like blasting) with the farmer to reduce noise where poultry is produced.	Local	Low	Temporarily	Possible	Low	
	6. Biological							
6.1	**Loss of high potential arable land**	No impact						
6.2	**Loss of cultivated land**	No impact						
6.3	**Loss of grazing land**	No impact						
6.4	**Loss of agricultural production**	No impact						

19.11 Air Quality

19.11.1 Potential Impacts

Sensitive receptors to dust and other air quality impacts in the study area include farm dwellings, surrounding towns and settlements, as well as livestock and sensitive game species.

Due to the dry nature of the study area, dust will easily be generated during the construction period from various sources, including blasting (if required), trenching, mining and stockpiling activities at the borrow areas, operations at the batching plant(s) and crusher area(s), aggregate stockpiles, use of haul roads and access roads by construction vehicles, transportation of spoil material to and from site, soil stockpiles and general construction activities on site.

Mitigation measures are included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored (dust fallout and particulate matter) and managed and that regulated thresholds are not exceeded. The EMPr also includes measures to control and minimize GHG emissions.

19.11.2 Impact Assessment

Environmental Feature	**Air Quality**
Relevant Alternatives & Activities	**Construction domain of all project infrastructure**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
Excessive dust levels as a result of construction activities	• Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. • Speed limits on site to be strictly adhered to. • The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, and pre-notification of affected parties). • Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust and sensitive receptors.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium	short-term	likely	2
After Mitigation	-	local	low	short-term	likely	1

19.12 Noise

19.12.1 Potential Impacts

Similar to air quality, the sensitive receptors to noise impacts in the study area include farm dwellings, surrounding towns and settlements, as well as livestock and sensitive game species. During the construction phase, localised increases in noise will be caused by blasting, trenching, mining activities at the borrow areas, operations at the batching plant(s) and crusher area(s), construction vehicles on haul roads and access roads, and general construction activities on site. Noise from night-time construction activities will particularly impact on the quality of living of the affected people. Vibration will also be felt close to construction equipment. Noise that emanates from construction activities are addressed through targeted best practices for noise monitoring and management in the EMPr.

Project personnel working on the construction site will experience the greatest potential exposure to the highest levels of noise and vibration. Workplace noise and vibration issues will be managed as part of the Occupational Health and Safety Management System to be employed on site. The proposed pump stations will be operating continuously, however, as they are existing structures in remote areas, it is assumed that no additional noise impacts will be caused.

19.12.2 Impact Assessment

Environmental Feature	**Noise**
Relevant Alternatives & Activities	**Construction domain of all project infrastructure**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
Excessive noise levels as a result of construction activities.	• The provisions of SANS 10103:2008 will apply to all areas within audible distance of residents. • Working hours to be agreed upon with Project Manager, so as to minimise disturbance. • Noise preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to be employed. • Blasting operations, if required, to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. • Survey potentially affected structures prior to and after blasting. • Noise to be monitored. Sampling locations to consider major noise sources and sensitive receptors.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium	short-term	likely	2
After Mitigation	-	local	low	short-term	unlikely	1

19.13 Historical and Cultural Features

19.13.1 Potential Impacts

The project could lead to the destruction of or damage to heritage and cultural features as a result of construction activities. A Phase 1 Heritage Impact Assessment and a Phase 1 Palaeontological Impact Assessment was conducted in accordance with the NHRA. Refer to **Section 17.3.4** and **Section 17.4.4** for the key findings of the assessments.

19.13.2 Impact Assessment

19.13.2.1 Heritage Impact Assessment

The criteria on which significance of impacts was based are explained in the Heritage Impact Assessment Report. The significance weightings for each potential impact were based on the following scale:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated); and
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Nature:

Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological or other heritage material or object (what affected).

The following assessment refers to impact on physical archaeological/heritage traces.

	Without mitigation	With mitigation
Extent	1	Not needed
Duration	5	Not needed
Magnitude	6	Not needed
Probability	2	Not needed
Significance	22	
Status (positive or negative)	WEAKLY NEGATIVE	But locally low to very low significance

Reversibility	No	
Irreplaceable loss of resources?	Low density and significance	Loss of context but possible to mitigate.
Can impacts be mitigated?	Not needed	Not needed
Mitigation: Not needed at this stage however, note the need for monitoring in environmental management plan recommendations, there is a probability that although highly unlikely in this case; artefacts occur in the subsurface. Other possible occurrences are burials and ostrich eggshell on pottery caches.		
Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur, direct impacts are once-off permanent destructive events. Secondary cumulative impacts may occur with the increase in development and operational activity associated with the life of the proposed development area.		
Residual Impacts: -		

19.13.2.2 Palaeontological Impact Assessment

Only the site will be affected by the proposed development. The expected duration of the impact is assessed as potentially permanent to long term. The impact will most likely happen (moderate to high sensitivity). The magnitude of the impact occurring is medium. There will be an irreversible and irreplaceable loss of fossil heritage. The significance of the impact will be a negative medium impact. Text in red, with an asterisk, in the impact assessment table below represents the impact of the proposed development, as selected by the Palaeontological Specialist.

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity. The Nature of the Impact is the possible destruction of fossil heritage		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site. *
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		

This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence). *
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite. *
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity). *

3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist. *
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources. *
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.

2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects. *
4	High cumulative impact	The impact would result in significant cumulative effects

SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (**Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures. *
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive

19.14 Existing Structures and Infrastructure

19.14.1 Potential Impacts

Potential impacts of the project to existing structures and infrastructure include:

- Disruptions to services may occur as a result of construction activities;

- Disruptions to traffic at road crossings and where pipeline route follows existing road and railway alignments;
- Construction-related disturbances (e.g. noise, dust);
- Permanent access along the pipeline servitude will be required after construction. Following the installation of the pipeline, the servitude can still be utilised by the landowner for certain types of land use, for examples grazing. However, the use of the land covering the servitude will be subject to certain restrictions. In this regard, certain activities will not be permitted such as the planting of trees, excavation over the pipeline, building of structures and installation of services.

As part of the land acquisition process, suitable compensation measures will need to be identified for the affected landowners, and the process will adhere to all statutory requirements.

Refer to **Section 19.9** for impacts associated with existing structures/infrastructure directly and adjacently affected by the proposed development, which was assessed as part of the Socio-Economic Impact Assessment (**Appendix H6**).

