ZUTARI
IMPACT. ENGINEERED.

Basic Assessment Report

Greater Mangaung Water Augmentation Project: Xhariep Pipeline (Scheme 1B), Mangaung Metropolitan Municipality, Free State

Department Water and Sanitation
Date: 2024/05/24

DFFE Ref No: 14/12/16/3/3/1/2996
Revision: 0

Document control record

Document prepared by:

Zutari (Pty) Ltd
Reg No 1977/003711/07
1 Century City Drive
Waterford Precinct
Century City
Cape Town
South Africa
PO Box 494
Cape Town
8000
Docex: DX 204

T +27 21 526 9400

E capetown@zutari.com

Document Control						
Project name		Greater Mangaung Water Augmentation Project: Xhariep Pipeline (Scheme 1B), Mangaung Metropolitan Municipality, Free State				
Document number		14/12/16/3/3/1/2996	**Project number**		1002533	
Client		Department Water and Sanitation (DWS)				
Client contact		Sanet van Jaarsveld	**Client reference**		Xhariep Scheme 1B Pipeline	
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
0	2024/05/30	Draft BAR for Public Review	C. Steyn	J. Finklestein W. Loftus	N/A	W. Loftus
1						
2						
Current revision		**0**				

Approval			
Author signature		Reviewer signature	
Name	Corlie Steyn	Name	Wynand Loftus
Title	Senior Environmental Consultant EAPASA: 2019/999	Title	Manager EAPASA: 2019/1203

Contents

Appendices

Figures

Tables

NEMA requirements for Basic Assessment Reports		
Appendix 1	**Content as required by NEMA**	**Section**
3(a)	(i) details of the EAP who prepared the report; and	Control sheet, Section 1.2 Annexure A
	(ii) details of the expertise of the EAP, including a curriculum vitae.	
(b)	the location of the activity, including -	Section 4.1, Section 4.
	(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;	N/A
(c)	a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is -	Section 5, Section 1 and Section 2.
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	Section 5.6 and Annexure F
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	NA
(d)	a description of the scope of the proposed activity, including -	Section 5
	(i) all listed and specified activities triggered;	Section 2.2
	(ii) a description of the activities to be undertaken, including associated structures and infrastructure;	Section 5.
(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 are to be considered in the assessment process; ii. how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	Section 2
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 5.9
(g)	a motivation for the preferred site, activity and technology alternative;	Section 6
(h)	a full description of the process followed to reach the proposed preferred alternative within the site, including -	Section 6
	(i) details of all the alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 4 and Annexure C
	(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;	Section 4.4, Annexure C
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7
	(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;	Section 7.

	(bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	
	(vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 3.3.2
	(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;	Section 7
	(viii) the possible mitigation measures that could be applied and level of residual risk;	Section 7
	(ix) the outcome of the site selection matrix;	Section 5
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Section 6
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Section 6, Section 8 and Section 9
(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;	Section 3.3
(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;	Section 7
(k)	where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Section 7
(l)	an environmental impact statement which contains - (i) a summary of the key findings of the environmental impact assessment;	Section 8
	(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 outcomes for the development for inclusion in the EMPr;	Section 7

(n)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 8.3
(o)	a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.4
(p)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 8.3
(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;	NA.
(r)	an undertaking under oath or affirmation by the EAP in relation to - (i) the correctness of the information provided in the report; (ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; (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 or affected parties;	Annexure A
(s)	where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	NA
(t)	any specific information required by the competent authority; and	Email correspondence from the DFFE form part of Annexure B.
(2)	any other matter required in terms of section 24(4)(a) and (b) of the Act.	N/A

ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
DFFE	Department of Forestry, Fisheries and the Environment
DEA	Department of Environmental Affairs
DESTEA	Department of Economic, Small Business Development, Tourism and Environmental Affairs (Free State)
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EI	Ecological Importance
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area (Biodiversity)
ESA	Early Stone Age (Heritage)
EWT	Endangered Wildlife Trust
FSPHRA	Free State Provincial Heritage Resources Authority
GN	Government Notice
GBWSS	Greater Bloemfontein Water Supply System
I&APs	Interested and Affected Parties
IBA	Important Bird Area
KLM	Kopanong Local Municipality
MMM	Mangaung Metropolitan Municipality
MSA	Middle Stone Age
NCW	Not Conservation Worthy
NEMA	National Environmental Management Act (No. 107 of 1998) (as amended)
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystems Priority Areas
NHRA	National Heritage Resources Act (No. 25 of 1999)
NPAES	National Protected Areas Expansion Strategy
NWA	National Water Act (Act 36 of 1998)
NWI	National Wetland Inventory
PES	Present Ecological State
ODL	Orange Data Listed
PDA	Primary Drainage Area
PPP	Public Participation Process
QDA	Quaternary Drainage Area
RDL	Red Data Listed
SANBI	South African National Biodiversity Institute
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SACNASP	South African Council for Natural Scientific Professions
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEI	Site Ecological Importance
SIP	Strategic integrated Projects
SPV	Special Purpose Vehicle
ToR	Terms of Reference
WMA	Water Management Area

WTW	Water Treatment Works
WTP	Water Treatment Plant
WULA	Water Use License Application
XDM	Xhariep District Municipality

Protection of Personal Information Act (POPIA), Act No. 4 of 2013.

Zutari and the Department of Water and Sanitation (DWS) places a high premium on the privacy & personal information of our stakeholders. The processing of personal information is subject to the Protection of Personal Information Act (POPIA), Act No. 4 of 2013.

As a responsible party, Zutari is entrusted with the personal information of many stakeholders such as yourself, potential clients, staff and service providers and we are therefore obligated to process this information in line with the law.

POPIA came into effect on the 1st of July 2021, and we would like to make sure that you are happy to continue receiving communications from us.

Please note that the following, as a Registered I&AP, you will be subject to the following conditions:

- As per the requirements of the Environmental Impact Assessment (EIA) Regulations, 2014, your personal details including your name, contact details and address will be entered into a register and appended to the Basic Assessment Report (BAR) that will be submitted to the Competent Authority (Department: Forestry, Fisheries and the Environment [DFFE]). Any comments received, including responses to such comments and records of meetings, will be recorded and attached in the BAR.
- The DRAFT BAR will be made available to members of the public as well as various authorities for review and decision making. As such the following measures have been implemented to adhere to the requirements of both the EIA Regulations, 2014 as amended and POPIA, 2013 as amended:
    - Personal Information of POTENTIAL I&APs will be omitted from the DRAFT BAR made available in the public domain.
    - Personal Information of REGISTERED I&APs will be included in the FINAL BAR as per the requirements of the EIA Regulations, 2014 as amended and will be submitted to the Competent Authority (DFFE).
    - As a Registered I&AP your personal details such as your name, contact details and address may, on written request to the EAP / project contact person, be omitted from the FINAL BAR.
    - Any comments / views / opinions received, including responses to such comments and records of meetings, will be recorded, and attached to the FINAL BAR.

1 INTRODUCTION

The Department of Water and Sanitation (DWS) is proposing to construct a potable water pipeline from the Gariep Dam wall to connect to the Greater Bloemfontein Water Supply System (GBWSS) to relieve the severe water shortages that are often experienced in the Greater Mangaung Metropolitan area. The proposed water augmentation scheme will traverse the Xhariep District Municipality (XDM) and the Kopanong Local Municipality (KLM) in particular, as well as the Mangaung Metropolitan Municipality (MMM). The entire project will be located in the Free State Province.

The Xhariep Pipeline Project was originally identified in the 2012 Reconciliation Strategy for the GBWSS as a future augmentation project to supply the area's water demands.

Several other interventions were identified in the Strategy, but this project focuses on the Xhariep Pipeline from Gariep Dam tying into the bulk water network of the GBWSS.

MMM previously applied for Environmental Authorisation (EA) through a Basic Assessment process which has since lapsed. Additionally, this study, in line with the Department of Water and Sanitation (DWS) perspective, has added new pipeline route options and the position of infrastructure components have changed.

The proposed Xhariep pipeline project will involve abstraction near the Gariep dam wall by connecting to an existing pipeline, a raw water low-lift pump station, and transfer pipelines to a water treatment works (WTW) located at a suitable site near the Gariep dam. The treated water will be pumped to Bloemfontein and Rustfontein WTW with two command reservoirs and a booster pump station on the route.

DWS appointed Zutari (Pty) Ltd (henceforth Zutari) as the independent Environmental Assessment Practitioner (EAP) to undertake the applications for Environmental Authorisation (EA) in terms of the National Environmental Management Act (Act No 107 of 1998) (NEMA) and its Environmental Impact Assessment (EIA) Regulations (2014 as amended in 2017).

DWS is applying for Environmental Authorisation (EA) for the proposed Xhariep Pipeline Project which is a regional bulk water scheme. The proposed project falls under the Strategic Integrated Project (SIP) 18 and 19 and forms part of the Bulk Raw Water Resources Development Infrastructure programme. Projects under this programme, together with any relevant associated infrastructure, are classified as Strategic Integrated Projects and are to be managed within the requirements of the Infrastructure Development Act (IDA) (Act No.23 of 2014) and its amendments [1].

The Basic Assessment (BA) process is undertaken in terms of regulations 19 and 20 of the 2014 NEMA EIA Regulations (as amended). The Water Use License Application (WULA) share a Public Participation Process (PPP) comment period with the BA process.

The BA process entails several phases which are further detailed in Section 3.1. The purpose of this BAR[2] is to set out and assess the environmental outcomes, impacts and residual risks of the proposed activity. Accordingly, the BAR includes the following chapters:

- Section 1 – Introduction
- Section 2 – Legal framework and planning context
- Section 3 – EIA methodology and description of the BA process
- Section 4 – Public participation process (PPP) indicating the methodologies used in notifying the potential interested and affected parties (I&APs) and the PPP stages, with estimated dates.
- Section 5 – Detailed project description and provisional layout with additional details on the project components and requirements.

[1] Infrastructure Development Act (IDA) (Act No.23 of 2014) - provides for an expedited BA process in terms of Schedule 2 (Section 17(2)) of the IDA.
[2] Appendix 1 of amended EIA Regulations (GN R982) of NEMA lists the content required in a Basic Assessment Report. This has been listed for cross checking purposes on the page preceding the table of contents.

- Section 6 – Alternatives. Motivation and description for the approach to alternatives.
- Section 7 – Baseline description and Environmental Impact Assessment of the environment i.e. the current state of the environment, on-site and surrounds, and assesses the potential impacts on the environment that may be caused by the project.
- Section 8 – Environmental Impact Statement. This Section provides environmental impact statements and summarises the outcomes of the impact assessment and key issues identified by the various specialists.
- Section 9 – Conclusion and recommendations. This Section provides concluding remarks and a way forward in terms of the application for Environmental Authorisation (EA).

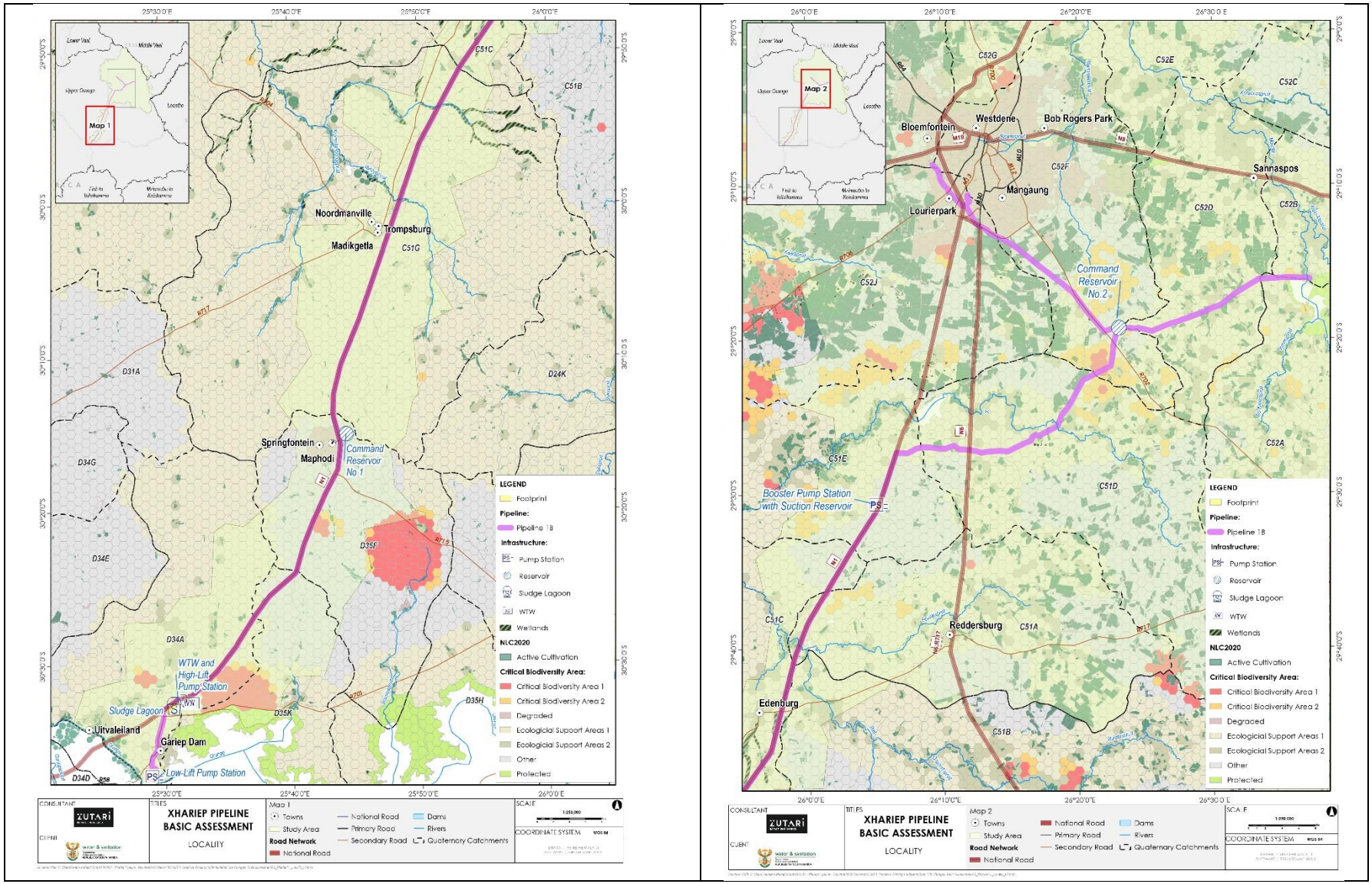


Figure 1-1: Project layout map for the Xhariep Pipeline Augmentation Scheme 1B (Refer to Appendix I for high resolution maps)

1.1 Project Overview

The Xhariep Pipeline Project was originally identified in the 2012 Reconciliation Strategy for the GBWSS as a future augmentation project to supply the area's water demands. Several other interventions were identified in the Strategy, but this project focuses on the Xhariep Pipeline from the Gariep Dam tying into the bulk water network of the GBWSS.

Previous independent feasibility studies have been completed by Mangaung Metropolitan Municipality (MMM) and Vaal Central Water Board (VCWB – previously known as Bloem Water) – which led to different conclusions. DWS recognised that a project of this scale must be considered from a regional and national perspective and as such appointed Zutari to undertake the current feasibility study.

MMM applied for Environmental Authorisation (via Basic Assessment) which has since lapsed. Additionally, this study, in line with the DWS perspective, has added new pipeline route options and the position of infrastructure components have changed.

The new applicant is the Department of Water and Sanitation (DWS) Head Office. NEMA 24C (2) (d) states the following in reference to Section 24C:

> ***24C. The procedure for identifying competent authority***
>
> *(2) The Minister must be identified as the competent authority in terms of subsection (1), unless otherwise agreed to in terms of section 24C (3), if the activity-*
>
> *(d) is undertaken, or is to be undertaken, by-*
>
> *(i) a national department*.

The Department of Forestry, Fisheries, and the Environment (DFFE) has therefore been identified as the Competent Authority (CA) because the applicant, DWS, is a National Department. This was conformed in the pre-application meeting that was held on 7 November 2023.

The proposed project entails construction of a bulk water pipeline and associated distribution infrastructure from the Gariep Dam for augmentation of water supply to the Greater Mangaung Metropolitan area and surrounding smaller urban centres by improving the system yield to meet current and future water requirements. The scheme will pump in the range of 20 - 101 million m^3/a of water for augmentation purposes.

As illustrated in Figure 1-1, the proposed water augmentation scheme will traverse the Xhariep District Municipality (XDM) and the Kopanong Local Municipality (KLM) in particular, as well as the Mangaung Metropolitan Municipality (MMM). The entire project will be in the Free State Province. The Xhariep pipeline project is known as Scheme 1B. The Scheme 1B route follows the N1 highway from Gariep Dam but turns eastwards before reaching Tierpoort Dam. The pipeline continues to a command reservoir east of the R702 where it splits into two gravity lines, one feeding Bloemfontein, tying into the MMM bulk network, while the other feeds Botshabelo / Thaba Nchu, tying into VCWB bulk network at the Rustfontein WTW. Scheme 1B is potable water to be treated at a new WTW (Refer Figure 1-1).

The detailed project description provided in Section 5 was disseminated to the six project specialists which informed the detailed impact assessment in Section 7. No project alternatives have been identified for assessment in this application (except the no-go option). The motivation and the approach taken to determine the project layout are described in Section 5. In keeping with best practice, for impact assessments, the No Go Alternative (or option) will be comparatively assessed which will assess the impacts should the project not proceed, and existing land use remain in effect.

1.2 EIA Project Team

Zutari has selected a team of experienced specialists and multi-disciplinary practitioners to execute this project in a professional manner. Please refer to Table 1-1 for the project team. Full CVs of the EAP and Project Management team are available in Annexure A. Specialist CVs are included in the respective specialist reports in Annexure D.

Table 1-1: BA Project Team

Role	Consultant	Company
EIA and Project Management		
Senior EAP	Corlie Steyn	Zutari
Senior Consultant	Jarryd Finklestein	Zutari
Senior EAP	Wynand Loftus	Zutari
PPP	Genie de Waal	Zutari
Sub-consulting Specialists		
Agricultural Assessment	Prof Johan van Tol and Willem Lombard	Digital Soils Africa (Pty) Ltd
Defence Statement	Wynand Loftus	Zutari (Pty) Ltd
Freshwater Ecological Assessment	Darius van Rensburg	Ecologists & Environmental Services (Pty) Ltd
Geotechnical Desktop Assessment	Elaine du Plooy	Zutari (Pty) Ltd
Heritage and Archaeology Assessment	John Gribble	TerraMare Archaeology (Pty) Ltd
Palaeontology Assessment	Elize Butler	Banzai Environmental (Pty) Ltd
Socio-Economic Assessment	Ingrid Snyman	Batho Earth (Pty) Ltd
Terrestrial Biodiversity (Fauna and Flora) Assessment	Johannes Maree and Ria Pretorius	Setlala Environmental (Pty) Ltd
Civil Aviation Statement	Wynand Loftus	Zutari (Pty) Ltd

1.3 Independence

The amended 2014 EIA Regulations under NEMA, provide general requirements for EAPs and specialists to reduce the potential for bias in the environmental process. The first requirement is that the EAP should be independent (Regulation 13(1)(a) of GN R982, as amended).

Neither Zutari nor any of its sub-consultants are subsidiaries of DWS nor is DWS a subsidiary of Zutari. The EAP and Specialists have provided declarations of independence, and these are appended to this report in Annexure J.

1.4 Assumptions, Limitations and Gaps in Knowledge

In undertaking the investigation and compiling the BAR, the following has been assumed:

- The information provided by the Applicant is accurate and no information that could change the outcome of the BA process has been withheld.
- All information provided by the appointed specialists is complete, accurate and true.
- The scope of this investigation is limited to assessing the environmental impacts associated with the proposed construction of the Xhariep pipeline project (Scheme 1B) in terms of cumulative considerations.
- The BA process is based on Best Practice Guidelines which were available at the time of writing this report.
- Any additional and requisite permits or authorisations required for the development in terms of other legislation will be dealt with by the developer outside this process.

Any gaps that have been encountered by the specialists are identified in their respective assessments (Annexure D).

The DFFE, and other authorities, were requested to provide comments on the project and the BA and associated reports. The assumptions, limitations and gaps in knowledge did not affect the EAP's assessment or findings of the proposed Xhariep pipeline project (Scheme 1B).

2 LEGAL AND PLANNING CONTEXT

There are a host of legal and policy documents and guidelines to consider when undertaking such a project. These have been detailed in the sections that follow.

2.1 Relevant Legislation

An overview of the relevant legislation is provided in Table 2-1 and further detail is provided in subsections to follow.

Table 2-1: Relevant legislation

Legal Requirements		
Legislation considered	**Relevant Organ of State / authority**	**Aspect of Project**
Constitution of the Republic of South Africa (Act 108 of 1996)	Republic of South Africa	Section 24 of the Constitution makes provision for an environment that is not harmful to human well-being.
Aviation Act (74 of 1962)	Civil Aviation Authority (CAA)	The DFFE Screening tool identified the affected area for Scheme 1B as a medium- high sensitivity site from an Aviation perspective and, per the "Protocol for The Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Civil Aviation Installations" (GN 320 of 20 March 2020). A compliance statement has been appended as Annexure D and no further assessment is necessary. Tall electrical infrastructure can interfere with radio navigation equipment or present potential physical obstacles. Eskom confirmed that their network can accommodate the Xhariep pipeline project's power supply requirements and that in time an application will be done by the relevant applicant and any possible interference will be dealt with during that process.
Conservation of Agricultural Resources Act, Act No. 43 of 1983 (CARA)	Department of Agriculture, Land Reform and Rural Development (DALRRD)	The purpose of this Act is to ensure that the natural agricultural resources of South Africa are conserved through maintaining the production potential of land, combating, and preventing erosion, preventing the weakening or destruction of water sources, protecting vegetation, and combating weeds and invader plants. As such, as part of the BA process for Scheme 1B, recommendations will be made to ensure that measures are implemented to maintain the agricultural production of land, prevent soil erosion, and protect any water bodies and natural vegetation on site. The Proponent together with the relevant farmers should also ensure the control of any undesired aliens, declared weeds, and plant invaders listed in the regulation that may pose a problem because of the proposed project. A full Agricultural Impact Assessment was done and is appended in Annexure D.

Mineral and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA)	Department of Mineral Resources and Energy (DMRE)	As per the requirements of the MPRDA, all mining activities, including the extraction of material from borrow pits and quarries also require authorisation from DMRE. No mining permits for borrow pits have been included in this application however should the development go ahead and borrow pits are required, the appropriate approvals in terms of the MPRDA would need to be sought from the DMRE.
National Environmental Management Act, Act No. 107 of 1998 (NEMA), as amended	Department of Forestry, Fisheries, and the Environment (DFFE)	Several listed activities in terms of NEMA GN No R983 and R985 in the Government Gazette of 4 December 2014 (as amended on 7 April 2017), have been triggered and need to be authorised for the proposed project (refer to Table 2-2). Based on the listed activities triggered, the application for environmental authorisation will follow the BA process as set out in Regulations 19-20 of GN R982.
National Environmental Management: Air Quality Act (39 of 2004)	Free State Province: Department of Economic, Small Business Development. Tourism and Environmental Affairs (DESTEA)	The Act aims to regulate and protect the environment by providing reasonable measures for the prevention of air pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto. No activities are envisaged that would require an Atmospheric Emissions License
National Environmental Management: Biodiversity Act, Act No. 10 of 2004 (NEMBA)	Department of Forestry, Fisheries, and the Environment (DFFE)	The act calls for the management of all biodiversity within South Africa. The vegetation and ecosystems in which the project footprint is situated are mostly in fair condition to moderately degraded. The impact of the proposed pipeline is very low due to the very narrow, linear footprint and the general absence of high sensitivity habitats or areas along the pipeline route. Some of the proposed areas for construction and placement of structures are within CBAs (i.e. Booster pump station with suction reservoir (Alt. B) and Command Reservoir No. 2). Refer to Section 7 for the terrestrial ecology impact assessment summary.
National Environmental Management: Waste Act (Act 59 of 2008)	Free State Province: Department of Economic, Small Business Development. Tourism and Environmental Affairs (DESTEA) (for general waste), DFFE (for hazardous waste) and Municipalities and their register landfill and Waste Management facilities	The Act aims to regulate waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement, and to provide for matters connected therewith. The project would not trigger any waste management activities requiring a permit but must manage solid hazardous and domestic waste streams in all phases of the project and wastes must be handled, stored, and disposed of in a manner that is consistent with the provisions of this legislation.

National Forests Act (84 of 1998), as amended (NFA)	Department of Forestry, Fisheries and the Environment (DFFE)	There are 47 protected tree species in terms of the NFA, that may not be cut, destroyed, damaged, or removed unless a permit has been granted by the DFFE. There are protected wild olive trees on the site earmarked for the booster pump station with suction reservoir (Alt. A). It is likely that a few of these trees will need to be removed. A tree permit will be needed. It is also likely that there are protected wild olive trees on the site of Command Reservoir No. 2. A tree permit will also be required if any protected trees need to be removed or destroyed. These will require site visits where the lifting and relocating of identified plants need to be supervised by the specialist. It has been determined and recommended by the specialist that for each protected olive tree removed/destroyed, five new trees must be planted in the area.
National Heritage Resources Act, Act No. 25 of 1999 (NHRA)	South African Heritage Resources Agency (SAHRA)	Section 38 of the NHRA is applicable since the DFFE screening tool indicates a high archaeological and cultural heritage theme sensitivity. As such, a Heritage Impact Assessment and Palaeontological Assessment (Appendix D) have been undertaken as required by the NHRA. Comment on the project will be obtained from SAHRA during the PPP (A BID/DSR report is accepted as the initial stage to the application. The NID process is not required for a s38(8) application – refer Appendix D.2.1) and appropriate mitigation measures have been included in the BAR and EMPr.
National Protected Areas Expansion Strategy (2008) (NPAES) & National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEM:PAA)	Department of Forestry, Fisheries and the Environment (DFFE)	The NPAES for South Africa sets out targets for protected area expansion, identifies possible expansion areas and recommends a mechanism for protected area expansion. Protected areas in terms of the NEM:PAA are considered 'formal' protected areas in terms of the NPAES. The NPAES further identifies 'National Parks', 'informal protected areas' and 'focus areas'. The proposed Xhariep pipeline (Scheme 1B) does not intersect with any of the identified NPAES areas.
National Road Traffic Act, Act No. 93 of 1996 (NRTA)	Free State Department: Community Safety, Roads and Transport	Certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the Regulations of the NRTA. The Free State roads department will be provided with an opportunity to review and comment on this BA process.
National Veld and Forest Fire Act (101 of 1998)	Department of Forestry, Fisheries and the Environment (DFFE)	The purpose of the Act is to prevent and combat veld, forest and mountain fires throughout South Africa. The Act applies to the open countryside beyond the urban limit and puts in place a range of requirements. Fire protection has been considered in the EMPr. The Act sets out the responsibilities of landowners or persons in control of the land which includes: 1. Prepare firebreaks on their side of the boundary if there is a reasonable risk of wildfire; 2. Have such equipment, protective clothing and trained personnel for extinguishing fires as are; 3. Prescribed (in the regulations);

		4. If there are no regulations, reasonably required in the circumstances; 5. Take all reasonable steps to notify the FPO of the local FPA (if there is one) when a fire breaks out; and 6. Do everything in their power to stop the spread of the fire.
National Water Act, Act No. 36 of 1998 (NWA)	Department of Water Affairs and Sanitation (DWS)	Section 21 of the NWA recognises water uses that require authorisation by DWS before commencement. Several freshwater features are located in and around the study area for Scheme 1B and the impact on these is considered in the freshwater impact assessment (Appendix D). Certain infrastructure may be located close to a defined watercourse and within the 500m, GN 509 zone of regulation and authorisation in the form of either a General Authorisation or Water Use License Application (WULA) may be required. The information required by the DWS for commenting purposes has been included in the aquatic ecology assessment in Appendix D. No water use may begin without the appropriate authorisation. The project may constitute the following water uses in terms of Section 21 of the Act: Section 21 (a): Abstraction of water from a water resource Section 21 (b): Storage of water Section 21 (c): Impeding and diverting the flow of a watercourse. Section 21 (i): Altering the beds, banks, course and characteristics of a watercourse. Section 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource. The information in the freshwater specialist's report would inform any future Water Use Licence Applications (WULA).
Subdivision of Agricultural Land Act (70 of 1970) (SALA)	Department of Agriculture, Land Reform and Rural Development (DALRRD)	The purpose of this Act is to control the subdivision and, in connection therewith, the use of agricultural land. A servitude will be registered across the agricultural land for which the landowners will be compensated. The servitude agreement will provide access to the owner of the infrastructure to undertake maintenance and repairs. No subdivision is required for the servitudes and agricultural activities are permitted over the registered servitudes. For the water treatment works, pump stations and command reservoirs, the land will be purchased and be subdivided. If required, rezoning will also take place and an application will be submitted to DALRRD for authorisation following the conclusion of the BA process. DALRRD has been included in the BA process to obtain comments and in principle consent as part of the BA process.
The National Energy Act, Act No. 34 of 2008	Department of Energy (DoE)	The proposed Scheme 1 B will obtain the necessary power supply from Eskom. Eskom indicated that they could accommodate the project.

Occupational Health and Safety Act (Act 85 of 1993, OSHA)	Department of Labour	This Act is intended to govern and ensure the safety of employees in the workplace. Skilled, semi-skilled and some unskilled workers will be involved in the construction and operation of the proposed project. The contract lengths of these employees will differ and will be subject to the provisions of the OSHA.
Public Access to Information Act (Act 2 of 2000)	Department of Justice	This Act provides for access to any information held by the State and access to information that is held by another person that is required for the exercise or protection of any rights. DWS needs to obtain servitudes from the existing landowners and these landowners and other interested and affected parties has the right to access information pertaining to the proposed project.

2.2 Listed Activities in terms of NEMA

NEMA is the primary legislation tasked with the management of environmental resources and, accordingly, lists of activities that require authorisation before commencement. The proposed project considered in this application process triggers different activities listed in the amended 2014 EIA Regulations (GN R982, as amended). These activities are detailed in Table 2-2.

Table 2-2: Listed activities triggered by the preferred alternative for the proposed project

Activity No(s):	**Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended**	**Describe the portion of the proposed project to which the applicable listed activity relates. Ensure to include thresholds/area/footprint applicable.**
9	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 railway line reserve; or (b) where such development will occur within an urban area.	Diameter 1.4-2m range, the expected flow will be a maximum of 3.2 m^3/s (≈3.2kl/s) The proposed project entails the construction of a potable water pipeline of approximately 244.4km with a minimum internal diameter of approximately 1400mm, and a maximum of 2000mm. A 100m wide corridor will be evaluated for the proposed pipeline routes. The construction corridor is likely to be 40 m wide with a final servitude width of 15m to be registered.
12	The development of— **(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or** **(ii) infrastructure or structures with a physical footprint of 100 square metres or more;** where such development occurs—	Three new command reservoirs ±80 ML each, will be constructed along the route with a booster pump station (footprint likely to be 37,500m^2).

	(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.	The proposed infrastructure will exceed a footprint of 100m^2 where such footprint occurs either within, or within 32m, of a watercourse.
13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	Three new command reservoirs ±80 ML (80 000m^3) each, will be constructed along the route with a booster pump station. Storage will therefore exceed 50 000m^3 (50ML).
14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	During construction cement and hydrocarbons may be stored in the construction camps, but it has been established that the combined capacity will not exceed 500 cubic metres but will be more than 80 cubes. At the WTW on-site chemical storage and volume will depend on the type of treatment required, which is still being investigated, though the amount will not exceed 500m^3.
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**.**	At watercourse crossings 10 cubic metres or more of soil, sand, pebbles or rock will be excavated and removed. The infilling or depositing of any material of more than 10m^3 into a watercourse will be triggered with the construction phase. There are a number of mostly small seasonal or ephemeral streams and drainage lines that the proposed pipeline crosses, with only 2 – 3 semi-perennial and perennial large streams / small

		rivers, such as the Van Zylspruit.
24	The development of a road— (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or **(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;** but excluding a road— (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.	While existing roads would be used as far as possible new sections of roads will be required and will be over 1km in length and be wider than 8m.
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.	The ancillary works (e.g. the WTW near the Gariep Dam; the pump stations and the command reservoirs) at various points along the route will equate to clearance of approximately 950 ha, but the main project is linear and therefore excluded. The total clearance in reference to the non-linear infrastructure will be **less than 20 ha**. The non-linear infrastructure will therefore not result in the clearance of more than 20 ha of indigenous vegetation.
Activity No(s):	**Provide the relevant Scoping and EIA Activity(ies) as set out in Listing Notice 2 of the EIA Regulations, 2014 as amended**	**Describe the portion of the proposed project to which the applicable listed activity relates. Ensure to include thresholds/area/footprint applicable.**
	None	
Activity No(s):	**Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 3 of the EIA Regulations, 2014 as amended**	**Describe the portion of the proposed project to which the applicable listed activity relates. Ensure to include thresholds/area/footprint applicable.**
2	The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres. **b. Free State** i. In a protected area identified in terms of NEMPAA, excluding conservancies; **ii. Outside urban areas:** (aa) National Protected Area Expansion Strategy Focus 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; (cc) Sites or areas identified in terms of an international convention;	Three new command reservoirs ±80 ML (80 000m^3) each, will be constructed along the route. Storage will therefore exceed 250 cubic metres (50ML). Construction of the reservoirs will occur outside of urban areas and within areas indicated as CBA.

	(dd) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ee) Core areas in biosphere reserves; or (ff) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or iii. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, or zoned for a conservation purpose; or (cc) Areas within urban protected areas.	
4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. **b. Free State** **i. Outside urban areas:** (aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy Focus 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; (dd) Sites or areas identified in terms of an international convention; **(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (ff) Core areas in biosphere reserves; or (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or (cc) Areas within urban protected areas	The construction of a road wider than 4m with a reserve of less than 13.5m (no reserve) will be required outside the urban area and within areas indicated as CBA, as the existing access roads
10	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. **b. Free State** **i. Outside urban areas:** (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus 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; (dd) Sites or areas identified in terms of an international convention; **(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (ff) Core areas in biosphere reserves;	During construction cement and hydrocarbons may be stored in the construction camps and be in excess of $80m^3$. At the WTW on-site chemical storage and volume will depend on the type of treatment required, which is still being investigated.

	(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; or (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.	
12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. **b. Free State** i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; **ii. Within critical biodiversity areas identified in bioregional plans;** iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or **iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.**	The proposed pipeline will traverse more than one wetland and watercourse. There are three critical biodiversity areas within the proposed pipeline route and more than 300 square metres if indigenous vegetation will be cleared.
14	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. **b. Free State** **i. Outside urban areas:** (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (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; (ee) Sites or areas identified in terms of an international convention; **(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (gg) Core areas in biosphere reserves; or	Small sections of the project are in areas designated as Critical Biodiversity Areas where the footprint will exceed $10m^2$ and where construction will either occur within or within 32m of a watercourse.

	(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose.	
LN3 Act 18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. **b. Free State** **i. Outside urban areas:** (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus 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; (dd) Sites or areas identified in terms of an international convention; **(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or ii. Inside urban areas: (aa) Areas zoned for use as public open space; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose	Access roads of up to 10 m in width would be required to develop the proposed project, the combination of which would exceed 1 km. Existing roads will be used as far as practically possible and feasible but would require widening by more than 4 m and new roads greater than 1 kilometre in length are likely to be required.

2.3 DFFE Screening Tool

Government Notice 960, gazetted on 05 July 2019, in accordance with the NEMA EIA Regulations 2014 (as amended) requires that a national web-based environmental screening tool is used to produce a report that should be submitted with an EA application to the DFFE from 05 October 2019.

This report shows, on a high level, the site's sensitivity to the proposed development based on different environmental themes (including, inter alia, terrestrial ecology, avifauna, and heritage) and identifies assessment protocols that must be undertaken depending on the environmental theme's sensitivity rating within the development site. These have informed the selection of specialists commissioned for the project.

Assessment protocols that set out the "procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24(5)(a) and (h) of the national environmental management act, 1998, when applying for environmental authorisation" were Gazetted on 20 March 2020. These protocols in terms of reporting of the identified environmental themes were met in terms of NEMA.

This tool identified the potential restrictions and sensitivities on the site as shown in Table 2-3. Zutari's response to these identified themes, based on its own site visit and specialist assessments conducted is also provided.

Please note 12 reports were created due the extent of the proposed Scheme 1B.

Table 2-3: Site sensitivity verification table

Relative Theme	Finding of Screening Tool	Outcome of the Site Sensitivity Verification	Identified Specialist Assessments	Specialist Study vs Compliance Statement
Agriculture	High sensitivity	Low sensitivity	Agricultural Assessment	Compliance Statement
Animal Species	High & Medium sensitivity	High & Medium sensitivity	Terrestrial Biodiversity	Specialist Study
Aquatic Biodiversity	Very High and Low sensitivity	Very High sensitivity	Aquatic Biodiversity	Specialist Study
Archaeological and Cultural Heritage Theme	Very High sensitivity	Very High sensitivity	Heritage Assessment	Specialist study
Civil Aviation Theme	High sensitivity	Low sensitivity	None required	Compliance statement
Defense Theme	Medium sensitivity	Low sensitivity	None required	Compliance statement
Paleontological Theme	Very high sensitivity	Medium sensitivity	Paleontological	Specialist Study
Plant Species Theme	Low sensitivity	Low sensitivity	Terrestrial Biodiversity	Specialist Study
Social Theme	Indicated as a study due to length of pipeline and affected landowners	Indicated as a study due to length of pipeline and affected landowners	Social specialist	Specialist Study
Terrestrial Biodiversity Theme	Very high & Low sensitivity	Very high & Low sensitivity	Terrestrial Biodiversity	Specialist study

The Screening Tool report is attached in Annexure E.

2.4 Relevant Guidelines

This BA process is informed by the series of national Environmental Guidelines where applicable and relevant:

- Integrated Environmental Information Management (IEIM), Information Series 5: Companion to the NEMA EIA Regulations of 2010 (DEA, 2010).
- IEIM, Information Series 3: Stakeholder Engagement (DEAT, 2002).
- IEIM, Information Series 4: Specialist Studies (DEAT, 2002).
- IEIM, Information Series 11: Criteria for determining Alternatives in EIA (DEAT, 2004).
- IEIM, Information Series 12: Environmental Management Plans (DEAT, 2004).

- IEM Guideline Series 7: Public Participation in the Environmental Impact Assessment Process (DEA, 2012)
- Department of Environmental Affairs (2017), Public Participation guideline in terms of NEMA
- EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (DFFE, 2017)

The following guidelines from the Department of Environmental Affairs and Development Planning (Western Cape) (DEA&DP) were also taken into consideration as best-practice to the Scheme 1B development which will fall in the Free State Province.

- Guideline for involving biodiversity specialists in EIA process (Brownlie. 2005).
- Guideline for involving heritage specialists in the Environmental Impact Report process (June Winter & Baumann, 2005).
- Guideline for involving visual and aesthetic specialists in the Environmental Impact Report process (Oberholzer.2005).
- Guideline for Environmental Management Plans (Lochner, 2005).
- Guideline for determining the scope of specialist involvement in EIA Processes (2005).
- Guideline for the review of specialist input into the EIA Process (June 2005).
- Guideline on Alternatives, EIA Guideline and Information Document Series. (DEA&DP, 2011).
- Guideline on Need and Desirability, EIA Guideline and Information Document Series. (DEA, 2012).
- Guideline on Public Participation, EIA Guideline and Information Document Series. (DEA&DP, 2011)

3 EIA PROCESS AND METHODOLOGY

The formal BA process is outlined in Figure 3-1 with the stipulated timeframes. The formal BA process commences with the submission of the Application form and is immediately followed by the 30-day comment period on the draft BA. A description of the activities which have been, and will be, undertaken during each phase is provided in the following sections.