19.14.2 Impact Assessment

Environmental Feature	**Existing Structures and Infrastructure**
Relevant Alternatives & Activities	**All construction activities that affect existing structures and infrastructure**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruption of existing services. • Relocation of infrastructure.	• Identify and record existing services and infrastructure. • Conform to requirements of relevant service providers and infrastructure custodians (e.g. Transnet, Department of Roads and Public Works, Openserve, Eskom, Telkom, DMs and LMs, etc.). • Implement cathodic protection and AC mitigation measures, where necessary. • Ensure access to infrastructure is available to service providers at all times. • Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site. • Notify landowners of any disruptions to essential services. • Deviate landowners' existing services (e.g. reticulation), where possible, to accommodate construction activities. • Adequate reinstatement and rehabilitation of affected environment.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	medium - term	almost certain	3
After Mitigation	-	local	low	short-term	moderate	1

19.15 Traffic

19.15.1 Potential Impacts

The proposed replacement of the sections of pipelines will take place within the existing servitude (approximately 10 m – 15 m wide). It is anticipated that the construction servitude will be 40 m wide and the permanent servitude will thus need to be widened temporarily. The existing pipeline mostly follows existing linear infrastructure (including roads and a railway line) as well as boundaries between properties, which are associated with existing disturbance to minimise the fragmentation of the receiving environment.

Permanent access roads will be required for the operational phase, whereas temporary access and haul roads will need to be created for construction purposes. Existing roads will be used, as far as possible, including R370 (Delportshoop), R31 (from Delportshoop to Koopmansfontein), R385 (from D3381 to Postmasburg), R325 (from Postmasburg to N14) and N14 (from R325 to Olifantshoek).

During the construction period there will be a significant increase in traffic on the local road networks, due to the delivery of plant and material, transportation of staff and normal construction-related traffic. Haul roads and access roads will also be created on site, within the construction domain. As part of the construction phase measures will be implemented for the selective upgrade of the roads (if necessary) and to render these roads safe for other users (amongst others). Dust suppression on the access and haul roads will also be addressed. Traffic management measures are included in the EMPr.

During the operational phase, the access road within the permanent servitude will be utilised as part of routine maintenance.

19.15.2 Impact Assessment

Environmental Feature	**Traffic and Access**
Relevant Alternatives & Activities	**All construction activities that may affect existing road networks**
Project life-cycle	**Construction**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruptions to existing road users. • Safety risks. • Crossing of main roads during construction. • Increase in dust levels. • Use of road network by construction vehicles.	• Determine and document the road conditions of the main and secondary roads (R370, R31, R385, R325, N14 and D3381) as well as all private access roads that will be affected by construction traffic, as relevant. Maintain adequate road conditions. • Obtain the necessary approval for road upgrades, pipe-jacking and wayleave for road construction from the relevant road authorities (Northern Cape Department of Roads and Public Works), as applicable. • Clearly demarcate all construction access roads.

	• Proper access control is to be maintained to prevent livestock / game from accessing construction areas, as well as for any other unauthorised access. • Strict adherence to speed limits by construction vehicles on public roads and access roads. Appropriate speed limits need to be posted on all access roads according to the geometric design and limitations of heavy vehicles. • The access roads need to provide sufficient width for heavy vehicles to navigate around curves in the road. • When construction vehicles are required to cross provincial and district roads (as relevant) appropriate safety and traffic calming measures need to be in place. This will include flag men, speed reductions and warning signage.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	short-term	almost certain	3
After Mitigation	-	local	low	short-term	moderate	1

19.16 Aesthetic Qualities

19.16.1 Potential Impacts

Potential visual impacts during the construction phase include:

- Clearing of vegetation;
- Construction-related activities;
- Light pollution;
- Inadequate waste management and housekeeping; and
- Inadequate reinstatement and rehabilitation of construction footprint.

Potential visual impacts during the operational phase include:

- Loss of “sense of place” to dwellings in close proximity to servitude;
- Section of cleared vegetation along servitude;
- Light pollution; and
- Inadequate reinstatement and rehabilitation of construction footprint.

19.16.2 Impact Assessment

Environmental Feature	**Aesthetic Qualities**
Relevant Alternatives & Activities	**Construction domain of all project infrastructure**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**

Reduction of visual quality of receiving environment.	• Lighting must not constitute an eyesore / hazard to users of the road and the surrounding community. • Lighting will be sufficient to ensure security but will not constitute 'light pollution' to the surrounding areas. • The site will be shielded / screened to minimise the visual impact, where practicable. • Development designs to compliment the natural surroundings in order to preserve a sense of place, where practicable. • On-going housekeeping to maintain a tidy construction area. • After the construction phase, the areas disturbed that are not earmarked for operational purposes (part of infrastructure footprint) must be suitably rehabilitated.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	short-term to permanent	almost certain	3
After Mitigation	-	local	low	short-term	moderate	1

19.17 "No-Go" Option

19.17.1 Potential Impacts

Should the proposed project not go ahead, any potentially significant environmental issues associated with the project (refer to **Section 19**) would be irrelevant and the status quo of the local receiving environment would not be affected by the project-related activities. The objectives of the project would, however, not be met and the current VGRWSS will not be able to supply the full design capacity (due to the pipeline's deteriorated condition) or be able to accommodate the increase in the demand of water supply.

The "no go option" needs to be considered in light of the motivation (see **Section 3**) as well as the need and desirability (see **Section 11**) of the proposed VGRWSS-II.

The "no-go option" (i.e. should the project not proceed) will have the following implications:

- The original Vaal Gamagara Scheme was constructed during 1968 and extended in 1976 and therefore the majority of the assets are approximately 35 years old and older. As a result the infrastructure not yet replaced are generally old and are operating over or very near to the expected useful life;
- Due to the aging pipeline infrastructure, pipe bursts and leaks along the pipeline route occur often; and
- Since the demand of the scheme is projected to increase substantially, the demand of the water supply to users will not be met as the current infrastructure will not be able to accommodate the increase in demand, thus suppressing economic growth.

19.17.2 Impact Assessment

Environmental Feature	"No-Go" Option
Relevant Alternatives & Activities	**All project infrastructure**
Project life-cycle	**All Phases of Project Life-Cycle**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Unreliable water supply due to aging infrastructure and pipe bursts/leaks; • Demand of scheme's water supply will not be met, suppressing micro and macro-economic growth. • No local labour/SMME employment during construction.	• Upgrading of the existing scheme to ensure that the water demand is satisfied. • Conducting regular inspections and maintenance checks on pipeline and associated water supply infrastructure.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	regional	high	Long-term	almost certain	3
After Mitigation	+	regional	high	Long-term	almost certain	3

19.18 Cumulative Impacts

A cumulative impact, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Cumulative impacts can be identified by combining the potential environmental implications of the proposed project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

The following potential cumulative impacts are associated with the project:

- The construction period may cause traffic-related impacts in terms of the local road network, which will be associated with heavy vehicle construction traffic for the delivery of material, transportation of construction workers and general construction-related traffic. This may compound traffic impacts if other large scale projects are planned during the same period. The EMPr includes mitigation measures to manage traffic-related impacts;

- There will be an increase in the dust levels during the construction phase, as a result of earthworks, use of haul roads and other gravel roads, stockpiles, material crushing, etc. Measures to manage dust are included in the EMPr;
- Land clearing activities and other construction-related disturbances could lead to the cumulative loss of natural vegetation as well as the proliferation of exotic vegetation. The EMPr includes mitigation measures provided by the Terrestrial Ecological Impact Assessment to manage impacts to flora;
- Construction activities on steep slopes that are already disturbed can contribute towards erosion, if proper reinstatement and rehabilitation is not undertaken. Mitigation measures for erosion protection are included in the EMPr;
- As the project entails the proposed upgrading of an existing pipeline that follows other linear infrastructure (roads and railway line), the overall width of the 'industrial corridor' will be temporarily enlarged during construction;
- During the operation of the scheme, the improvement of water supply to the users within the region will sustain / enable future developments, growth and influx of people. This will place a strain on the existing infrastructure of the major towns within the region (i.e. Danielskuil, Lime Acres, Postmasburg and Olifantshoek). Interventions to ensure that the existing infrastructure can accommodate the growth and increase in population, will need to form part of municipal planning, which includes IDPs and SDFs; and
- Improvement of water supply to users, will improve the socio-economic conditions for local residents, businesses and SMME's. The basic service delivery of the local municipalities will be improved.

20 ANALYSIS OF ALTERNATIVES

By conducting a comparative analysis of alternatives, the Best Practicable Environmental Option (BPEO) can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that "provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term".

As discussed in **Section 6**, the proposed project entails the upgrading of an existing scheme and the only alternatives that were thus considered were the preferred option (discussed in **Section 5.2**) and the no-go/do nothing option.

Refer to **Section 19.17** for the implications associated with the "no-go" option.

The BPEO for the VGRWSS-II: Upgrade of the Existing Scheme was determined to be the current proposed route (adjacent to the existing pipeline sections).

21 CONCLUSIONS AND RECOMMENDATIONS

21.1 Sensitive Environmental Features

The following sensitive environmental features and aspects that are associated with the project are highlighted (refer to **Figure 65 – 69**), for which mitigation measures are included in the BAR and EMPr:

- All watercourses situated within the project area, including the Vaal River, Steenbok River, Klein Riet River, Groenwaterspruit and Olifantsloop and their tributaries, as well as all wetlands and pans, are regarded as sensitive and require suitable protection from the construction and operational activities. All activities of the project life-cycle shall comply with the NWA, as well as the mitigation measures identified as part of the Wetland and Aquatic Impact Assessment.
- Heritage and archaeological sites, as identified through the Heritage Impact Assessment, that are situated in relative close proximity to the project infrastructure, are protected in terms of the NHRA and shall be suitably safeguarded. The specialist indicated that graves were found at two localities close to the proposed route, the first at 28^0 23' 35.8"S; 24^0 16' 13.2" E which is approximately 45 meters from the new proposed route, at a turn pipe near an open valve. The second was at 28^0 17' 34.0" S; $23^0$20' 26.3" E, an old cemetery, which lies beyond the proposed route, but noted here for precautionary measures to be put in place. Under NHRA 25 (1999) a permit is required to remove or destroy a grave or headstone marker outside a formal cemetery. A buffer of at least 30 m is recommended, with fencing to protect such graves.
- Flora and fauna species of conservation concern that are known to naturally occur in certain areas of the project footprint were identified during the Terrestrial Ecological Impact Assessment. The proposed pipeline also traverses CBA 1, CBA 2, ESAs and other natural areas. All project activities that may impact on species of conservation concern shall comply with NEM:BA (and associated Regulations), National Forest Act (Act No. 84 of 1998), Northern Cape Conservation Act (Act No. 9 of 2009), as well as the mitigation measures identified as part of the Terrestrial Ecological Impact Assessment.
- The dominant land use in the study area is animal grazing. Irrigated land is situated at Ulco and is a maximum of 1,3 hectares. There is an uncultivated strip of 25m between the pipeline and the irrigated lands and construction vehicles shall remain in this strip to prevent impacts to the irrigated land. Agricultural / farming infrastructure types, such as buildings, poultry, reservoirs and dams are located in close proximity to the pipeline construction servitude. Specific mitigation measures for managing impacts to farming practices are provided in the Agricultural Impact Assessment, which shall be adhered to.
- Specific measures shall be implemented to prevent erosion at all steep areas, such as the low mountains encountered from Lime Acres to Postmasburg, and to avoid or minimise impacts to koppies that occur at the end of the pipeline route, near the Olifantshoek reservoir in Olifantshoek.

- The safety and security of the public is of paramount importance and shall not be compromised by the activities associated with the construction and operational phases.
- Measures provided in the EMPr shall be implemented to safeguard all traffic and pedestrians on the public and private roads.
- All existing infrastructure and structures along the proposed pipeline shall be safeguarded from construction activities until they have been relocated, where avoidance is not possible. This shall take place in consultation with the owners or custodians of the infrastructure.

21.2 Environmental Impact Statement

Based on the feasibility studies undertaken, the upgrading of the VGRWSS-II was determined as the best option to rehabilitate and increase the capacity of the scheme to cater for increased water demands.

Mitigation measures are included in the EMPr, based on the findings of all the specialist studies and environmental best practices, to address the impacts associated with the proposed infrastructure to the receiving environment. The proposed project entails the replacement of sections of pipelines which will take place within the existing servitude. It is anticipated that the construction servitude will be 40 m wide and the permanent servitude will thus need to be widened temporarily. To further minimise impacts, the proposed route is also aligned to follow existing linear-type infrastructure, such as roads (main and dirt roads), the railway line and existing farm boundaries.

The study area for the EIA included at least an 80 m corridor (i.e. 40 m on either side of the centre line) for the pipeline, which allows for possible deviations from the proposed alignment within this corridor during the design phase (e.g. avoidance of sensitive features, if possible).