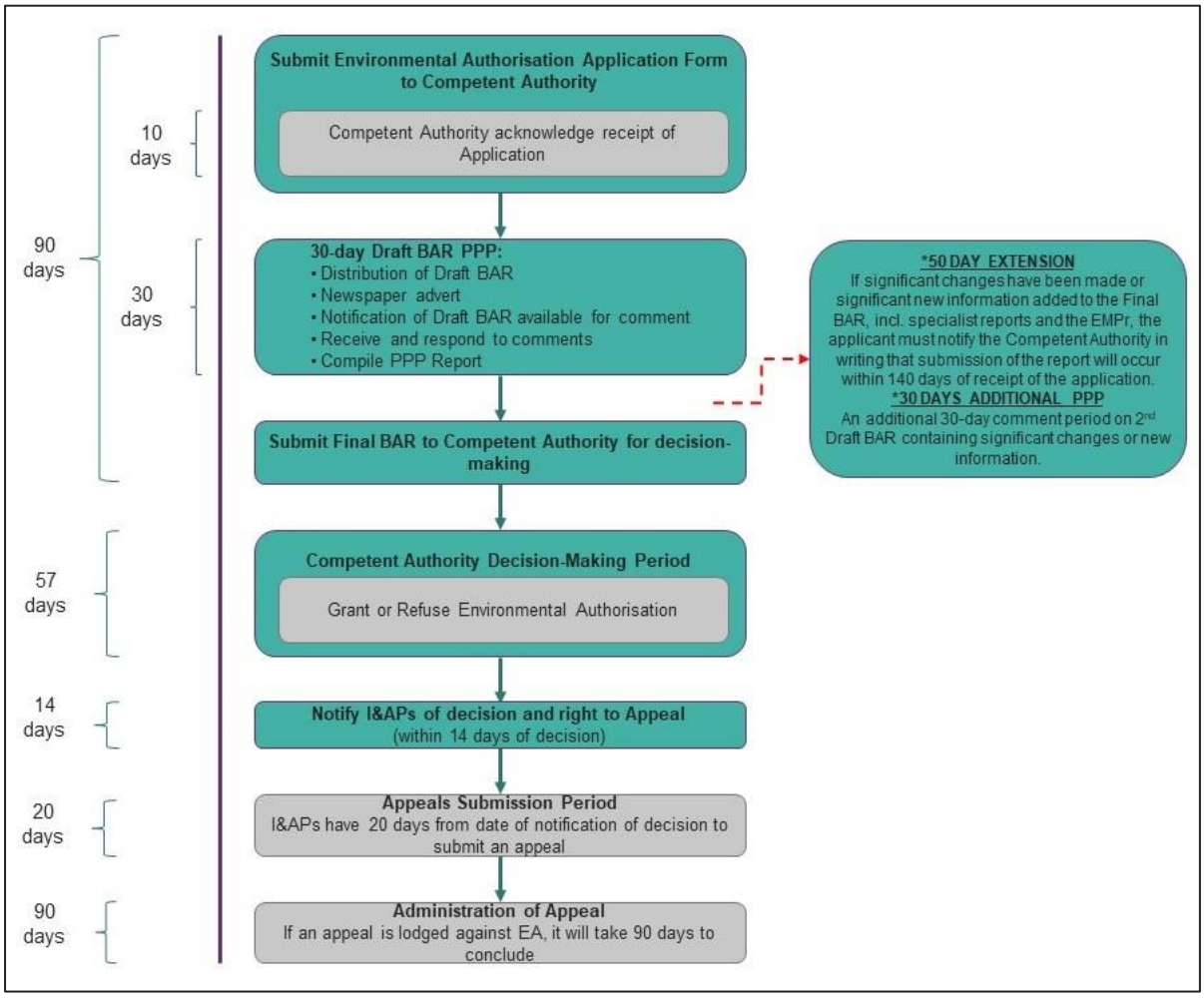


Figure 3-1: The BA process in terms of NEMA (SIP Project)

As illustrated in Figure 3-1, only one stage of public participation is included in a formal BA process, i.e. comment period on the Draft BAR. More information on the Public Participation Process (PPP) is included in Section 4.

The project falls into the ambit of SIPS 18 and 19 – Water and Sanitation Infrastructure, which is a nationwide project in all provinces. In terms of this SIPS, there is a 10-year plan to address the estimated backlog of adequate water supply to 1.4 million households and 2.1 million households to basic sanitation. The project will involve provision of sustainable supply of water to meet social needs and support economic growth. Projects will provide new infrastructure, rehabilitation and upgrading of existing infrastructure, as well as improve management of infrastructure.

The decision-making time for the competent authority is therefore **57days** as per Figure 3-1.

3.1 Phases of the BA Process

3.1.1 Pre-application meeting with DFFE

A pre-application meeting was undertaken on 7 November 2023, firstly, to confirm that DFFE is the competent authority, to provide background on the project and previous EA which has since lapsed, to agree on the activities triggered and which EIA process is required and, secondly, to confirm the list of specialist assessments required for the application.

DFFE confirmed responsibility as the competent authority since the applicant is a national department namely DWS.

All correspondence with the DFFE, including the notes of the pre-application meeting, are attached in Annexure B1.

3.1.2 Screening phase

The Applicant appointed Zutari to do a pre-feasibility study. Specialists undertook desktop assessments and site visits to ground truth the DFFE sensitivity report and map the site features and areas, and compile their Impact Assessments and Compliance statements which are all appended to this BAR.

1. Specialists identified and mapped all sensitive features and areas of the site and provided suitable buffers for these areas/features and all the sensitive areas (including buffers) were categorised into one of the following sensitivity categories, Very High, High, Medium, Low or not sensitive (or uncategorised). With notes regarding these sensitivities.
2. The Applicant used the screening information from the specialists to identify suitable areas for the Geo-Tech investigations.
3. Site visits - Zutari Engineers visited the proposed sites and inspected existing infrastructure on 22 February 2023 and separately visited the existing Gariep WTP on 30 January 2024.

3.2 Basic Assessment Phase

The objectives of the basic assessment process are to, through a consultative process -

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 possible feasible and reasonable alternatives, including the activity, location, and technology alternatives;

c) describe the need and desirability of the proposed project and 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 the 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;

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 identify and motivate a preferred site, activity and technology alternative;

i) identify suitable measures to avoid, manage or mitigate identified impacts; and

ii) identify residual risks that need to be managed and monitored.

Various methods and sources were utilised to identify the potential social and environmental aspects associated with the proposed project and to develop the ToRs for the specialist studies. The sources of information for the preparation of this report include, *inter alia*, the following:

- Collection of information specific to the project, as provided by the Applicant;
- Project description;
- Basic methodology for the construction of the various project components;
- Basic methodology during operations and decommissioning;
- The expected timeframe for project development;
- Maps and figures, outlining the proposed facilities;
- Technical descriptions relating to the function and layout of project components;
- Other relevant BARs/ EIRs prepared for BAs/EIAs undertaken in the area;
- Environmental baseline literature and desktop spatial surveys for this site and surrounding areas;
- Environmental baseline surveys for this site and surrounding areas from site visits by specialists;
- Consultation with the project team (including specialists); and
- Consultation with I&APs, including authorities.

An application form for the project was submitted to DFFE (to register the project on the Department's database). The draft BAR will be made available for 30 days (hard copies and online) and I&APs will be notified of the availability. All comments received will be recorded and responded to in a Comments and Response Report and the draft BAR will be updated to address I&AP comments, where appropriate. The final BAR will be submitted to DFFE for decision-making, with the final BAR being submitted no later than 90 days from the receipt of the application form. The competent authority must then decide within 57 days of receipt of the final BAR and EMPr,and in writing –

(a) Grant environmental authorisation in respect of all or part of the activity applied for; or

(b) Refuse environmental authorisation.

Summary of the key dates of the formal BAR process:

- The BA Application form was submitted to DFFE on 7 May 2024.
- DFFE confirmed receipt and accepted the application form on 13 May 2024.
- Lodging hard copies of the Draft BAR at the public libraries and making a digital copy available online – 3 June 2024
- Notification of potential I&APs, affected landowners, neighbouring landowners and state departments of availability of the Draft BAR for review and comment – 3 June 2024
- Last day to submit comment on Draft BAR – 4 July 2024
- Submit Final BAR to DFFE – Towards the end of July 2024
- DFFE provide decision on application – 57-days from date of submission of Final BAR to issue decision.
- Notification of registered I&APs of DFFE decision and appeal process – upon receipt of DFFE decision.

3.3 Methodology

3.3.1 Specialist Assessments

To provide a scientific assessment that is transparent and robust, a clear methodology is required. Although each specialist required a methodology that was specific to their investigation (detailed in their reports in Annexure D), they were each given the following Terms of Reference (ToR):

- Undertake a site investigation to determine the status quo and identify any sensitive features or no-go areas;
- Provide shapefiles of all sensitive features;
- Assess all impacts associated with the proposed project and the no go alternative;
- Make use of the Zutari Impact Assessment Methodology (explained below in Section 3.2.2) when assessing the impacts of the proposed project, as well as cumulative impacts (detailed below in Section 3.2.3);
- Provide a detailed description of appropriate mitigation measures that can be adopted to reduce or avoid negative impacts and improve positive impacts for each phase of the project. Indicate the level of significance of impacts pre- and post-mitigation;
- Provide a summary of succinct and practical recommendations based on mitigation measures identified to form the basis of environmental authorisation requirements, should the development be authorised;
- Comply with the content requirements for specialist reports listed in Appendix 6 of the 2014 EIA Regulations (GN R982 of 2014). (These have been updated where required to consider the amendments made to the Regulations on 7 April 2017); and
- Comply with procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the NEMA, 1998, when applying for environmental authorisation (GN R320, of 20 March 2020).

3.3.2 Impact Assessment Methodology

This section outlines the proposed method for assessing the significance of the potential environmental impacts. For each predicted impact, criteria are ascribed, and these include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criterion based on a seven-point scale (refer to Figure 3-2); and the significance is auto-generated using a spreadsheet through the application of the calculations in Table 3-1. Specialists can comment where they disagree with the auto-calculated impact significance rating.

Figure 3-2: Calculation of Significance

Calculations

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** *(*size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (intensity + duration + extent)

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category, negligible, minor, moderate or major, and the type would be either positive or negative.

Table 3-1: Assessment criteria for the evaluation of impacts

Criteria	Numerical Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately
	2	Brief	Impact will not last longer than 1 year
	3	Short term	Impact will last between 1 and 5 years
	4	Medium term	Impact will last between 5 and 10 years
	5	Long term	Impact will last between 10 and 15 years
	6	On-going	Impact will last between 15 and 20 years
	7	Permanent	Impact may be permanent, or in excess of 20 years
Extent	1	Very limited	Limited to specific isolated parts of the site
	2	Limited	Limited to the site and its immediate surroundings
	3	Local	Extending across the site and to nearby settlements
	4	Municipal area	Impacts felt at a municipal level
	5	Regional	Impacts felt at a regional level
	6	National	Impacts felt at a national level
	7	International	Impacts felt at an international level
Intensity	1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered

	2	**Very low**	Natural and/ or social functions and/ or processes are slightly altered
	3	**Low**	Natural and/ or social functions and/ or processes are somewhat altered
	4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
	5	**High**	Natural and/ or social functions and/ or processes are notably altered
	6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered
	7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered
Probability	**1**	**Highly unlikely / None**	Expected never to happen
	2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	**Probable**	Has occurred here or elsewhere and could therefore occur
	5	**Likely**	The impact may occur
	6	**Almost certain / Highly probable**	It is most likely that the impact will occur
	7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also taken into account. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in Table 3-2, Table 3-3, and Table 3-4, respectively.

Table 3-2: Definition of confidence ratings

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 3-3: Definition of reversibility ratings

Category	Description

Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 3-4: Definition of irreplaceability ratings

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

4 PUBLIC PARTICIPATION

A Public Participation Process (PPP) is a broad, inclusive, and continuous process of communication between a Proponent of a project, and those potentially affected by the activities of the proposed development. This can include a wide range of activities that are relevant to the entire life of a project. During the BA process, the aim is to provide an opportunity for stakeholders to be (1) informed of projects occurring in their area which may affect them directly or indirectly and (2) provide an accessible and meaningful opportunity for people to ask questions, raise concerns or grievances and (3) to ensure that these are used to guide the new development, and planned operations, in a responsible manner that complements the local socio-economic environment, reduces environmental impact and enhances the benefits of the project.

South African legislation and guidelines (refer to Section 2) have formalised the Public Participation Process (PPP) for BA. PPP forms an integral component of this process and enables interested and affected parties (I&APs) to identify issues, and concerns, and make suggestions during the BA process. This PPP is structured to provide I&APs with the opportunity to learn about the proposed project, to provide input through the review of documents/ reports, and to voice any issues of concern at various stages throughout the BA process. These stages are described below.

Proof of Public Participation actions and documents are included in Annexure C and will be added to as the project proceeds.

4.1 Public Participation Process

A combined Public Participation Process (PPP) will be run for Scheme 1B and the WULA. The PPP will involve the following:

4.1.1 Draft BAR (formal phase)

- **Notifications:** the following methods of notification are used

  BID – a Background Information Document (BID) will be sent out to all I&APs who were on the previous I&AP list, as obtained from GladAfrica (previous consultants), as well as to newly-identified I&APs, hand delivered (where possible) to land owners along the proposed pipeline route, and placed along with the draft BAR hard copies in the four identified public libraries as listed below.

  Written notice – Written notices are to be sent to registered I&APs. This notification will inform the reader of the availability of the draft BAR, where and when to access it and where to send a comment. Written notices were distributed via email

  Site Notices – The availability of the Draft BAR was advertised via ten site notices placed at strategic locations along the project.

  Newspaper advert – The availability of the Draft BAR was advertised in the 'The City Press and the "Rapport" newspapers and informed the public of the public participation opportunities and the availability of the Draft BAR for comment.

- **Information for review:** the draft BAR will be accessible during the comment period as follows:

  Hard copies: Four hard copies have been made available at the following locations: (i) Gariep Dam, (ii) Trompsburg, (iii) Edenburg and (iv) Bloemfontein

  - Gariepdam Public Library - 11 Patrys Street
  - Edenburg Public Library - 16 Church Street
  - Trompsburg Public Library - 78 Voortrekker Street
  - Lourierpark Public Library - Cnr Doringkiaat & Nanabessie Streets

  Electronic copy: was accessible via either of the following links:

- Zutari : **https://geoverse.zutari.com/portal/apps/experiencebuilder/experience/?id=2f48681c19a24836bcfc03da3c653c3a**
- DWS
- **https://www.dws.gov.za/projects.aspx**

► **Focused Engagements:** focused engagements with key stakeholder groups, e.g. farmers and land owners, to take place during the 30-day comment period. Three engagements will take place at Gariep Dam, Trompsburg and Bloemfontein on 11 June 2024 at the following times and venues:

* Gariep Dam: 08:30 to 10:30: de Stijl Gariep Hotel, 2 Aasvoel Street
* Trompsburg: 12:30 to 15:00: Trompsburg Primary School (Kuier & Klets Sentrum), 392 Wessels Street
* Bloemfontein: 18:00 to 20:30: Protea Hotel by Marriott Bloemfontein Willow Lake, 101 Henry Street, Willows

► **Comment period:** The Draft BAR was available for comment for 30-days from the 3rd of June 2024 to the 4th of July 2024

► **Comments and responses report:** all comments will be captured and responded to in a comments and responses report (CRR). The CRR will be appended to the final BAR and submitted to the DFFE as part of the final application. Where appropriate the final BAR may be revised in response to comments received.

4.1.2 Decision phase

► Following submission of the final BAR the DFFE have 57-days to reach and issue a decision.
► Registered I&APs will be notified in writing within 14-days of the decision. I&APs will be informed of the right to appeal and the procedure to follow.
► I&APs will have 20-days from the date of the written notification to lodge an appeal.

4.2 Identification of stakeholders

A database of I&APs has been obtained from GladAfrica (previous EA) and has since been updated according to the new additional section of the Scheme 1B. Landowners will be asked to forward details of all occupiers for registration and share the notification with them. Farmers Associations will be contacted to obtain information re affected landowners.

The database was initiated by including the details of the following affected parties:

► Landowners, adjacent landowners and occupiers;
► Relevant district and local municipal officials and ward councillor/s;
► Relevant national and provincial government departments; and
► Relevant environmental bodies or organisations.
► Farmer Associations

Potential inetrested parties and stakeholders will be reached via the site notices, newspaper adverts and hand distrubition of the BID and comment forms at strategic locations along the project route where possible. All notifications will include the relevant information and guidance on how to register as an I&AP, access documentation and submit comments. This I&AP database will be updated as new I&APs are identified throughout the project lifecycle. The list of I&APs is included in Annexure C.

4.3 Authority Involvement

In terms of Section 24O (2) and (3) of the NEMA, the following state departments and/or parastatal bodies were sent a copy of the draft BAR for comment.

National, Provincial and local authorities, and parastatal organisations:

- Department of Agriculture (Free State): Land Use Management.
- Department of Agriculture, Land Reform and Rural Development (DALRRD).
- Department of Health.
- Department of Public Works.
- Department of Water and Sanitation (DWS).
- DFFE: Biodiversity Conservation.
- DFFE: Integrated Environmental Management.
- DFFE: Protected Areas Planning and Management Effectiveness.
- DESTEA (Free State Provincial Authority)
- Eskom.
- National Department of Transport (DOT).
- National Department of Water and Sanitation.
- Rate payers' association
- Farmers Association (Free State)
- South African National Defence Force.
- Civil Aviation
- South African National Roads Agency (SANRAL).
- Free State Department of Agriculture.
- Free State Department of Rural Development and Land Reform.
- Free State Department of Transport and Public Works: Road Network Management.
- Free State Department of Transport and Public Works: Road Planning.
- Free State Roads Department.
- Free State: Transport and Public Works
- Conservation agencies: WESSA, EWT.
- Endangered Wildlife Trust (EWT).
- SAHRA
- FSHRA

4.4 Summary of Comments and Responses

All comments received during the 30-day comment period will be responded to in a CRR and appended to the fBAR and ultimately be submitted with the final BAR to inform the decision-making. The CRR will be found in Annexure C after the commenting period is complete.

The basic assessment report, specialist reports and EMPR will be updated where appropriate to accommodate issues raised during the PPP.

5 DESCRIPTION OF THE PROPOSED PROJECT

The following subsections provide more information on the project context, location, components and activities of the proposed Xhariep Pipeline Scheme 1B.

5.1 Site location and extent

DWS is proposing to construct a potable bulk water pipeline from the Gariep Dam wall connecting to the existing bulk water distribution system for the GBWSS. The proposed scheme will traverse the Xhariep District Municipality (XDM) and the Kopanong Local Municipality (KLM) in particular, as well as the Mangaung Metropolitan Municipality (MMM). The entire project will be located in the Free State Province.

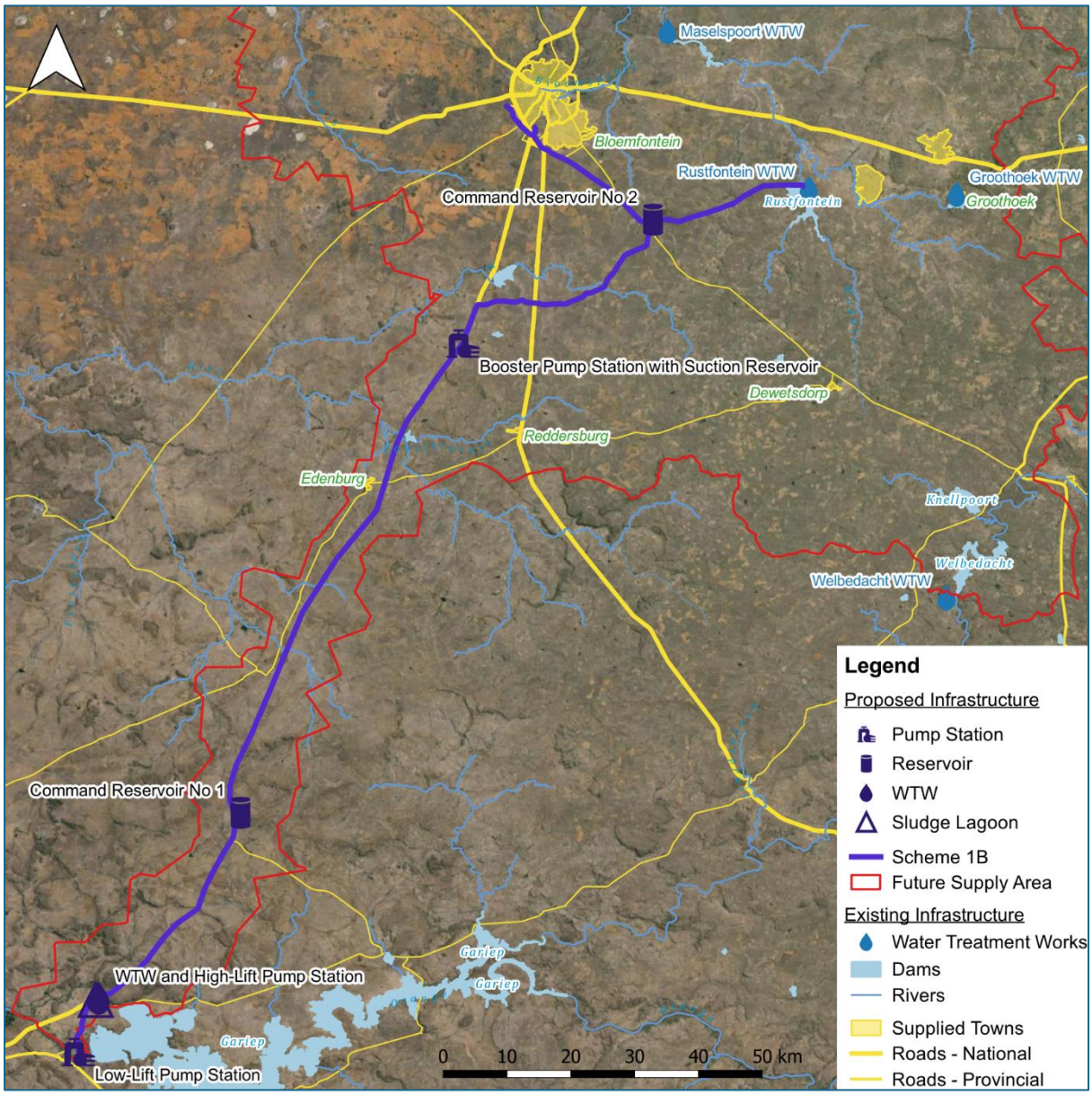


Figure 5-1: Location map

5.2 Description of Xhariep Pipeline Scheme 1 B

The proposed route is known as Scheme 1B and will be a potable bulk water pipeline from Gariep Dam to Bloemfontein (mostly along the N1) and Botshabelo / Thaba Nchu consisting of the following:

- Tie-in at existing pipeline downstream of Gariep Dam Wall,
- The low lift pump station at or near the connection to the Gariep Dam,
- A WTW with a high lift pump station,
- A command reservoir,
- A booster pump station with suction reservoir,
- A 2nd command reservoir,
- The entire pipeline route from the Gariep Dam to the connection points in Bloemfontein and near Rustfontein WTW (supplying Botshabelo / Thaba Nchu).

The Scheme 1B route follows the N1 highway from Gariep Dam but turns eastwards before reaching Tierpoort Dam. The pipeline continues to a command reservoir east of the R702 where it splits into two gravity lines, one feeding Bloemfontein, tying into the MMM bulk distribution network, while the other feeds Botshabelo / Thaba Nchu, tying into the Vaal Central Water Board (VCWB) bulk distribution network. Scheme 1B is potable water to be treated at a new WTW close to Gariep Dam.

5.3 Description of the Preferred Alternative: Scheme 1B

The components listed in section 5.2 are described in more detail under respective headings to follow.

5.3.1 Pipeline Route Description

Scheme 1B is a potable bulk pipeline from Gariep Dam to Bloemfontein and Botshabelo / Thaba Nchu consisting of:

- Tie-in at existing pipeline downstream of Gariep Dam Wall
- The low lift pump station at or near the connection to the Gariep Dam,
- A WTW with a high lift pump station,
- A command reservoir,
- A booster pump station with suction reservoir,
- A 2nd command reservoir,
- The entire pipeline route from the Gariep Dam to the connection points in Bloemfontein and near Rustfontein Dam (supplying Botshabelo / Thaba Nchu), and,
- Substations
- Access roads and borrow pits (to be determined by the geotech investiagtions)

The sizing and capacity of the various components are shown in Table 5-1. The total footprint is estimated to be 10,553,100 m² (1,055 ha), excluding the pipelines the total is 777,500 m² (78 ha).

Table 5-1: Sizing and capacity of the proposed infrastructure for Scheme 1B

Component	Capacity (m^3/s) (1)	Capacity (Ml/d) (1)	Estimated Footprint (m^2)
Gariep Low Lift Pump Station	3.8	328.1	10,000
Gariep WTW	-	312	600,000
Gariep High Lift Pump Station	3.62	312.4	(included in WTP above)
Command Reservoir (3 sites)	-	80 Ml	37,000 per site
Booster Pump Station	3.62	312.4	10,000

Component	Capacity (m^3/s) (1)	Capacity (Ml/d) (1)	Estimated Footprint (m^2)
Gariep Pipeline (188.5 km, 1800 Ø)	3.62	312.4	7,540,000
Gravity Pipeline to Brandkop (31.37 km, 2000 Ø)	3.62	312.4	1,254,800
Gravity Pipeline to Rustfontein Pump Station (24.52 km, 1400 Ø)	2.43	209.8	980,800
Substation (2 sites)	-	-	22,500 per site

(1) Final capacities of infrastructure still to be confirmed.

5.3.1.1 Locations

The project area is made up of six sites, namely:

1. The low lift pump station,
2. A WTP with sludge lagoons with a high lift pump station,
3. A command reservoir,
4. A booster pump station and suction reservoir,
5. A 2nd command reservoir, and,
6. The pipeline route from the Gariep Dam to the connection points at Bloemfontein and Rustfontein Pump Station.

The central co-ordinates of the proposed sites are provided below:

1. Proposed Low Lift Pump Station — 30°37'30.01"S and 25°29'03.00"E.
2. Alternative Low Lift Pump Station — 30°37'32.86"S and 25°29'03.46"E.
3. Proposed WTP and High Lift Pump Station — 30°32'27.60"S and 25°30'46.80"E.
4. Proposed Command Reservoir — 30°15'02.00"S and 25°44'18.00"E.
5. Proposed Booster Pump Station — 29°30'56.00"S and 26°05'15.00"E.
6. Proposed 2nd Command Reservoir — 29°19'7.70"S and 26°23'04.70"E.

The co-ordinates of the approximate pipeline tie-in points are as follows:

1. Gariep Dam — 30°37'28.17"S and 25°30'05.59"E.
2. Bloemfontein (MMM) — 29°08'37.54"S and 26°09'18.39"E.
3. Rustfontein Pump Station (VCWB) — 29°16'13.23"S and 26°37'09.62"E.

5.3.2 Low Lift Pump Station

The proposed low lift pump station would be located close to the existing Gariep WTP and connect into one of the existing 2.1m Ø pipelines from the Gariep Dam wall. The raw water would then be pumped to a new WTP.

The site information available from the Surveyor General's GIS Website is summarised in Table 5-2 and photos of the site are shown in Table 5-3.

Table 5-2: Summary of land information for proposed low lift pump station site.

Parameter	Information
Geometry Identifier	1612110
Parcel Type	Farm Portion

Parameter	Information
Farm Name	Waschbank No. 274
Parcel Number	1/274
Province Name	Free State
Major Region	Phillippolis
Major Code	F0260000

The key observations from the site visit are (see maps and figures below for illustration):

- Site located east of the surfaced road (proposed in the previous EA) has a steep slope. For this application the site for the low lift pumpstation is located west of the surfaced road as the topography is more suitable.
- Overhead powerlines are in close proximity to the site.
- Site is accessible from existing roads
- The proposed site is located above the existing Gariep water treatment works and therefore deemed to be located above the 1:50 year floodlines.

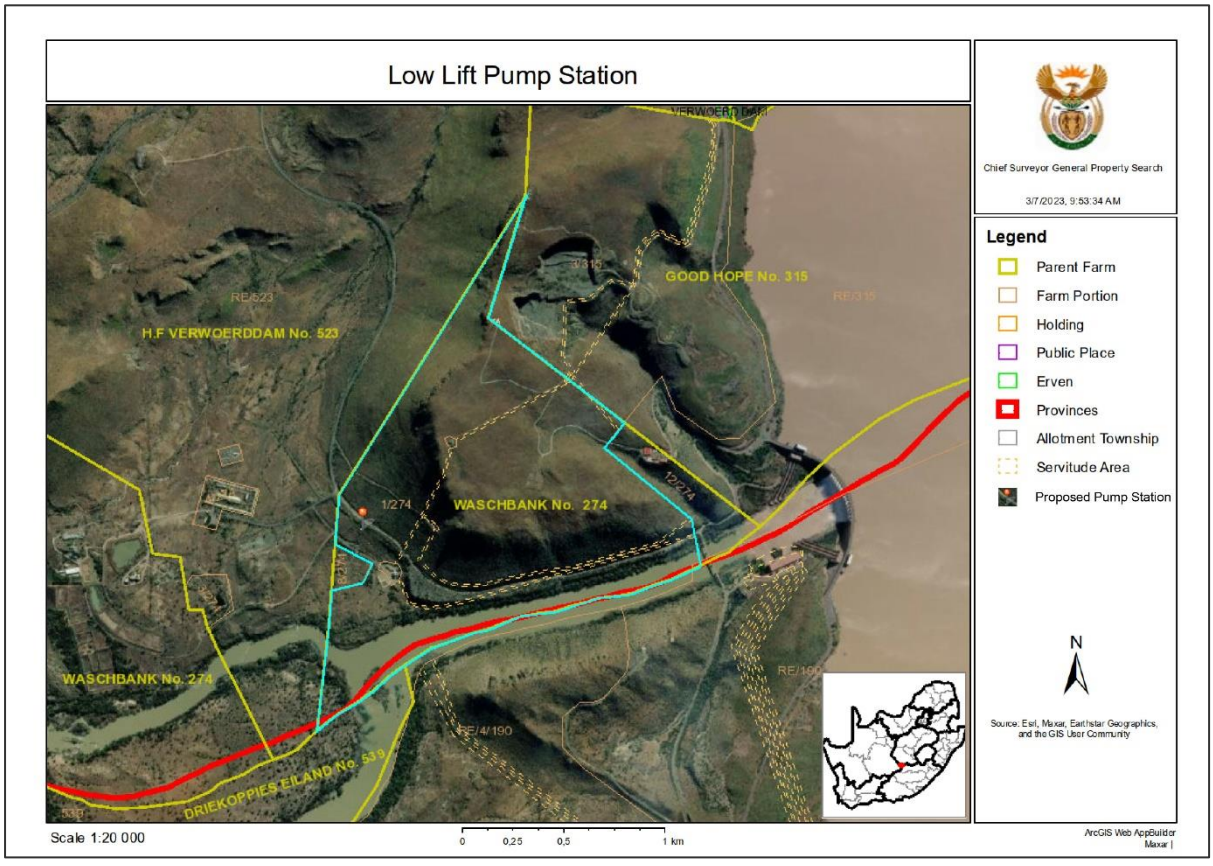


Figure 5-2: Proposed location of Low Lift Pump Station

Table 5-3: Pictures of proposed low lift pump station site

Existing Gariep WTP

Southern end of potential site

Middle of potential site

Alternative site at existing structure

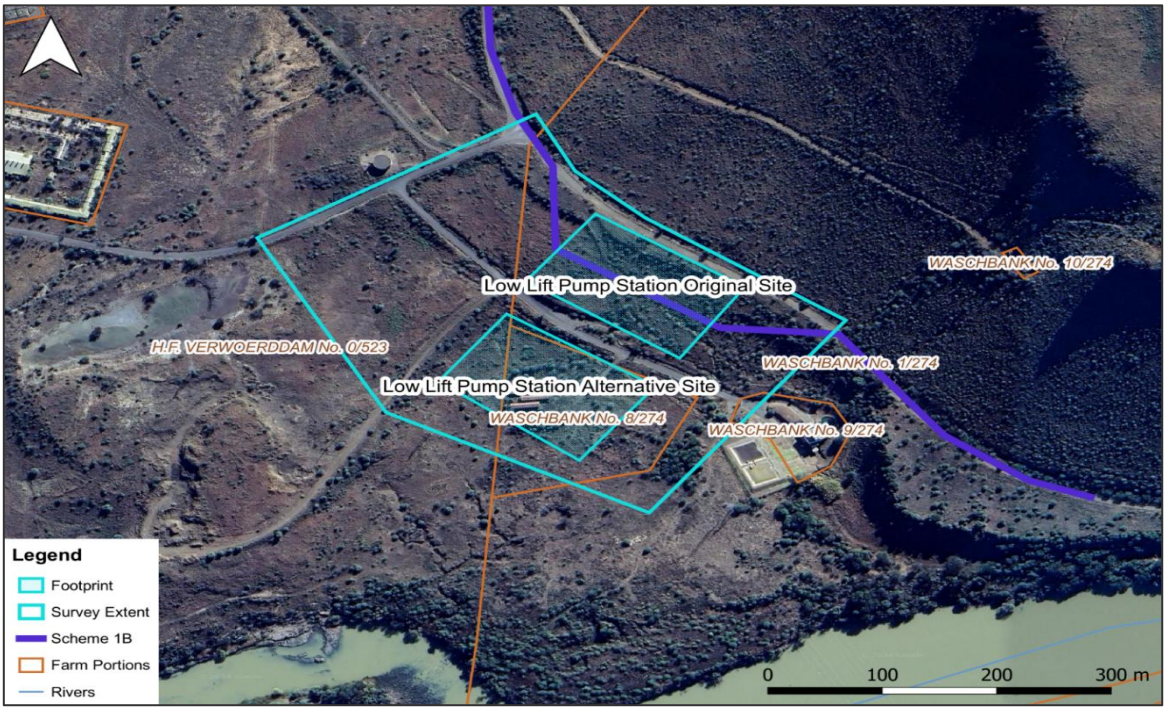


Figure 5-3: Location of originally proposed (previous EA) and alternative sites (this application) for low-lift pump station

Figure 5-4:Layout and access for the proposed low-lift pump station

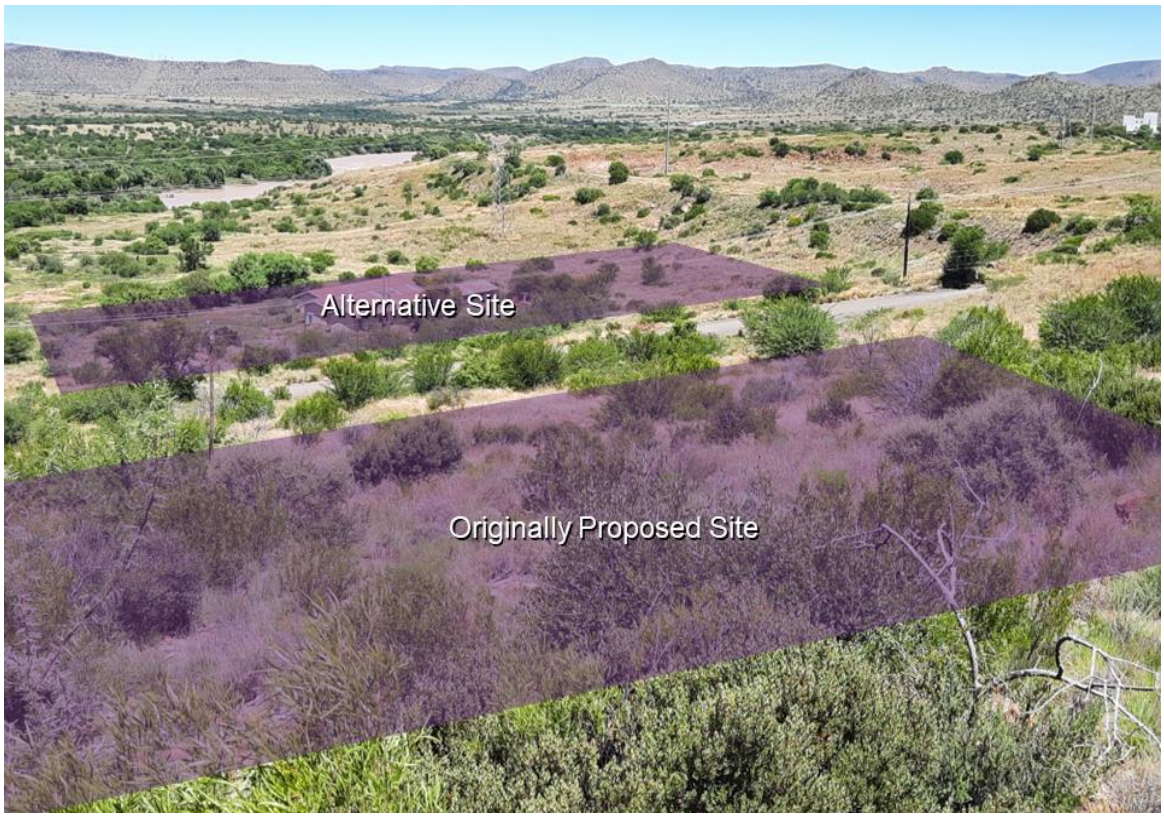


Figure 5-5: Photo of proposed and alternative sites for low-lift pump station.

5.3.3 Water Treatment Works and High Lift Pump Station

The proposed WTW would receive water from the low lift pump station and is located approximately 10km from the low lift pump station (refer to Figure 5-6 for proposed location of WTW). The site information available from the Surveyor General's GIS Website is summarised in Table 5-4 and photos of the site are presented in Table 5-5.

Table 5-4:Summary of land information for proposed WTP site

Parameter	Information
Geometry Identifier	871549
Parcel Type	Farm Portion
Farm Name	Inhoek No. 495
Parcel Number	1/495
Province Name	Free State
Major Region	Phillippolis
Major Code	F0260000

The key observations from the site visit are:

- Site is located next to the N1 highway and will be very visible from the road.
- Access to site will need to be created from the R701 road.
- There is plenty of space on this site.
- Site has a gentle slope to aid the treatment process to function under gravity.
- Sufficient space is available for the construction of sludge lagoons.
- Overhead powerlines are in close proximity to the site.

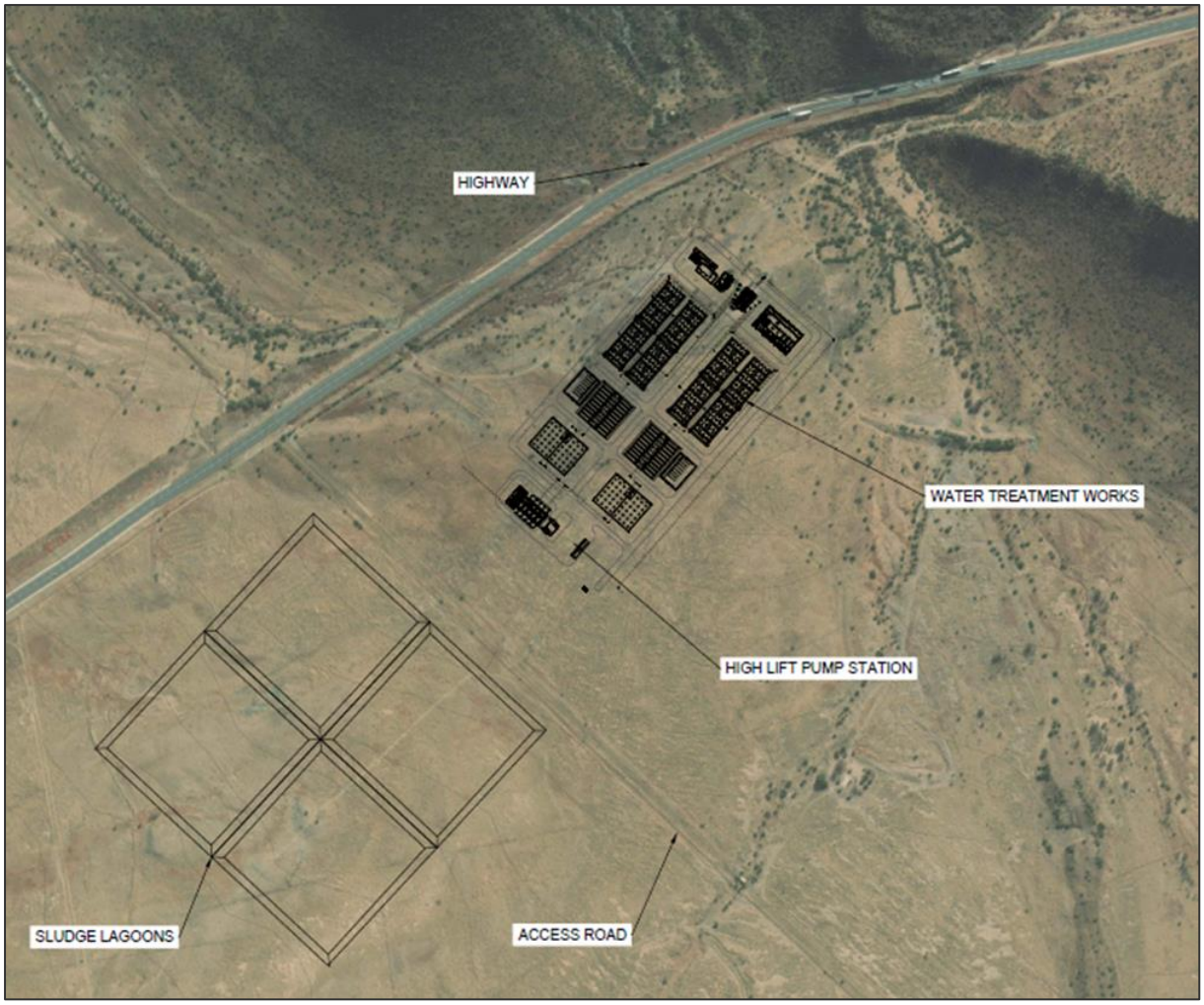


Figure 5-6: Proposed location of WTP, sludge lagoons, and High Lift Pump Station

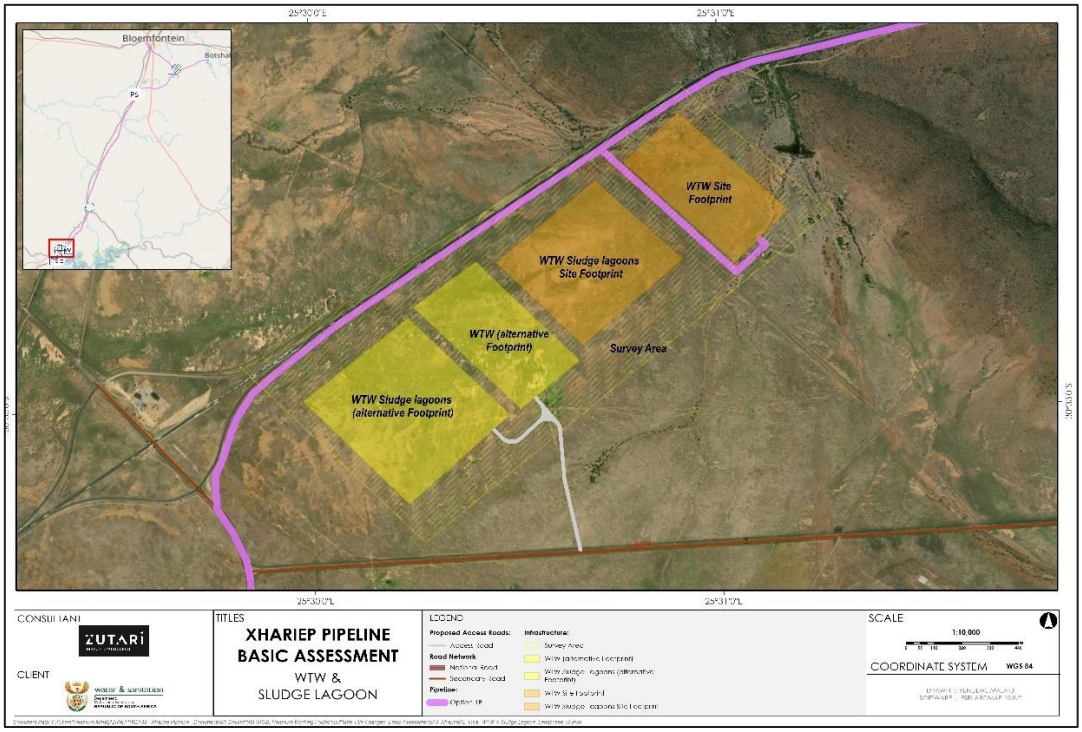


Figure 5-7: Proposed layout access of the WTP, sludge lagoons, and High Lift Pump Station

Table 5-5:Pictures of proposed WTP and high lift pump station site

 Location next to the N1	 View towards the eastern boundary of the site
 View of the middle of the site	 View towards to the western boundary

5.3.4 Command Reservoir No 1

The proposed Command Reservoir No 1 will provide balancing capacity and supply the booster pump station. The Command Reservoir will be required in the vicinity of Springfontein (refer to Figure 5-8 for proposed location).