Critical environmental activities that need to be executed during the project life-cycle include the following:

- Pre-construction Phase –
  - Diligent compliance monitoring of the EMPr, Environmental Authorisation, General Authorisation, Water Use Licence and other relevant environmental legislation;
  - Develop Environmental Monitoring Programme (air quality, water quality, noise, traffic, social) – determine environmental baseline;
  - A walk-down survey be undertaken prior to the start of the construction activities in order to survey the construction servitude in detail for any Red Data Listed species and protected species, and also to propose mitigation measures to limit the impacts imposed by the proposed development activities within the project area. The walk-down survey should preferably be undertaken during the summer season in order to have a higher probability of detecting species of special concern.
  - Obtain permits for species of conservation concern situated within the conservation servitude, as required;
  - Obtain permits if heritage resources are to be impacted;

- On-going consultation with IAPs.

❖ Construction Phase –

- Diligent compliance monitoring of the EMPr, Environmental Authorisation, General Authorisation, Water Use Licence and other relevant environmental legislation;
- Ongoing search, rescue and relocation of red data, protected and endangered species, heritage resources and graves (based on area of influence of the construction activities) – obtain the relevant permits for impacts to protected environmental features;
- Implement Environmental Monitoring Programme (air quality, water quality, noise, traffic, social);
- Reinstatement and rehabilitation of construction domain (as necessary); and
- On-going consultation with IAPs.

❖ Operational Phase –

- Monitoring Programmes (including erosion, invasive alien species and servitude encroachments);
- On-going consultation with IAPs; and
- Routine maintenance and inspections of the infrastructure.

With the adoption of the mitigation measures included in this report and specialist studies, and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

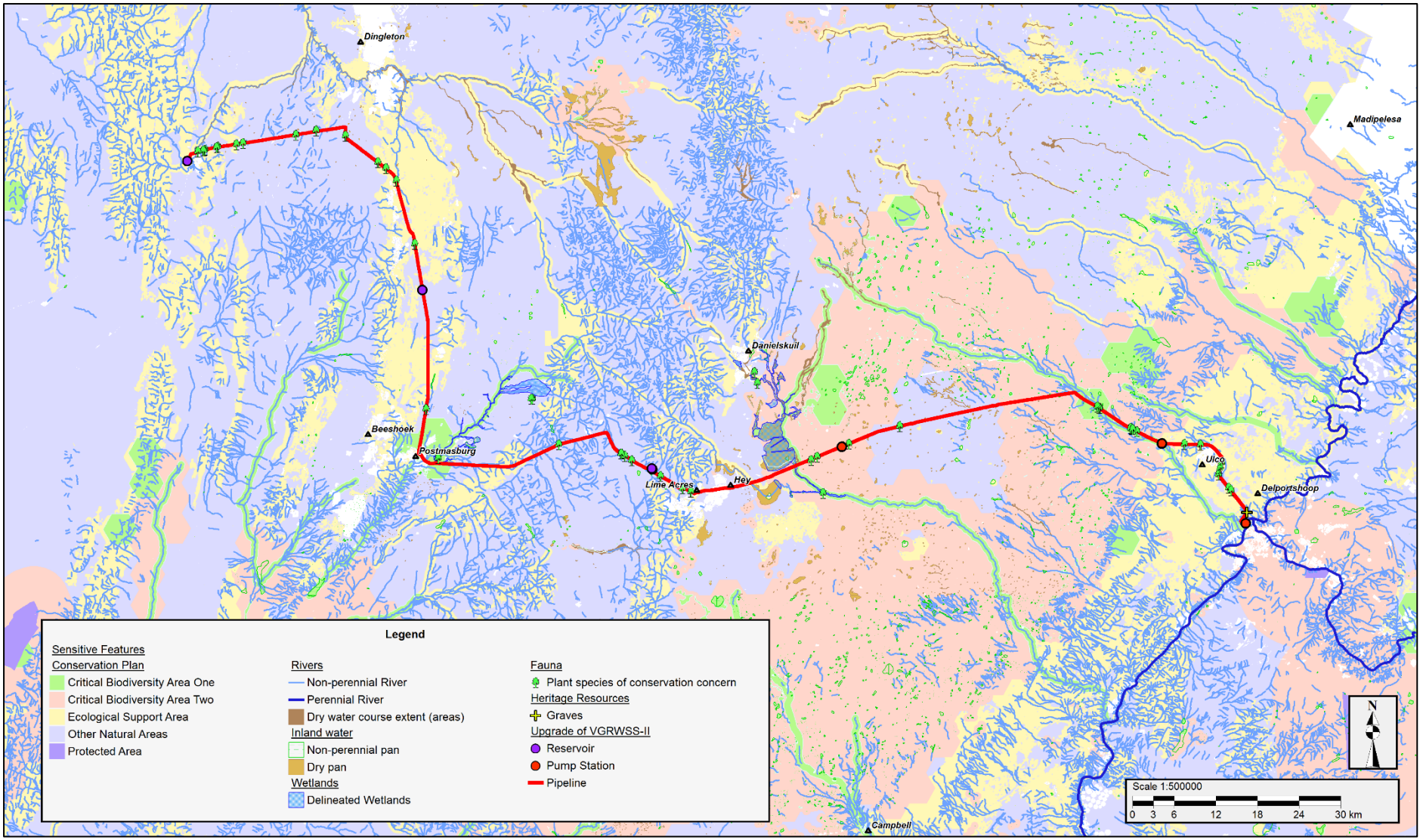


Figure 65: Overall Sensitivity Map

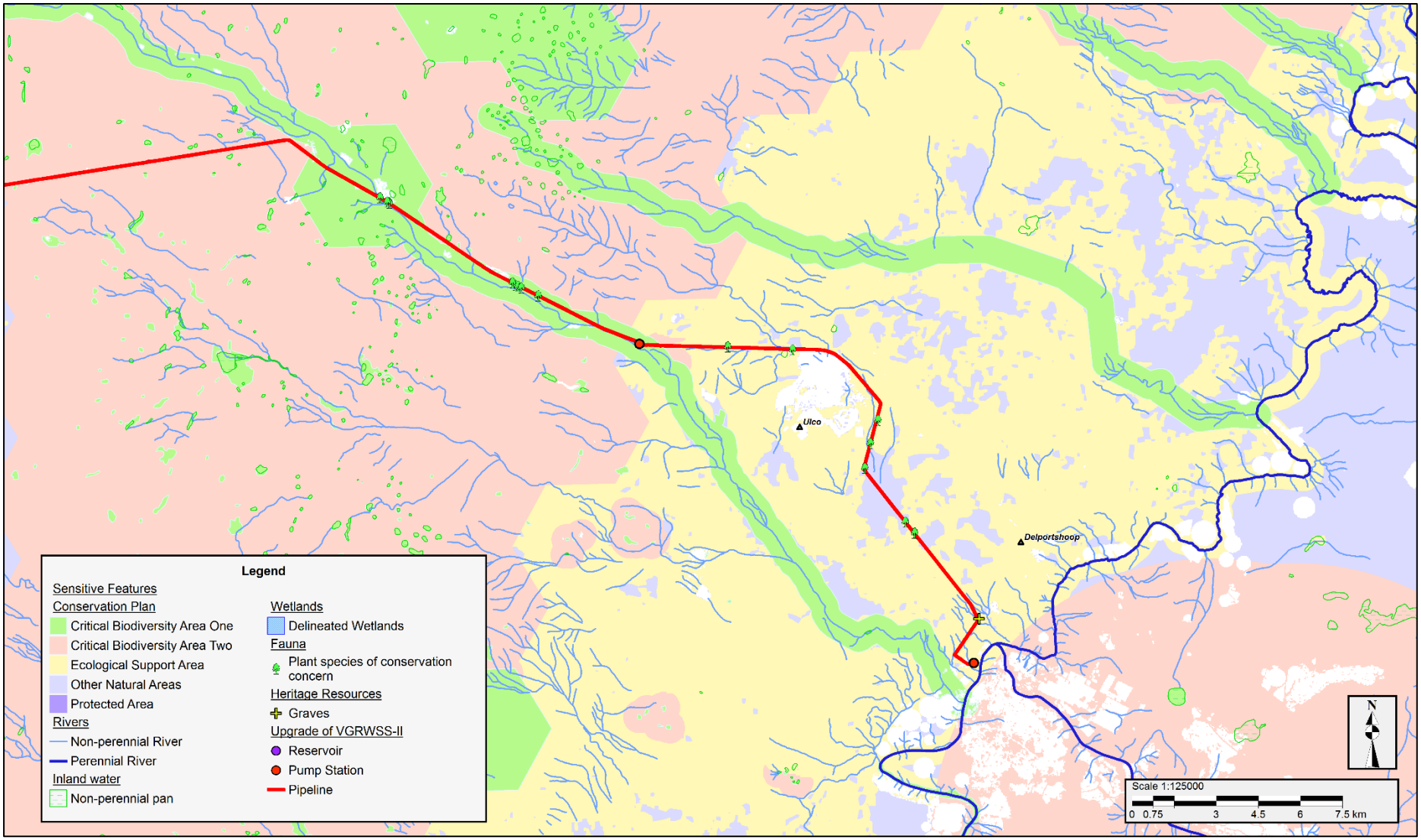


Figure 66: Sensitivity Map – Section 1 (Delportshoop)

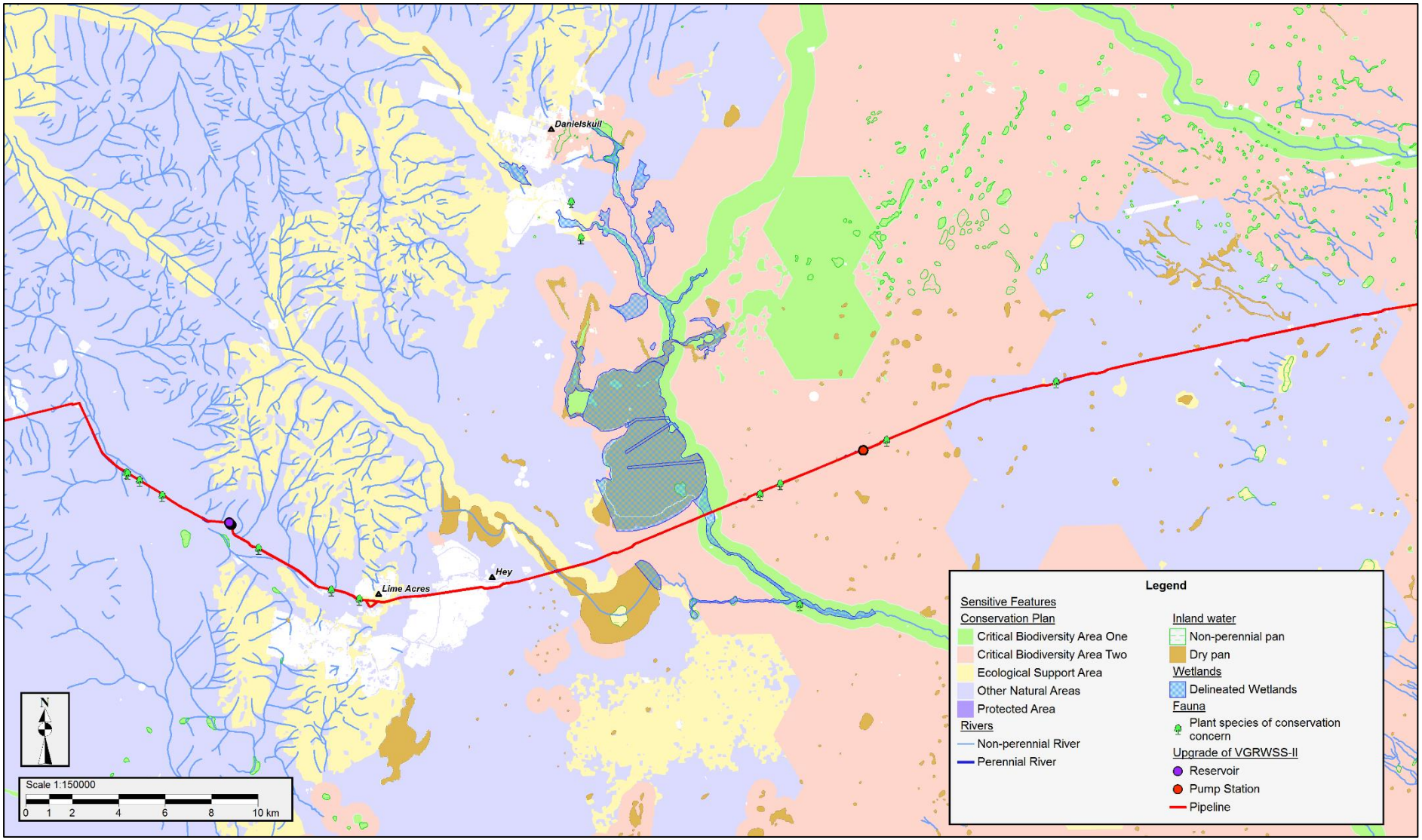


Figure 67: Sensitivity Map – Section 2 (Danielskuil/Lime Acres)