The site information available from the Surveyor General's GIS Website is summarised in Table 5-6**Table 5-6:** and photos of the site are presented in Table 5-7.

Table 5-6:Summary of land information for proposed command reservoir No 1

Parameter	Information
Geometry Identifier	839511
Parcel Type	Farm Portion
Farm Name	Viljoensdam No. 498
Parcel Number	RE/498
Province Name	Free State
Major Region	Bethulie
Major Code	F0020000

The key observations from the site visit are:

- Site access will be off the N1 highway towards the Dam.

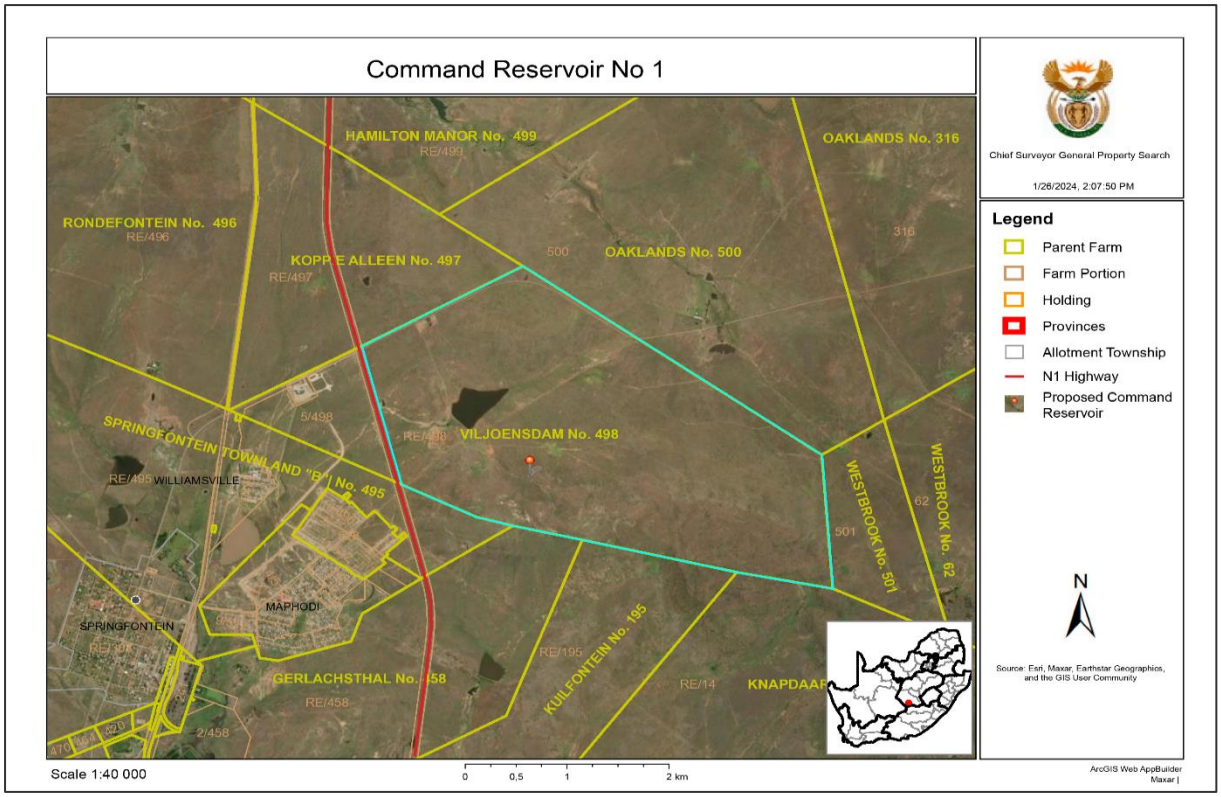


Figure 5-8:Proposed location of Command Reservoir No 1

Table 5-7: Pictures of proposed command reservoir site

 Existing intersection off N1 and eastern end of potential site	 Site located before truck stop and Springfontein
 Western end of potential site	 Middle of potential site

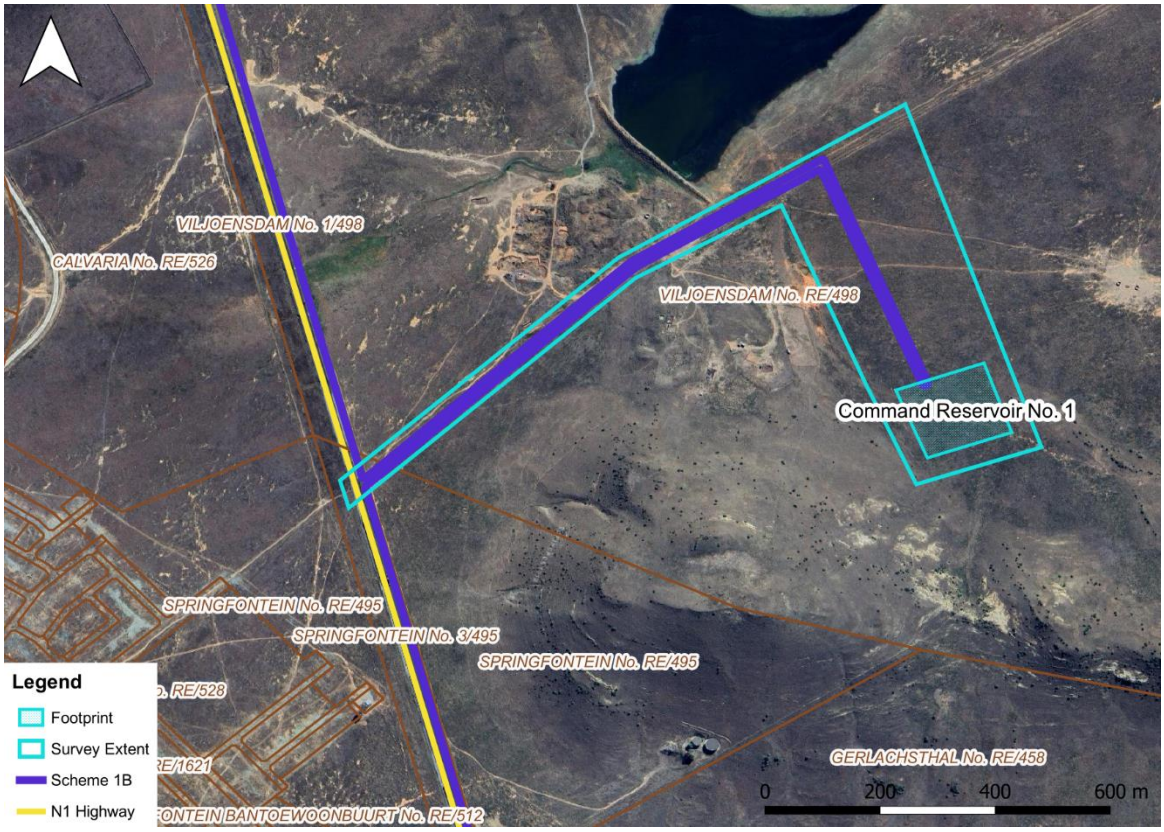


Figure 5-9: Layout of the proposed command reservoir No 1

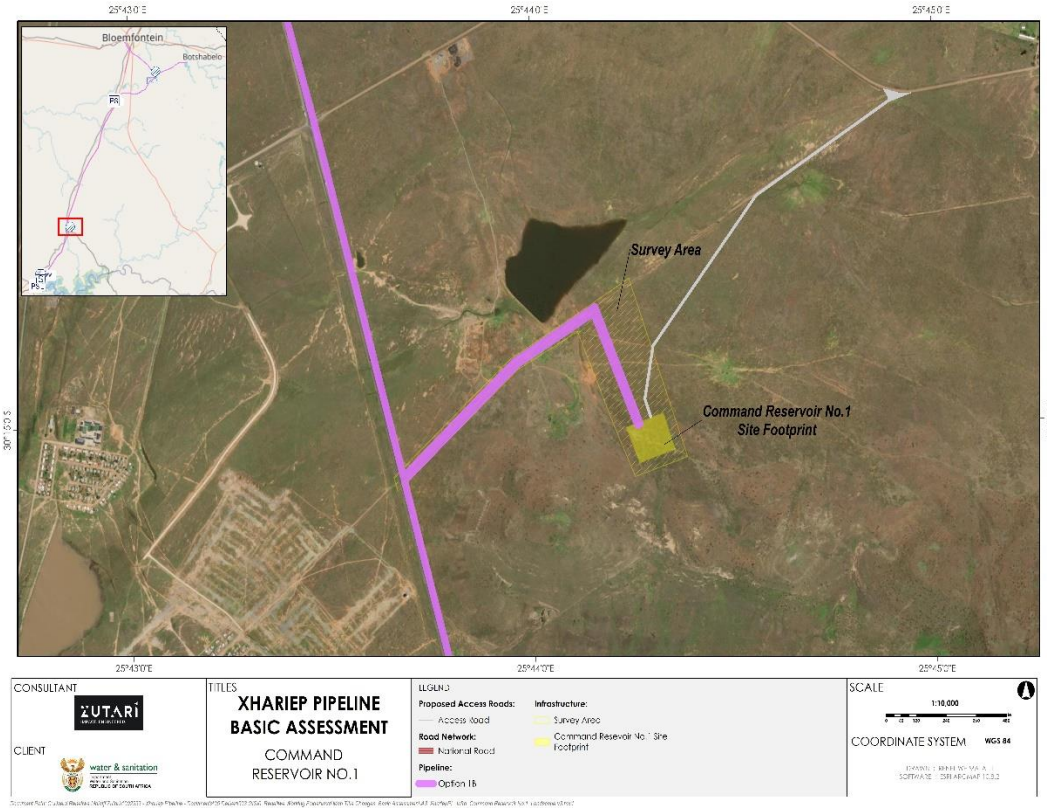


Figure 5-10: Layout ad access of the proposed command reservoir No 1

5.3.5 Booster Pump Station with Suction Reservoir

The proposed booster pump station would receive treated water from Command Reservoir No 1 and pump it to Command Reservoir No 2. The site is located along the N1 before the pipeline turns to the east, (refer to Figure 5-11 for the proposed location).

The site information available from the Surveyor General's GIS Website is summarised in Table 5-8.

Table 5-8: Summary of land information for proposed booster pump station site

Parameter	Booster Pump Station
Geometry Identifier	10465867
Parcel Type	Farm Portion
Farm Name	Vaalkop No. 2589
Parcel Number	2/2589
Province Name	Free State
Major Region	Bloemfontein
Major Code	F0030000

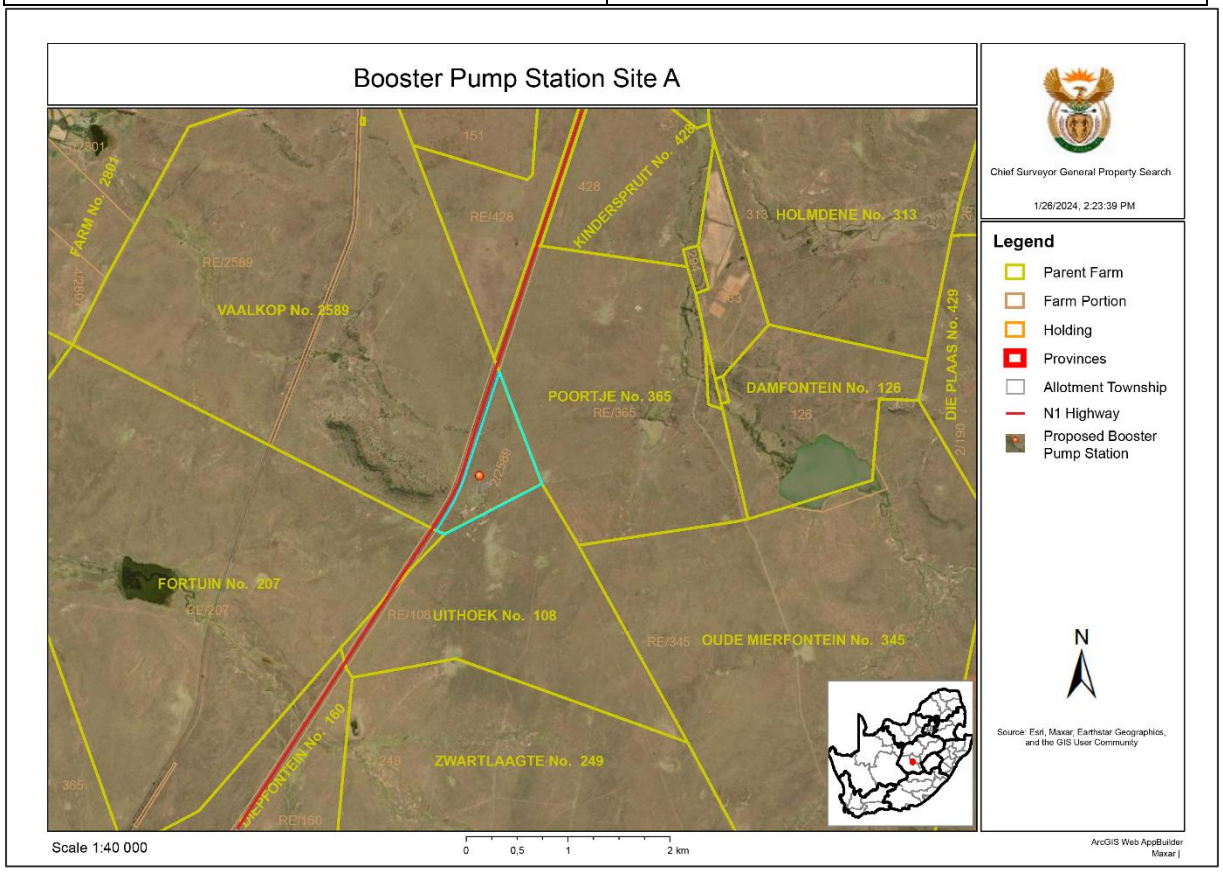


Figure 5-11:Proposed location booster pump station with suction reservoir

Figure 5-12:Photo of proposed site for booster pump station

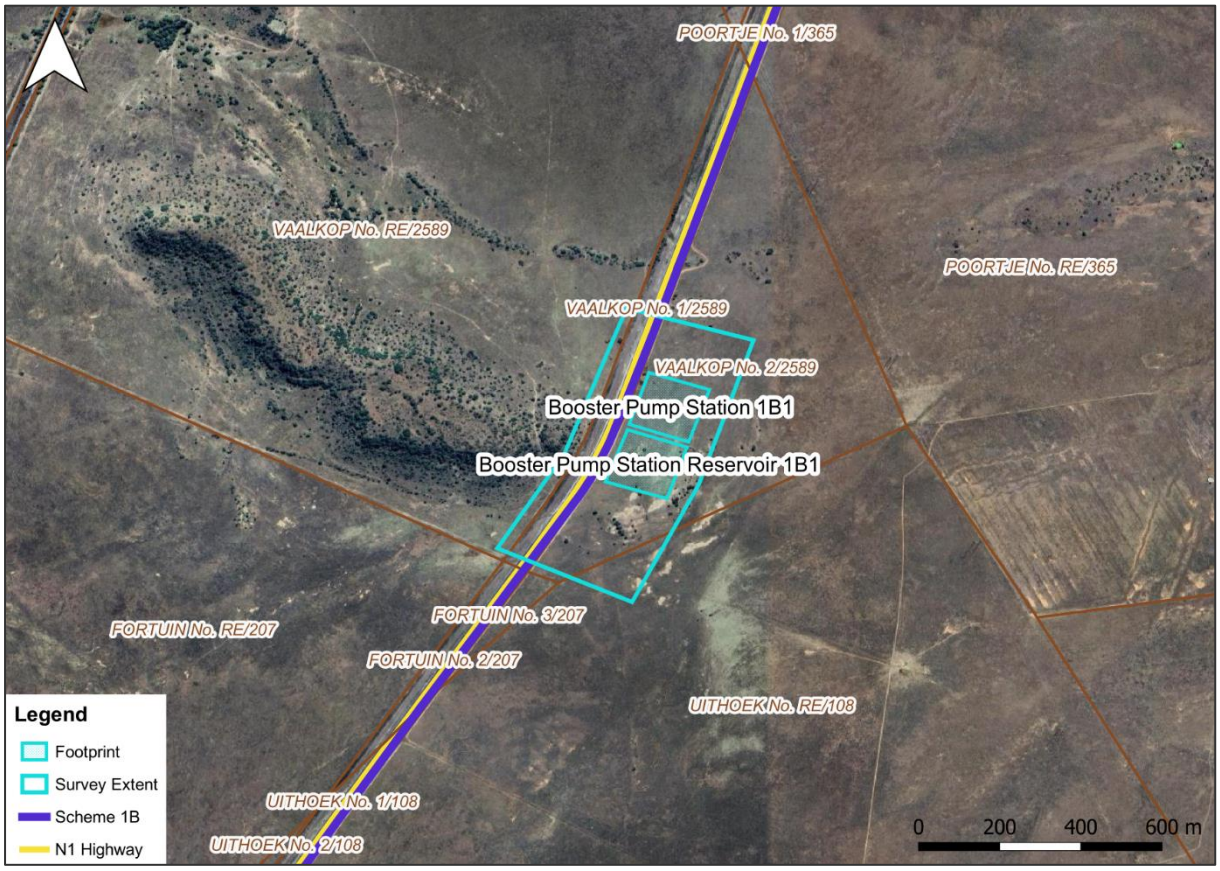


Figure 5-13: Proposed layout for booster pump station with suction reservoir

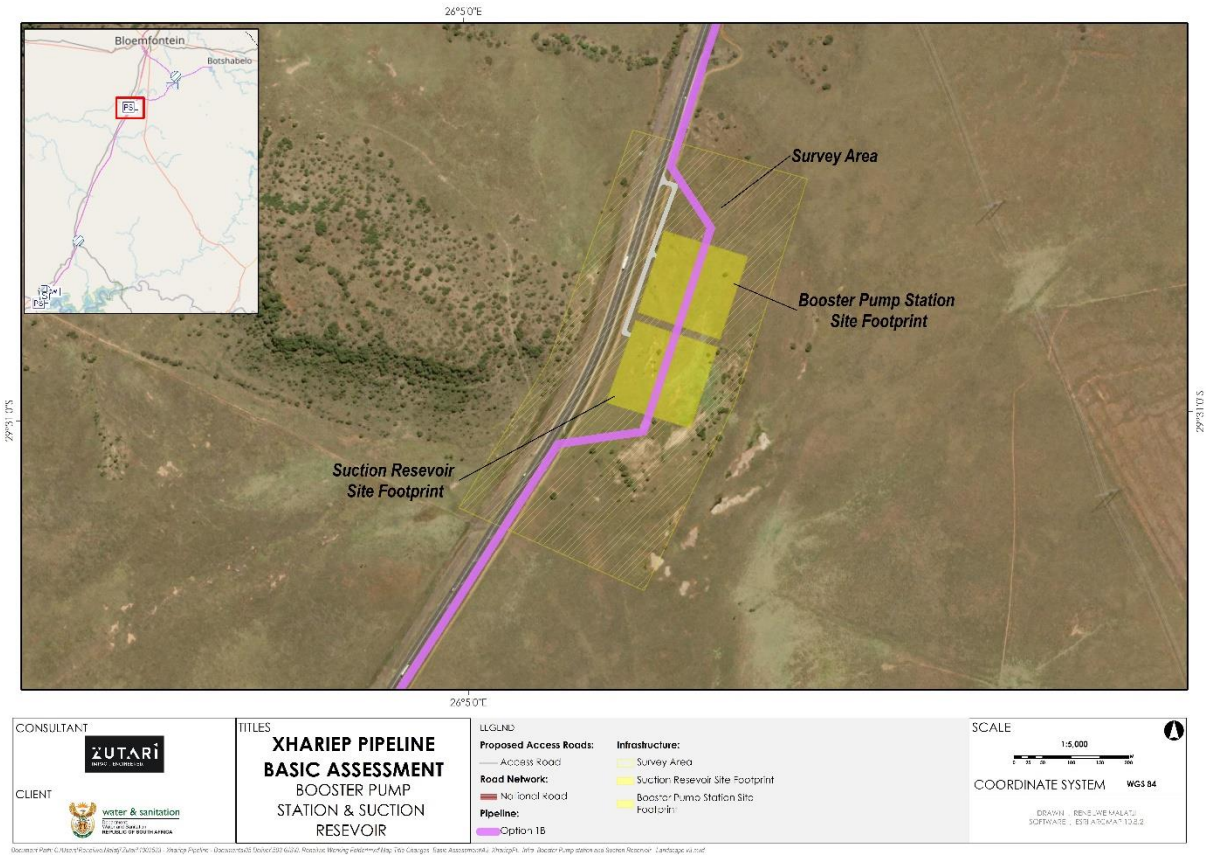


Figure 5-14: Proposed layout and access for booster pump station with suction reservoir

5.3.6 Command Reservoir No 2

The proposed second command reservoir would gravity feed to Rustfontein WTP pump station (refer to Figure 5-15 for proposed location and Figure 5-16 for a site photo).

The site information available from the Surveyor General's GIS Website is summarised in Table 5-9**Table 5-9:** .

Table 5-9: Summary of land information for proposed command reservoir site

Parameter	Information
Geometry Identifier	10467452
Parcel Type	Farm Portion
Farm Name	Lieuw Kop No. 105
Parcel Number	105
Province Name	Free State
Major Region	Bloemfontein
Major Code	F0030000

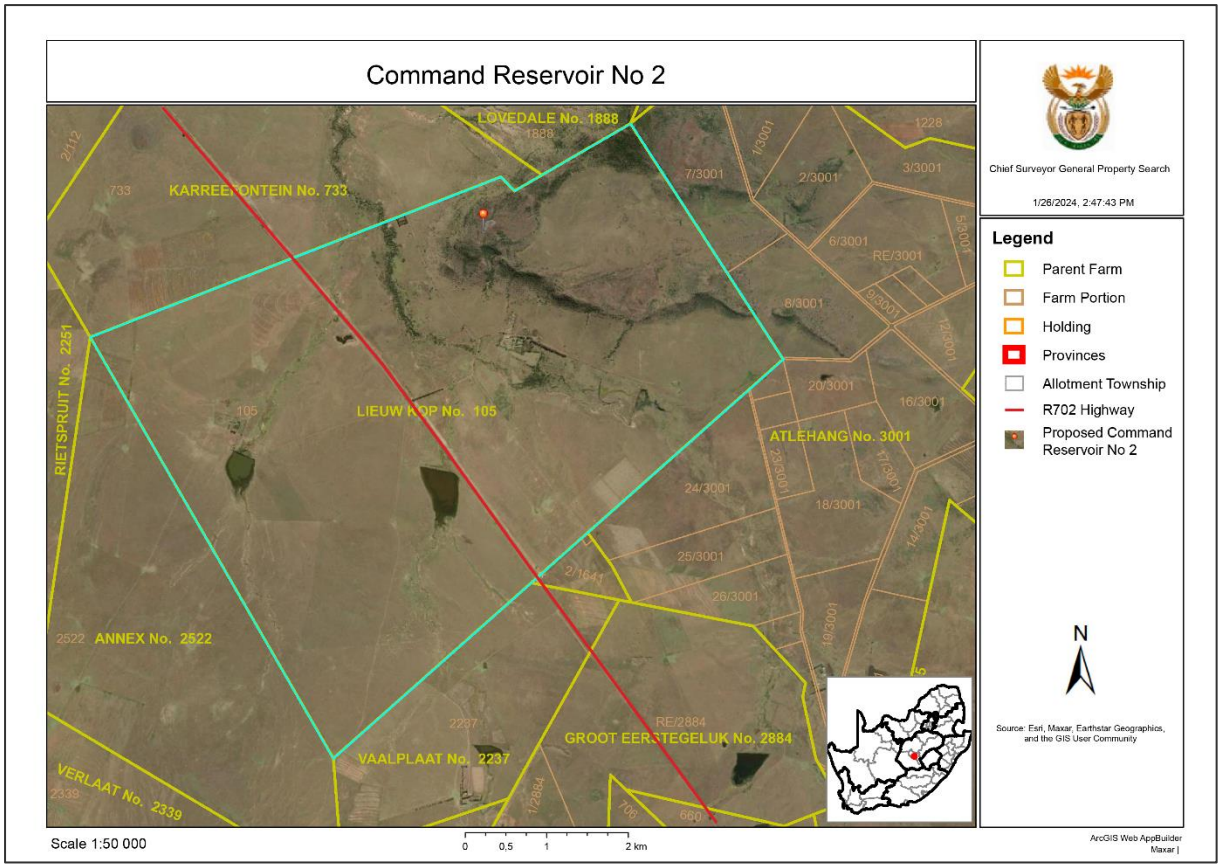


Figure 5-15:Proposed location of proposed 2nd command reservoir

Figure 5-16: Photo of the proposed site for the command reservoir no. 2

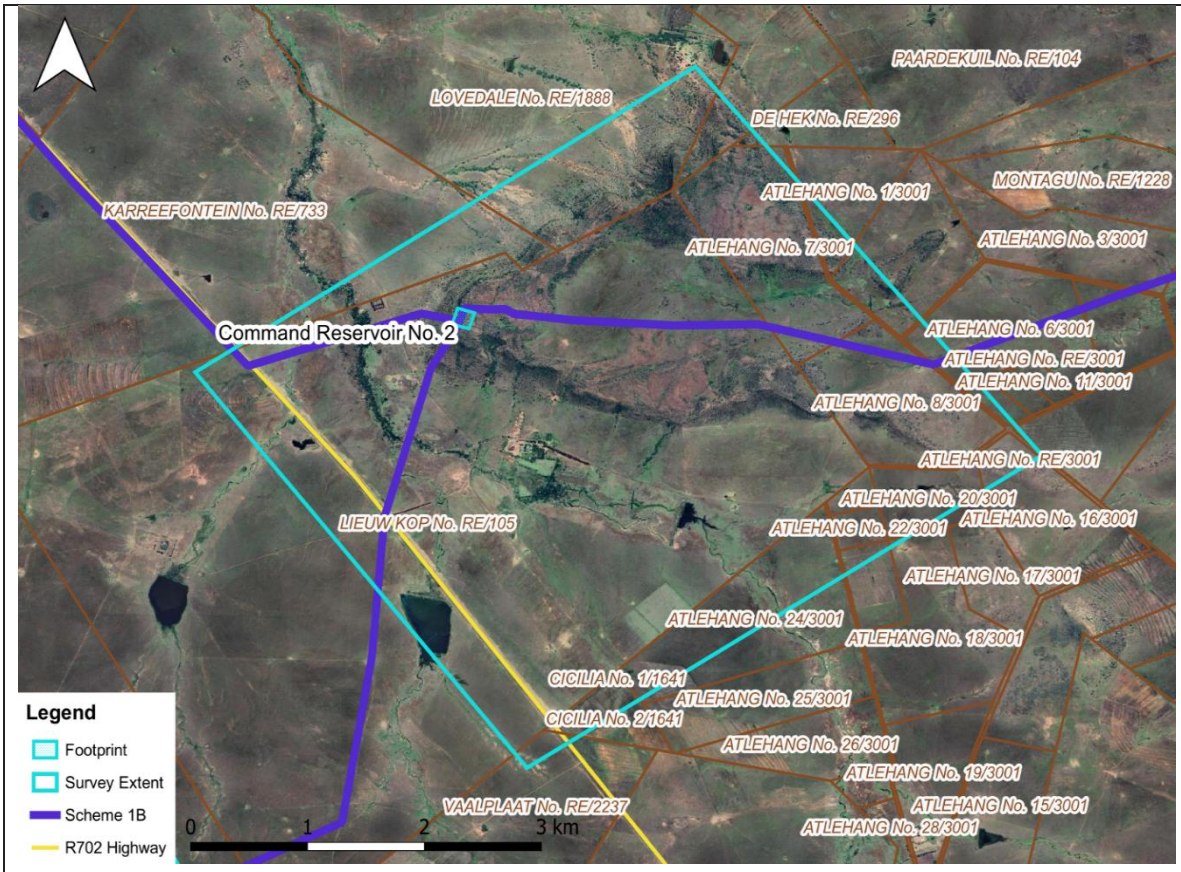


Figure 5-17: Proposed layout of the command reservoir No 2

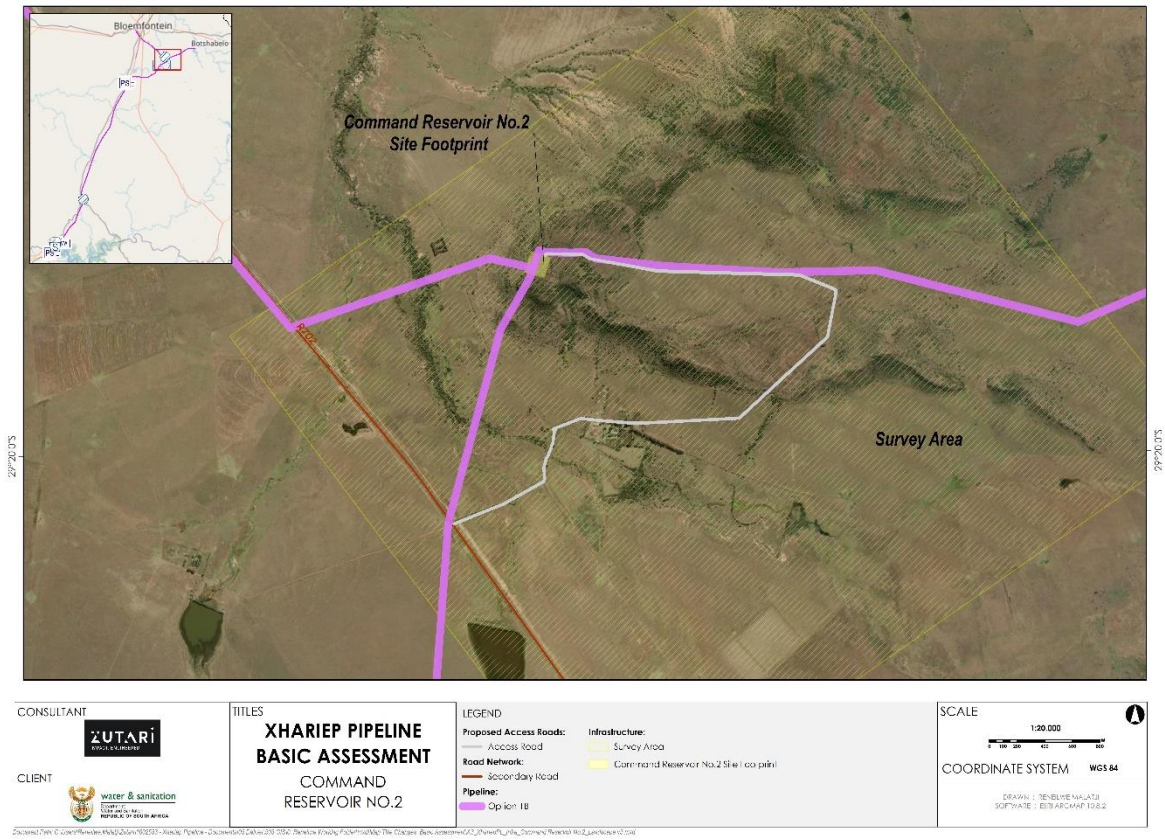


Figure 5-18: Proposed layout and access of the command reservoir No 2

5.3.7 Pipelines

It is proposed that a 100 m wide corridor be evaluated for the proposed pipeline routes to enable minor amendments to the horizontal pipeline alignment during construction should unforeseen circumstances be encountered.

The construction corridor is likely to be 40 m wide with a final servitude width of 15 m to be registered.

5.4 Access

Existing roads will be used as far as practically possible and feasible with new access roads to be constructed to permanent infrastructure locations, e.g. the water treatment works, pump stations and command reservoirs. The access roads to the water treatment works and pump stations will be 8.6m wide roads (two x 3.4m wide lanes) that will be asphalt surfaced or paved. The access roads to the command reservoirs will be 6m wide and be a combination of paved and gravel roads (i.e. paving required at steeper sections and where erosion is likely to occur). Access to the pipeline and associated structures will be along existing gravel and farms roads.

During the construction period a few internal roads will need to be established, however these roads will only be temporary and be scarified upon completion of construction activities.

5.5 Temporary Construction Yard(s)

Temporary construction yards will be required due to the length of the pipeline route. The positioning of camps will need to be determined by the contractor based on their construction sequencing, however, these camps will be carefully placed away from environmentally sensitive areas, wetlands, and watercourses. Construction camps will be constructed with permission and negotiations with the relevant landowners.

The steel pipes will be strung along the pipe trenches, within the approved working widths, to mitigate the need for double handling of the pipes. The contractor may, however, request temporary laydown areas to stockpile pipes. These laydown areas, which can be 100m x 100m in size, will be placed away from environmentally sensitive areas, wetlands and watercourses and will be subject to approval by the Engineer and negotiations with the relevant landowners.

5.6 Powerlines

Eskom confirmed that the network can accommodate the project's power supply requirements and that in time the application will be done by the relevant applicant.

The contractor will make temporary arrangements for power supply required during the construction phase. At remote sites, diesel generators will be used for generating electricity.

5.7 Provision of Services required during Construction

5.7.1 Employment

The construction phase would endure for approximately 18 months; however, this would vary depending on the seasonal and environmental conditions at the time of construction. During construction phase, direct job creation opportunities related to the construction of the development and indirectly through expenditure on sectors supplying goods and services will contribute toward the creation of employment. During the operational phase, operational expenditure on the proposed development is expected to

continue employment creation. Such jobs will be made up of both highly skilled, skilled, and unskilled employment opportunities. The unskilled labourers are generally trained by the contractors and sourced from local communities. The provision of employment opportunities would improve the income levels of the employees thus, in turn, improving on their standard of living.

The project should utilise semi- and unskilled local workers to alleviate local unemployment. Knowledge sharing and on the job, training should be viewed as a prerequisite, where feasible, for all service contractors/service providers working on the development and employing local labour.

5.7.2 Water Supply

The project will require water during the construction phase predominantly for concrete mixing, watering of pipeline bedding material to achieve compaction, and dust control and drinking water for the construction workers. Based on a total bedding volume of 750 000 m^3 over a length of 250 km, the total volume of water required is estimated at 60 000 m^3. This volume will probably need to be supplied over a period of 3 to 4 years, i.e. 15 000 m^3/a (40 m^3/d) to 20 000 m^3/a (55 m^3/d). The volumes needed for cleaning, ablutions, etc. will be very small compared to the volumes needed for watering of bedding material. It is unknown at present whether the contractor will order ready-mix concrete (batched commercially off-site), in which case it will reduce the water requirements. The quantity of water required will be determined at Detailed Design Stage.

It is highly unlikely that a borehole will be used given the linear construction activity of the pipeline – arrangements will likely be made with municipalities along the pipeline route to obtain water for construction purposes. In the case of concrete mixing, potable water will be required.

This is subject to the necessary agreements with the landowners concerned. The contractor appointed for the construction phase will be responsible for sourcing water for the construction phase from a sustainable source and with the necessary approvals in place.

5.7.3 Waste

- General waste

Rubbish bins will be placed at key locations around the site in both the construction and operations phases. Solid waste would be collected as needed and returned to a central waste area at the construction yard in the construction phase or O&M area in the Operations phase. As soon as a truck load of waste has accumulated, this will be transported to the nearest registered landfill for disposal. The EMPr will make recommendations regarding the reduction, reuse and recycling of solid waste.

- Hazardous waste

Hazardous wastes produced in the construction phase, i.e. paint, fuel, lubricant or other construction chemical residues and packaging or contaminated soil will be collected for disposal and an appropriate facility, where a certificate of disposal can be issued, or returned to the suppliers for disposal or reuse.

- Sewage

Portable toilets will be used across the site in the construction and operations phases and sewage will be collected and transported to a sewage treatment plant. In the operational phase the project would use a conservancy tanks. Sewage associated with the construction and operational phases would not be significant and would be disposed of via one of the municipal wastewater facilities or via an existing commercial service provider with established agreements with the municipality. Groundwater is a critical resource in the arid karoo, and every effort must be taken to avoid contamination of the surface and groundwater resources with sewage or other contaminants.

5.8 Project Phases

From a practical perspective the project lifecycle will likely be phased as follows:

- Post Environmental Authorisation
- Pre-Construction
- Construction
- Operation
- Decommissioning

5.8.1 Post Environmental Authorisation

The following will be applicable to the Xhariep Scheme 1B project process:

- DWS Environmental authorisation = 8 – 12 months = ± December 2024
- Complete detailed feasibility study = September 2024
- Appoint PSP for detailed design = August 2025
- Detailed design and tender documentation = January 2027
- Procure contractors = July 2028
- Construction commences by = July 2028
- Construction completed by = June 2032
- Commissioning of infrastructure completed by = October 2032

5.8.2 Pre-construction Phase

Pre-construction activities involve tasks that establish the site, both in terms of the construction activities, as well as the social and environmental management systems. During this time, efforts should be made to ensure that the planning of the project is completed effectively to ensure that there are no delays to the project and that no unnecessary environmental degradation occurs. Detailed design must be consistent with the assessed layout and project description (or altered through an EA amendment process) and must incorporate all design recommendations and mitigations arising from the current assessment.

Before the mobilisation of the main contractor on site, the boundaries of the work areas and nearby no-go areas will be demarcated. No-go areas will be identified and demarcated according to specialist recommendations. Once demarcated, the Contractor may then set up their construction yard, mobilise their staff and equipment on site.

It is also important to ensure that social risk is addressed during the pre-construction period by ensuring that an appropriate grievance mechanism is put in place from the outset. Furthermore, all the Contractors' staff must undergo training to ensure they understand the environmental and social sensitivities of the site. The Applicant or Contractor should also establish a labour desk in town to avoid work seekers arriving on site where they could be at risk or a risk to others.

5.8.3 Construction Phase

The typical activities for the construction of pipelines and reservoirs and treatment works are as follows:

- Establishment of access roads: During the construction period internal roads need to be established; however, these roads will only be temporary. There are a number of permanent roads that need to be established for operation and will be gravel based – refer to Section 5.4 for more detail on roads. Existing roads will be used, where possible.
- Site preparation: Vegetation would need to be cleared for the footprint of the infrastructure as well as for the access roads to the site/internal roads and the laydown yard, etc. Topsoil stripped from

the construction of access roads and infrastructure would need to be stockpiled and used to rehabilitated areas of the construction footprint.

- Transportation of equipment and components to the site: The main component of the proposed Scheme 1B would be transported by road to the sites. Excavators, graders, trucks, compacting equipment etc., will need to be brought to the site for the pipeline, reservoir and pump station construction. In addition, a concrete batching plant may be erected at the water treatment plant.
- Establishment of workshops and construction yards: Once all the equipment has been brought to the site, dedicated construction yards will be established. Fuel will most likely be stored on site during construction; appropriate mitigation measures must be employed to ensure no pollution occurs as a result.

Impacts related to the construction phase are considered in the impacts section in each component in the Baseline Environment and Environmental Impact Assessment section.

5.8.4 Operational Phase

Scheme 1B's operational lifespan is estimated at approximately 50 years or longer. The facility would create a small number of permanent employment opportunities during operation. The typical activities during the operational phase would be as follows:

- Maintenance of infrastructure, including inspections of chambers along the pipeline route,
- Initiating and monitoring treatment processes and pumping,
- Maintenance of equipment,
- Procurement of chemicals, mechanical and electrical spare parts,
- Cleaning and housekeeping activities,

The possibility of upgrading the proposed Scheme 1B to more advanced technologies, to extend its operational lifespan, would be investigated towards the end of this period. Should the facility undergo expansion or significant upgrading, an environmental authorisation may be required at that time, in accordance with the prevailing legislation.

Should decommissioning be considered, it would potentially take 6 to 12 months to complete. The impacts of the decommissioning phase generally correlate closely with impacts identified for the construction phase.

The rehabilitation of the disturbed areas would form part of the decommissioning phase. The aim would be to establish the appropriate conditions required to restore the land as close as possible to its pre-development vegetation conditions or to another suitable use. The restoration activities would include the following:

- Removal of foreign materials and debris;
- Reshaping of the land to conform with the natural topography, if necessary;
- Breaking up compaction (ripping / scarifying) where required, loosening the soil and the redistribution of topsoil;
- Replanting with a suitable indigenous grass seed mix. Alternatively, the total footprint can immediately be reintroduced to game farming;
- Light irrigation to re-establish a biological soil crust and trigger germination and early growth; and
- Removal of alien vegetation for a period of no less than 1 year, or as otherwise prescribed by a rehabilitation specialist.

5.9 Project Need and Desirability

The Xhariep Pipeline Project was originally identified in the 2012 Reconciliation Strategy for the GBWSS as an augmentation project to supply the area's future water demands. Several other interventions

were identified in the Strategy, but this project focuses on the Xhariep Pipeline from Gariep Dam tying into the bulk water network of the GBWSS.

MMM previously applied for an EA through a Basic Assessment process which has since lapsed. Additionally, this study, in line with the DWS regional perspective, has added new pipeline route options and the position of infrastructure components have changed.

The proposed Xhariep project will involve abstraction at the Gariep dam from existing outlet pipes in the Gariep Dam, a raw water pumping station, and transfer pipelines to a WTW located at a suitable site near the Gariep dam. The treated water will be pumped to Bloemfontein and Rustfontein WTW with command reservoirs and booster pumpstations along the route. Support services for bulk power and communication will be provided.

The DEA&DP Guideline for Need and Desirability (2013)[3] highlights the obligation for all proposed activities that trigger the EIA regulations to be considered against (amongst others) the National Framework for Sustainable Development[4], the spatial planning context, broader societal needs, and financial viability. This information allows the authorities to contemplate the strategic context of a decision on the proposed project. This section seeks to provide the context within which the need and desirability of the proposed activity should be considered.

5.9.1 Community development

The need to improve the quality of life for stakeholders, and especially for the poor, through job creation is critical in South Africa, particularly after the economic impact of COVID-19. Further community involvement would be achieved through direct employment or indirectly through service industries e.g. catering, subcontracting and accommodation.

5.9.2 Need and desirability checklist

Specific need and desirability questions raised by the national and DEA&DP need, and desirability guidelines are addressed in Table 5-10 below.

Table 5-10: Need and desirability checklist

Need and Desirability	
Question	**Response**
1. Is the activity permitted in terms of the property's existing land use rights?	The proposed Scheme 1B and ancillary works will occur on privately owned agricultural land and to a lesser extent on land owned by the Government of South Africa, the South African National Roads Agency Limited (SANRAL), Eskom servitudes, the Free State Department of Police, Roads and Transport, and Transnet. Negotiations will take place and agreements will be reached with each of the landowners to register a servitude on the land parcel. Once the proposed pipeline is constructed, little impact is expected, since normal activities can take place. There will only be an exclusion on constructing buildings and planting trees.
2. Will the activity be in line with the following? (a) Provincial Spatial Development Framework (PSDF)	The Provincial Spatial Development Framework (PSDF) 2023/2024 of the Free State is an attempt at ensuring that the objectives of Vision 2030 are integrated into the planning process. The PSDF takes the national and global imperatives and applies them to the

[3] This guideline, although written for the Western Cape, has been used in conjunction with the national guideline, since it is the most recent guideline on need and desirability and is more comprehensive than the national guideline.
[4] Republic of South Africa (2008) People – Planet – Prosperity: A National Framework for Sustainable Development in South Africa. Pretoria: Department of Environmental Affairs (DEA), Republic of South Africa [Internet]. Available from: http://www.environment.gov.za [Accessed 29 March2011].

Need and Desirability	
Question	**Response**
	unique characteristics (social, economic and environmental) of the Free State Province. In its own words, the Provincial Spatial Development Framework (PSDF) is a "broad and essentially generic provincial framework" (CoGTA, 2014, p. 6) and acknowledges the right of landowners and others to bring applications for developments, stipulating that each should be measured on its own merit (CoGTA, 2014). In the same vein, the PSDF notes that due regard must be given to the National Environmental Management Act and a clear need and desirability should be proven. Also, the proposed development must fit in with the Integrated Development Plan (IDP), Spatial Development Framework (SDF), and Environmental Management Framework (EMF). Finally, the principles of Integrated Environmental Management (IEM) should always be considered (GoGTA, 2014). The National Development Plan (NDP) provides several pointers. One of the enabling milestones are of particular importance in this study. It states, "make sure that all South Africans have access to clean running water in their homes" (CoGTA, 2014, p. 10). Two of the critical actions mentioned on page 11 of the same document are also relevant. They are "Public infrastructure development at 10% of gross domestic product (GDP), financed through tariffs, public-private-partnerships, taxes and loans and focused on transport, energy and water." And "Interventions to ensure environmental sustainability and resilience to future shocks" – such as droughts. From the above, it is notable that infrastructure projects that focus on the provision of potable water is crucial to the development of the Free State province and is mentioned several times in the PSDF. This project is therefore in line with the PSDF.
(b) Urban edge / Edge of Built environment for the area	The project will not impact on the urban edge / edge of the built environment in any of the towns that along the way and will also not impact on the urban edge in Bloemfontein.
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	**Mangaung Spatial Development Framework (SDF) (2020-2036)** The Mangaung SDF noted a marked development towards the south and south-east of the CBD around the Mangaung Township. The proposed pipeline will not infringe on the Mangaung Township but will traverse some of the small holdings in the area, as well as brush close to the Bloemfontein Cemetery and solid waste landfill site (which is next to the N1). Note that the cemetery and landfill will not be affected by the proposed development at all. Negotiations will take place with the landowners of farms and on the small holdings, and they will be duly compensated for the servitude according to the prevailing land value. It should be noted that the urban edge will not be disturbed in any way. **Mangaung Integrated Development Framework (IDP) (2023)** One of the indicators chosen to measure compliance with the Millennium Development Goals (MDGs) is sustaining the environment and the population's access to housing, water, energy, and sanitation, amongst others. The aim of this project is to ensure a sustainable flow of potable water to the population of the Mangaung Municipal area. Furthermore, there is a focus on eradicating the bucket system in Mangaung, Botshabelo and Thaba

Need and Desirability	
Question	**Response**
	Nchu. This will result in an increase in the need for water within the municipal area. As highlighted, it is the intention of the Mangaung Metropolitan Municipality to improve water supply through the construction of the water pipeline to address the current and expected water demand issues as outlined in the SDF and the IDP. **Xhariep District Municipality Spatial Development Framework (SDF)** The proposed pipeline does not go through any of the towns along the route. The document obtained shows the spatial development areas in each of the towns within the District Municipality, however no information on the areas between the towns were obtained. Due to the fact that the proposed pipeline runs through extensive farming land and adjacent to existing linear services, the impact is not expected to be significant in terms of spatial planning for the Kopanong Local Municipality or Xhariep District Municipality. **Xhariep District Municipality Integrated Development Framework (IDP) (2022)** The 2017 – 2022 Integrated Development Plan for Kopanong Local Municipality states the vision of the Municipality as "By 2030 Kopanong Local Municipality should be a vibrant, sustainable and successful municipality which provides quality services" (p. 7). One of the focus areas of the Xhariep District Municipality IDP is the eradication of existing inequalities – such as potable water in the house. This IDP relies heavily on the Local Government Turnaround Strategy (LGTS). The key outcomes (Outcomes 2 and 9) of this strategy resulted in an agreement between the President, the Minister of the Department of Co-operative Governance and Traditional Affairs (CoGTA) and the mayors of the various municipalities. The Xhariep interpretation of Point 4 under Output 2 (ensure improved access to essential services) includes the implementation of a drought / water response plan and 100% access to water. Point 8 under Outcome 9 speaks of "...improved quality of household life" (p. 5). This includes access to potable water at home. With the proposed project that will provide potable water to some of the small towns along the route (within the Kopanong Local Municipal area). From the local perspective, the public participation process for the IDP has identified water and sanitation as two of the key elements that must be addressed. Another related aspect is infrastructure development for economic development and sustainable human settlements. (p. 9). In 2011, the ANC also undertook to improve and broaden public services. Although the Local Municipality IDP and SDF does not make specific provision for the proposed pipeline, the potable water to the small towns and the economic injection is much needed and therefore it fits into the wider framework of where Xhariep and Kopanong is going.
(d) Approved Structure Plan of the Municipality	**Mangaung Metropolitan Municipality** The N1, Longridge Reservoir Complex, Mangaung Landfill and the Bloemfontein Cemetery already form part of the approved Structure Plan. Since the proposed pipeline runs adjacent to these structures

Need and Desirability	
Question	**Response**
	(towards the Longridge Reservoir Complex), there will be no impact on the Structure Plan of the Municipality. **Kopanong Local Municipality** No Structure Plan could be obtained, but the proposed development is in line with the objectives of the Integrated Development Plan and the Spatial Development Framework. Both local municipalities have been engaged during the Basic Assessment process and will further be consulted before and during the Implementation phase of the project.
(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	There is no approved Environmental Management Framework for this area. As stated above, the proposed pipeline will in many instances run alongside existing services (e.g. Eskom power lines, the railway line or roads).
(f) Any other Plans (e.g. Guide Plan)	The proposed project entails the provision of potable water that is in line with the Integrated Development Plans of both Mangaung Metropolitan Municipality and Kopanong Local Municipality.
3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved 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 credible IDP)?	The provision of potable water has been identified as an urgent need in both the Mangaung Metropolitan Municipality's and the Kopanong Local Municipality's Integrated Development Plans.
4. 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.)	The delivery of potable water to the Mangaung Municipal area and some of the small towns along the way is necessary as there are already moderate to severe water shortages that are expected to grow with time. The provision of potable water is both a societal priority in the areas where the water will be delivered to as well as of a strategic nature as living conditions will deteriorate and economic growth with be stifled without adequate potable water.
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	The proposed project is a water pipeline that will transfer potable water from a water treatment works close to the Gariep Dam to Bloemfontein. Eskom confirmed that the network can accommodate the project and that in time the application will be done by the relevant applicant.
6. 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 and opportunity costs)?	The proposed development has been planned for by the Mangaung Metropolitan Municipality that will be the implementing municipality.

Need and Desirability	
Question	**Response**
7. Is this project part of a national programme to address an issue of national concern or importance?	Yes, the proposed development addresses an issue of national concern / importance (namely potable water delivery to the Mangaung Municipal area as well as some of the small towns along the way between the Gariep Dam and Bloemfontein). The project is registered as a Strategic Infrastructure Project (SIP).
8. 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.)	None of the land is built-up. At present, stretches of the pipeline run adjacent to existing linear infrastructure (such as the railway line, the Eskom power lines and roads). The location favours the project as it will not detrimentally affect the current land use of the site i.e., agriculture. The agricultural activities will be able to continue.
9. Is the development the best practicable environmental option for this land/site?	Most of the land along the proposed alignment is currently used for extensive livestock farming (either sheep or cattle), while other parts of the proposed alignment run alongside existing infrastructure. Disruption will take place during the construction period where an area of approximately 40m wide will be affected. However, once the construction period is over and the proposed pipeline is operational, the current activities can continue with minimal further disruption. On the other hand, the proposed project will provide potable water and the possibility of life, dignity, and economic growth to the Mangaung Metropolitan area and some of the small towns along the route will prevail.
10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	The negative impacts will mainly be construction-related impacts, which would dissipate once the project becomes operational. The only parts of the project that will not be construction-related are the abstraction of water from the Gariep Dam and the ancillary infrastructure (where the land will no longer be available for other activities, because it will be built up). Weighed against the existing water scarcity and economic growth of the MMM area and the provision of water to some of the towns along the way, the negative impacts are outweighed by the positive impacts of the proposed project. With careful management of the construction phase and effective rehabilitation, the impact on the environment, the social fabric, and landowners will be small.
11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	No, the pipeline should not set any precedent for similar activities in the area. The proposed pipeline runs along a number of existing linear activities and many more such activities are not foreseen.
12. Will any person's rights be negatively affected by the proposed activity/ies?	Yes, the landowners on whose land the pipeline and infrastructure will transect will be impacted on negatively, mainly during the construction phase. Rights will therefore be temporarily affected mostly through potential ease of access and potential construction nuisance. The affect would however be limited to the construction phase for the most part. During the operational phase, the servitude will be established and will have been rehabilitated. Normal activities will be allowed along the servitude and grazing will be allowed on the servitude. Agreements would need to be put in place with all landowners prior to construction commencing and must take into account affects on

Need and Desirability	
Question	**Response**
	existing rights to manage any such issues. These agreements will have to negotiated with landowners where relevant.
13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?	No, because this is a linear activity and most of the ancillary infrastructure are well outside of towns and cities, it would not impact on the urban edge.
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?	The project falls into the ambit of SIPS 18 and 19 – Water and Sanitation Infrastructure, which is a nationwide project in all provinces. In terms of this SIPS, there is a 10-year plan to address the estimated backlog of adequate water supply to 1.4 million households and 2.1 million households to basic sanitation. The project will involve provision of sustainable supply of water to meet social needs and support economic growth. Projects will provide new infrastructure, rehabilitation and upgrading of existing infrastructure, as well as improve management of infrastructure.
15. What will the benefits be to society in general and to the local communities?	It is estimated that the Mangaung Metropolitan Municipality (MMM) has a population of around 747 431 (according to the 2011 Census). Approximately 95% of the households within the MMM is supplied from bulk surface water systems that are operated by the MMM (Vaal Central Water Board, MMM and the Department of Water and Sanitation (DWS) as the Water Service Providers (WSPs)). *"Unfortunately, like many other cities in the world, old towns, such as Bloemfontein, suffer from large losses and about R 132 million (or 26.7 million m3/a) is currently lost as non-revenue water primarily due to ageing water supply network. To aggravate the matter even more a number of recent studies have shown that the MMM system input volume will exceed the capacity of the bulk water systems within the next two years. It is therefore essential that water conservation and water demand management (WCDM) initiatives be accelerated as a matter of urgency and that additional long term sources be identified in parallel to the WCDM initiatives."* *2015-2016 Integrated Development Plan, Mangaung Metropolitan Municipality (p. 236)* As a measure to reduce the water shortages, water restrictions have recently been implemented as per the Department of Water and Sanitation (DWS) Regulatory Performance Requirements (Government Gazette 37421, Gazetted on 14 March 2014). This was necessary even though Non-Revenue Water losses (e.g. from leaking pipes and toilets) have been reduced by 12%, and stepped-tariff measures and water re-use have been initiated by the Metro. It has therefore become necessary for MMM to investigate other means of increasing the water supply to its system as a matter of urgency. The construction of the proposed pipeline will, amongst others: ▶ Bring water to the MMM area where it can be utilised to service the existing and growing community. ▶ It will bring water that will assist in MMM's desire to eradicate the bucket system. ▶ It will provide water for some of the towns along the way to increase their potable water yield.

Need and Desirability	
Question	**Response**
	▶ Create temporary jobs for some local inhabitants. ▶ Create work for contractors who will be responsible for construction.
16. Any other need and desirability considerations related to the proposed activity?	No, it is estimated that the Mangaung Metropolitan Municipality (MMM) has a population of around 747 431 (according to the 2011 Census). Approximately 95% of the households within the MMM is supplied from bulk surface water systems that are operated by the MMM (Vaal Central Water Board, MMM and the Department of Water and Sanitation (DWS) as the Water Service Providers (WSPs)).
17. How does the project fit into the National Development Plan for 2030?	**The project falls into the objective that was developed to focus on creating a decent standard of living for all (namely potable water).** One of the segments in this objective comprise of water, sanitation, housing and electricity. An increased and efficient water infrastructure in Mangaung and some of the small towns *en* route will not only improve living conditions and human dignity, but also pave the way for economic growth, especially in Mangaung where development of the city is hampered by the constant water shortages. **Regarding women and the National Development Plan**, access to safe drinking water can help to free women from having to do unpaid work to search for paid employment. Due to a reduction in capital spending, South Africa has missed a generation of capital investment in roads, rail, ports, electricity, water, sanitation, public transport and housing. To grow faster and in a more inclusive manner, the country needs a higher level of capital spending.
18. Please describe how the general objectives of Integrated Environmental Management as set out in section 23 of NEMA have been taken into account.	The purpose of section 23 of NEMA is to promote the application of appropriate management tools in order to ensure the integrated environmental management of activities. Figure 5-19 below lists the general objectives of integrated management and provides a motivation as to how the proposed development has taken the objectives into account. This report is a Basic Assessment Report (BAR) where the potential impacts (social, economic and environmental) will be thoroughly assessed and evaluated. It will also provide mitigation measures for those potential negative impacts that have been identified.

Figure 5-19: Consideration of NEMA objectives.

Section 23(2) of NEMA: The general objective of integrated environmental management is to:	**Description as to how the proposed development has taken these general objectives into account.**
(a) promote the integration of the principles of environmental management set out in section 2 of NEMA into the making of all decisions which may have a significant effect on the environment.	The underlying principle of this BA process is to ensure that the development is socially, environmentally, and economically sustainable. This has guided the assessment of impacts of the project by Specialists to ensure that the project will be undertaken in an environmentally responsible manner. In recognition that social responsibility is something which needs to be actively developed, a public participation process (PPP) will be undertaken. This process will be undertaken in such a manner to promote active participation and foster

Need and Desirability	
Question	**Response**
	a clear understanding of the project and transparent sharing of information.
(b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in section 2;	This BAR includes the list of potential impacts associated with this project. Each aspect was evaluated to determine the significance of the impact and mitigation measures have been proposed to reduce negative impacts and to enhance positive impacts. The generic EMPr has been updated to include the recommendations from the respective specialists to guide the construction and operational phases in an environmentally and socially sound manner (Refer to Annexure G).
(c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them.	Specialist studies were commissioned to ensure that specific impacts are adequately assessed, and appropriate mitigation measures are proposed.
(d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment.	The PPP that will be undertaken for the proposed Scheme 1B is described in detail in Section 4. The PPP will be done in accordance with Regulation 41 of the 2014 EIA Regulations (GN R982 as amended) and the applicable best practice guidelines.
(e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment.	Detailed designs (approx. July 2025 – January 2027) and layouts of infrastructure within the site footprint will take sensitivities and buffer zones into account, as detailed in the specialist assessments in Section 6 and Annexure D.
(f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.	Recommendations and mitigation/ enhancement measures for each of the impacts identified in Section 6 have been included in the EMPr in Annexure G. The purpose of these recommendations is to minimise the disturbance to the environment, and enhance possible opportunities associated with locating the proposed development at this particular site. Where negative impacts are unavoidable, strict management and rehabilitation is recommended to minimise the potential negative impacts.
19. Please describe how the principles of environmental management as set out in section 2 of NEMA have been taken into account.	Section 2 of NEMA lists a number of principles that underpin the role of Sustainable Development and the consideration of environmental impact within the Act. These principles are critical to achieve Sustainable Development as it is important to find the balance between the competing demands for resources from the Economic system, the Social system, and the Ecological system. These principles are applicable to the “actions of all organs of state that may significantly affect the environment” and it is therefore crucial to apply them to the proposed development, for decision-makers to be confident that their decision to allow a development, promotes Sustainable Development. The underlying principle of this BA process is to ensure that the development is socially, environmentally, and economically sustainable. This has guided the assessment of impacts of the project to ensure that the project will be undertaken in an environmentally responsible manner. Recognising that social responsibility is something that needs to be actively developed, PPP will be undertaken (as detailed above in Section 3.3). This process will be undertaken in such a manner to promote active participation and foster a clear understanding of the project and transparent sharing of information. Furthermore, knowledge from I&APs will be included in all forms, including traditional or ordinary knowledge. The

Need and Desirability	
Question	**Response**
	PPP and consultation with the directly affected landowners will also aim to improve environmental awareness in the area (Section 2(4)(h) of NEMA). Key organs of state that may have interest in the project have been proactively identified, and an effort has been made to promote intergovernmental coordination as far as possible to reduce the potential for conflicts of interest, caused by lack of information or inappropriate communication channels. Proof of this correspondence is detailed in Section 3.3 and Annexure C. Environmental management has been considered to place people and their needs at the forefront of its concern, aiming to serve their physical, psychological, developmental, cultural and social interests equitably (Section 2(2) of NEMA). However, it is crucial that ecological considerations are also considered through this process and avoidance, minimising or rehabilitating measures are detailed for the disturbance of ecosystems and loss of biodiversity, pollution and degradation of the environment, disturbance of landscapes, and sites that constitute the nation's cultural heritage, waste, and the use and exploration of non-renewable natural resources (Section 2(4)(a)(i-v) of NEMA). Where a negative impact is unavoidable, measures have been considered to remedy the disturbance and address the effects (Section 2(4)(p) of NEMA). The nature of this BA process has been to undertake a risk-averse and cautious approach, and where relevant the worst-case scenario has been assessed. Each specialist has detailed their methodology as well as their assumptions and limitations about their assessments, and these reports have been included in full in Annexure D. The specialists undertook their site visits between February and April 2024. The findings of these assessments have been amalgamated into this BAR which have assessed the impact of this proposed development. Should this BAR be granted a positive environmental authorisation, stringent environmental health and safety standards will be required. It will also acknowledge the right of workers to refuse work that is harmful to human health, or the environment, and be informed of any potential dangers (Section 2(4)(e & j). Specialists in various fields were contracted to investigate and assess the potential impact of the proposed activity on various aspects of the environment. The potential negative impacts were identified, and mitigation measures were proposed to curb / obviate the negative impacts. Furthermore, proposals were also made to increase the potential positive effect of the development on the environment. Interested and affected parties and stakeholders (such as landowners, farmers' associations, local government, tourism operators, etc.) were identified and consulted. Their issues, comments and concerns will be recorded and addressed as part of the process.

6 CONSIDERATION OF ALTERNATIVES

The NEMA requires that alternatives are considered during the BA process. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

The DEA&DP Guideline on Alternatives (2013)5 states that: "every EIA process must identify and investigate alternatives, with feasible and reasonable alternatives to be comparatively assessed. If, however, after having identified and investigated alternatives, no feasible and reasonable alternatives were found, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not proceeding, is required during the assessment phase. What would, however, have to be provided to the Department in this instance is proof that an investigation was undertaken and motivation indicating that no reasonable or feasible alternatives other than the preferred option and the no-go option exist."

The 2014 EIA Regulations (GN R982) (as amended) provide the following definition: "*Alternatives*", in relation to a proposed activity, means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to the –

a) property on which or location where the activity is proposed to be undertaken;

b) type of activity to be undertaken;

c) design or layout of the activity;

d) technology to be used in the activity;

e) operational aspects of the activity; and

f) includes the option of not implementing the activity ("No-Go" alternative).

The proposed project involves the application for environmental authorisation for Xhariep Pipeline Augmentation Scheme 1B.

A consultative approach to the development of the project layout has been followed. Technical, environmental and landowner constraints were provided to the applicant who developed a layout based on these constraints. The layout was then presented and refined further through interaction with specialists, various stakeholders and I&APs in the pre-application PPP to arrive at the current layout or preferred layout. Earlier layouts are not seen as reasonable or feasible alternatives for comparative assessment purposes as they have been eliminated through a consultive process leaving only the preferred alternative and the No Go option. As far as other alternatives are concerned, no reasonable type, location, technology, or operational alternatives to the preferred alternative has been identified that are reasonable and feasible as the marketplace is relatively particular and competitive, limiting options.

The following alternatives are considered in the BAR are discussed in more detail further in the Section:

1) **Alternative 1 (preferred):** Development of the Xhariep Pipeline Augmentation Scheme 1B and;

2) **No-Go option:** No development

6.1 Alternatives

The 2014 EIA Regulations require that any feasible and reasonable activity, location and technology alternatives be considered, described and comparatively assessed.

[5] This guideline has been used as a best practice tool since it is the most recent guideline on alternatives.

No feasible or reasonable alternatives have been identified and in terms of the guidelines on alternatives assessment (See Section 5 for motivations and approach). In accordance with best practice in impact assessment the only alternative being comparatively assessed is the no-go alternative. The no-go alternative deals with the potential impacts that may arise in the event the project does not proceed and heed *status quo* land use remains in effect. In this case it is assumed that the site would continue to be used for extensive agricultural purposes (i.e. rangeland).

6.2 Alternative 1 (preferred)

This preferred alternative is detailed in Section 5.

6.3 No-Go Alternative

The assessment of alternatives must always include the “no-go” option as a baseline against which all other alternatives must be measured. The no-go option represents the status quo which normally presents the option of not implementing the activity. The assessment of the No-Go is a requirement of NEMA but also considered a global best practice. This assessment can provide a baseline scenario against which the project (or its alternatives) can be compared.

7 BASELINE ENVIRONMENT AND ENVIRONMENTAL IMPACT ASSESSMENT

The description of the affected environment provided below draws on existing knowledge from published data, previous studies, site visits to the site and surrounding area, specialist studies and discussions with various role players.

The high-level identification of potential impacts which may occur as a result of the proposed activities described in Section 5, is broad and covers the four phases of the project (i.e. pre-construction, construction, operation and decommissioning). Cumulative impacts have been assessed per environmental aspect in the BAR and by specialists.

Impacts of negligible significance have been screened out, to ensure that the BA is focused on the potentially significant impacts only. The following environmental aspects are further discussed in this chapter below:

- Agriculture
- Archaeology and Cultural Heritage
- Aquatic Biodiveristy
- Civil Aviation
- Defence
- Palaeontology
- Socio-economic environment
- Terrestrail Biodiveristy (inclusive of Plant and Animal Species)

The specialist assessments conducted as part of the BA process have been included as Annexure D to this report. Annexure D also includes the required biodiversity compliance statements as compiled by the relevant specialists.

As such, the baseline descriptions of the study area, followed by the predicted impact assessments are detailed below, as assessed by the specialist team. Sensitivity maps are also included in Annexure I.

7.1 Agriculture

Digital Soils Africa (DSA) was appointed as an independent agricultural specialist to conduct the agricultural assessment. The objective and focus of an agricultural assessment are to assess whether or not the proposed development will have an unacceptable agricultural impact, and based on this, to make a recommendation on whether or not it should be approved.

The Agricultural Compliance Statement will form part of the Environmental Authorisation process in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (“NEMA”), Environmental Impact Assessment (“EIA”) Regulations, 2014. As per GN960 of 2019, read with Section 24(5)(a) of the NEMA, Environmental Screening Reports (ESR) were generated for the application using the National Web-based Screening Tool. The ESR classifies the area as having High sensitivity for the Agricultural theme. The majority of the development is ‘linear’, and a compliance statement is deemed sufficient according to GN320 of 2020.

The Compliance Statement is reported according to the protocol for the specialist assessment and minimum report content requirements for the environmental impacts on agricultural resources (GN320 of 2020).

7.1.1 Receiving environment

The current atmospheric condition in Bloemfontein is recognized as a regional steppe climate. The mean yearly temperature recorded in Bloemfontein is 17.1 °C as per the available data. The precipitation level on a yearly basis amount to 545 mm as per the meteorological records. The proposed Scheme 1B is located within a semi-arid zone.

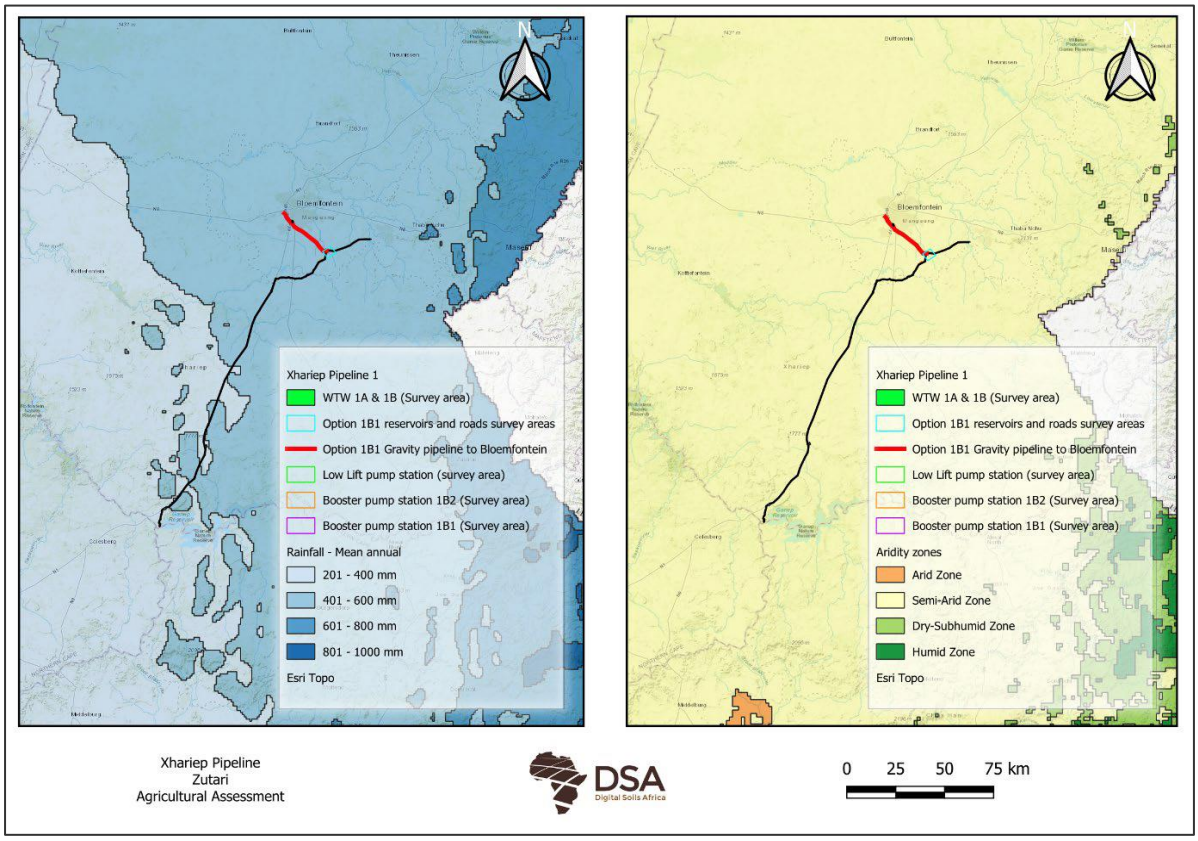


Figure 7-1: Climate of the proposed site and surrounding area [Schulze, 2007 (Courtesy of DSA)]

7.1.1.1 Climate capability

Climate capability is the highest weighted factor (40%) in the calculation of the Land capability (DAFF, 2017) which is used in the Screening Tool to determine the agricultural sensitivity. Soil capability (30%) and Terrain capability (30%) contribute the remaining considerations.

The Climate capability determined by the following factors:

- Moisture supply capacity (50%)
- Physiological capacity (20%)
- Climatic constraints (30%)

The climate capability according to the Department of Agriculture, Forestry and Fisheries, 2017, is a value of 6 (**Figure 7-2**). This is considered a low to moderate climate capability.

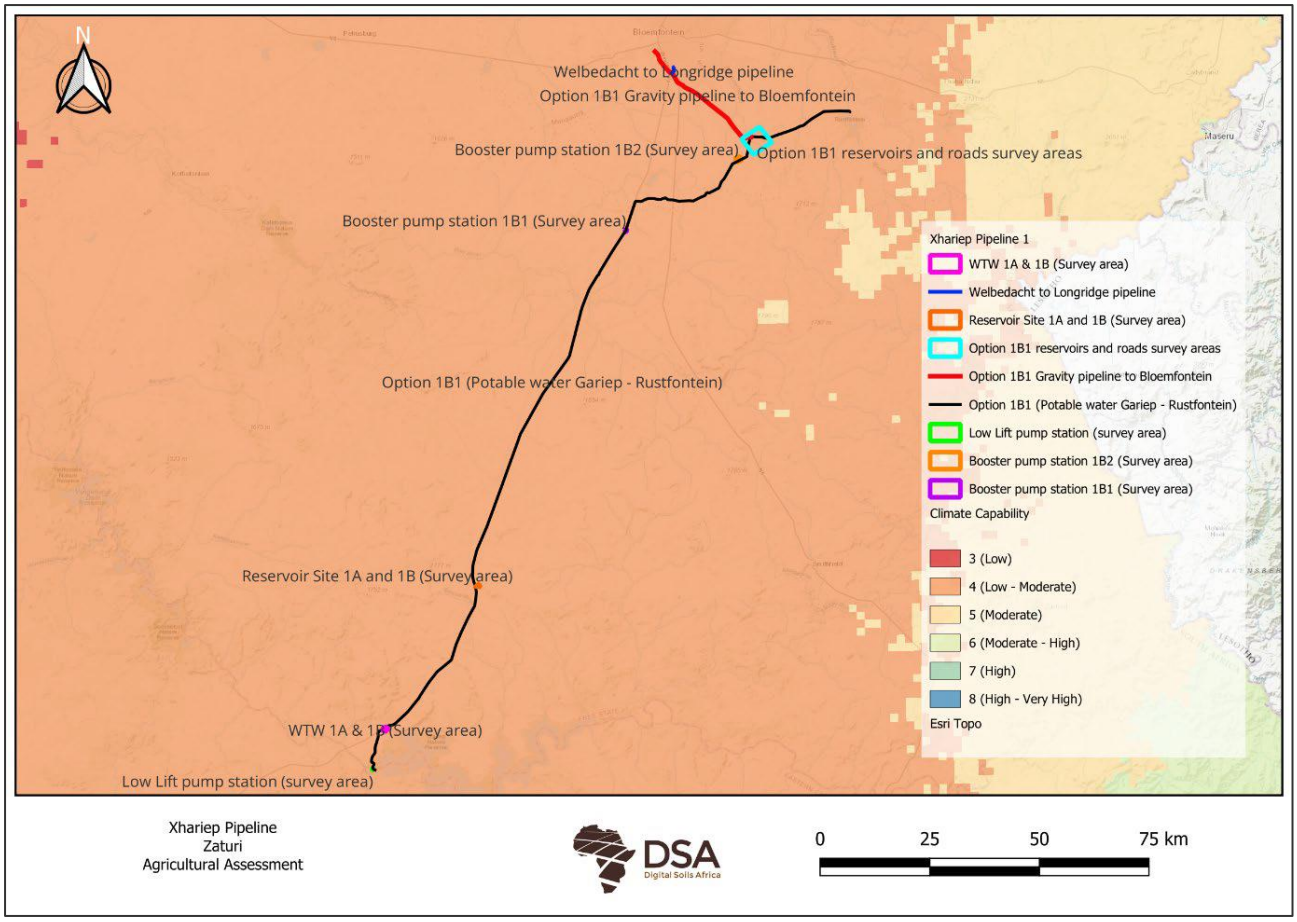


Figure 7-2: The Climate capability of the proposed site for Scheme 1B and the surrounding area [DAFF, 2017(Courtesy of DSA)]

7.1.1.2 Land type

A land type is an area which can be demarcated at a scale of 1:250 000 with similar soil forming factors and therefore soil distribution patterns. A land type does therefore not represent uniform soil polygons, but rather information regarding the occurrence of different soils on different terrain units can be obtained from the land type inventory. Landtype data was used in calculating the soil capability (DAFF, 2017), and therefore, indirectly used in the Screening tool for estimating the agricultural sensitivity.

The study area for the proposed Scheme 1B is largely comprised of the Ca, Dc, Ea and Db landtypes north of Trompburg while the south part of the study area towards the Gariep reservoir comprises of Da, Ib and Fb landtypes. The Ca landtype qualifies as Ba-Bd, but >10% occupied by upland duplex/margalitic soils, the Dc of either red or non-red duplex soils (sandier topsoil abruptly overlying more clayey subsoil) comprise >50% of land type; plus >10% occupied by black or red clays, the Ea consists of Black or red clays comprise >50% of land type, Db of either red or non-red duplex soils (sandier topsoil abruptly overlying more clayey subsoil) comprise >50% of land type; plus >10% occupied by black or red clays, Da consists of duplex soils (sandier topsoil abruptly overlying more clayey subsoil) comprise >50% of land type; >50% of duplex soils have red B horizons, Ib comprises of rock outcrops >60% of land type and Fb of shallow soils (Mispah & Glenrosa forms) predominate; usually lime in some of the bottomlands in landscape (Refer to Figure 7-3).

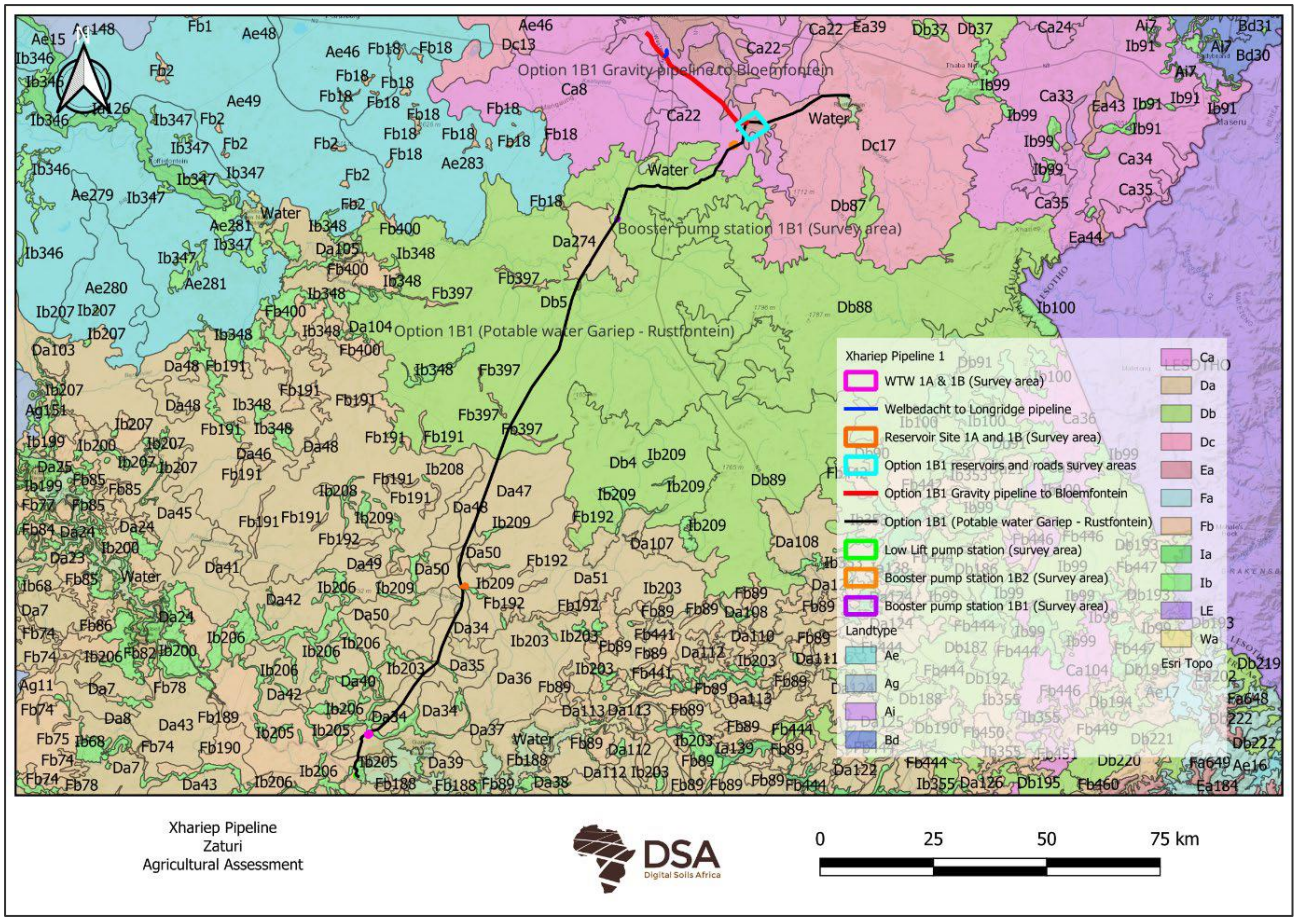


Figure 7-3: Land types found in the study area for Scheme 1B and the surrounding area (Lant type survey staff, 1972-2002 (Courtesy of DSA)]

7.1.1.2.1 Soil capability

- The Soil capability consists of 9 values, with 1 being the lowest value and 9 being the highest value. The main factors contributing to the soil capability consist of:
- Plant available water (80%)
- Soil sensitivity (17%)
- Soil fertility (3%)

The soil capability according to the DAFF (2017) for Option 1B1 Gravity pipeline to Bloemfontein has a majority value of 4 (Low - Moderate) and 5 (Moderate) to 6 (Moderate to high) in some parts. The Option 1B1 (Potable water Gariep - Rustfontein) site ranges from a majority of 2 (Very – Low) to 3,4, 5 and 6.

The Option 1B1 reservoirs and roads survey areas have values of 3-6, the Booster pump station 1B2 (Survey area) values of 4 with a few pixels with a value of 6. The Booster pump station 1B1 (Survey area) site has value of 2 to 4.

The Reservoir Site 1A and 1B (Survey area) of 2 and 4. The WTW 1A & 1B (Survey area) site has values of 3 and 4 while the Low Lift pump station (survey area) has values of 2 and 3. The majority soil capability of the site is between 2 and 4 which is Very Low – Low to Low – Moderate (Refer Figure 7-4 to Figure 7-7).