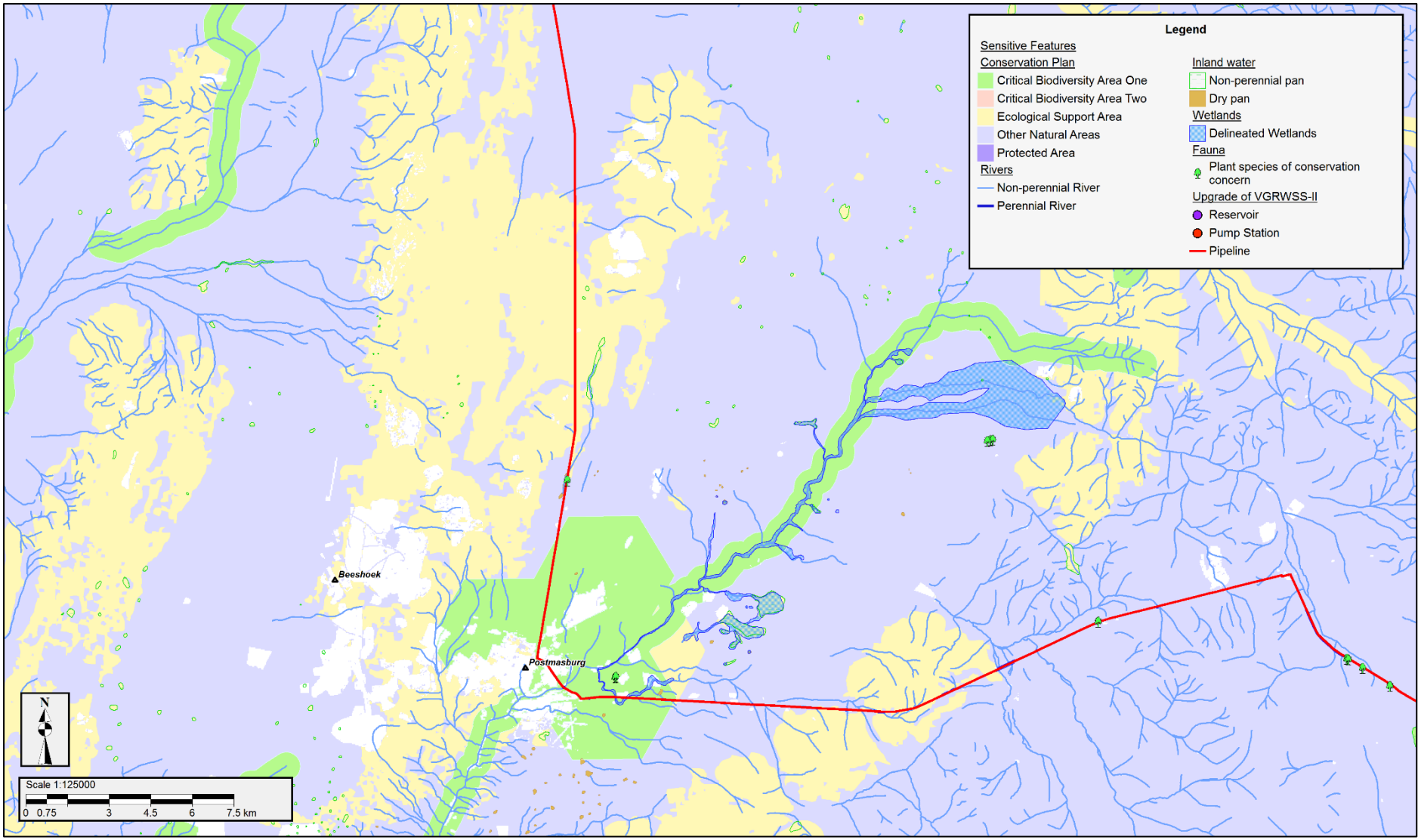


Figure 68: Sensitivity Map – Section 3 (Postmasburg)

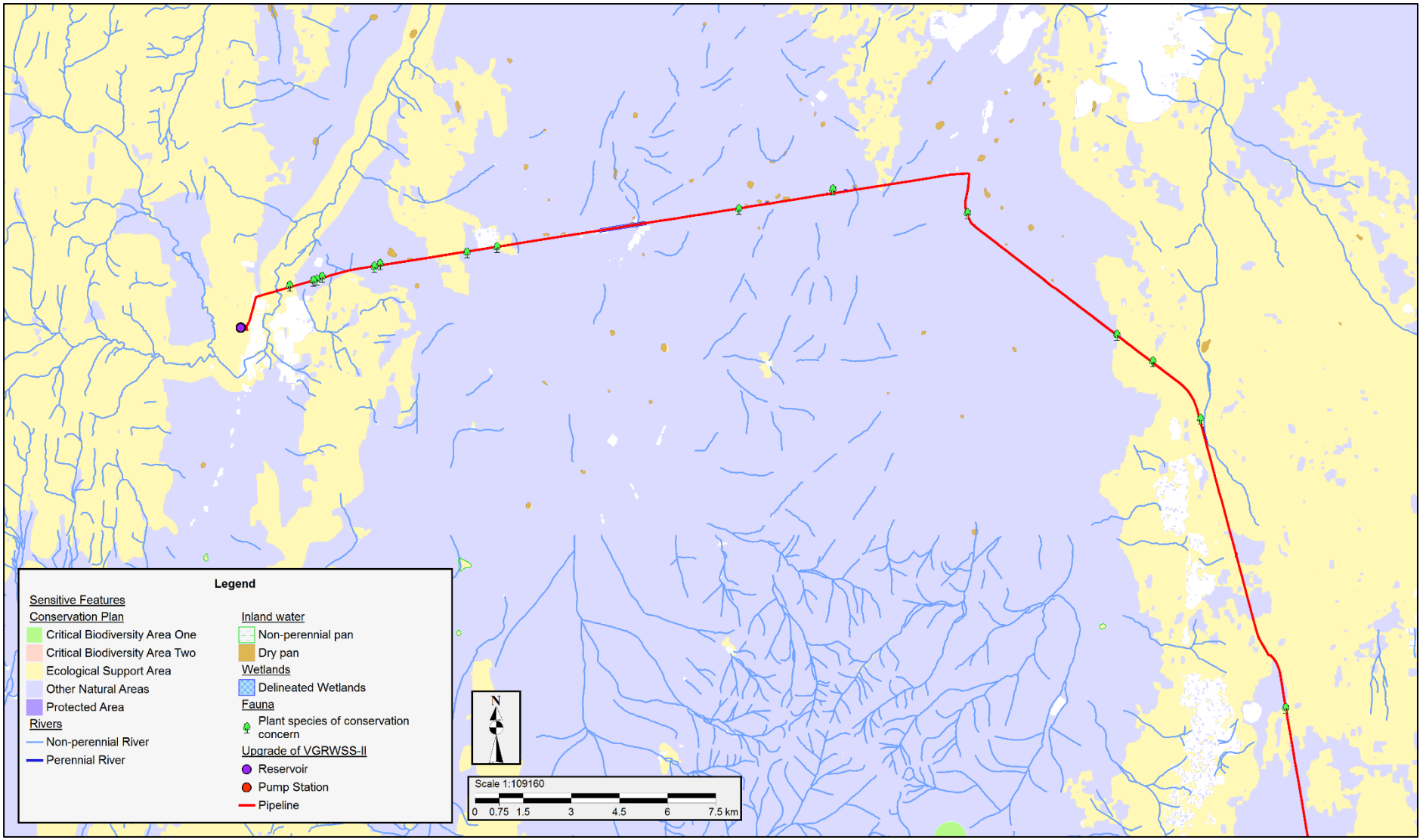


Figure 69: Sensitivity Map – Section 4 (Olifantshoek)

21.3 Recommendations

The following key recommendations, which may also influence the conditions of the Environmental Authorisation (where relevant), accompany the BAR for the proposed VGRWSS-II: Upgrade of the Existing Scheme –

1. Conduct environmental sensitivity walk through survey of entire project footprint prior to construction. Survey team to include the following specialists –
   a. Terrestrial ecologist;
   b. Aquatic ecologist; and
   c. Heritage specialist.
2. Specific attention will need to be paid to managing impacts to road users for all public roads and private roads. Traffic monitoring programme to be implemented and roads to be maintained. Safety of road users to be ensured at all times through appropriate safety and traffic calming measures.
3. Properties may not be accessed for construction purposes unless a construction servitude has been registered.
4. The land acquisition and compensation process needs to adhere to all legal requirements, in negotiation with the affected landowners. This process must be undertaken fairly and must commence timeously prior to the construction phase.
5. As discussed in the EMPr, various forms of monitoring is required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project. The types of monitoring to be undertaken include –
   a. Baseline Monitoring needs to be undertaken to determine to the pre-construction state of the receiving environment, and which will serve as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects;
   b. Environmental Monitoring will entail checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded; and
   c. Compliance monitoring and auditing by the independent ECO against the EMPr and Environmental Authorisation.

Pertinent recommendations provided by the environmental specialists are provided below:

- Agricultural Impact Assessment (Index, 2019) -
  - Entrances to some farms will be affected and need to be managed in consultation with the farmers;
  - Some farm infrastructure will be lost and has to be replaced; and
  - Fencing of farms needs to be maintained where construction is taking place. This is to ensure that animals do not escape and/or fall into the trench at the construction site.

- Wetland and Aquatic Impact Assessment (The Biodiversity Company, 2019) -
  - Apart from instream structures and activities, all other construction activities should remain outside of the 32 m buffer. The positions where the pipeline will enter and exit the 32 m buffer on the boundary of a wetland will need to be demarcated;
  - Signpost the area beyond the construction footprint as an environmentally sensitive area and keep all excavation, soil stockpiling, general access and construction activities out of this area.
- Terrestrial Ecological Impact Assessment (Nemai Consulting, 2019a) -
  - Undertake a walk-down survey prior to the start of the construction activities for any Red Data Listed species and also to propose suitable mitigation measures. The walk-down survey should preferably be undertaken during summer season in order to have a higher probability of detecting species of special concern. This is relevant in the areas that have been labelled as ecologically sensitive;
  - Prior to construction and vegetation clearance, a suitably qualified environmental officer/herpetologist, should undertake a walk-through and relocate any affected animals to appropriate habitat away from the servitude;
  - In order to conserve the faunal species community structures within the region, habitat destruction should be limited to an absolute minimum as intact habitat would result in higher faunal and floral species diversity. It is therefore critical that construction works are limited to the required footprint only; and
  - All areas affected by construction should be rehabilitated upon completion of the construction phase of the development to its pre-construction state where possible, in agreement with the ECO.
  - In order to alleviate the loss of habitat within the study area, it is recommended that a clear, concise and well formulated rehabilitation plan be implemented after the construction activities, focussing on fauna species relocation, as well as the concurrent reinstatement of faunal habitat post construction activities.
- Heritage Impact Assessment (McGregor Museum, 2019) -
  - Graves were found at two localities close to the proposed route, the first at 28^0 23' 35.8"S; 24^0 16' 13.2" E which is approximately 45 meters from the new proposed route, at a turn pipe near an open valve. The second was at 28^0 17' 34.0" S; $23^0$20' 26.3" E, an old cemetery, which lies beyond the proposed route, but noted here for precautionary measures to be put in place. Under NHRA 25 (1999) a permit is required to remove or destroy a grave or headstone marker outside a formal cemetery. A buffer of at least 30 m is recommended, with fencing to protect such graves.
  - It would remain possible that material of significance may occur, which is not identified and such chance finds, if encountered, should be brought to the attention of heritage authorities for further assessment and mitigation if necessary.
- Palaeontological Impact Assessment (Banzai Environmental, 2019) -
  - If fossil remains are discovered during any phase of construction, either on the surface or exposed by new excavations, the Chance Find Protocol must be implemented by the ECO in charge of these developments. These discoveries ought to be secured (if

possible, in situ) and the ECO ought to alert SAHRA so that appropriate mitigation (documented and collection) can be undertaken by a palaeontologist.

- These recommendations must be incorporated in the EMPr of this project.

22 OATH OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

I (name and surname) Donavan Henning

Of (address) 147 Bram Fischer Drive, Randburg, 2194

ID No. 7612065057080 *Contact No.* 011 781 1730

I hereby make an oath and state that:

In accordance with Appendix 1 of Government Notice No. R. 982 of the amended 2014 EIA Regulations (07 April 2017), this serves as an affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

Section 1(j) -

1. *The correctness of the information provided in this report(s);*
2. *The inclusion of comments and inputs from stakeholders and interested and affected parties;*
3. *The inclusion of inputs and recommendations from the specialist reports where relevant; and*
4. *Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.*

Section 1(k) -

The level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment.