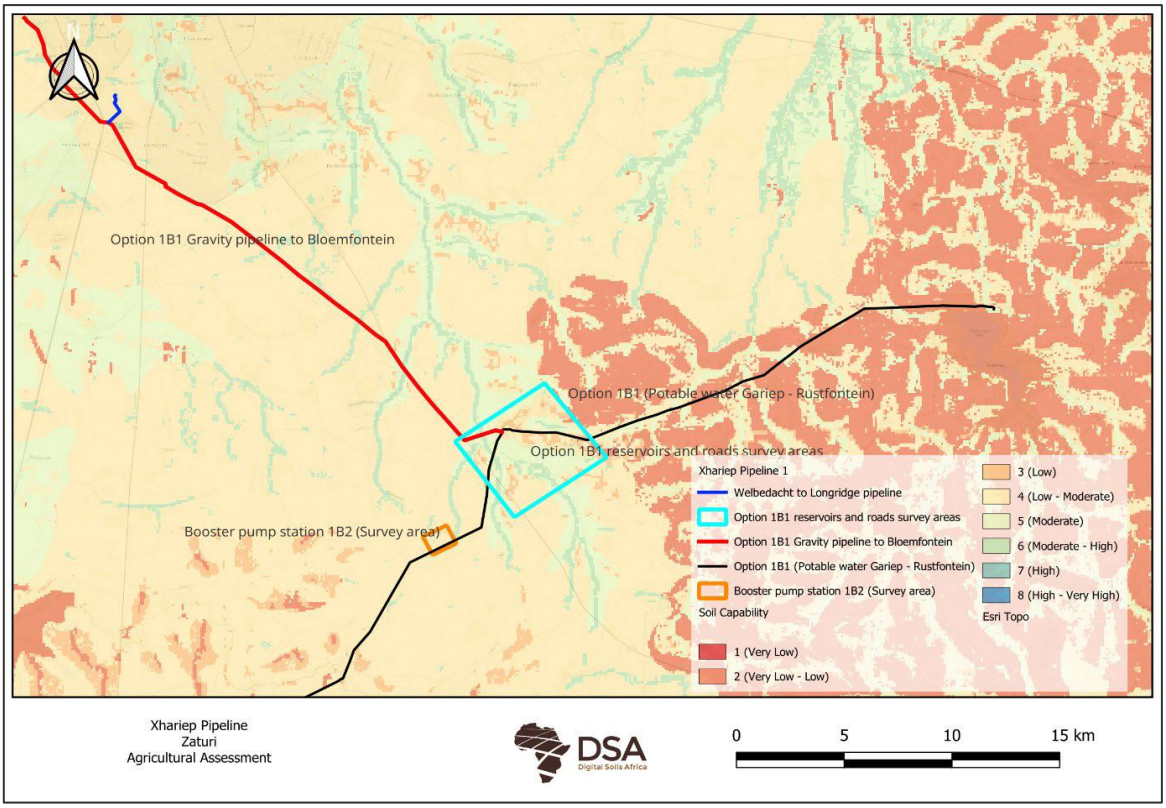


Figure 7-4: The soil capability of the site and the surrounding area (DAFF, 2017) for option 1B1 gravity pipeline to Bloemfontein, Welbedacht to Longridge pipeline, Option 1B1 and the booster pump station 1B2 (Courtesy of DSA)

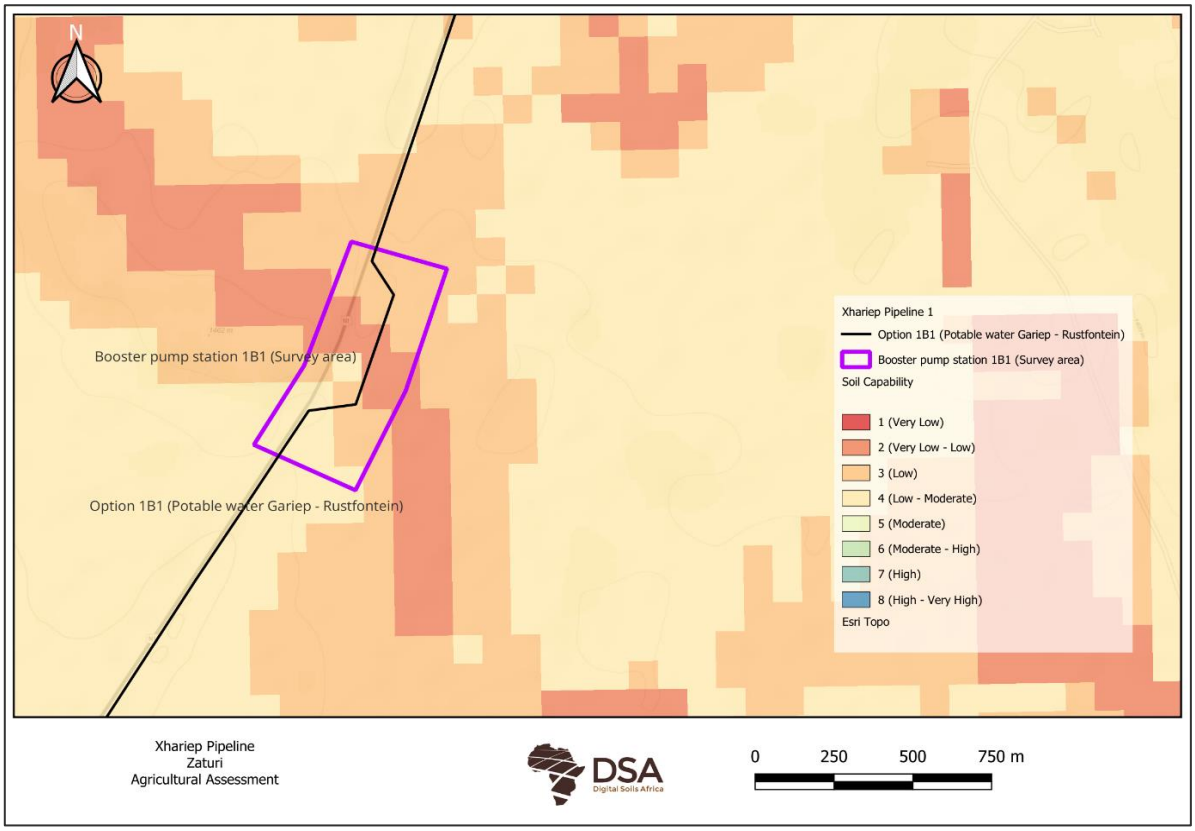


Figure 7-5: The soil capability of the site and the surrounding area (DAFF, 2017) for booster pump station 1B1 (Courtesy of DSA)

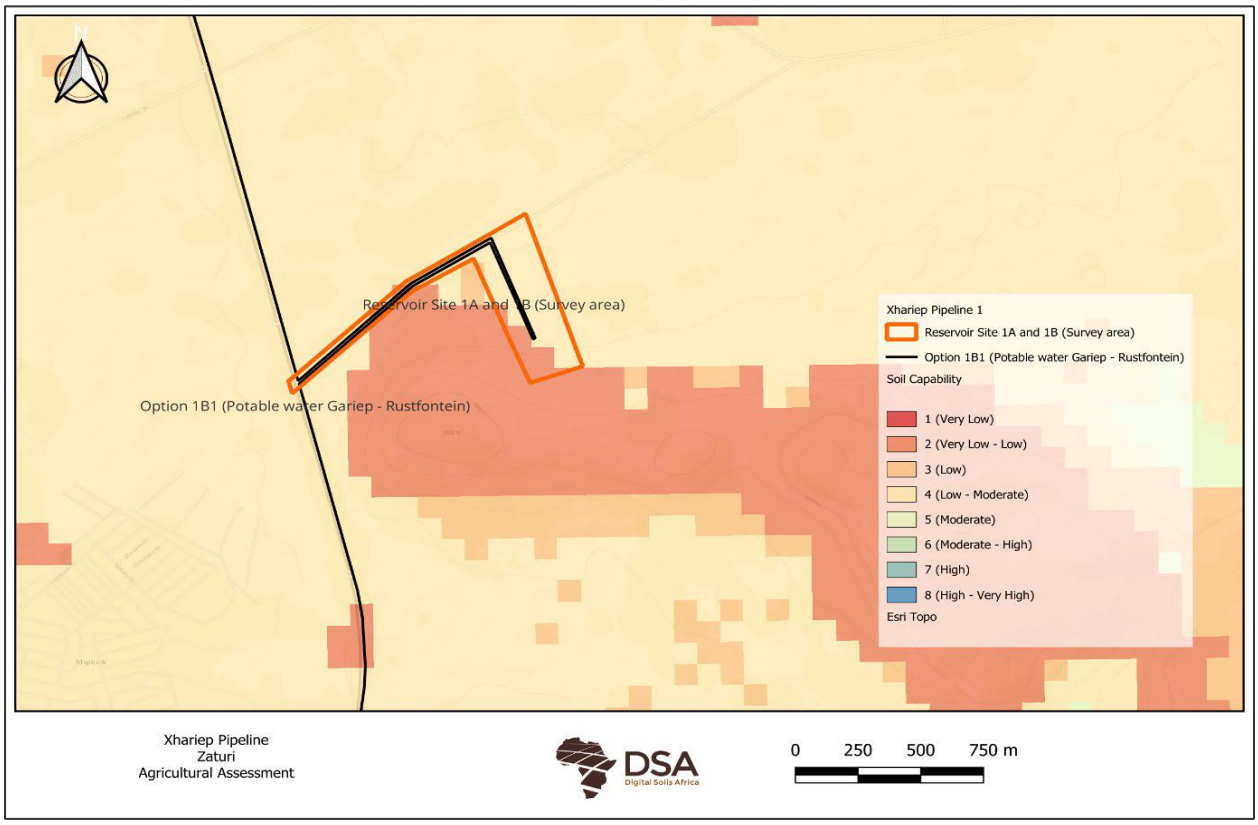


Figure 7-6: The soil capability of the site and the surrounding area (DAFF, 2017) for reservoir site 1A and 1B (Courtesy of DSA)

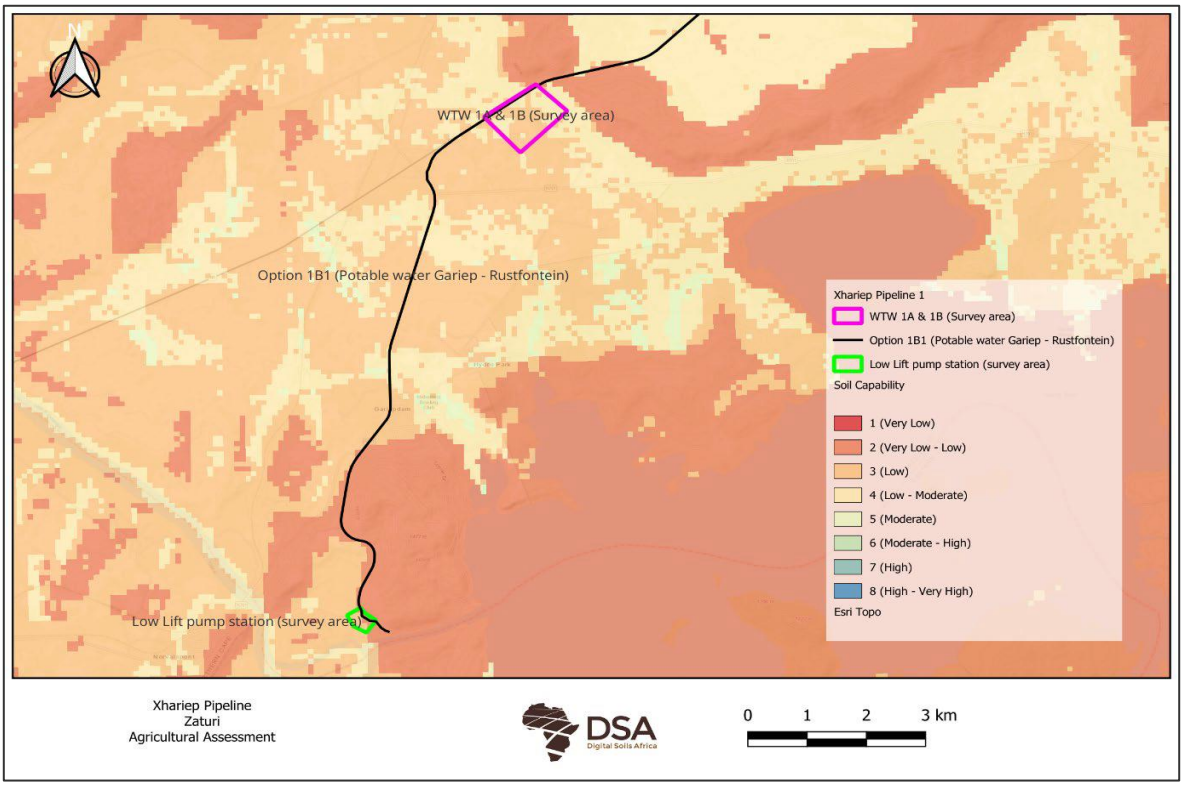


Figure 7-7: The soil capability of the site and the surrounding area (DAFF, 2017) for the WTW 1A & 1B and the low lift pump station (Courtesy of DSA)

7.1.1.3 Terrain capability

Terrain plays an important role in a plants' physiological growth requirements, and from a sensitivity and accessibility perspective, Therefore, the two terrain modelling concerns included in the terrain capability modelling exercise were plant physiology and terrain sensitivity. The Terrain capability consists of 9 values, with 1 being the lowest value and 9 being the highest value. The terrain capability varies within the proposed site foe Scheme 1B with low terrain capabilities to the southwest of the study area and moderate to high in the centre of the study area and north of the study area.

7.1.1.3.1 Land capability

The new Land capability (Department of Agriculture, Forestry and Fisheries, 2017) has fifteen classes, as opposed to the eight classes described by Schoeman et al. (2002), refer to Figure 7-8.

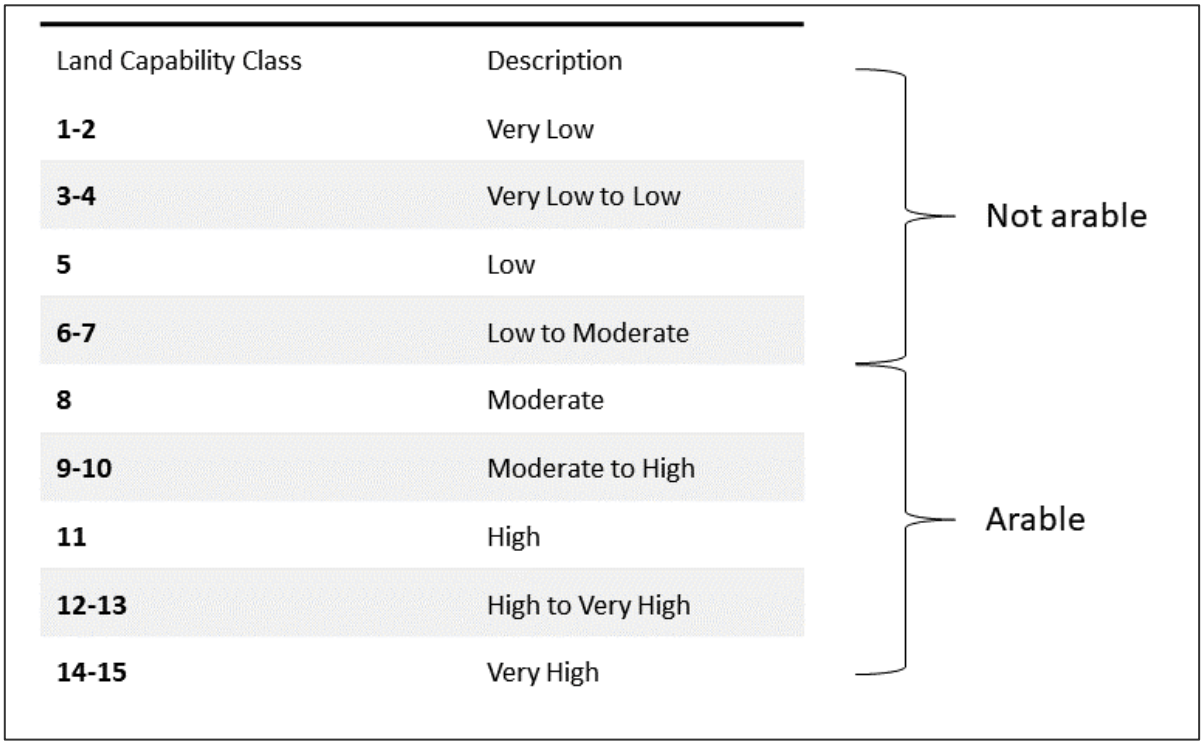


Figure 7-8: Land capability class and the description of the class (Courtesy of DSA)

The Land capability for the proposes Scheme 1B values ranges from 3 (Very Low - Low) and 7 (Low - Moderate), which is generally considered not arable.

7.1.1.3.2 Grazing capacity

The unit used in the grazing capacity is hectares per large stock unit (ha/LSU). The proposed site has a high grazing capacity of 6-9 ha/LSU (Figure 33) north of the Reservoir Site 1A and 1B (Survey area) and a slightly lower capacity of 11 – 15 south of the study area. Refer to Figure 7-9.

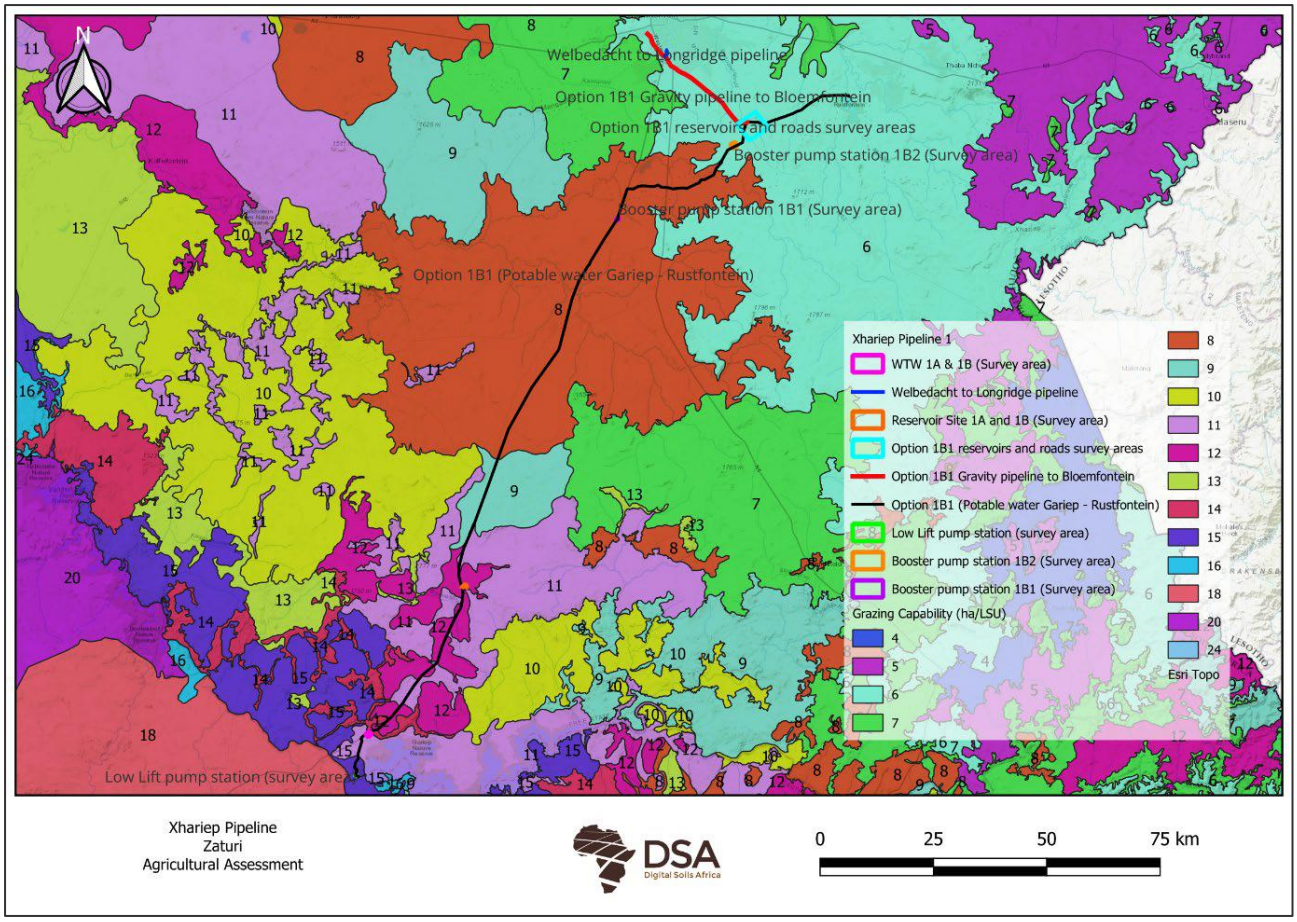


Figure 7-9: Grazing capacity for the proposes site and the surrounding are [Department of Agriculture, Forestry and Fisheries, 2016 (Courtesy of DSA)]

7.1.1.3.3 Land use

South African National Land-Cover 2020 (SANLC 2020) (GeoTerraImage, 2020) was compared to the 2014 Land Cover to determine if there was a land use change since 2014.

The Google satellite images (refer to the Specialist study in Annexure D) suggest that the landuse within the study site has not changed over the period of 2014 to 2022. The study area was deliberately laid out to avoid intersecting with field boundaries and roads, which have not changed from 2014 to 2023.

7.1.2 Impact assessment

7.1.2.1 Construction phase

Table 7-1: Construction phase: Agriculture - Pipeline from Gariepdam to connection points

Project phase	**Construction**	
Impact	**Loss of potential grazing land - Pipeline from Gariepdam to connection points**	
Description of impact	**Option 1B1 Gravity pipeline to Bloemfontein, Option 1B Gravity pipeline to Botshabelo and Option 1B Potable water from Gariep to Command Reservoir could results in loss of low to medium potential grazing land**	
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts
Potential mitigation	**Removal of rubble, complete closure of excavation and re-vegetation. Limit construction footprint**	

Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	The proposed pipeline is a linear development whose impacts could be mitigated through rehabilitation. The significance will therefore be negligible with mitigation			
Cumulative impacts	N/A			

Table 7-2 Construction phase: Agriculture - Low lift pump station

Project phase	Construction			
Impact	**Loss of land for livestock production/grazing - Low lift pump station**			
Description of impact	**Construction of low lift pump station in an area with low agricultural sensitivity; approximately 3.75 ha will be taken out of livestock production**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Clearing of building rubble, re-vegetation around site, keep disturbance footprint to a minimum**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge

Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	Since the land capability of the area under the low lift pump station is low, the loss of 3.75 ha will not have a significant impact on agricultural resources			
Cumulative impacts	N/A			

Table 7-3 Construction phase: Agriculture - Water Treatment Works with high lifting pump

Project phase	**Construction**			
Impact	**Reduce low land capability grazing area with 60ha - Water Treatment Works with high lifting pump**			
Description of impact	**Construction of a water treatment facility with associated infrastructure in area with low land capability will reduce potential grazing area with 60 ha**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Clearing of building rubble, re-vegetation around site, keep disturbance footprint to a minimum**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	Since the land capability of the area under the Water Treatment Works are low and mainly used for extensive livestock grazing, the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Water Treatment Plant does not overlie this high sensitivity area			
Cumulative impacts	N/A			

Table 7-4 Construction phase: Agriculture - Booster pump station 1B2

Project phase	Construction			
Impact	**Loss of 1 ha of low grazing capacity land - Booster pump station 1B2**			
Description of impact	**Construction of Booster pump station will take approximately 1 ha of low grazing capacity land out of production**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Clearing of building rubble, re-vegetation around site, keep disturbance footprint to a minimum**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	Since the land capability of the area under the Booster Pump station 1B2 is low and mainly used for extensive livestock grazing, the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Booster Pump station 1B2 does not overlie this high sensitivity area			
Cumulative impacts	N/A			

Table 7-5 Construction phase: Agriculture - Booster pump option 1B1

Project phase	Construction			
Impact	**Loss of 1 ha of low grazing capacity land - Booster pump option 1B1**			
Description of impact	**Construction of Booster pump station will take approximately 1 ha of low grazing capacity land out of production**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Clearing of building rubble, re-vegetation around site, keep disturbance footprint to a minimum**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site

Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	Since the land capability of the area under the Booster Pump station 1B1 is low and mainly used for extensive livestock grazing, the development will not have a significant impact on agricultural resources.			
Cumulative impacts	N/A			

Table 7-6 Construction phase: Agriculture - Reservoir sites 1A and 1B

Project phase	**Construction**			
Impact	**Loss of 3.7 ha of low grazing capacity land - Reservoir sites 1A and 1B**			
Description of impact	**Construction of reservoir sites 1A and 1B will take approximately 3.75 ha of low potential grazing land out of production.**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Clearing of building rubble, re-vegetation around site, keep disturbance footprint to a minimum**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	

Comment on significance	Since the land capability of the area under the Reservoir 1A and 1B are low and mainly used for extensive livestock grazing the developments will not have a significant impact on agricultural resources.
Cumulative impacts	N/A

Table 7-7 Construction phase: Agriculture - Reservoir option 1B1

Project phase	**Construction**			
Impact	**Loss of 1 ha of low grazing capacity land - Reservoir option 1B1**			
Description of impact	**Construction of reservoir site 1B1 will take approximately 1 ha of low potential grazing land out of production.**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Clearing of building rubble, re-vegetation around site, keep disturbance footprint to a minimum**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	Since the land capability of the area under the Reservoir Option 1B1 is low and mainly used for extensive livestock grazing, the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Reservoir 1B1 does not overlie this high sensitivity area			
Cumulative impacts	N/A			

7.1.2.2 Operational phase

Table 7-8 Operational phase: Agriculture - Low lift pump station

Project phase	**Operation**
Impact	**Loss of approximately 3.75 ha low agricultural sensitivity land for livestock production - Low lift pump station**
Description of impact	**Low lift pump station in an area with low agricultural sensitivity, approximately 3.75 ha will be taken out of livestock production**

Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Infrastructure is fixed so mitigation will not be possible**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Since the land capability of the area under the low lift pump station is low, the loss of 3.75 ha will not have a significant impact on agricultural resources			
Cumulative impacts	N/A			

Table 7-9 Operational phase: Agriculture - Water Treatment Works with high lifting pump

Project phase	**Operation**			
Impact	**Reduce grazing potential by 60ha in area with low capability -Water Treatment Works with high lifting pump**			
Description of impact	**Water treatment facility with associated infrastructure in area with low land capability will reduce potential grazing area with 60 ha**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Infrastructure is fixed so mitigation will not be possible**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur

Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Since the land capability of the area under the Water Treatment Works are low and mainly used for extensive livestock grazing, the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Water Treatment Works does not overlie this high sensitivity area			
Cumulative impacts	N/A			

Table 7-10 Operational phase: Agriculture - Booster pump station 1B2

Project phase	**Operation**			
Impact	**1 ha of low grazing capacity land out of production - Booster pump station 1B2**			
Description of impact	**Booster pump station will take approximately 1 ha of low grazing capacity land out of production**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Infrastructure is fixed so mitigation will not be possible**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Since the land capability of the area under the Booster Pump station 1B2 is low and mainly used for extensive livestock grazing, the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Booster Pump station 1B2 does not overlie this high sensitivity area			

Cumulative impacts	N/A

Table 7-11 Operational phase: Agriculture - Reservoir sites 1A and 1B

Project phase	**Operation**			
Impact	**3.75 ha of low potential grazing land out of production - Reservoir sites 1A and 1B**			
Description of impact	**Reservoir sites 1A and 1B will take approximately 3.75 ha of low potential grazing land out of production.**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Infrastructure is fixed so mitigation will not be possible**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Since the land capability of the area under the Reservoir 1A and 1B are low and mainly used for extensive livestock grazing, the developments will not have a significant impact on agricultural resources.			
Cumulative impacts	N/A			

Table 7-12 Operational phase: Agriculture - Reservoir site 1B1

Project phase	**Operation**			
Impact	**1 ha of low potential grazing land out of production - Reservoir site 1B1**			
Description of impact	**Reservoir site 1B1 will take approximately 1 ha of low potential grazing land out of production**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Infrastructure is fixed so mitigation will not be possible**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site

Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Since the land capability of the area under the Reservoir Option 1B1 is low and mainly used for extensive livestock grazing the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Reservoir 1B1 does not overlie this high sensitivity area			
Cumulative impacts	N/A			

7.1.3 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the agricultural potential is concerned. The agricultural specialist is confident that the project footprint can be rehabilitated to such an extent that the site can be grazed once again and returned to its current capacity.

The no-go option will result in not reaching the objectives of the SIP 18 and 19 project outcomes namely: to meet (i) water requirements as well as (ii) to meet the desired assurance of supply for both urban and agricultural water requirements.

7.1.4 Mitigation measures

Mitigation measures are all inherent in the project design and/or are standard, best-practice for construction sites.

- Follow the Environmental Management Plan (EMPr) for successful rehabilitation, of which revegetation is important.
- All rubble should be disposed of in accordance with the EMP to ensure it does not pose a hazard to animals.
- Restrict the proposed development to the smallest footprint possible and refrain from disturbing or altering areas outside the designated development zone.
- Ensure access roads remain clear, and that construction and operational activities do not impede agricultural activities.
- Maintain fencing to prevent animals from entering the site.

7.2 Archaeology and Cultural Heritage

TerraMare Archaeology was appointed as an independent heritage specialist to conduct the archaeological and cultural heritage assessment. The objective and focus of an archaeological and cultural heritage assessment is to assess whether or not the proposed development will have an unacceptable archeological and heritage impact, and based on this, to make a recommendation on whether or not it should be approved.

7.2.1 Receiving Environment

7.2.1.1 Cultural Landscape and Heritage

In respect of the landscape within which Scheme 1B is proposed, the geology and climate of the area have produced undulating landforms interspersed by steep koppies most of which, although farmed, is largely natural and undeveloped. Much of the area is given over to stock farming, with only occasional fields of crops present.

The paucity of natural landscape features that could have served as foci for pre-colonial human activities suggest that the landscape of Scheme 1B was of limited significance to, and thus lightly used and occupied by a succession of pre-colonial people.

The modern land-use on the area does not significantly alter its natural character. The area is sparsely populated, with large farms, and the landscape is largely natural and with only a light agricultural overlay comprised of occasional planted field, gravel roads, farm tracks, fence lines, and the handful of historical towns described earlier.

The proposed Scheme 1B is, therefore, situated in what may be described as an organically evolved, continuing landscape which is overwhelmingly natural, with only a relatively light human imprint.

The construction of the pipeline will introduce an industrial element into the landscape which will, particularly in the proposed infrastructure areas, alter the character or sense of place of the immediate landscape in which it will be constructed.

7.2.1.1.1 The Karoo as a Cultural Landscape

The central Karoo is almost entirely given over to sheep and game farming. Overgrazing since the advent of formal farming in the 19th century has caused some changes to the landscape in terms of the composition of vegetation. Acocks (1953) has claimed that pure grass veld gave way to Karoo scrub only after livestock was introduced, however it is apparent that rainfall fluctuation does cause seasonal and even cyclical oscillations with respect to prevalence of Karoo scrub versus grasslands. The Free State Karoo enjoys a greater influence of the summer rainfall system with Karoo scrub often taken over by seasonal grasses which closer to Mangaung are a permanent characteristic.

Overall, the impacts of modern surface development have been slight. To all intents and purposes the southern Free Sate Karoo has the qualities of an intact natural area, although it is used for agriculture. In areas where transformation has taken place – sheet erosion and donga formation has had an impact.

The scattered towns and farms represent a comparatively ephemeral on of the landscape of colonial settlement. The flood zones of major water courses such as the Orange, Riet and Modder River which traverse the study area, have been transformed by intensive irrigation agriculture. Aside from these comparatively moderate interventions the region remains dominated by its wilderness qualities although in reality stock keeping takes place throughout.

Indications are that this situation is changing as there are numerous proposals for the establishments of renewable energy facilities close the Springfontein and Norvalspont, which will have a significant

impact in terms of industrialisation of the landscape. This will accumulatively add a 21st century development layer that will significantly impact the status-quo and probably irreversibly so.

The heritage of the South African interior is essentially a series of layers of events (or landscapes) that has become superimposed on the land surface. The earliest of these is the Karoo palaeontology – an ancient landscape that was deposited as a result of a vast inland sea. The shores and swamps of this landscape abounded with ancient species of fish, plants, invertebrates and early mammal-like reptiles. After the breakup of Gondwanaland the Karoo took on the geology that has resulted in its particular character.

Millions of years later it was home to successions of early human occupation. Stone Age occupations of the Early, Middle and Later Stone Age (ESA, MSA, LSA) left a million or more years of human made debris on the land surface.

Superimposed on the Karoo landscape once more is the history of European colonisation and the wars that went with it.

7.2.1.1.2 The Pre-Colonial Landscape

The comprehensive survey of 5000 km^2 of the Zeekoei River catchment, from the Sneeuberg Mountains to the Gariep River Valley by Sampson revealed the presence of some 10000 archaeological sites, representing a history of human occupation that dates back at least 250 000 years. Sampson identified some seven industries or phases of human history within his study area (Refer to Figure 7-10) each of which are legible on the landscape today, and each of which represents a pre-colonial layer of the human history of the Karoo which is directly applicable to the southern Free State.

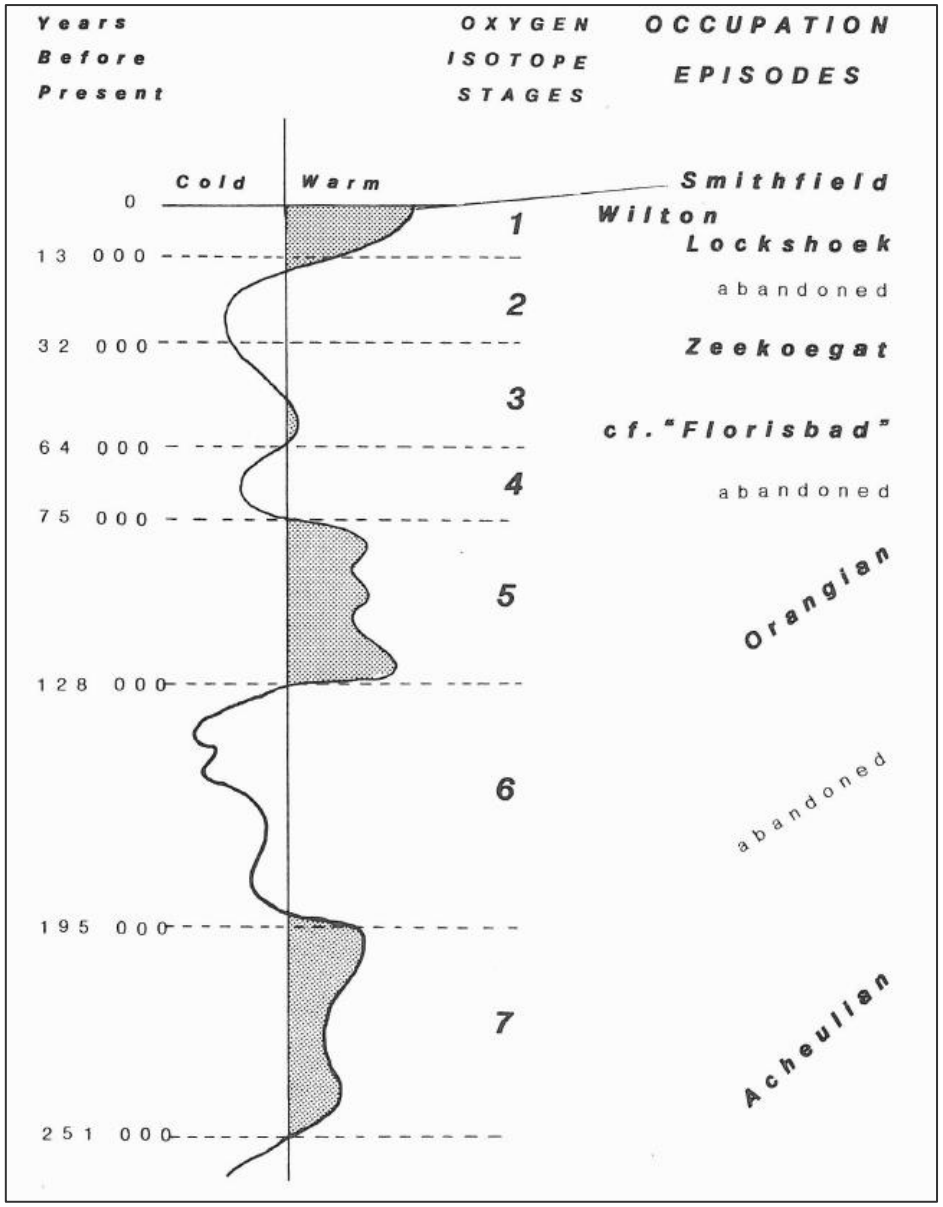


Figure 7-10 The sequence of occupation of the Karoo by humans as proposed by Sampson [After Sampson, 1985) (Courtesy of Terramare)]

Each phase of occupation left its archaeological signature on the landscape which is identifiable by the kinds of stone artefacts that have been left behind. Artefacts of both the ESA and MSA are widespread and may generally be described as an ancient litter that occurs at a low frequency across the landscape. Where definable scatters of Early and Middle Stone Age material occur, they are considered to be significant heritage sites.

The latest pre-colonial phase of occupation of the southern Free State is a period was by LSA peoples and represents the heritage of the Khoekhoen (historically known as “Hottentot” by early writers) and San (popularly known as Bushman) people of South Africa. The direct descendants of these groups make up a significant proportion of the population today.

The scarcity of natural caves and shelters in the southern Free State landscape has resulted in most archaeological sites being open occurrences of stone artefacts, ostrich eggshell fragments and occasionally, pottery. Bone remains are rarely preserved in open contexts. The most recent archaeological remains relating to the San have been historically described as the “Smithfield Industry” and are found from the Free State to the Northern and Eastern Cape. The Smithfield typically contains flaked lithics (on unpatinated blue-black hornfels), grinding equipment, bored stones, and potsherds

(typically relating to bowl-shaped pots with stamp impressed decoration). Formal stone tools include end scrapers. A slightly earlier toolmaking tradition is the Interior Wilton, which is characterised by a microlithic stone artefact industry characterised by lightly patinated hornfels (indurated shale stone).

Sampson also recognized a Khoekhoen ceramic tradition in the Karoo, however the extent of this is not yet resolved (1988, 2010). Also associated with the Late Stone Age are rare rock paintings which occur in the few caves and shelters to be found in the dolerites, however more plentiful are engraved rocks and stones and stone surfaces (Webley and Orton 2012) (Refer to Figure 7-11 for examples).

Figure 7-11: A selection of stone artefacts made from hornfels. the most favoured stone for tool making in the Karoo [(Photo: T Hart), Courtesy of Terramare]

After c. 1000 years before present people who were herding sheep/goats and possibly cattle, made an incursion into the interior and established a new economic order based on transhumant pastoralism (Hart 1989, Sampson, Hart, Wallsmith and Blagg 1989, Sampson 2010). The presence of herding people is represented by stone walled structures that occur throughout the Karoo although few have yet been reported from the Southern Free State. The spatial distribution of Late Stone Archaeological sites in the Karoo is quite patterned. People needed to be close to water so rivers, pans and springs played an important role in influencing where people lived. The climate also played a key role. The winters can be extremely cold with temperatures dropping well below zero, made worse by freezing winds. The summers in contrast are harsh, hot and rainfall is unreliable.

Sampson has observed that almost all Late Stone Age sites are situated at the bottom of the breaks of dolerite dykes, in sheltered areas on the crests of dolerite dykes, as well as in dolerite mazes and outcrops. So too, are the stone circles and circle complexes (Refer Figure 7-12) built by Khoekhoen groups after 1000 AD which are almost always built on the edges of low ridges and dykes. The higher ridges provided a view, some security, loose stones with which to build kraals and screens and allowed people to be elevated above the frost levels in winter.

Figure 7-12: A Khoekhoen type stone-piled herder kraal on the side of a dolerite ridge [(Photo: T Hart), Courtesy of Terramare]

7.2.1.1.3 The Landscape of Colonial Settlement

As described above, the indigenous San people waged a bitter war against colonial expansion as they gradually lost control of their traditional land. The situation became so desperate that the colonists fought back by establishing the “kommando” system (Penn 2005). The “hunting” of San was officially sanctioned in 1777 (Dooling 2007) and in some instances bounties were obtainable from the local *landrost*. The Drosdy of Graaf Reinett played a significant role in this long and bitter war which eventually saw the almost complete destruction of the Karoo Bushmen.

The movement of the early European settlers into the interior is one which is largely un-documented. These European pastoralists were highly mobile, trekking between winter and summer grazing lands. Land ownership was informal, and only became regulated after the implementation of the quitrent system used by the Government in the 19th to control the lives and activities of the farmers. The Orange/Gariep River was a natural divide between the Cape Colony and the lands to the north. It is not clear when *trekboere* first penetrated this area however there is a likelihood that frontiersmen found themselves crossing the Gariep River in the late 1700’s, the movement of ordinary Dutch pastoralist farmers not being recorded in history.

What is now the Free State Karoo or Transgariep was a refuge for Korana and Griqua groups living on the edge of colonial control and in all likelihood the last of the Karoo San who survived the “Bushman wars” of the Cape Colony. By 1825 Boer farmers began to penetrate the Transgariep in large numbers, which lead them into a minor conflict with the Griqua nation who lived close to where Phillopollis is now (Saks 1995).

Beaufort West and Graaf Reinet were, historically, the main administrative centers until the Great Trek of the mid-19th century opened and saw the settlement of lands to the north of the Gariep River (Bulpin, 1986, Fransen, 2006).

Outside of the main administrative areas the development of small towns took place mostly after 1860. The Voortrekkers who crossed the Gariep River encountered what seemed to be an empty landscape. Unknown to them at the time, this was contested territory. The Mfecane expansion had caused the displacement of many groups of people, while the indigenous San of the region found themselves being displaced by Sotho-Twana agriculturalists – the last remaining descendants living out their lives in hiding in the foothills of the Drakensberg.

Many of the small towns of the study area developed as “kerksdorpies” or church towns or developed from railway sidings. It was a tradition of the early farmers to gather monthly at a central area conduct a church service, socialise and trade. Eventual formal churches were built at these points (on land generally donated by farmers) that became the catalysts for settlement and commerce (Fransen, 2006).

Within the project area the railway line which was built in the 1880’s was an impetus for much activity. It was part of the landscape of conflict during the South African War in that it was heavily fortified with block houses and was the scene of many a skirmish. Railway sidings at Springfontein, Edenburg and Trompsburg made obvious garrison points even before the towns were established.

In respect of the landscape within which the Xhariep pipeline is proposed, the geology and climate of the area have produced undulating landforms interspersed by steep koppies most of which, although farmed, is largely natural and undeveloped. Much of the area is given over to stock farming, with only occasional fields of crops (mainly mielies) present.

The paucity of natural landscape features that could have served as foci for pre-colonial human activities suggest that the landscape of the proposed Scheme 1B was of limited significance to, and thus lightly used and occupied by a succession of pre-colonial people.

The modern land-use on the area does not significantly alter its natural character. The area is sparsely populated, with large farms, and the landscape is largely natural and with only a light agricultural overlay comprised of occasional planted field, gravel roads, farm tracks, fence lines, and the handful of historical towns described earlier.

The proposed Xhariep Scheme 1B pipeline is, therefore, situated in what may be described as an organically evolved, continuing landscape which is overwhelmingly natural, with only a relatively light human imprint.

The construction of the pipeline will introduce an industrial element into the landscape which will, particularly in the proposed infrastructure areas, alter the character or sense of place of the immediate landscape in which it will be constructed.

7.2.1.1.4 Heritage sites close to the proposed Scheme 1 B

The pipeline avoids impacting historic townscapes, South African War heritage and historical farm structures. Impacts to archaeological sites are expected to be of low significance. The field survey of the development footprint conducted by Banzai Environmental found no fossiliferous material. Refer to Annexure D for the Palaeontolgical Impact Assessment as well as Section 7.6 of this report.

- Gariep Dam to Springfontein

The pipeline will exit the take-off point and Low Lift Pump Station below the Gariep Dam and follow the N1, on the Free State side of the Gariep River. The town of Norval’s Pont and its associated heritage lies on the southern side of the Gariep and will thus not be affected.

The pipeline will pass for several kilometres along the northern side of the Gariep Valley. There is potentially sensitive landscape here in terms of pre-colonial archaeology due to its riverine context, but a large amount of this locale has already been surveyed and found not to be sensitive by Dreyer (2008a-c, 2013).

The route bends northwards passing the western side of the town of Gariepdam, the construction town of the Gariep Dam (sometimes known as Oranjekrag), which consists of a formally laid out town with mostly asbestos board prefabricated houses, now transferred in private hands.

The pipeline then passes through sloping but mostly un-transformed land, crosses the R701 then traverses and extensive grassy plain before reaching the eastern side of the N1. Indications are that this section of the route avoids known historic sites and cemeteries.

The TerraMare Archaeology survey of the site of the Water Treatment Plant / Sludge site was curtailed by a thunderstorm but did record the presence of two LSA lithic scatters (J003 and J004), a background signature of patinated MSA lithics (J003, J004 and G002) and a small, rectangular packed stone historical structure (J005). The latter lies outside the proposed development footprint (Figure 7-22).

Hart and Schietekatte (2017) noted the presence of several round and square historic kraals close just to the north-east of the WTP site, but these are outside the area that will be impacted by the pipeline (Figure 7-13).

Figure 7-13: Archaeological sites identified within the WTP / Sludge Dam footprint. The TerraMare Archaeology survey coverage is indicated by the yellow tracks. The historical kraals identified by Hart and Schietekatte (2017) are marked by the white oval (Courtesy of Terramare)

Thereafter the proposed route runs in a north-easterly direction, just outside the N1 road servitude and, for the most part, directly inside the fence lines of the numerous farms it traverses. This means that much of the pipeline route paralleling the N1 is located in areas that have been impacted by farm tracks that follow boundary fences.

The landscape traversed along much of the N1 undulating grasslands, interspersed with occasional low dolerite ridges. The grasslands are unlikely to be archaeologically sensitive, but the dolerite ridges may have archaeological potential.

The town of Springfontein developed after the South African War, but before that was a railway siding that was used for embarking and disembarking troops, particularly the wounded and sick who were accommodated at a very large field hospital close to the edge of where the town is now. Close by there a hill fortified with cannon and blockhouse, and in later years a concentration camp for Boer refugees. A cemetery for the 712 men, women and children who died there, graves of troops and hospital staff

who mostly died of epidemic disease, maintained by the Commonwealth War Graves Commission, is located immediately east of Springfontein (Figure 7-14)

The route of the pipeline east of the N1 will avoid the South African War block house, fortified hill and concentration camp cemetery flagged by Hart & Schietekatte (2017) by more than 13 km which will ensure that there are no impacts to these sites (Figure 7-14**Figure 7-14:**).

The TerraMare Archaeology walkover survey of the Command Reservoir 1 site north-east of Springfontein recorded only two ephemeral occurrences of MSA lithics (J002 and G001) (Figure 7-15).

Figure 7-14: South African War heritage resources outside Springfontein. The proposed route of the Xhariep pipeline is indicated by the red line paralleling the N1 (After Hart & Schietekatte, 2017- Courtesy of Terramare).

Figure 7-15: **The location of heritage resources recorded within the footprint of Command Reservoir 1 outside Springfontein (Courtesy of Terramare)**

- Springfontein to Trompsburg

Between Springfontein and Trompsburg the proposed pipeline alignment continues to parallel the N1 across mainly flat country which is likely to be unremarkable in heritage terms. According to Hart & Schietekatte (2017), Frans Prins of Active Heritage conducted a HIA of the proposed N1 interchange at Trompsburg and identified no sensitive heritage (Prins, no reference).

- Trompsburg to north of Edenburg

Between Trompsburg and the routing of the pipeline to the east, north of Edenburg, the route continues to parallel the N1 across mainly flat country. Edenburg is one of the older towns in the district that was established in the 19th century. Hart and Schietekatte (2017) reference letters published by the South African Military History Society which mention that troops were disembarked at Edenburg from time to time and reference is made to the establishment of a camp for black Boer refugees. The camp was small and suffered no casualties.

Edenburg itself contains a number of dwellings and structures that are generally protected by the NHRA but the proposed pipeline route passes well to the east of the town, through largely flat grassland that is unlikely to be archaeologically sensitive.

Booster Pump Station (Alternative 1) is located directly adjacent to the N1 on this section of the pipeline route. The proposed site is on sandstone ridge adjacent to a dolerite outcrop and although TerraMare Archaeology was not able to walk this area, observations made from the N1 suggest that it will not be archaeologically sensitive.

- Edenburg to Rustfontein Dam

Approximately 34 km north-east of Edenburg the pipeline route diverges from the N1 and tracks east to the Rustfontein Dam. Much of this route comprises the same type of undulating landscape interspersed with occasional koppies and rocky outcrops encountered along the N1.

TerraMare Archaeology recorded two instances of historical structures adjacent to the proposed pipeline route (J011 and G005), but neither are likely to directly impacted by the construction of the pipeline.

7.2.2 Impact assessment

7.2.2.1 Construction phase

Table 7-13 Construction phase: Disturbance or destruction of fossil material

Project phase	**Construction**			
Impact	**Palaeontology**			
Description of impact	**Disturbance or destruction of fossil material**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**Implementation of a Chance Fossil Finds Protocol**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	High	The resource is irreparably damaged and is not represented elsewhere
Significance	**Moderate - negative**		**Minor - positive**	
Comment on significance	Significance pre-mitigation is moderately negative but if fossil heritage is discovered the impact could be positive			
Cumulative impacts	If mitigation measures are implemented the cumulative impact will be LOW			

Table 7-14 Construction phase: Disturbance or destruction of archaeological sites and/or materials

Project phase	**Construction**			
Impact	**Pre-colonial Archaeology**			
Description of impact	**Disturbance or destruction of archaeological sites and/or materials**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• A pre-construction archaeological walkdown survey of areas of rocky outcrops and those infrastructure areas that could not be accessed during the TerraMare Archaeology survey is recommended. • Any archaeological sites or material encountered during construction activities must be reported to the ECO by contractors, and SAHRA must be notified of any such discovery by the ECO so that the find can be assessed and arrangements made to mitigate it, if necessary.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - positive**	
Comment on significance	Significance pre-mitigation is moderately negative but if the recommended mitigation measures are implemented, the impact could be positive			
Cumulative impacts	If mitigation measures are implemented the cumulative impact will be LOW			

Table 7-15 Construction phase: Damage to or destruction of historical buildings and other colonial period sites

Project phase	**Construction**	
Impact	**Colonial Period Heritage**	
Description of impact	**Damage to or destruction of historical buildings and other colonial period sites**	
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts
Potential mitigation	**Identifiable historical built structures and/or sites are avoided during the construction of the pipeline and associated infrastructure**	
Assessment	**Without mitigation**	**With mitigation**
Nature	Negative	Positive

Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - positive**	
Comment on significance	Significance pre-mitigation is minor negative but if the recommended mitigation measures are implemented, the impact could be positive			
Cumulative impacts	If mitigation measures are implemented the cumulative impact will be LOW			

Table 7-16 Construction phase: Impacts to the cultural landscape

Project phase	**Construction**			
Impact	**Cultural landscape**			
Description of impact	**Impacts to the cultural landscape**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Mitigation measures could include, the screening of infrastructure area(s), keeping the construction and decommissioning duration as short as possible and as much of the activity as possible out of the public view.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment

Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Moderate - positive**	
Comment on significance				
Cumulative impacts	If mitigation measures are implemented the cumulative impact will be LOW			

7.2.3 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the heritage and cultural impact is concerned. The heritage specialist is confident that the impact of all negative impacts can be mitigated.

7.2.4 Mitigation measures

The ACO Associates and TerraMare Archaeology field surveys, and the desktop assessment conduced for this project identified very little surface archaeological material within the area that will be affected by the Xhariep pipeline project. Experience indicates, however, that there may be archaeological material buried within the surficial sediments within the development area, potentially covering the whole range from the ESA to the LSA and possibly historical archaeology.

Earthworks and excavations for the project may encounter and disturb such buried archaeological material if it is present and the following mitigations are recommended:

- The packed stone kraal (J001) which is on the alignment of the pipeline must be avoided and not subject to impacts arising from the project. A buffer of 10 m is recommended around this site.
- A pre-construction archaeological walkover survey of those portions of the pipeline route which cross dolerite ridges and river valleys, and those infrastructure areas that could not be accessed during the TerraMare Archaeology survey must take place.
- Any archaeological sites or material encountered during construction activities must be reported to the ECO by contractors, and SAHRA must be notified of any such discovery by the ECO so that the find can be assessed and arrangements made to mitigate it, if necessary. Such finds may require inspection or collection/excavation by an archaeologist. Such heritage is the property of the state.
- In this regard, should rock engraving be encountered, they may need to be moved away from the pipeline servitude with the assistance of the contractors.
- The archaeological mitigation work can be done as a single burst or arranged as a series of site visits by a local archaeologist. Given that the project has a long construction period, annual or bi-annual field proofing of landscape ahead of construction phases is possible.

No identifiable graves have been recorded in the development area, but it is possible that human remains will be encountered during construction work. In this regard it is recommended that:

- Should human remains be encountered, activities work in the vicinity of the find must cease, the remains must be left in situ but made secure and SAHRA must be notified immediately so that mitigatory action can be determined and be implemented.

It appears unlikely that the project will results in the need to demolish any historical built structures, but should this occur, a permit for such an activity will be required, in advance, from the FSPHRA.

To mitigate impacts to the cultural landscape the following measures are recommended:

- The sympathetic screening of infrastructure area(s) from the N1 and the nearby towns and/or farmsteads should be considered.
- The pipeline trench is properly and effectively rehabilitated following the installation of the pipe.
- All of the recommendations above must be incorporated into the Environmental Management Programme (EMPr) and EA for the Xhariep pipeline project.

7.3 Aquatic Biodiversity

DPR Ecologists & Environmental Services was appointed as an independent aquatic specialist to conduct the freshwater (wetland and river) assessment. The objective and focus of an aquatic assessment are to assess whether or not the proposed development will have an unacceptable agricultural impact, and based on this, to make a recommendation on whether or not it should be approved.

7.3.1 Receiving Environment

Watercourses and wetlands along the proposed Scheme 1B pipeline route seem are in a natural state to a large extent. This is due to the absence of large towns or cities within these catchments, except for the Modder River, which is heavily modified by the MMM. It only covers a small portion of the pipeline route in the most northeastern section of the route. The topography also promotes the formation of numerous small watercourses and wetlands which contain quite prominent wetland conditions. Due to the large extent of the pipeline route, the wetlands and watercourses along the route also differ to a significant degree. Most of these watercourses drain from the higher lying areas to the east toward the lower lying areas in the west and south. Almost all these watercourses are seasonal or ephemeral, functioning as rapidly flushing systems, containing main channel flow only for short periods after rainfall events occurring. The section of the pipeline route situated along the N1 National Road affects the watercourses and wetlands to a more significant extent than those situated along the Tierpoort Dam – Rustfontein Dam section where the pipeline will be situated to a large degree within natural areas. This is mostly because of the impact the road has on the geomorphology and hydrology of these watercourses and wetlands. The impact is therefore anticipated to be lower where the pipeline is situated within the road reserve of the N1 and R702 tarred roads while being higher where the pipeline is situated within natural areas.

The entire proposes Scheme 1B pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and RietModder Sub WMA. As a result, these watercourses all form part of the same drainage system, they are largely similar in terms of their functioning and composition which does aid in simplifying assessment of them and the likely impacts that the development will have. Where some differences occur between these drainage areas, it can be summarised as follows:

- Vanderkloof Sub WMA: The southern section of the pipeline route, roughly from the town of Springfontein to the Gariep Dam which contain numerous but small watercourses and wetlands all of which drain directly into the Orange River. As a result, most of these affected watercourses also drain from north to south toward the Orange River. Most of these also drain largely intact and natural catchments and they are consequently still largely unmodified and natural. As a result, many of these, such as the Donkerpoortspruit, of which the pipeline route will cross over several of its tributaries, are listed as a National Freshwater Ecosystem Priority Area's (NFEPA) system.
- Riet River Sub WMA: Covering the majority of the pipeline route, especially within the central section of the pipeline route. This catchment is extensive and contains a high number of watercourses and wetlands including some of the larger rivers such as the Riet River,

Vanzylspruit and Tierpoort River all of which are tributaries of the main, Riet River system. As a result, almost all of these affected systems also drain from west to east following the drainage pattern of the Riet system. The catchment of this system is also still largely intact and not affected by any significant transformation pressures and consequently, most watercourses and wetlands are also still largely unmodified and natural. As a result, some of these covering large areas, are also listed as NFEPA systems, notably the Vanzylspruit system and a large tributary of the Tierpoort River.

- Modder River Sub WMA: The most north eastern section of the pipeline route, roughly from the R702 tarred road and eastwards to the Rustfontein Dam. The section contains many watercourses and wetlands, some being prominent stream and river systems such as the Renosterspruit, Koringspruit and Modder River. Agricultural transformation due to crop cultivation is more abundant here, though the upper reaches of some watercourses such as the Renosterspruit and Koringspruit area still largely natural and as a result these are also listed as NFEPA systems. The Modder River being a heavily utilised and modified system is however well known to be heavily modified.

Those watercourse systems which are listed as a NFEPA is afforded to only a select few watercourses in South Africa. Very few watercourses in the country are still natural with almost all being affected by some significant impact and being modified. Being an NFEPA system signifies that these systems have been identified as one of those few remaining natural watercourses and it is therefore of utmost importance that their natural condition be retained, and the proposed pipeline development does not compromise this natural functioning to any significant degree.

Figure 7-16: Watercourses along the pipeline route contain extensive floodplains with strong affinities with karroid vegetation communities with large areas dominated by dwarf karroid shrubs (Courtesy of DPR)

Figure 7-17: The floodplain formed arid environments promoting the establishment of a variety of dwarf karroid shrubs and dwarf succulent species (Courtesy of DPR)

Figure 7-18: Extensive floodplain with erosion being prominent (Courtesy of DPR)

The floodplains are extensive and since they are also associated with largely ephemeral watercourses flooding only occurs during years of exceptional rainfall which may only occur every few decades. The floodplain is therefore a fairly arid habitat, and it contains a high degree of terrestrial species. These includes a substantial grass layer which may include *Themeda triandra, Digitaria eriantha, Eragrostis obtusa, Heteropogon contortus, Aristida diffusa, Cymbopogon pospischillii, Fingerhuthia africana, Panicum coloratum, Tragus koelerioides* and *Aristida congesta*. All of these are terrestrial species indicating the largely absence of saturated soils, i.e. the floodplain is largely devoid of wetland conditions. However, two notable riparian grasses, *Sporobolus ioclados* and *Sporobolus tenellus* are also abundant in the floodplain, especially in those areas with low vegetation cover. These species are well known to be riparian indicators for these ephemeral rivers and are also adapted to habitats with higher salt concentrations. As indicated, these floodplains also resemble karroid vegetation communities which is also clearly illustrated by the abundance of dwarf karroid shrubs which include *Pentzia incana, Pteronia sp., Chrysocoma ciliata, Lycium horridum, Salsola calluna, Rosenia humilis, Osteospermum spinescens, Helichrysum lucilioides, Eriocephalus karooicus* and *Pteronia glauca.* As with the grass component, many of these species are terrestrial species which are also abundant in surrounding terrestrial habitats. However, a few of these are strictly riparian and along these ephemeral rivers they are reliable indicators of riparian conditions. These include *S. calluna, O. spinescens, H. lucilioides* and *P. glauca* and are also often associated with areas with elevated salt levels (Highveld

salt pans and Bushmanland vloere). As previously indicated, the habitat conditions form a relatively arid environment which also promotes the establishment of a prominent succulent component. These include many dwarf succulent shrubs and also dwarf cryptic succulents found underneath karroid shrubs. These succulent species include *Mestoklema tuberosum, Crassula capitella, Ruschia intricata, Microloma armatum, Trichodiadema pomeridianum, Nananthus sp., Euphorbia arida, Tridentea gemmiflora, Ruschia sp.* and *Curio radicans*. Some of these are also endemic to these floodplain habitats, such as *Euphorbia arida, Mesembryanthemum rabiei* and *Nananthus sp.* and are also of significant conservation value.

These floodplain areas are in general largely devoid of exotic weeds. However, where the arid micro habitats are formed, they are susceptible to the establishment of invasive succulents such as *Cyllondropuntia imbricata* and *Opuntia humifusa*. This may indicate a degree of natural disturbance due to erosion of the floodplain but may also be coupled with increased anthropogenic impacts. These extensive floodplains associated with the watercourses in this region clearly form part of the riparian zone of these watercourses. These habitats are varied and contain a strong affiliation with Nama Karoo vegetation types and provide conditions suitable for a variety of dwarf succulent species. These arid habitats formed within the floodplain also provide unique habitat for the establishment of regional endemic species such as *Euphorbia arida, Mesembryanthemum rabiei* and *Nananthus sp.* which are confined to these riparian areas. These floodplain habitats also contain a higher diversity of habitats and consequently a higher species diversity.

The above provides give a general description of the functioning of the watercourses along the proposed Scheme 1B pipeline route and should also serve to indicate that although they may seem small, and flow only occur sporadically they still have a complex functioning which provides several unique ecosystem services. They should consequently still be considered as sensitive systems which may be easily altered or affected by activities such as the construction of the proposed pipeline.

Habitat diversity along the pipeline route is considered moderate. Along the entire route only five vegetation types occur indicating that the broad diversity of habitats is not exceptionally high. The entire route is dominated by grassland with a karroid component increasing from north to south. Hills and watercourses increase the habitat diversity and contribute a shrub and tree layer to the grassland of the plains. As a result of the moderate habitat diversity, the species diversity is also not considered high. This region is not known for high levels of species diversity and is not included within any centres of endemism. Despite this the area does still contain a significant number of protected species and certain habitats may contain a higher diversity of species often associated with watercourses and their floodplains and hills and ridges.

The ecological function of the watercourses along the pipeline route are all largely intact and the majority is relatively natural with only a few being modified significantly. The majority of available habitat is still largely intact providing an ecological function to the fauna dependant on the watercourses. Their function in terms of water transportation is also largely intact. The flow and flooding regime of most is also still intact although modified to a low degree by small impoundments and road crossings. The larger watercourses such as the Tierpoort, Riet and Modder River which contain larger impoundments (Tierpoort Dam, Rustfontein Dam) has been much more affected in this regard as these impoundments will have a large impact on their flow and flooding regime. The flow pattern and ecological functioning should not be affected any further by the installation of the pipeline as long as comprehensive and successful rehabilitation is implemented.

7.3.2 Impact assessment

7.3.2.1 Construction phase

Table 7-17: Construction phase: Freshwater - Loss of riparian and wetland vegetation, including protected and rare species

Project phase	Construction			
Impact	**Loss of riparian and wetland vegetation, including protected and rare species**			
Description of impact	**The installation of the pipeline will result in the removal of vegetation of the footprint area and the consequent disturbance of the bed and banks of watercourses and wetlands. The construction footprint of the pipeline, 40 meters in width, is fairly large for a linear development and a substantial loss of vegetation will occur.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Minimise footprint, keep construction footprint within road reserve wherever possible, transplant protected and rare plant species and implement adequate topsoil management and rehabilitation.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	Impact is considered to generally moderate though through adequate and successful rehabilitation can be limited to the construction phase.			
Cumulative impacts	Where the pipeline is situated outside the road reserve, this will contribute toward the overall cumulative impact. Wherever the pipeline can be retained within the existing road reserve, the cumulative impact will be low as it will overlap with an existing impact, not contributing to it.			

Table 7-18: Construction phase: Freshwater - Disturbing the bed and banks of watercourses and the associated erosion and sedimentation

Project phase	Construction		
Impact	**Disturbing the bed and banks of watercourses and the associated erosion and sedimentation**		
Description of impact	**The removal of vegetation and excavation of the trench will result in the disturbance of the bed and banks of the watercourses. This in turn will promote erosion, prevent the banks from stabilising and lead to increased sedimentation of the watercourses.**		
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts	
Potential mitigation	**Minimise disturbance footprint and removal of vegetation, reinstate bank and bed geomorphology to natural state, implement comprehensive rehabilitation of wetland and riparian vegetation and implement erosion management structure where necessary.**		
Assessment	**Without mitigation**		**With mitigation**

Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	This impact may potentially be the most detrimental to watercourses and wetlands along the pipeline route. Where the bed and banks of watercourses remains unstable, erosion will be allowed to continue, and this will cause a negative cycle. It is therefore vital that the bed and banks be stabilised, and erosion prevented.			
Cumulative impacts	Where existing structures such as bridges crossing affect wetlands and watercourses, the pipeline is likely to contribute toward the cumulative impact in the area though the impact is likely to decrease should adequate and successful rehabilitation be implemented.			

Table 7-19: Construction phase: Freshwater - Establishment of exotic weeds and invaders

Project phase	**Construction**			
Impact	**Establishment of exotic weeds and invaders**			
Description of impact	**The disturbance caused by construction will also cause susceptible conditions for further establishment of exotics.**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**This impact is however easily mitigated should adequate weed eradication and monitoring be implemented.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Short term	impact will last between 1 and 5 years
Extent	Municipal area	Impacts felt at a municipal level	Local	Extending across the site and to nearby settlements
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment

Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	Without mitigation it is highly likely that exotic and invasive species will establish, persist in the long term and spread into downstream areas.			
Cumulative impacts	Areas of disturbance such as the road reserve of the N1 National Road already contain exotic weeds and invasive species and disturbance caused by the pipeline will contribute toward this cumulative impact in that the establishment and spread of invasives will increase in disturbed areas.			

Table 7-20: Construction phase: Freshwater - Altering the flow and flooding regime of watercourses

Project phase	**Construction**			
Impact	**Altering the flow and flooding regime of watercourses**			
Description of impact	**Altering the flow and flooding regime seriously modifies the natural functioning of watercourses.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Keep the construction timeframe through watercourses and wetlands to a minimum, conduct trenching during the dry season and implement successful diversion structures where necessary.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Municipal area	Impacts felt at a municipal level	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	The impact has the potential to be high in the event that significant flooding takes place or during years of high rainfall, in which case the impact will extend far downstream and is likely to cause permanent alteration of the system. Overall, and provided that adequate and successful mitigation is implemented, the impact should remain moderate.			

Cumulative impacts	Cumulative impacts is only likely where existing structure such as bridge pylons and excavation of trenches will increase the overall impact on watercourses and wetlands in terms of altering the flow and flooding regime.

7.3.2.2 Operational phase

Table 7-21: Operational phase: Freshwater - Maintenance and repair of pipeline and associated infrastructure

Project phase	**Operation**			
Impact	**Maintenance and repair of pipeline and associated infrastructure**			
Description of impact	**During the operational phase, periodic maintenance, fixing and replacing of sections of the pipeline will be required from time to time. As a result, even though adequate rehabilitation may previously have been done this may again destabilise the system and result in new impacts and may also have long-term impacts should poor rehabilitation be done after maintenance operations.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**A comprehensive maintenance management plan should be compiled and implemented for use during the operational phase and should also include comprehensive rehabilitation and monitoring measures much the same as being recommended for the construction phase.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	The impact with and without mitigation will be much the same as for those during the construction phase and can be significant should adequate and successful rehabilitation is not implemented.			
Cumulative impacts	Cumulative impacts should remain fairly low as repair and maintenance is usually confined to localised sites.			

7.3.3 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the aquatic is concerned and service delivery will not take place. The aquatic specialist is confident that the impact of all negative impacts can be mitigated and the constriction of Scheme 1B is supported.

7.3.4 Mitigation measures

- After construction of the pipeline the area must be rehabilitated. This includes removal of all construction material. Excavated rock may not be left in heaps and must be removed and disposed of at a registered facility.
- Compacted areas must be ripped.
- Construction roads not being utilised afterwards must be rehabilitated.
- Where construction occurs through watercourses or wetlands, it is important that comprehensive rehabilitation and monitoring of the rehabilitation takes place. It is therefore recommended that a comprehensive rehabilitation and monitoring plan be compiled and strictly adhered to.
- A natural riparian vegetation should be re-instated where this was disturbed/removed. It is important that the rehabilitation succession and establishment of wetland and riparian vegetation be continuously monitored to indicate the success of rehabilitation and the manner to which the original occurring natural vegetation can be re-established. This will also aid in improving or maintaining rehabilitation techniques.
- The affected area contains numerous protected species (Appendix B to the Specialist report in Annexure D of this report). These consist of protected trees, succulents and geophytes. The following recommendations should be followed for protected species:
    - Where protected tree species (*Olea europaea subsp. africana* – Wild Olive) occur in the construction footprint they should be avoided as far as possible.
    - Where this is not possible, permits should be obtained from the relevant authority to remove them.
    - Where protected succulent/geophytic species will be affected by construction, permits should be obtained and these transplanted to adjacent or rehabilitated areas where they will remain unaffected.
    - These species are cryptic and inconspicuous and it is recommended that a walkthrough survey be conducted prior to an area being affected by construction. This should include identification and marking of all protected plants in such an area.
    - The transplanting of these species should be overseen by an ecologist, botanist or other suitably qualified person.
    - Monitoring of the success of establishment should also be undertaken.
- Problematic weeds and invasive species must be eradicated where these establish on the constructed pipeline route (Appendix B to the Specialist report in Annexure D of this report). The affected wetland and watercourses should particularly be monitored for establishment of weeds.
- Adequate monitoring of weed establishment and their continued eradication must be maintained Appendix B to the Specialist report in Annexure D of this report). Where category 1 and 2 weeds occur, they require removal by the property owner according to the Conservation of Agricultural Resources Act, No. 43 of 1983 and National Environmental Management: Biodiversity Act, No. 10 of 2004.
- No littering must be allowed and all litter must be removed from the site.
- The installation of the pipeline will result in the disturbance of the bed and banks of the river. This in turn will promote erosion, prevent the banks from stabilising and lead to wetlands and watercourses. As a result, disturbance of the banks should be kept to a minimum and erosion remediated where it occurs.
- The construction footprint along watercourses and wetlands as well as the removal of riparian and wetland vegetation should also be kept to a minimum.

- Construction of the pipeline should be retained, wherever possible, within the road reserve of the N1 National Road, R702 tarred road and gravel roads, which is already affected by significant disturbance and will significantly decrease impacts on wetlands and watercourses.
- Construction materials, waste including hazardous materials and ablution facilities should be kept outside the delineated border of affected watercourses and wetlands.
- Where such materials need be kept within the floodplain, adequate storm water management and a laydown area with berms should be erected around these.
- Construction through watercourses and wetlands should be completed in the shortest timeframe to minimise the likelihood of flooding taking place and that no open trenches through the watercourse or wetland be left for any extended period.
- When excavating through wetlands and watercourses, the upper 30 cm, or topsoil, should be removed together with the vegetation and stored as sods on the site. These should then be replaced on top of the installed pipeline. Subsoil should be used as backfilling and not as top dressing. Only removed sods and topsoil should be utilised to rehabilitate the bed and bank surface.
- The soil surface should also be re-instated to the virgin soil level and not depressed or elevated as this will promote erosion and cause flow barriers.
- Many of the watercourses along the pipeline route contain a bedrock main channel. Where the pipeline will be installed underneath the watercourse this will require blasting, excavation or cutting through the rock and removal thereof. It is recommended that in such instances backfilling with resistant material up to the watercourse bedrock surface be considered.
- Where concrete is utilised the detrimental impacts of uncured cement on watercourses must be taken into consideration.
- The construction site, especially wetlands and watercourses should constantly be monitored for erosion. Where erosion is evident this must be remedied.
- Where steep banks occur and erosion is evidently problematic it is recommended that geotextiles be utilised to stabilise soils. Available options include contouring, berms, gabions and geotextile netting.
- After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility.
- Installation of the pipeline through wetlands and watercourses should preferably be undertaken during the winter months (July to September) when baseflow will be at its lowest level.
- Where trenches are being excavated through wetlands and watercourses this should preferably be done during the winter months when flooding is unlikely to take place. Where this is not possible and the main channel experiences active connected flow, only half of the channel should be blocked off for construction whilst the remaining half is allowed to maintain flow. This will still result in some impacts but will be much less than blocking the whole watercourse. Blocking of half of the watercourse is often done by constructing a berm and diverting the flow into the remaining half of the channel. This causes concentration of flow which in turn may increase erosion. In such instances, the use of attenuation ponds or similar should be implemented, this will also be relevant where any dewatering of construction sites area required, i.e. water should be pumped into attenuation ponds, sediments allowed to settle and with water seeping back into the system.
- These impacts will persist until adequate rehabilitation of the construction area has been completed. This should include rehabilitation of the soil surface, including re-instating the natural surface, including areas affected by vehicle trampling and tracks, scarifying compacted soil surfaces and the monitoring and eradication of exotic weeds until a competitive indigenous vegetation layer has been able to re-establish.
- Monitoring of construction and compliance with recommended mitigation measures must take place and should include:
- Monitoring should include monthly water quality sampling, sediment release (turbidity), Index of Habitat Integrity and WET-Health or a combination thereof.

- The larger seasonal and perennial watercourses should be monitored using aquatic monitoring methods such as the SASS5 and FRAI indices.
- Following completion of construction it is recommended that a 2 year period of monitoring be initiated which should include monitoring of erosion, bank and bed stability, vegetation and weed establishment and remediating this.
- A comprehensive maintenance management plan should be compiled and implemented for use during the operational phase and should also include comprehensive rehabilitation and monitoring measures much the same as being recommended for the construction phase.
- The necessary authorisations must be acquired from Department of Water and Sanitation (DWS) for the construction of the bulk water pipeline that will affect wetlands and watercourses along the pipeline route.

7.4 Civil Aviation

7.4.1 Receiving Environment

Zutari visited the site on 20 to 22 February 2023. The following aviation installations have been depicted in proximity of the proposed Scheme 1B (Refer Figure 7-19):

- Bram Fischer International Airport air traffic control zone
- Airspaces:
  - FAD 28: Bloemfontein MIL Low Flying Area
  - FAD 107 (B): Bloemfontein Military Flying Area South
  - FAD 107 (A): Bloemfontein Military Flying Area North
  - FABL CTR: GND - 6500FT ALT
  - New Tempe Glider Area
  - FAD106: BLOEMFONTEIN/NEW TEMPE FLYING AREA
  - FAR29: DE BRUG RANGE
- FAHV Gariep Dam Airfield

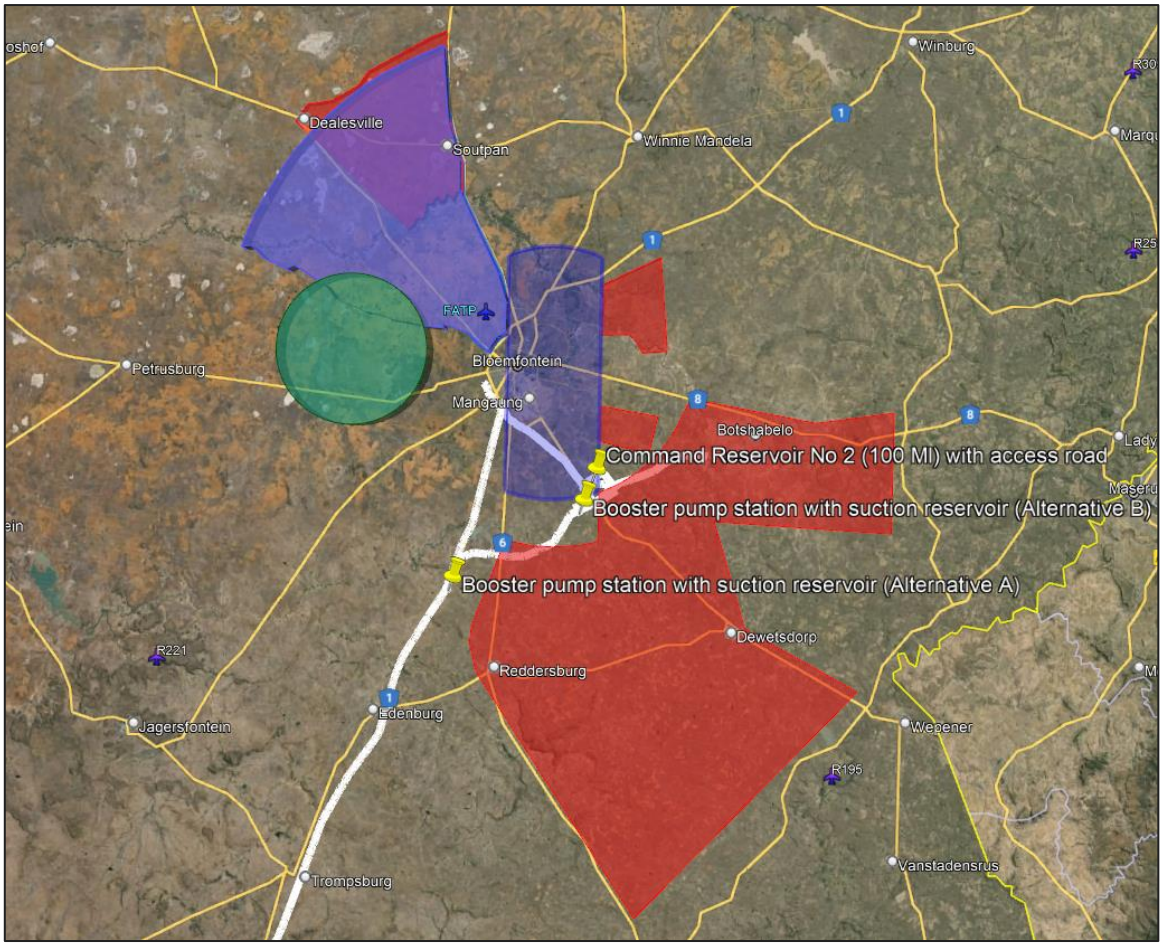


Figure 7-19: The proposed project (bold white line) and its proximity to airspaces around Bloemfontein.

The Gariep Dam Airspace is located approximately 1.3km south-east of the proposed water treatment works at the southern end of the development. The northern runway is aligned with the sludge lagoons of the proposed water treatment works. The risk of this would need to be confirmed by the SACAA, however it must be noted that a high-voltage power line runs through the potential site for the sludge dams. A reasonable assumption can therefore be made that if the risk associated with the existing powerline is being managed, the new infrastructure will not pose a risk that can't be managed to acceptable limits.

Figure 7-20: The Gariep Dam airspace is located approximately 2km south-east of the proposed water treatment works at the southern end of the proposed development.

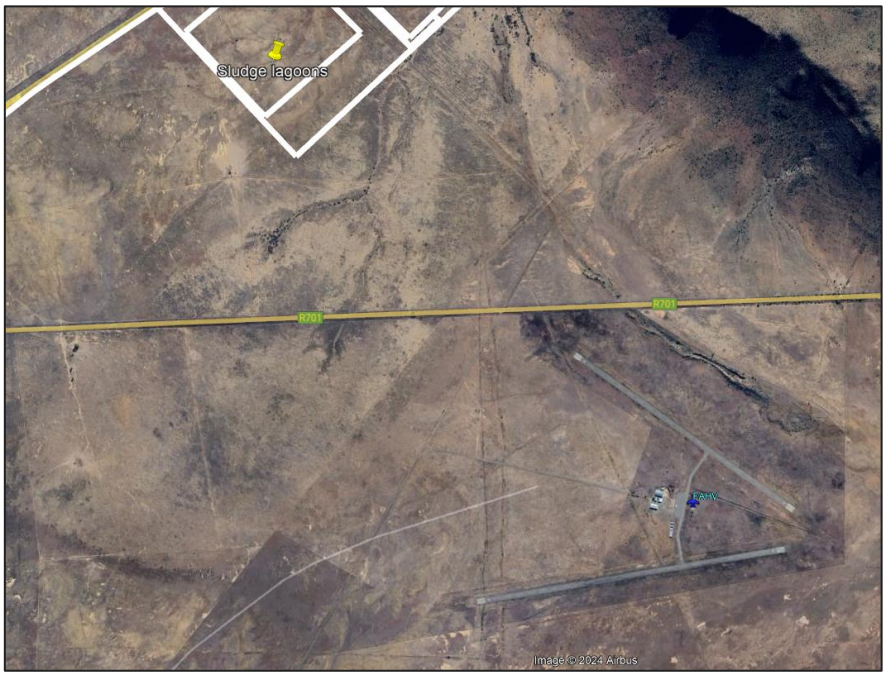


Figure 7-21: Showing the alignment of the runways at the Gariep Dam airspace in relation to the proposed water treatment works.

7.4.2 Mitigation measures

The project involves the development of both above ground and below ground infrastructure as described in the project description above. The proposed new infrastructure would be typical service delivery infrastructure i.e., pipeline, reservoirs and pumpstation and such would not introduce components to the character of the greater that are not managed in other places.

- A mitigating circumstance is that the *status quo* will largely remain and any potential negative impacts have a high likelihood for mitigation and therefore no further assessment of the impacts are required.
- The SACAA and particularly the Gariep Dam Airspace must however be contacted for comment and inputs to find out whether any furthermore detailed investigations are requried.

7.5 Defence

7.5.1 Receiving Environment

Zutari visited the site on 20 to 22 February 2023. The proposed Scheme 1B will be located in proximity to the Bram Fischer International Airport air traffic control zone and Tempe Military Base at Bloemfontein.

7.5.2 Mitigation measures

- A comment should be solicited from the Department of Defence, which should (a) confirm if there will be unacceptable impact and (b) if further assessment (and the nature of the assessment) is required.

7.6 Palaeontology

Banzai Environmental was appointed as an independent palaeontology specialist to conduct the palaeontology assessment. The objective and focus of a palaeontology assessment is to assess whether or not the proposed development will have an unacceptable palaeontological impact, and based on this, to make a recommendation on whether or not it should be approved.

7.6.1 Receiving Environment

The proposed Xhariep pipeline Project in the Free State is depicted on the 1:250 000 Koffiefontein 2924 (2992); Bloemfontein 2926 (1966) and 3024 (1997) Colesberg, while the 3026 (1983) Aliwal North Geological Map is also included in Figure 7-22 (Council of Geoscience, Pretoria).

The 2926 Bloemfontein map indicates that the study area is underlain by the Permian aged sediments of the Upper stage (K3u) and Middle Stage (K3m) of the Beaufort Group, Karoo Series as well as Jurassic dolerite. This geological map and terminology are outdated. The Koffiefontein 2924 (1992) and Colesberg (3024) Geological maps indicates that the study area is underlain by the Adelaide Subgroup (Pa) as well as Jurassic dolerite (Jd, red).

The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) is Very High while that of the Jurassic dolerite is Zero (grey) (Almond and Pether, 2009; Almond et al., 2013, Groenewald *et al* 2014). As elsewhere in the country, the underlying sediments is mantled by Quaternary superficial sediments not mapped on the 1:250 000 Geological Map. The DFFE Web based Screening tool indicates that the Palaeontological Sensitivity of the study area is Very High while areas with a Medium (orange) Sensitivity is also crossed. Updated geology (Council for Geoscience, Pretoria) refined the geology and indicates that the proposed development is underlain by the Jurassic dolerite (jd), Balfour Formation (pbf) as well as the Middelton (pm) (Adelaide Subgroup, Karoo Supergroup).