1. I know and understand the contents of this declaration.

2. I do not have any objection in taking prescribed oath.

3. I consider the prescribed oath to be binding on my conscience.

Signature _____ *Date:* 03/02/2020

I certify that the deponent has acknowledged that he/she knows and understands the contents of the statement and the deponent signature was placed there on in my presence.

COMMISSIONER OF OATH	MRS. COLETTE HENNING	PRACTISING ATTORNEY
	FULL NAME	DESIGNATION

Colette Henning
Commissioner of Oaths
Ex Officio - Practising Attorney
7 Katbos Avenue
Bassonia, Johannesburg
082 463 5547

23 REFERENCES

Animal Demography Unit, 2019. FrogMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=FrogMAP on 2019-05-02

Animal Demography Unit, 2018. MammalMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=MammalMAP on 2019-05-02.

Animal Demography Unit, 2018. ReptileMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=ReptileMAP on 2019-05-02.

Banzai Environmental, 2019. Palaeontological Phase 1 Impact Assessment of the proposed upgrade of the Vaal Gamagara Regional Water Supply Scheme: Phase 2 and groundwater abstraction. Banzai Environmental (Pty) Ltd, Bloemfontein.

Barbour, M.T., Gerritsen, J. & White, J.S. 1996. Development of a stream condition index (SCI) for Florida. Prepared for Florida Department of Environmental Protection: Tallahassee, Florida.

Blaustein, A. R, 2003. Amphibian Population Declines. Encyclopedia.com. [Online] 2003. [Cited: 05 February 2019.] http://www.encyclopedia.com/doc/1G2-3409400018.html.

Child, M.F, Roxburgh, L, Do Linh San, E, Raimondo, D, Davies-Mostert HT, 2017. Mammal Red List 2016: Introduction and Methodology. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa

Dikgatlong IDP, 2019. Final Review of the Dikgatlong Municipality's Integrated Development Plan, 2019-2020. Dikgatlong Local Municipality, Barkly West.

DWAF, 2009. FIGURE 8B, WMA 14 : LOWER ORANGE: Irrigation Canals and Supply Pipelines. Department: Water Affairs and Forestry (DWAF), Pretoria.

Francis Baard EMF, 2010. Environmental Management Framework, 2010, Volume 1: Status Quo Report. Francis Baard District Municipality, Kimberley.

Francis Baard IDP, 2017. Final Integrated Development Plan 2017/18-2021/2022. Francis Baard District Municipality, Kimberley.

Gamagara IDP, 2017. Draft Integrated Development Plan 2017-2022. Gamagara Local Municipality, Kathu.

Index, 2019. Agricultural Impact Assessment for Upgrading of the existing Vaal Gamagara Regional Water Supply Scheme Phase 2 (VGRWSS-II). Index (PTY) LTD, Pretoria.

iX engineers, 2019. Vaal Gamagara Water Supply Scheme: Updated demographics and water balance to 2043. iX engineers (Pty) Ltd, Kimberley.

John Taolo Gaetsewe IDP, 2019. Final Integrated Development Plan, 2019-20 Review. John Taolo Gaetsewe District Municipality, Kuruman.

Kgatelopele LM SDF, 2010. Spatial Development Framework, 2010-2015. Kgatelopele Local Municipality, Danielskuil.

Kotze DC, Marneweck GC, Batchelor AL, Lindley DC, Collins NB. 2009. A Technique for rapidly assessing ecosystem services supplied by wetlands. Mondi Wetland Project.

Low, A.B & Rebelo, A.G, 1996. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs and Tourism, Pretoria.

Macfarlane. D.M., Dickens, J. & von Hase, F. 2009. Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries. Institute of natural resources. INR Report No. 400/09.

McGregor Museum, 2019. Heritage Impact Assessment for the proposed Upgrade of the Vaal Gamagara Regional Water Supply Scheme Phase 2. McGregor Museum, Kimberley.

Mucina, L. & Rutherford, M.C, 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African Biodiversity Institute, Pretoria.

Nemai Consulting, 2019a. Proposed Upgrading of the Vaal Gamagara Regional Water Supply Scheme: Phase 2 in Northern Cape Province. Terrestrial Ecological Impact Assessment Report. Nemai Consulting, Johannesburg.

Nemai Consulting, 2019b. Proposed Upgrading of the Vaal Gamagara Regional Water Supply Scheme: Phase 2 in Northern Cape Province. Socio-Economic Impact Assessment Report. Nemai Consulting, Johannesburg.

Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.

Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. & Manyama, P.A. (eds), 2009. Red List of South African plants. Strelitzia 25. South African National Biodiversity Institute, Pretoria.

Sedibeng Water, 2011. Main Report: Feasibility. Development of Reconciliation Strategies for the Area Served/Interacting by/with Sedibeng Water's Vaal Gamagara Scheme as well as a Water Master Plan. Sedibeng Water, Bothaville

Siegfried. W.R, 1989. Preservation of species in Southern African nature reserves. In: Biotic diversity in southern Africa. Concepts and conservation, (ed.) B.J. Huntley, pp. 186-201.

Siyanda EMF, 2008. Siyanda Environmental Management Framework Report, 2008. Siyanda District Municipality, Upington.

South African National Biodiversity Institute, 2012. Vegetation Map of South Africa, Lesotho and Swaziland [vector geospatial dataset] 2012. Available from the Biodiversity GIS website, downloaded on 08 February 2019.

Tate RB, Husted A. 2015. Aquatic macroinvertebrate responses to pollution of the Boesmanspruit river system above Carolina, South Africa. African Journal of Aquatic Science. 1-11.

The Biodiversity Company, 2019. Baseline Aquatic and Impact Study for the Upgrading of the existing Vaal Gamagara Regional Water Supply Scheme Phase 2 (VGRWSS-II). The Biodiversity Company, Johannesburg.

Tsantsabane IDP, 2018. Revised Draft Integrated Development Plan, 2018/19-2019/20-2020/21. Tsantsabane Local Municipality, Postmasburg.

Van Wyk A.E, & Smith, G.F, 2001. Regions of floristic endemism in southern Africa: A review with emphasis on succulents. Umdaus Press, Hatfield.

Wake, D.B, 1991. Declining amphibian populations. Science 253:860.

White, F, 1983. The vegetation of Africa. UNESCO, Paris, France.

Wyman, R.I, 1990. What's happening to the amphibians? Conservation Biology 4:350-352.

ZF Mgcawu IDP, 2019. Draft Integrated Development Plan 2019/2020. ZF Mgcawu District Municipality, Upington.