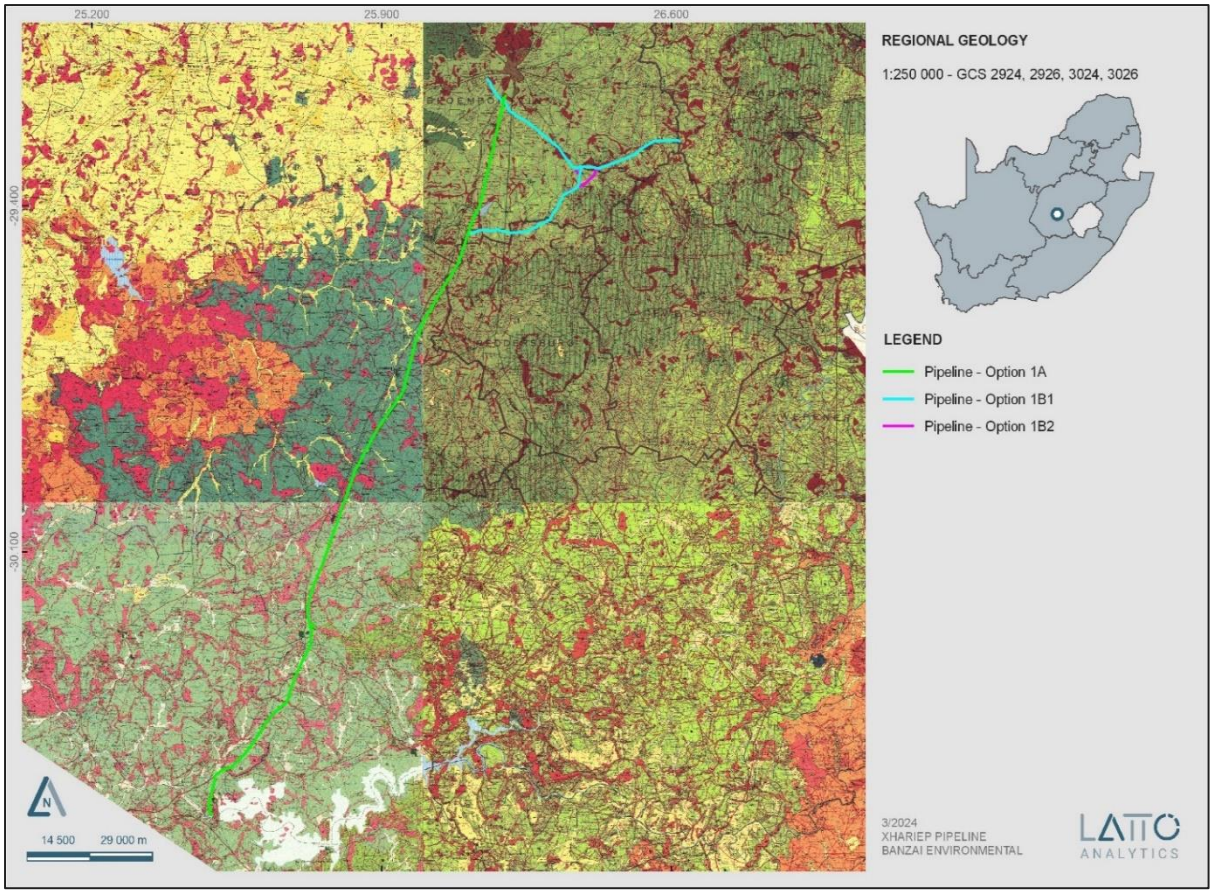


Figure 7-22: **Extract of the 1:250 000 Bloemfontein 2926 (1966), Koffiefontein 2924 (1992) and Colesberg 3024 (1997) and 3026 Aliwal North (1983) Geological map (Council of Geoscience, Pretoria) which indicates that the Xhariep pipeline Project is underlain by Jurassic dolerite (red) as well as the Upper Stage (K3u), Middel Stage (K3m) and the Adelaide Subgroup (of the Beaufort Group, Karoo Supergroup).**

As elsewhere in the country superficial deposits mantle underlying sediments but is not always indicated on the 1:250 000 geological maps. Superficial sediments are represented by the Pleistocene to Recent superficial deposits and comprise of alluvium, downwasted surface gravels, pedocretes, and sandy soils. These sediments are most probably of Low Palaeontological Significance but could contain mammalian teeth, bones and horn corns, reptile skeletons and fragments of ostrich eggs. Microfossils, non-marine mollusc shells are also known from Quaternary deposits. Plant material such as foliage, wood, pollens, and peats are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps/ mounds) and rhizoliths (root casts). Reworked Stone Age artifacts have been found in Quaternary alluvium.

Post-Karoo Dolerite (igneous in origin) is present close to the proposed Scheme 1B. The Adelaide Group's prospective fossiliferous sedimentary bedrocks have frequently been thermally metamorphized by overlaying dolerite sills, limiting their palaeontological sensitivity. The Karoo dolerite present around the development form part of the Karoo Igneous Province is one of the worlds classic continental flood basalt (CFB) provinces. This Suite was formed approximately 183 million years ago and consists of intrusive and extrusive rocks that occur over a large area (Duncan et al, 2006). Generally, the flood basalts do not contribute to prominent volcanic structures but instead are formed by successive eruptions from a set of fissures that form sub-horizontal lava flows (sills and dikes) varying in thickness. This lava caps the landscape on which they erupted. As the Karoo is an old flood basalt province it is today preserved as erosional fragments of a more extensive lava cap that covered much of southern Africa in the geological past. It is estimated that the Karoo lava outcrop currently covering at least 140 000 km^2, was larger in the past [~2 000 000 km^2 (Cox 1970, 1972)]. The Karoo Igneous Province can be divided into the Lebombo and the Drakensberg Groups. This Igneous Province contains a large volume of flood basalts as well as silicic volcanic rocks. These units consist of hyodacite and rhyolitic

magma and crops out along the Lebombo monocline. Individual units span up to 60 km and sometimes show massive pyroclastic structures and are thus classified as rheoignimbrites. The basal lavas lie conformably on the Clarens Formation but in specific localities, sandstone erosion occurred before the volcanic eruptions took place. Lock *et al* (1974) described evidence in the Eastern Cape that in the early stages of volcanism magma interacted with ground water to produce volcaniclastic deposits as well as phreatic and phreatomagmatic diatremes. Eales *et al* (1984) also found evidence of aqueous environments during early volcanism by the existence of pillow lavas and associated hyaloclastite breccias and thin lenses of fluviatile sandstones interbedded with the lowermost magmas.

The proposed Scheme 1 B is underlain by a series of Karoo sandstones, mudstones, and shales, deposited under fluvial environments of the Adelaide Subgroup that forms part of the Beaufort Group, refer **Figure 7-23**. The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods and was deposited on land through alluvial processes. The Beaufort Group covers a total land surface area of approximately 200 000 km2 in South Africa and is the first fully continental sequence in the Karoo Supergroup and is divided into the Adelaide subgroup and the overlying Tarkastad subgroup. The Adelaide subgroup rocks are deposited under a humid climate that allowed for the establishment of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments. The Adelaide Subgroup is approximately 5 000m thick in the southeast, but this decreases to about 800m in the centre of the basin which decreases to about 100 to 200m in the north.

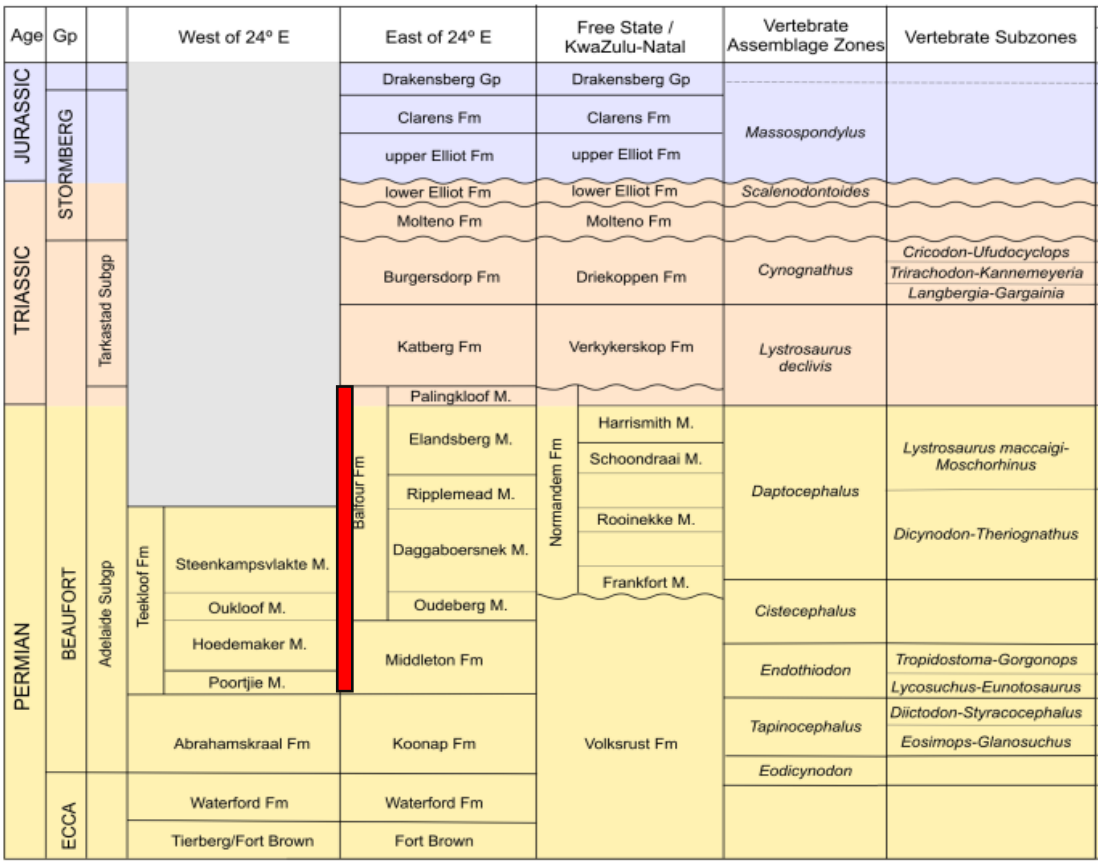


Figure 7-23 Vertebrate biozonation range chart for the Main Karoo Basin of South Africa

7.6.2 Impact assessment

7.6.2.1 Construction phase

Table 7-22 Construction phase: Loss of fossil heritage

Project phase	**Construction**			
Impact	**Loss of fossil heritage**			
Description of impact	**Surface clearance and excavations**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**Implement chance find protocol**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	High	The resource is irreparably damaged and is not represented elsewhere
Significance	**Moderate - negative**		**Minor - positive**	
Comment on significance	Significance pre-mitigation is moderately negative but if fossil heritage are discovered the impact could be positive			
Cumulative impacts	If mitigation measures are implemented the cumulative impact will be LOW			

7.6.3 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the palaeontology impact is concerned. The palaeontology specialist is confident that should construction take place the impact will be negligible.

7.6.4 Mitigation measures

- The ECO for this project must be informed that the Beaufort Group has a Very High Palaeontological Sensitivity. The ECO must also stress this matter during his/her induction training with the contractor.
- If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be

protected and the ECO/site manager must report to South African Heritage Resources Agency (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 mitigation (recording and collection) can be carried out.

- 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

7.7 Social-economic environment

Batho Earth was appointed as an independent social specialist to conduct the social impact assessment. The objective and focus of a social assessment is to assess whether or not the proposed development will have an unacceptable social impact, and based on this, to make a recommendation on whether or not it should be approved.

7.7.1 Receiving Environment

The Free State, located in the geographical centre of South Africa, is the third-largest province as it covers an area of approximately 130 000km² and has a population of 2 964 412. It can be described as a rural province of farmland, mountains, mining areas and widely dispersed towns. Its capital is Bloemfontein, the judicial capital of South Africa. The province has the second lowest population profile in South Africa and the second lowest population density (StatsSA, 2023).

The provincial economy is dominated by agriculture, mining and manufacturing. Approximately 90% of the province is under cultivation for crop production. It produces approximately 70% of the total grain production of South Africa. The mining sector is the major employer.

The Free State is divided into one metropolitan municipality (Mangaung Metropolitan Municipality) and four district municipalities, which are further subdivided into eighteen local municipalities (Local Government, 2023).

The proposed project falls under the jurisdiction of the Mangaung Metropolitan Municipality (MMM) area, as well as the Kopanong Local Municipality (KLM). The latter municipality falls within the Xhariep District Municipality (XDM) area.

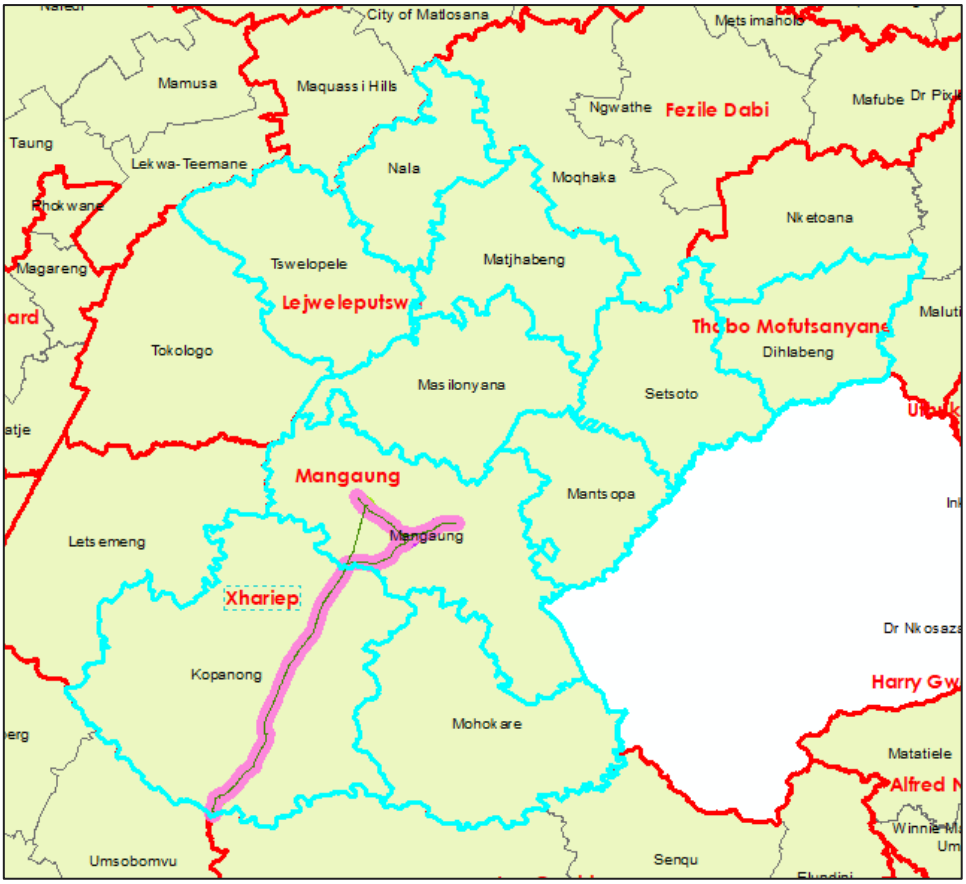


Figure 7-24 Map indicating the Xhariep pipeline project: Scheme 1B crossing the various municipal areas

7.7.1.1 Xhariep District Municipality

The Xhariep District Municipality (XDM) is a Category C municipality situated in the southern part of the Free State. It is bordered by the Mangaung Metro to the north, Eastern Cape to the south, Lesotho to the east, and Northern Cape to the west.

It is the largest district in the province and comprises three local municipalities: Letsemeng, Kopanong and Mohokare. Its administrative headquarters are in Trompsburg, which is approximately 125km south of Bloemfontein.

The area is a semi-arid rural area with dispersed towns or rural nodes throughout. Approximately 74% of the district comprises of extensive agriculture of livestock farming (sheep and cattle) that produces wool and meat. Areas adjacent the Orange River are also used for irrigated agriculture which includes maize, wheat and lucerne production (XDM IDP, 2022).

The main national roads traversing the area are the N1 (Gauteng to Western Cape), N6 (Eastern Cape to Bloemfontein) and N8 (Bloemfontein to Kimberley).

Development challenges in the XDM include the following:

- Poverty and unemployment;
- Inadequate access to basic services (water, sanitation, refuse collection, electricity, and housing and primary health care);
- Infrastructure, maintenance and service backlogs;
- HIV and AIDS prevalence rate, antenatal care and Tuberculosis (TB);
- Substance abuse;
- Illegal dumping;
- High rate of illiteracy and lack of tertiary institutions; and

► Lack of integrated planning between the three spheres of government (XDM IDP, 2022).

With a GDP of R7.86 billion in 2017, the XDM contributed 3.36% to the Free State Province GDP. There is an annual average of 2.2% growth in the GDP. The main employment sectors are the trade sector, followed by the community service sector. In 2017, the percentage of people living in poverty in the district was calculated at 57.9% which was slightly lower compared to the national figure in this regard (XDM IDP, 2022).

7.7.1.2 Kopanong Local Municipality

The Kopanong Local Municipality (KLM) is a Category B municipality situated within the Xhariep District of the Free State Province. Its surface area covers 15 663 km^2. The towns situated in the KLM are Trompsburg (municipal head office), Gariepdam, Springfontein, Bethulie, Philippolis, Jagersfontein, Fauresmith, Edenburg and Reddersburg.

The municipality also accommodates Bethany which is part of a national land restitution case. The Bethany Land Restitution Project is situated on the farm Bethany 610 to the north of Trompsburg and near Edenburg on the N1 near the Bethany Mission (along the Wurasoord-Reddersburg Road).

The municipal area is predominantly agricultural with limited value-adding activities taking place. Basic agricultural products are exported from the area for processing and re-imported into the area as consumer products.

The characteristics of the main towns along the proposed pipeline alignment are briefly discussed below.

Gariepdam town serves as a key regional tourist destination linked to water sports and water recreational activities. Gariepdam has two main tourist attractions in the Free State, namely the Gariep Dam Nature Reserve and the Forever Resorts Gariep, a holiday resort. There are also a number of guest houses and bed and breakfast facilities at Gariepdam to cater for the visitors. There is a need for the integration of the former separated town areas through infilling planning and sustainable land management. In 2011, the town had a population of 1 568 individuals. It is anticipated that this figure grew steadily as per the growth rate of the district.

Springfontein/Maphodi/Williamsville serves as a general agricultural service centre and is situated approximately 22 km south of Trompsburg. Access to the town is via the N1 between Bloemfontein and Colesberg. There is a need for commercial and social integration of the former separated town areas, where Springfontein is to the west of the railway line and Maphodi and Williamsville to the east. A shortage of especially lower income housing creates further challenges. Various developmental projects were initiated in the area, but not completed. According to recent articles 90% of the people of Springfontein depend on grants and have to travel to Trompsburg for basic necessities (Lategan, 2023 & ActionSA, 2023).

Trompsburg/Madikgetla serves as the regional administrative seat within KLM. It is situated approximately 108 km south of Bloemfontein. Access to the town is via the N1 between Bloemfontein and Colesberg. The main social and economic functions of the town include its function as a local municipal administrative centre, and regional agricultural, as well as social services centre. There is a lack of sufficient housing and sustainable land-use management (XDM IDP, 2022).

Edenburg/Ha-Rasebei also serves as a general agricultural service centre within KLM. It is approximately 39km north of Trompsburg. The town also require social integration and housing for lower income individuals (XDM IDP, 2022).

7.7.1.3 Mangaung Metropolitan Municipality

Mangaung Metropolitan Municipality (MMM) includes three urban centres, namely Bloemfontein, Botshabelo, and Thaba Nchu. It covers an area of 9886 km² and had a population density of 86 people per km² in 2019.

Botshabelo was established in the early 1980s and is located 55km to the east of Bloemfontein. It was intended to provide labour to Bloemfontein whereas Thaba Nchu is situated 12km further to the east of Botshabelo and used to be part of the Bophuthatswana area. As a result it exhibits a large area of rural settlements on former trusts lands (MMM IDP, 2023).

In 2016, the Naledi Municipalitiy and the town of Soutpan merged under the MMM. The expansion of MMM meant that the municipality had not only serve more people but had to further expand its infrastructure over a larger geographical area. The municipality were challenged by the financial pressure and was placed under administration in 2019. This made MMM more dependent on external grants which also affected the development of infrastructure. It therefore requires:

- Good intergovernmental relations to translate into joint planning and transformation;
- Build on existing state capability to accelare progress; and
- An effective socio-political administrative interface for project planning (SA Cities Network, 2021).

The rural area of the MMM is characterised by extensive commercial farming, mainly mixed crop production and cattle farming, as well as subsistence and small farmers mostly operating in the areas surrounding Thaba Nchu and Botshabelo (MMM IDP, 2023).

The Mangaung residential area which represents the south-eastern quadrant of the metropolitan area is the most densely populated section. Originally this area developed southwards in a narrow strip to the east of Hamilton industrial area and Church Street (along Maphisa Road and Moshoeshoe Street up to Rocklands) located between the existing rail and road infrastructure in the south-eastern parts of the city. The area expanded rapidly to the south-east on both sides of Dr Belcher Road (R702). A large percentage of these residential areas include informal settlements especially to the south where the proposed pipeline alignment would travers. Pockets of illegal occupation of land occur in this area of Mangaung, where the majority of the various informal settlements in the metropolitan area are located. This stimulates urban sprawl as there is continuous pressure to formalise these settlements. This land use pattern within the southern edge of the urban footprint leads to longer travelling distances for the urban poor. It also creates a travel demand from these areas along the major roads to the CBD resulting in traffic congestion along these routes (MMM SDF, 2020).

7.7.2 Impact assessment

7.7.2.1 Construction phase

Table 7-23: Construction phase: Social - Employment Creation

Project phase	**Construction**	
Impact	**Employment Creation**	
Description of impact	**Direct and indirect employment creation for medium and lower skilled categories with some specialised skills**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts
Potential mitigation	**Maximise the use of suitably qualified local individuals and contractors; Contractors to meet the construction standards and specifications; Develop a Procurement Policy and Procurement Plan; Ensure cooperation with the local authorities and legitimate business forums**	
Assessment	**Without mitigation**	**With mitigation**
Nature	Positive	Positive

Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Municipal area	Impacts felt at a municipal level	Regional	Impacts felt at a regional / provincial level
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	High	Natural and/ or social functions and/ or processes are notably altered
Probability	Likely	The impact may occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - positive**		**Moderate - positive**	
Comment on significance	Employment of locals can enhance the benefit, especially in the lower skilled categories.			
Cumulative impacts	None foreseen			

Table 7-24: Construction phase: Social - Inflow of workers and jobseekers

Project phase	**Construction**			
Impact	**Inflow of workers and jobseekers**			
Description of impact	**Movement of construction workforce can result in intrusions and impacts on daily living and movement patterns. Inflow of workers can result in social conflict with locals if local labour is not maximised. Negative intrusion impacts on the property owners and possible impact on resources and infrastructure should jobseekers remain in the area**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Maximise the use of suitably skilled local labour where applicable and where available; Development of a Procurement Policy and Procurement Plan and ensure that it is transparently and consistently applied. Develop specific local recruitment targets for the different skill categories as part of the plan; Communicate with legitimate business forums**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Municipal area	Impacts felt at a municipal level	Local	Extending across the site and to nearby settlements
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge

Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Maximise the use of suitably skilled local labour where applicable and where available to minimise the impact			
Cumulative impacts	None foreseen			

Table 7-25: Construction phase: Social - Accommodation of workforce

Project phase	**Construction**			
Impact	**Accommodation of workforce**			
Description of impact	**Unsuitable accommodation facilities can result in social conflict and environmental pollution**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**Workers to be accommodated in suitable existing accommodation facilities where available**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Municipal area	Impacts felt at a municipal level
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - positive**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-26: Construction phase: Social - Local Economic Contribution

Project phase	**Construction**	
Impact	**Local Economic Contribution**	
Description of impact	**Local and Regional Economic benefits as a result of the construction activities, capital investment into the local economy, procurement of local goods and services, as well as direct and indirect employment creation**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts

Potential mitigation	**Involve local businesses in the procurement of local goods and services; maximise the employment of local labour, where skills are available**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Positive		Positive	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Municipal area	Impacts felt at a municipal level
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	High	Natural and/ or social functions and/ or processes are notably altered
Probability	Likely	The impact may occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - positive**		**Minor - positive**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-27: Construction phase: Social - Impact on Metropolitan and Local Municipality

Project phase	**Construction**			
Impact	**Impact on Metropolitan and Local Municipality**			
Description of impact	**Provision of reliable potable water**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Implementation of the project**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Positive		Positive	
Duration	Short term	impact will last between 1 and 5 years	Long term	Impact will last between 10 and 15 years
Extent	Municipal area	Impacts felt at a municipal level	Regional	Impacts felt at a regional / provincial level
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	High	Natural and/ or social functions and/ or processes are notably altered
Probability	Likely	The impact may occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment

Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - positive**		**Moderate - positive**	
Comment on significance	Implementation of the project will ensure that the metropolitan and local municipalities can provide sufficient potable water to its customers			
Cumulative impacts	Water conservation and demand management can further enhance the benefits			

Table 7-28: Construction phase: Social - Community Health Risks

Project phase	**Construction**			
Impact	**Community Health Risks**			
Description of impact	**Spread of HIV/Aids associated with construction projects and inflow of workers; environmental pollution on site can result in community health risks; construction related accidents**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Awareness creation; Adherence to EMPR; Implementation of SHEQ principles**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Municipal area	Impacts felt at a municipal level	Local	Extending across the site and to nearby settlements
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-29: Construction phase: Social - Community Safety Risks

Project phase	**Construction**	
Impact	**Community Safety Risks**	
Description of impact	**Loss of security during construction activities on private property; possible increase in crime levels; risk of veld fires; risk of unauthorised access to the sites; movement of workforce and construction vehicles**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts

Potential mitigation	**Compliance to rural safety protocol; conduct of workers; safety and security measures to be implemented at construction sites; vehicles to be in good working order and to keep to speed limits; fire prevention management plan to be developed**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-30: Construction phase: Social - Impact on Infrastructure and Services

Project phase	**Construction**			
Impact	**Impact on Infrastructure and Services**			
Description of impact	**Disruption of infrastructure and services where roads, railways and other infrastructure are crossed**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Develop construction management plan; adherence to EMPr; Negotiations and agreements with relevant landowners, Transnet Freight Rail, SANRAL and other relevant provincial departments**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge

Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-31: Construction phase: Social - Impact on agricultural practices

Project phase	**Construction**			
Impact	**Impact on agricultural practices**			
Description of impact	**Impact on rotational grazing system; impact on resource use; removal of fencing; possible poaching of animals and plants; safety and security impacts; damage to property and veld; possible erosion; dust impacts; increased risks of veld fires**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Worker conduct; Compliance to rural safety protocol; fire prevention plan to be development; adherence to EMPr; proper site management; communication with landowners; grievance mechanism and process in place**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-32: Construction phase: Social - Daily Living and Movement Patterns and Possible Relocation

Project phase	**Construction**
Impact	**Daily Living and Movement Patterns and Possible Relocation**
Description of impact	**Intrusion on private properties with possible damage to infrastructure and veld; Possible relocation of households in southern section of Bloemanda and JB Mafora**

Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Re-alignment of pipeline along road corridor in the Bloemanda and JB Mafora area; Worker conduct; Compliance to rural safety protocol; fire prevention plan to be development; adherence to EMPr; proper site management; communication with landowners; grievance mechanism and process in place**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Municipal area	Impacts felt at a municipal level	Local	Extending across the site and to nearby settlements
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	Re-alignment of the pipeline will successfully address and mitigate the potential for relocation			
Cumulative impacts	None foreseen			

Table 7-33: Construction phase: Social - Noise Impacts

Project phase	**Construction**			
Impact	**Noise Impacts**			
Description of impact	**Noise impacts associated with construction activities, as well as people and vehicle movement with impacts on nearby residents, especially near densely populated areas**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Avoid placement of pipeline and/or stationary infrastructure in close proximity to residential dwellings and high-density settlements**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur

Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-34: Construction phase: Social - Dust Impacts

Project phase	**Construction**			
Impact	**Dust Impacts**			
Description of impact	**Dust generated due to clearing of land and general construction activities with possible impacts on residents/landowner's health and on grazing capacity of veld**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Adherence to EMPR; dust management measures**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-35: Construction phase: Social - Visual Impact and Sense of Place

Project phase	**Construction**	
Impact	**Visual Impact and Sense of Place**	
Description of impact	**Temporary visual disturbances of construction site and construction activities**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts

Potential mitigation	Adherence to EMPR; Rehabilitation of the land as soon as the construction management plan allows			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

7.7.2.2 Operational phase

Table 7-36: Operational phase: Social - Employment Opportunities

Project phase	Operation			
Impact	**Employment Opportunities**			
Description of impact	**Limited direct and indirect employment opportunities during the operations and maintenance of the pipeline and infrastructure**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Maximise the use of suitably qualified local individuals; Develop a Procurement Policy and Procurement Plan; Develop a Skills Development Plan for permanent employees**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Positive		Positive	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Municipal area	Impacts felt at a municipal level	Municipal area	Impacts felt at a municipal level
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact

Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - positive**		**Minor - positive**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-37: Operational phase: Social - Inflow of Workers

Project phase	**Operation**			
Impact	**Inflow of Workers**			
Description of impact	**Limited impact apart from maintenance activities on private properties**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Adhere to EMPr; Compliance to security protocols when accessing private properties; pro-active notification to landowners regarding scheduled maintenance activities; code of conduct of workers**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-38: Operational phase: Social - Local Economic Contribution

Project phase	**Operation**			
Impact	**Local Economic Contribution**			
Description of impact	**Increased water security and supply; indirect economic investment into the area**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Sustainable development; Proper system design and construction practices adhering to standards and specifications; Maintenance of the infrastructure**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Positive		Positive	

Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Municipal area	Impacts felt at a municipal level	Municipal area	Impacts felt at a municipal level
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	High	Natural and/ or social functions and/ or processes are notably altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - positive**		**Moderate - positive**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-39: Operational phase: Social - Daily living and movement patterns

Project phase	**Operation**			
Impact	**Daily living and movement patterns**			
Description of impact	**Servitude restrictions; intrusions during maintenance activities**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Adhere to EMPr; Compliance to security protocols when accessing private properties; pro-active notification to landowners regarding scheduled maintenance activities; code of conduct of workers**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	

Comment on significance	None
Cumulative impacts	None foreseen

Table 7-40: Operational phase: Social - Impact on agricultural activities

Project phase	**Operation**			
Impact	**Impact on agricultural activities**			
Description of impact	**Servitude restrictions; Loss of land due to ancillary infrastructure**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Negotiations and communication with landowners to ensure minimal impacts on resource use; compensation as part of servitude agreement**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-41: Operational phase: Social - Community Health Risks

Project phase	**Operation**			
Impact	**Community Health Risks**			
Description of impact	**Health risks associated with water quality and accidents**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Maintain water quality integrity; Maintenance of the system and infrastructure to limit potential for disasters, spillage and accidents**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Municipal area	Impacts felt at a municipal level	Municipal area	Impacts felt at a municipal level

Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-42: Operational phase: Social - Community Safety Risks

Project phase	**Operation**			
Impact	**Community Safety Risks**			
Description of impact	**Possible unauthorised connections; bursting of pipes; vandalism and damage to infrastructure**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Implement security at stationary infrastructure; regular inspections and maintenance of the infrastructure**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-43: Operational phase: Social - Visual Impact and Sense of Place

Project phase	Operation			
Impact	Visual Impact and Sense of Place			
Description of impact	Visual intrusion of infrastructure on the sense of place at the stationary infrastructure sites			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	Limited screening at the sites, but the type of infrastructure and topography makes screening difficult			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Minor - negative		Minor - negative	
Comment on significance	None			
Cumulative impacts	None foreseen			

Table 7-44: Operational phase: Social - Noise Impact

Project phase	Operation			
Impact	Noise Impact			
Description of impact	Increase in noise mainly due to vehicular traffic at WTP, reservoirs and pump stations			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	Impact is of low significance - no mitigation is proposed			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Immediate	Impact will self-remedy immediately	Immediate	Impact will self-remedy immediately
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered

Probability	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None foreseen			

7.7.3 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the social impact is concerned.

The no-go option will result in not reaching the objectives of the SIP 18 and 19 project outcomes namely: to meet (i) water requirements as well as (ii) to meet the desired assurance of supply for both urban and agricultural water requirements.

7.7.4 Mitigation measures

The proposed project will improve the water related infrastructure and services through the provision of a sufficient and stable supply of potable water to the Bloemfontein area. This would have vast indirect positive impacts which would be beneficial to the local economy and the socio-economic development in the area.
The proposed project could also result in different negative social impacts with varying rates of intensity and significance. In most cases, the negative social impacts resulting from the proposed development are not perceived to be a threat to the quality of life of the residents of the area, but rather as nuisance factors that would mostly occur during the construction phase of the project. The following mitigation measures are proposed:

- In line with the economic development challenges and opportunities within the municipal area, it is recommended that the project should strive to develop the local human resources through meaningful skills development. The involvement of locals, especially women and the youth are important.
- The project must aim to maximise the use of suitably skilled local labour where applicable and where available, through the development of a Procurement Policy and Procurement Plan. This plan must be transparently and consistently applied.
- The proposed alignment of the water pipeline, where it exits the Longridge Reservoir should be placed along existing road infrastructure to limit intrusions on residential sections in this area and to avoid the Suidpark Cemetery. Placing the pipeline to the south of the M30, after the alignment

has crossed the M30/N6 intersection, will avoid the southern sections of Bloemanda and JB Mafora and any possible resettlement of households located close to the north of the M30. This will further mitigate negative intrusion impacts on the residents during the construction phase.

- Mitigation measures are critical. The mitigation measures proposed as part of the Social Management Plan should be incorporated in the EMPr and should be strictly implemented.
- Negotiations with individual property owners regarding the alignment of the pipeline and final locations of the ancillary infrastructure should be undertaken in a considerate and constructive manner. Sensitive issues such as the possible impact on agricultural activities and subsequent economic impact should be taken into account.
- It is recommended that a platform for open communication with the affected landowners be developed should the necessary authorisations be obtained by the applicant. The communications strategy for the proposed project should therefore ensure effective and transparent communication between the project proponent, project managers, contractors and the landowners prior to the construction phase and during the operational phase.
- There is an obligation on the government to deliver sufficient potable water to the beneficiary communities, but it is critical to ensure that this is undertaken in a sustainable manner whereby the negative impacts are minimised and the benefits be enhanced.
- It is critical to ensure that the water quality integrity is maintained. Water of an acceptable potable quality should be continued to be provided to the users.
- In this regard it should be noted that the operation and maintenance of a water distribution system can be greatly affected by the system design and construction practices used. The system components must adhere to construction standards and specifications, and preventative maintenance must be performed on a continuous basis.
- It is recommended that the Social Management Plan be implemented and integrated as part of the Environmental Management Programme (EMPr).

Based on the social assessment and considering the concluding remarks and recommendations noted above, it is recommended that the environmental authorisation of the Xhariep Pipeline Project: Scheme 1B be allowed.

7.8 Terrestrial Biodiversity (inclusive of Plant and Animal Species)

Setala was appointed as an independent biodiversity specialist to conduct the biodiversity impact assessment (inclusive of plant and animal species). The objective and focus of a biodiversity assessment are to assess whether or not the proposed development will have an unacceptable social impact, and based on this, to make a recommendation on whether or not it should be approved.

7.8.1 Receiving Environment

7.8.1.1 Topography, soils, and rainfall

The topography of the study area and immediate surrounding is predominantly that of flat, open grassland plains with scattered inselbergs and small rocky hills. The topography is a hillier around the Gariep Dam where the dam is at the bottom of the plateau of the grassland plains.

The dominant geology of the study area is that of sedimentary mudstones (mudrock) and layers of subordinate sandstone mainly of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). Deep (>300 mm) layer of red sand (aeolian origin) covers the more clayey B-horizons. Soil forms such as arable Hutton, Bainsvlei and Bloemdal occur here and are typical of the Ca land type. The Ea land type

has shallow gravelly soils underlain by dolerite sills. Ca and Ae land types are nearly equally represented (Mucina & Rutherford, 2010).

The study site is situated across the medium rainfall zone (401mm – 600mm per annum) and the low rainfall zone (201mm – 400mm) and in the Cold Interior Climatic Zone of South Africa. The study site is within the summer rainfall region of South Africa, with average rainfall decreasing as a person moves from east to west. The lower rainfall in evident in the grass cover moving when along the project site from Bloemfontein, where the grass is often denser and taller, compared to the in areas of Trompsburg and Springfontein where the grass cover is sparser, shorter and interspersed with small karoo (karroid) shrubs, typical of arid, semi-desert areas.

7.8.1.2 Terrestrial ecology

7.8.1.2.1 Vegetation of the Study Area

The study site is within the Mesic Highveld Grassland Bioregion of the Grassland Biome, which consists of the wetter, sour grasses of the central Highveld region of the country. The study site is situated predominantly in the original extent / historical distribution of the two grassland veldtypes of Xhariep Karroid Grassland and Bloemfontein Dry Grassland (Mucin & Rutherford, 2010, updated 2012 & 2018). In the area of the Rustfontein Dam the study site (pipeline) is within Central Free State Grassland. In small areas, such as at the Gariep Dam, the study site is within Besemkaree Koppies Shrubland, which dominates on the inselbergs and rocky hills in the grassland plains and gives the effect of bushveld with its' mix of small- to medium-height trees, compared to the tree-less grassland plains of the rest of the study site and surrounding areas.

In the area just north of VanZylspruit (Stream), just below a slight plateau, the proposed Scheme 1B pipeline runs across a narrow band of Windburg Grassy Shrubland.Bloemfontein Dry Grassland and Winburg Grassy Shrubland are vegetation units that are endemic to the Free State Province.

The vegetation of the study site is predominantly dry grassland and karroid grassland with little to no middle and upper layers of shrubs and trees. The dry grassland is moderately degraded in most areas with the biggest impact that of grazing livestock which in some cases can be easily over-grazed during years of low rainfall. Dry grassland is mostly in the north of the study area close to Bloemfontein and the vegetation is dominated by grasses such as *Anthephora pubescens*, *Aristida congesta*, *Aristida diffusa*, *Cynodon dactylon*, *Digitaria argyrograpta*, *Elionurus muticus*, *Eragrostis chloromelas*, *Eragrostis lehmanniana*, Eragrostis *plana*, *Heteropogon contortus*, *Setaria sphacelata* and *Themeda triandra.*

Karroid grassland, which is the dominant veldtype in the study area, is in fair to moderately degraded condition in the study area. The vegetation is relatively sensitive to disturbance due to the low average rainfall and slower recovery rates compared to the dry grassland in the north. Pressures are felt in areas with heavy grazing of livestock, mainly sheep. The vegetation in the study area in Karroid grassland is dominated by grass species such as *Aristida adscensionis*, *Aristida canescens*, *Aristida congesta*, *Chloris virgata*, *Cynodon incompletus*, *Eragrostis chloromelas*, *Eragrostix lehmanniana* and Eragrostis *obtusa.*

The species mix of these short grasses are the same as many of those in the dry grassland, but here there is a lack of the taller grasses such as *Heteropgon contortus* (Thatching grass) and other grasses such as *Cynodon dactylon* and *Themeda triandra.* A further significant difference is the prominent presence of small karroid (dry / Karoo) shrubs such as *Chrysocoma ciliata*, *Eriocephalus ericoides*, *Eriocephalus spinescens*, *Felicia filifolia* subsp. *filifolia*, *Felicia muricata*, *Pentzia globosa* and *Pentzia incana*.

For the most part, the proposed Scheme 1B pipeline and study area is within the open plains of the grassland and mostly in or alongside the road reserve, in areas that are degraded due to regular cutting

and/or burning for firebreaks. Some of the pumpstations and reservoirs are located on higher ground and therefore typically on rocky hills. Besemkaree Koppies Shrubland dominates the vegetation mix on these hills and the vegetation consists of a lower layer of grasses and herbs and a middle layer of tall shrubs and short trees, mostly thorntrees.

The shrub and tree (middle layer) are dominated by *Ziziphus mucronata*. *Diospyros austro-africana*, *Euclea crispa* subsp. *ovata*, *Buddleja saligna*, *Diospyros lycioides* subsp. *lycioides*, *Grewia occidentalis* and species of *Searsia* (Karee and Besemkaree. The vegetation on the hills were mostly in good condition with low impacts, except occasionally hills in the area of Rustfontein Dam were found to be badly invaded by alien prickly pear.

	**Besemkaree Koppies Shrubland at the Gariep Dam in the area of the start of the proposed Scheme 1B pipeline and infrastructure**
	**Xhariep Karroid Grassland showing the short grass and small karroid shrubs (In the area of Springfontein)**

	**Xhariep Karroid Grassland in an area with obviously lower rainfall resulting in more open denuded areas, more karroid shrubs and less grass (In the area of Donkerpoort)**
	**Dry Bloemfontein Grassland in the foreground, with Besemkaree Koppies Shrubland covering the rocky hill in the background. The grass in this veldtype / ecosystem tends to be denser than further south where partly due to lesser rainfall the grass is less dense and dispersed with karroid shrubs**
	**Dry Bloemfontein Grassland, with Besemkaree Koppies Shrubland covering the rocky hills in the background.**

	**Besemkaree Koppies Shrubland on a rocky hill near Rustfontein badly infested with prickly pear cacti.**
	**Central Free State Grassland in the area of Rustfontein Dam**

Figure 7-25 Photos of the Vegetation / Veldtypes / Ecosystems found in the Study Area (Courtesy of Setlala)

7.8.1.3 Threat Status of Ecosystems / Veldtypes in the Study Area

There are 40 vegetation types / veldtypes (ecosystems) in the Free State (excluding forests) of which 1 is classified as Endangered (Vaal-vet Sandy Grassland) and 6 are classified as Vulnerable (Bloemfontein Dry Grassland, Eastern Free State Clay Grassland, Eastern Temperate Freshwater Wetlands, Rand Highveld Grassland, Soweto Highveld Grassland, and Vredefort Dome Granite Grassland). Three vegetation types are endemic to the Free State, these being Bloemfontein Dry Grassland, Western Free State Clay Grassland and the Winburg Grassy Shrubland; that together comprise 10% of the Free State surface area) (www.soer.environment.gov.za)

Threatened ecosystems / veldtypes in the Free State Province cover between 12% and 15% of the natural remaining habitat extent of the province.

According to the IUCN's Red List of Ecosystems (RLE) (2018) the number of threatened ecosystem types has decreased from 9 to 5. The differences are caused by the higher habitat loss thresholds for

Endangered and Critically Endangered categories in the IUCN system compared to the South African system (Skowno, *et.al*., 2019. SANBI). It is recommended to follow the Free State Provincial listing as the project is within the province.

Table 7-45 below and Figure 7-26 highlight the threat statuses of the five veldtypes / ecosystems that the study site (project footprint) is within.

Table 7-46 below, indicates the differences in extent of veldtypes / ecosystems listed as threatened on a national level versus a provincial level.

Table 7-45: Comparison of Threat Status across NEMBA (2011), RLE (2018) & Provincial (2016)

Veldtype	NEMBA (2011)	NEMBA (2022)	RLE (2018)	FSBP (2016)
Xhariep Karroid Grassland	Least Concern	-	Least Concern	Least Concern
Bloemfontein Dry Grassland	Vulnerable (A3)	-	Least Concern (A1)	Vulnerable
Besemkaree Koppies Shrubland	Least Concern	-	Least Concern	Least Concern
Winburg Grassy Shrubland	Least Concern	-	Least Concern	Least Concern
Central Free State Grassland	Least Concern	-	Least Concern	Vulnerable

FSBP – Free State Biodiversity Plan (v1.0): Technical Report 2016

A1 - Based on national landcover

A3 - Based on national landcover and using biodiversity targets and thresholds

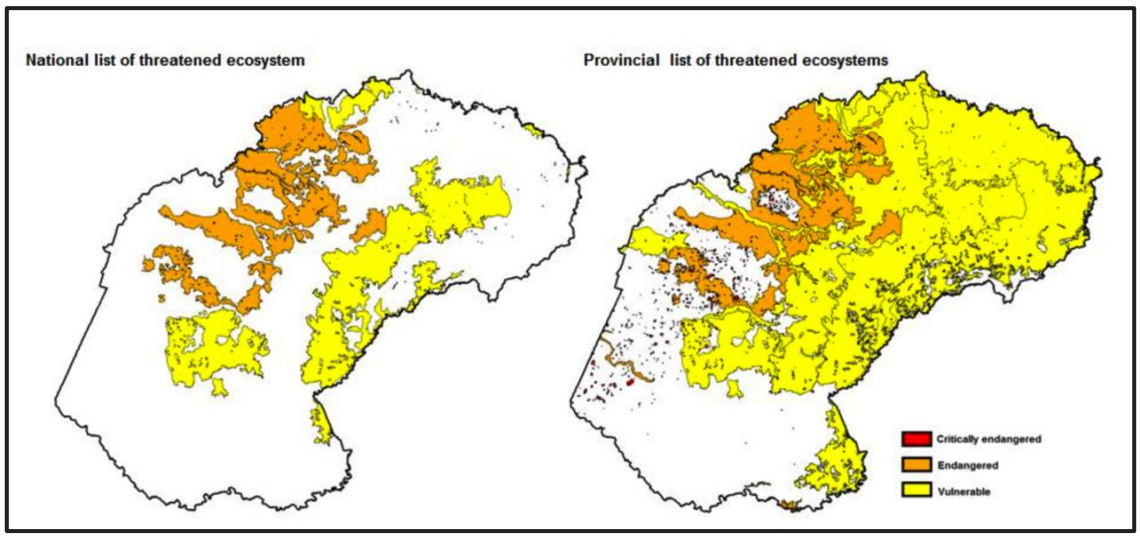


Figure 7-26: National and Provincial List of Threatened Ecosystems

Table 7-46: Veldtype status

Veldtype	Status	Description
Xhariep Karroid Grassland	Least Concern	About 2.5% statutorily conserved in Gariep Dam, Tussen Die Riviere, Kalkfontein Dam, Oviston, Wurasdam and Rolfontein Nature Reserves. Some 4% already transformed by cultivation and dam-building (Bethulie,

		Gariep, Kalkfontein, Straussfontein and Tierpoort Dams). This dry grassland is prone to encroachment of low, unpalatable karroid shrubs when exposed to heavy grazing (Mucina & Rutherford, 2010).
Bloemfontein Dry Grassland	Vulnerable	Target 24%. Only a small portion is statutorily conserved in the Soetdoring Nature Reserve. More than 40% already transformed, e.g. for crop production (mainly Ae and Ca land types) as well as by urban (and related) development (the largest part of this vegetation unit on the Ae land type is situated in the Genl De Wet military training area, west of Bloemfontein). Especially those grasslands on shallow gravelly soils as well as the low-lying areas on clayey soils are prone to karoo-bush encroachment when overgrazed (Mucina & Rutherford, 2010).
Besemkaree Koppies Shrubland	Least Concern	Veldtype largely excluded from intensive agricultural activities. About 5% statutorily conserved in the Rolfontein, Tussen Die Riviere, Oviston, Gariep Dam, Caledon and Kalkfontein Dam Nature Reserves. In addition a small patch is also protected in the private Vulture Conservation Area. About 3% of the area has been lost through building of dams (Bethulie, Egmont, Gariep, Kalkfontein, Vanderkloof and Welbedacht Dams) (Mucina & Rutherford, 2010).
Winburg Grassy Shrubland	Least Concern	Almost 2% statutorily conserved in the Willem Pretorius Nature Reserve. More than 10% transformed for cultivation and by urban sprawl (Mucina & Rutherford, 2010).
Central Free State Grassland	Vulnerable	Only small portions enjoy statutory conservation (Willem Pretorius, Rustfontein and Koppies Dam Nature Reserves) as well as some protection in private nature reserves. Almost a quarter of the area has been transformed either for cultivation or by building of dams (Allemanskraal, Erfenis, Groothoek, Koppies, Kroonstad, Lace Mine, Rustfontein and Weltevrede). No serious infestation by alien flora has been observed, but encroachment of dwarf karoo shrubs becomes a problem in the degraded southern parts of this vegetation unit (Mucina & Rutherford, 2010).

7.8.1.4 Floral Species of Conservation Concern and Protected Trees within the Study Area

During field investigations done by Setlala (Biodoveristy specialists) no red data listed (RDL) (Critically endangered, endangered, or vulnerable) species were observed in the pipeline servitude or in the proposed areas for pump stations and reservoirs.

Two floral SCC were found within the footprint of the study area, namely a provincial orange data listed (ODL) species (*Ledebouria revoluta* - Squill, African hyacinth) and the provincial protected tree (*Olea europaea subsp. africana* – Wild Olive). Refer Figure 7-27.

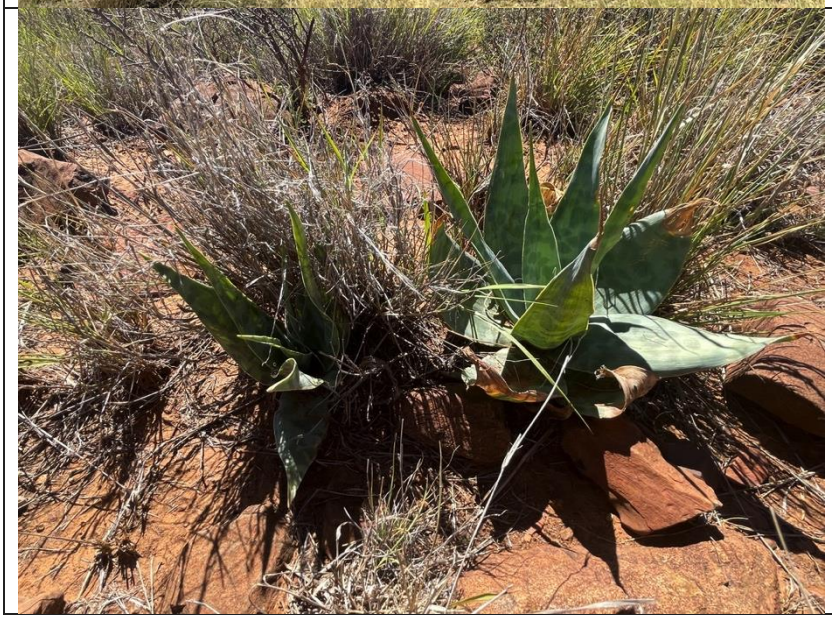
	Wild Olive tree (*Olea europaea subsp. africana*) growing on the small hill in the area of the proposed 'Booster pump station with suction reservoir (Alternative A)' Other olive trees can be seen in the background. The wild olive tree is a provincial protected tree.
	*Ledebouria revoluta* (Squill, African hyacinth) is not threatened and has a regional status of 'Least Concern'. All squill (which includes *Ledebouria spp.* are protected in the Free State Province. A number of plants were found growing scattered around in the area of the proposed "Sludge Lagoons' at the proposed 'Water Treatment Works'

Figure 7-27: Wild Olive tree (Olea europaea subsp. africana) and *Ledebouria revoluta* (Squill, African hyacinth) (Courtesy of Setlala)

7.8.1.5 Fauna within the Study Area

The study area is situated across a vast area of the Free State Province predominantly in open grassland plains, but also in other areas such as ridges, rocky hills, mountains and rivers. The study site stretches from the Gariep Dam in the south to Bloemfontein in the north, across a distance of approximately 185km, including a distance of approximately 60km east to west from Rustfontein Dam along route Option B up to the N1 National Road. It is therefore understandable that numerous wild indigenous faunal species are present across the study site and surrounding areas. Refer Figure 7-28.

	A termites mound broken open most likely by an Aardvark (*Orycteropus afer*) which is a protected species
	Weaver's nest in a sweet thorn tree close to a dam.

	Droppings from a small antelope, probably a common duiker (*Sylvicapra grimmia*)
	Bat found dead near the Tierpoort Dam, probably belonging to the Vesper group of bats

	Droppings of scrub hare
	African Monarch (*Danaus chrysippus*), a common butterfly species found across the entire region

Figure 7-28: Fauna within the Study Area (Courtesy of Setala)

No large- or medium-sized mammals such as buck, pigs, and cats were observed during field investigations. A number of active and inactive (old) burrows were found, which appear to be used by small field mice and other rodents such as scrub hare (*Lepus saxatilis*), slender mongoose (*Herpestes sanguineus*), yellow mongoose (*Cynictis penicillata*), rock mouse (*Aethomys namaquensis*), striped mouse (*Rhabdomys pumilio*), and multimate mouse (*Mastomus natalensis*). In open, areas outside of the main study area, in some more open grassland evidence of scrub hare (*Lepus sacatilis*) and yellow mongoose (*Cynictis penicillata*) was observed. On a few occasions scrub hare adults were observed running through the area.

The spoor (tracks) and droppings of common duiker (*Sylvicapra grimmia*) were observed. Caracal (Rooikat) (*Caracal caracal*) is known to occur in the greater region and can be more common than realised. The smaller, elusive African wild cat (*Felis silvestris lybica*) and Small spotted cat (*Felis nigripes*) are the other two indigenous feline species that have a distribution range across the entire Free State Province.

A number of other mammal SCC do occur in the Free State, such as the Oribi, but these are not commonly found in the area of the study site. For example, Oribi (*Ourebia ourebi ourebi*) (Regional

Status – Endangered) is found more in the northeast and east of the Free State Province. Oribi requires short- to medium- open grassland, or open grassy bushveld. The antelope prefers some nearby trees and shrubs for hiding and shade and seldom venture into valleys and lowlands but prefers higher ground.

The study area is not situated directly within an Important Bird Area (IBA). The closest IBA is the Upper Orange River IBA that includes the Gariep Dam.

There are limited ideal habitats in the study area for red data listed (RDL) amphibians and reptiles. Snakes tend to be fairly widespread, and many species adapt well to different habitats, including human settlements. Numerous common snake species will therefore be present across the entire region, but with low possibility of snake RDL species or SCC. For example, the African rock python (*Python natalensis*), which is a SCC, is not found through most of the Free State Province, including the entire study area.

Lizards tend to prefer rocky habitats such as rocky hills (koppies), rocky ridges and rock sheets. Therefore, all the rocky outcrops, ridges and hills are ideal habitats for numerous lizard species.

Most of the study site is within dry to semi-arid grassland and rocky hill areas with limited ideal habitat for amphibians. This therefore makes the presence of small rivers, streams, wetlands and even farm dams in the study area or nearby areas sensitive and important for the presence of amphibians.

Invertebrates such as spiders, scorpions and butterflies are important faunal groups, but are difficult to properly assess in a short period of time. During field investigations specific attention was given to priority species such as Mygalomorphae arachnids (Trapdoor and Baboon spiders) and red data butterflies. The nature and scope of the project is such that it will have low to negligible negative impact on these species should they occur. No priority species were observed.

7.8.1.1 Aquatic vegetation

Aquatic associated vegetation (hydrophytes) consists of hydrophyllic (water-loving); hydrophytes (water-loving plants); hygrophilous (moisture-loving); and true aquatic (water-dwelling) plants.

The watercourses in the study area mostly have little to no distinctive riparian vegetation or riparian zone. Where watercourses have distinctive riparian zones alien trees such as weeping willows or grey poplars usually dominate. No red data listed (RDL) of other species of conservation concern (SCC) were observed.

At small seasonal streams, perennial streams, rivers and more permanent wetlands there is a mix of indigenous herbaceous aquatic species comprising of a variety of water-loving grasses, rushes and sedges. The presence of common reeds (*Phragmites australis*) and bulrushes (*Typha capensis*) was found to be scarce. There are a number of small seasonal and ephemeral streams and drainage lines in the study area. The rainfall across most of the study site is medium to low, especially in the south resulting in a lack of large perennial streams and rivers, as well as wetlands with permanent bodies of open water (Permanent zone).

Watercourses in the Study Area

There are a number of small seasonal and ephemeral streams and drainage lines in the study area. The rainfall across most of the study site is medium to low, especially in the south resulting in a lack of large perennial streams and rivers, as well as wetlands with permanent bodies of open water (Permanent zone). The proposed pipeline servitude (a total of all options) crosses over 96 watercourses. The largest, important rivers and streams that the pipeline route crosses, or that the project footprint of WTWs and pumpstations are in close proximity to, are listed in the table below.

Table 7-47 Main Rivers and Streams in the Project Footprint

ID	Watercourse	Latitude (S)	Longitude (E)
-	Orange River – Vicinity of the start of the project at the Gariep Dam.	30°37'41.58"S	25°29'26.44"E
15	Paardeplass	30°26'11.01"S	25°37'38.57"E
25	Bossiespruit	25°37'38.57"E	25°43'1.66"E
41	Vanzylspruit	29°59'46.95"S	25°48'38.04"E
45	Erfdeel	29°53'40.29"S	25°51'44.35"E
46	Edenburg	29°49'35.57"S	25°54'39.14"E
50	Riet River	29°39'48.73"S	25°59'13.73"E
56	Holspruit	29°28'27.88"S	26° 6'6.19"E
62	Xspruit	29°25'38.98"S	26°18'26.55"E
65	Renosterspruit - In the area of Leeuwkop and Reservoir	29°19'53.74"S	26°22'47.67"E
76	Koringspruit – West of Rustfontein Dam	29°17'58.96"S	26°30'3.13"E
81	Modder River – At Rustfontein Dam	29°16'4.76"S	26°36'56.79"E
89	Xspruit / Tierpoortspruit – Along N1 near Tierpoort Dam	29°24'58.40"S	26° 7'38.12"E
91	Klein Kaalspruit	29°20'2.16"S	26° 9'19.40"E.
93	Kaalspruit	29°16'42.86"S	26°10'12.27"E

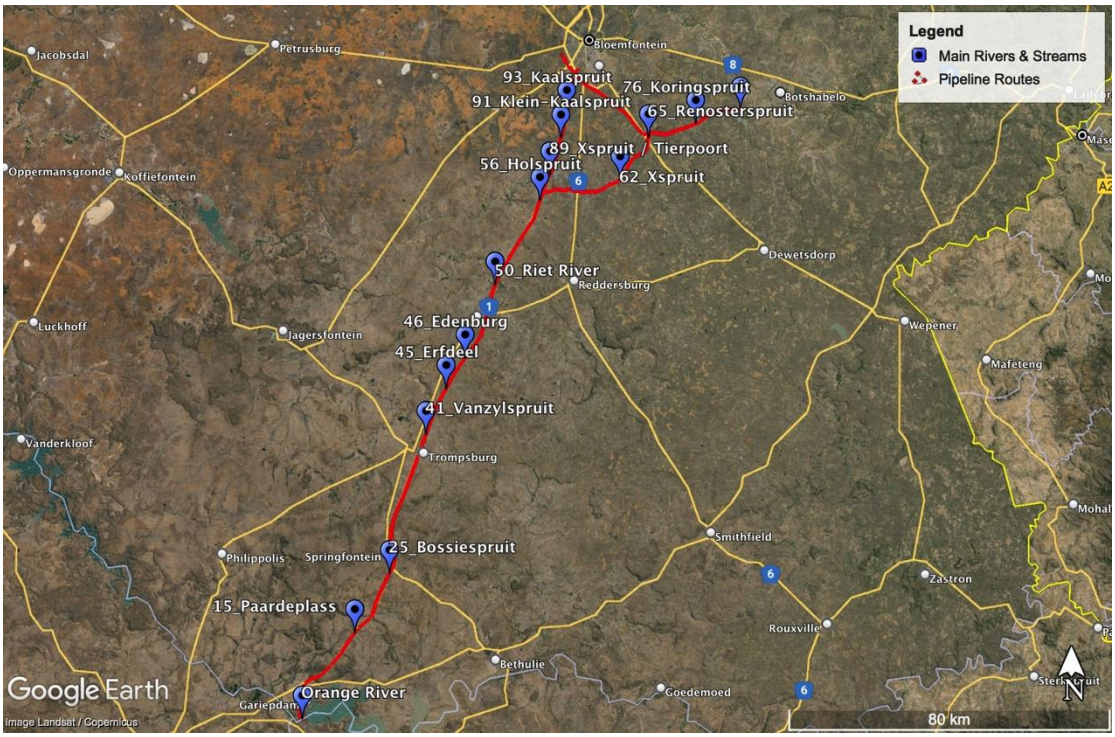
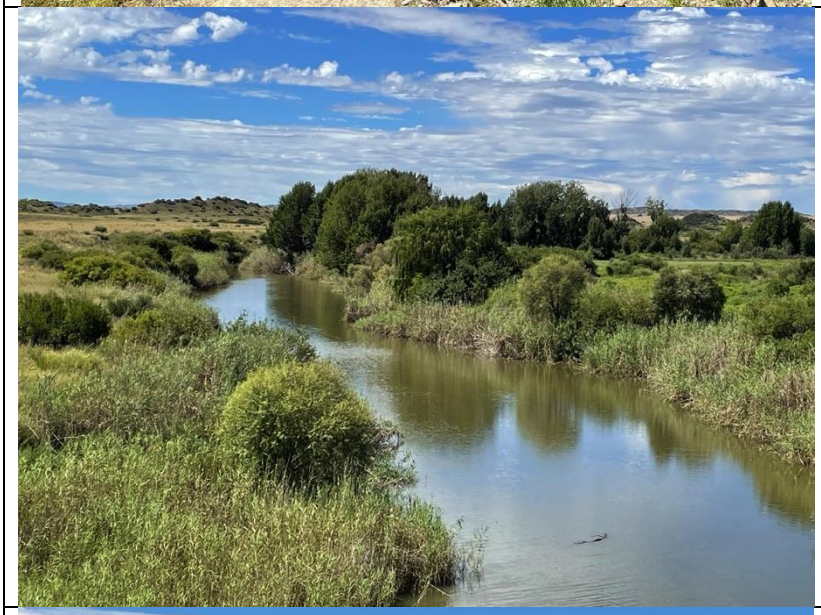
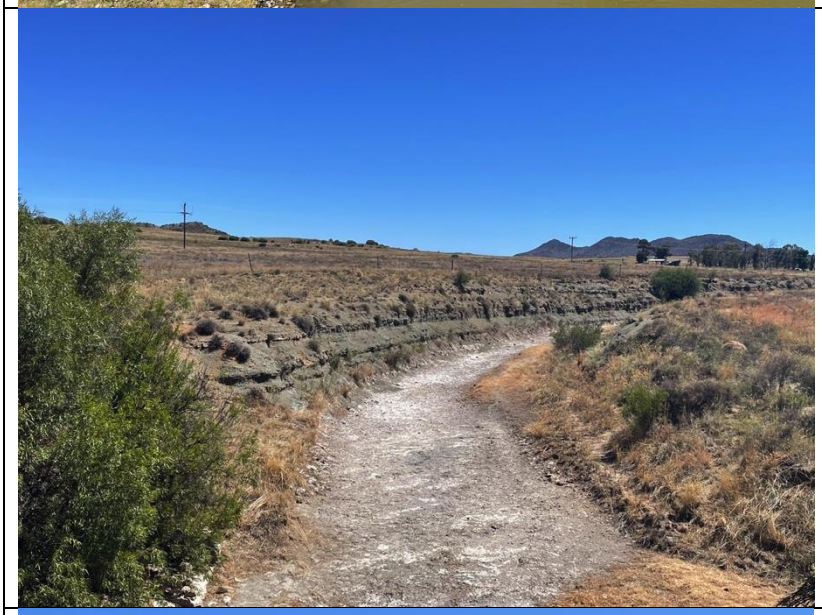
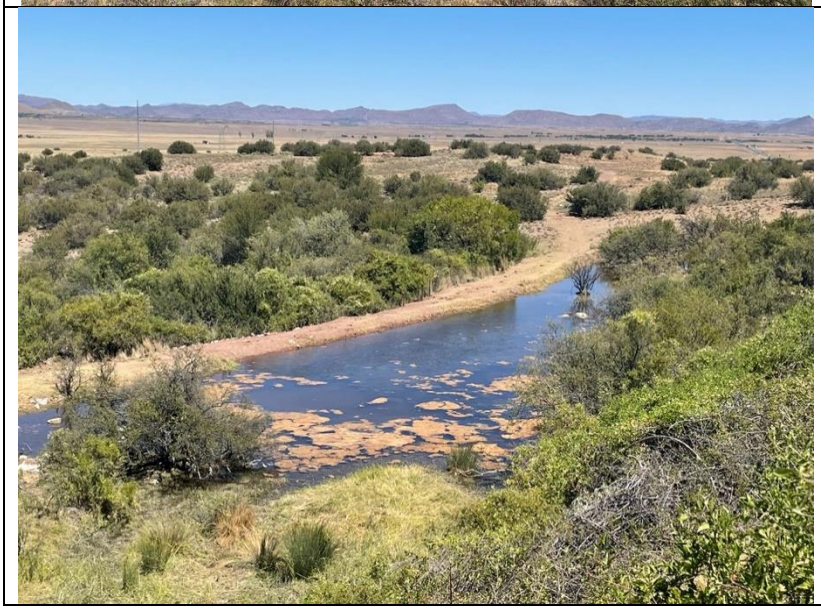


Figure 7-29: Main Rivers and Streams in the Project Footprint (Courtesy Setlala)

	Xspruit / Tierpoort Downstream from the Tierpoort Dam at N1 (29°24'58.40"S; 26° 7'38.12"E)
	Riet River (29°39'48.73"S; 25°59'13.73"E) One of the few perennial rivers along the route as well as one of the few watercourses with common reeds (*Phragmites austalis*)
	Erfdeel Stream (29°53'40.29"S) Notice the lack of a distinctive riparian zone along the stream edges, which is common of watercourses in the grasslands of the Free State Province

	Vanzylspruit (29°59'46.95"S; 25°48'38.04"E) One of the few perennial rivers along the pipeline route. The trees along the riverbanks include indigenous Acacia thorntrees (*Vachellia sp*), Karree (*Searsia / Rhus*) and alien weeping willow (*Salix*)
	Paardeplass (30°26'11.01"S; 25°37'38.57"E) A fairly large seasonal stream that is unusually dry for the time of year. However, there are a few upstream dams that also have a major impact on flow. Green bush / small tree in foreground growing on the stream bank is an indigenous karree that are common to the area
	Orange River below the Gariep Dam. The start of the pipeline will be in the area of the existing Gariep Pump Station. The pump station is across the river just below the road and foot of the mountain in the mid-ground of the photo (left of the foot of the hill)

	Gariep Dam Orange River downstream of the dam wall
	Rustfontein Dam
	Farm Dam In the area of the WTW at Donkerpoort near the Gariep Dam

	A typical stormwater culvert under the road. To allow for the free flow of surface stormwater from one end to the other. These are not watercourses and are not sensitive
	Concrete stromwater drains channeling stormwater run off from the road (N1) into the neighbouring grassland / veld. These are not watercourses and sometimes erosion gullies form at the release points or the run off is impeded and small artificial 'wetlands' form, which are also not usually sensitive, unless they have become large and have started to sustain aquatic ecosystems and fauna and flora such as frogs.
	Irrigation Canal (29°24'54.38"S; 26° 7'40.44"E) The open soil canal flows west / northwest from the Tierpoort Dam. At the point in the photo it flows through a concrete culvert under the N1. The canal is not a natural watercourse but still needs to be approached with caution and care taken not to pollute or silt the waterway.

Figure 7-30: Aquatic vegetation (Courtesy Setlala)

7.8.2 Impact assessment

7.8.2.1 Construction phase

Table 7-48: **Construction phase: Biodiversity - Loss of vegetation - Pipeline Servitude**

Project phase	**Construction**			
Impact	**Loss of vegetation - Pipeline Servitude**			
Description of impact	**Loss of vegetation due to excavation of the trench for the water pipeline that is going to be placed underground**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**Top 30cm - 50cm of soil (topsoil) must be kept separate when excavation pipeline trench. This top layer of soil (top soil) contains seeds, bulbs, rhizomes of locally indigenous flora. When closing up the trench this topsoil must be the final layer of soil thereby returning the seedbank to the area and resulting in better uptake and emergence of locally indigenous vegetation species. Level soils, return topsoil to area removed, only remove vegetation in servitude and keep clearance of vegetation to a minimum. A site and project specific rehabilitation plan is required. An alien weed control plan is required and must be implemented during the construction phase as well.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-49: **Construction phase: Biodiversity - Loss of vegetation - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)**

Project phase	**Construction**
Impact	**Loss of Vegetation - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)**

Description of impact	**Clearance of vegetation (including trees and shrubs) at pump station site**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Keep the project footprint as small as possible. Only remove necessary trees. There are no protected trees in this site. Trees where no development is taking place should be left. No trees should be unnecessary cleared for a temporary laydown area, as there are sufficient open spaces in the site area. Existing access roads to the site must be used as far as possible. Before any tree is cut down / removed it must be inspected to ensure that there are no active bird nests present. If active nests are present, then the tree must be marked and a Specialist consulted (via the ECO) as how best to proceed. No poisons may be used to kill the trees or other vegetation on the site, as the site is too close to the important Orange River. The slope / gradient of the ground at the site is fairly steep which increases the erosion potential, especially after a rain downpour. Therefore, erosion must be continually monitored, and corrective steps taken if any erosion is noticed. The steps may initially be temporary during the construction phase, but final stormwater control and erosion prevention are important in the design and layout of the site.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-50: **Construction phase: Biodiversity - Loss of vegetation - WTW & Sludge Lagoons**

Project phase	**Construction**	
Impact	**Loss of Vegetation - WTW & Sludge Lagoons**	
Description of impact	**Clearance of vegetation for the construction of the WTW, Sludge Lagoons and related infrastructure**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts

Potential mitigation	**Keep the project footprint as small as possible. Only remove necessary shrubs and herbaceous vegetation. There are no protected trees and only a few small common trees on the site. Natural vegetation where no development is taking place should be left. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas. Final access roads for the WTW site to be used as access roads during the construction phase as well. No new temporary access roads to be built. There are protected / flora SCC on the site - a plant permit will be required to life and relocate the plants prior to site establishment and construction. A rehabilitation plan is required and must form part of the final phase of the construction phase.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-51: **Construction phase: Biodiversity - Loss of vegetation - Reservoir Site (1B) near Springfontein**

Project phase	**Construction**	
Impact	**Loss of Vegetation - Reservoir Site (1B) near Springfontein**	
Description of impact	**Clearance of vegetation for the construction of the Reservoir and access road**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts
Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation that is directly within the project footprint. There are no protected trees or flora SCC on the site. Natural vegetation where no development is taking place should be left undisturbed. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes. A rehabilitation plan is required and must form part of the final phase of the construction phase.**	

Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-52: **Construction phase: Biodiversity - Loss of vegetation - Booster Pumpstation & Suction Reservoir (Alt. A)**

Project phase	Construction			
Impact	**Loss of Vegetation - Booster Pumpstation & Suction Reservoir (Alt. A)**			
Description of impact	**Clearance of vegetation for the construction of the pumpstation and reservoir**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint.** **There are a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and, in that case, only those directly in the footprint may be removed. A tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / koppie. These trees need to be looked after and watered for the first two years until established and survival is guaranteed.** **Natural vegetation where no development is taking place should be left undisturbed.** **Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients.** **Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built.** **The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes.** **A rehabilitation plan is required and must form part of the final phase of the construction phase.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years

Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-53: Construction phase: Biodiversity - Loss of vegetation - Booster Pumpstation & Suction Reservoir (Alt. B)

Project phase	**Construction**			
Impact	**Loss of Vegetation - Booster Pumpstation & Suction Reservoir (Alt. B)**			
Description of impact	**Clearance of vegetation for the construction of the pumpstation and reservoir**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. Natural vegetation where no development is taking place should be left undisturbed. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas. The site is within a CBA and therefore even more care to avoid loss of vegetation and negative impacts is necessary. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. A rehabilitation plan for the site is required. During the construction phase all farm roads used need to be maintained and rehabilitated, with a final rehabilitation at the end of construction. All excess materials brought on to site need to be removed, unless some is required for maintenance / spare parts and then these need to be properly and neatly stored. No excessive pipe joints to be left lying around. All disturbed areas to be levelled, soils recontoured to surrounding contours, rubble removed, etc.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered

Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-54: Construction phase: Biodiversity - Loss of vegetation – Command Reservoir 2

Project phase	**Construction**			
Impact	**Loss of Vegetation - Command Reservoir 2**			
Description of impact	**Clearance of vegetation for the construction of large concrete closed reservoir and access road**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. There are (most likely) a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and in that case only those directly in the footprint may be removed. A final walk-down will be required and (most likely) a tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / ridge. These trees need to be looked after and watered for the first two years until established and survival is guaranteed. Natural vegetation where no development is taking place should be left undisturbed Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas below the hill / ridge and not on steep gradients nor on top of the hill / ridge. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. The site has some very steep areas that need to be monitored for erosion, gully formation from rainfall and movement of loose soils down slopes. A site-specific rehabilitation plan is required and must form part of the final phase of the construction phase. An independent ECO is required for the construction of the reservoir. The site is very sensitive and is within a CBA. Note: The specific site was not able to be accessed during field investigations. However, the site was viewed from a distance and furthermore, the Specialist has a good understanding and knowledge of the general environment and aspects of these inselbergs / hills / ridges in the Free State Province.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	High	Natural and/ or social functions and/ or processes are notably altered

Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Major - negative**		**Moderate - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-55: Construction phase: Biodiversity - Loss of Faunal Habitat - Pipeline Servitude

Project phase	**Construction**			
Impact	**Loss of Faunal Habitat - Pipeline Servitude**			
Description of impact	**Clearance of vegetation that has a direct impact on loss of habitat utilised by fauna for foraging, nesting, breeding, cover, etc.**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**Keep construction footprint as small as possible. Within a 100m wide servitude / work area along pipeline. Only remove vegetation (habitat) where absolutely necessary. That is, exactly on the pipeline servitude which is only a few metres wide. Do not clear any vegetation for temporary laydown areas, site offices, etc. During construction any active nests, burrows, etc. found directly within the pipeline footprint / construction footprint must first be cordoned off (danger netting, pole marker, etc) and then a Specialist / ECO contacted on how best to proceed. No wild animals or active nests / burrows may be interfered with.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact

Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-56: Construction phase: Biodiversity - Loss of Faunal Habitat - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)

Project phase	**Construction**			
Impact	**Loss of Faunal Habitat - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)**			
Description of impact	**Clearance of vegetation that has a direct impact on loss of habitat utilised by fauna for forraging, nesting, breeding, cover, etc.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Keep construction footprint as small as possible. Only remove vegetation (habitat) where absolutely necessary. Do not clear any vegetation for temporary laydown areas, site offices, etc. In particular do not remove any trees unnecessarily. During construction any active nests, burrows, etc. found directly within the project footprint / construction footprint must first be cordoned off (danger netting, pole marker, etc) and then a Specialist / ECO contacted on how best to proceed. No wild animals or active nests / burrows may be interfered with. It is recommended to plant some locally indigenous trees such as sweet thorn and karee along the boundaries of the site and/or within parking lot areas as offset.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-57: **Construction phase: Biodiversity - Loss of Faunal Habitat – WYW & Sludge Lagoons**

Project phase	Construction			
Impact	Loss of Faunal Habitat - WYW & Sludge Lagoons			
Description of impact	Clearance of vegetation that has a direct impact on loss of habitat utilised by fauna for foraging, nesting, breeding, cover, etc.			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	Keep the project footprint as small as possible. Only remove necessary shrubs and herbaceous vegetation. There are no protected trees and only a few small common trees and shrubs on the site. Natural vegetation where no development is taking place should be left. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and also where no trees need to first be removed. Final access roads for the WTW site to be used as access roads during the construction phase as well. No new temporary access roads to be built. There are protected / flora SCC on the site - a plant permit will be required to life and relocate the plants prior to site establishment and construction. It is recommended to plant a few locally indigenous trees (eg. sweet thorn, karee) as part of the general landscaping of the site, including in carparks. No alien species allowed to be used in landscaping. During construction any active nests, burrows, etc. found directly within the project footprint / construction footprint must first be cordoned off (danger netting, pole marker, etc) and then a Specialist / ECO contacted on how best to proceed. No wild animals or active nests / burrows may be interfered with.A rehabilitation plan is required and must form part of the final phase of the construction phase.			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	Moderate - negative		Minor - negative	
Comment on significance	None			
Cumulative impacts	None			

Table 7-58: **Construction phase: Biodiversity - Loss of Faunal Habitat – Reservoir Site (1B) near Springfontein**

Project phase	Construction
Impact	Loss of Faunal Habitat - Reservoir Site (1B) near Springfontein
Description of impact	Clearance of vegetation that has a direct impact on loss of habitat utilised by fauna for foraging, nesting, breeding, cover, etc.

Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation that is directly within the project footprint. Natural vegetation where no development is taking place should be left undisturbed. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes. A rehabilitation plan is required and must form part of the final phase of the construction phase. Breeding wild animals encountered on site must be cordoned off (if possible) and a Specialist or ECO contacted on how best to proceed.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-59: Construction phase: Biodiversity - Loss of Faunal Habitat - Booster Pumpstation & Suction Reservoir (Alt. A)

Project phase	**Construction**	
Impact	**Loss of Faunal Habitat - Booster Pumpstation & Suction Reservoir (Alt. A)**	
Description of impact	**Clearance of vegetation that has a direct impact on loss of habitat utilised by fauna for foraging, nesting, breeding, cover, etc.**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts

Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. There are a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and in that case only those directly in the footprint may be removed. A tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / koppie. These trees need to be looked after and watered for the first two years until established and survival is guaranteed. Natural vegetation where no development is taking place should be left undisturbed. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes. A rehabilitation plan is required and must form part of the final phase of the construction phase.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-60: Construction phase: Biodiversity - Loss of Faunal Habitat - Booster Pumpstation & Suction Reservoir (Alt. B)

Project phase	**Construction**	
Impact	**Loss of Faunal Habitat - Booster Pumpstation & Suction Reservoir (Alt. B)**	
Description of impact	**Clearance of vegetation that has a direct impact on loss of habitat utilised by fauna for foraging, nesting, breeding, cover, etc.**	
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts

Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. Natural vegetation where no development is taking place should be left undisturbed. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas. The site is within a CBA and therefore even more care to avoid loss of vegetation and negative impacts is necessary. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. A rehabilitation plan for the site is required. During the construction phase all farm roads used need to be maintained and rehabilitated, with a final rehabilitation at the end of construction. All excess materials brought on to site need to be removed, unless some is required for maintenance / spare parts and then these need to be properly and neatly stored. No excessive pipe joints to be left lying around. All disturbed areas to be levelled, soils recontoured to surrounding contours, rubble removed, etc. There is a watercourse on the east of the site that needs to be buffered and protected. Denuded open areas during construction phase need to be rehabilitated and re-grassed with locally indigenous species only.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-61: **Construction phase: Biodiversity - Loss of Faunal Habitat – Command Reservoir 2**

Project phase	**Construction**	
Impact	**Loss of Faunal Habitat - Command Reservoir 2**	
Description of impact	**Clearance of vegetation that has a direct impact on loss of habitat utilised by fauna for foraging, nesting, breeding, cover, etc.**	
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts

Potential mitigation	**Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. There are (most likely) a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and in that case only those directly in the footprint may be removed. A final walk-down will be required and (most likely) a tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / ridge. These trees need to be looked after and watered for the first two years until established and survival is guaranteed. Natural vegetation where no development is taking place should be left undisturbed Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas below the hill / ridge and not on steep gradients nor on top of the hill / ridge. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. The site has some very steep areas that need to be monitored for erosion, gully formation from rainfall and movement of loose soils down slopes. A site-specific rehabilitation plan is required and must form part of the final phase of the construction phase. An independent ECO is required for the construction of the reservoir. The site is very sensitive and is within a CBA. Note: The specific site was not able to be accessed during field investigations. However, the site was viewed from a distance and furthermore, the Specialist has a good understanding and knowledge of the general environment and aspects of these inselbergs / hills / ridges in the Free State Province.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	On-going	Impact will last between 15 and 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	High	Natural and/ or social functions and/ or processes are notably altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Major - negative**		**Moderate - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-62: **Construction phase: Biodiversity - Impeding and Impounding a Watercourse - Pipeline Servitude**

Project phase	**Construction**	
Impact	**Impeding and Impounding a Watercourse - Pipeline Servitude**	
Description of impact	**Activities within a watercourse resulting in impeding natural flow and impounding water in the system**	
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts

Potential mitigation	**Construction across all watercourses should preferably take place in the dry season when water flow is at its' lowest, especially across the few semi-perennial and perennial watercourses such as Van Zylspruit. During construction the upstream and downstream connectivity must be maintained. The main channel may not be rerouted or redirected even temporarily.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-63: **Construction phase: Biodiversity - Impeding and Impounding a Watercourse - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)**

Project phase	**Construction**			
Impact	**Impeding and Impounding a Watercourse - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)**			
Description of impact	**Activities within a watercourse resulting in impeding natural flow and impounding water in the system**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There are no watercourses on site. However, surface stormwater run-off needs to be properly managed. A detailed stormwater plan is required. This plan normally forms part of the engineering designs and layouts for the entire site.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site

Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere	Highly unlikely / none	Expected never to happen
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-64: **Construction phase: Biodiversity - Impeding and Impounding a Watercourse - WTW & Sludge Lagoons**

Project phase	**Construction**			
Impact	**Impeding and Impounding a Watercourse -WTW & Sludge Lagoons**			
Description of impact	**Activities within a watercourse resulting in impeding natural flow and impounding water in the system**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There are watercourses on the north, east and west sides of the site. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of watercourses needs to be monitored during the construction phase.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Immediate	Impact will self-remedy immediately
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	High	Substantive supportive data exists to verify the assessment

Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-65: **Construction phase: Biodiversity - Impeding and Impounding a Watercourse - Reservoir Site (1B) near Springfontein**

Project phase	**Construction**			
Impact	**Impeding and Impounding a Watercourse - Reservoir Site (1B) near Springfontein**			
Description of impact	**Activities within a watercourse resulting in impeding natural flow and impounding water in the system**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There is a small ephemeral drainage line at the foot of the hill that needs to be protected. The watercourse has been delineated and buffered and no development is allowed to take place in it or the buffer zone. Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of watercourses needs to be monitored during the construction phase.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-66: **Construction phase: Biodiversity - Impeding and Impounding a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. A)**

Project phase	**Construction**			
Impact	**Impeding and Impounding a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. A)**			
Description of impact	**Activities within a watercourse resulting in impeding natural flow and impounding water in the system**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There are no watercourses on site. However, surface stormwater run-off needs to be properly managed. A detailed stormwater plan is required. This plan normally forms part of the engineering designs and layouts for the entire site.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Immediate	Impact will self-remedy immediately
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-67: **Construction phase: Biodiversity - Impeding and Impounding a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. B)**

Project phase	**Construction**	
Impact	**Impeding and Impounding a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. B)**	
Description of impact	**Activities within a watercourse resulting in impeding natural flow and impounding water in the system**	
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts

Potential mitigation	**There are watercourses on the east of the site. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of watercourses needs to be monitored during the construction phase even though erosion potential is low in this area.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-68: **Construction phase: Biodiversity - Impeding and Impounding a Watercourse - Command Reservoir 2**

Project phase	**Construction**			
Impact	**Impeding and Impounding a Watercourse - Command Reservoir 2**			
Description of impact	**Activities within a watercourse resulting in impeding natural flow and impounding water in the system**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There are no watercourses on the site or the reservoir, but there are small streams at the foot of the hills and over which access roads will need to cross. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of stormwater needs to be monitored during the construction phase as the reservoir is on top of a high peak with steep contours and slopes.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year

Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-69: **Construction phase: Biodiversity - Changing the Characteristics of a Watercourse - Pipeline**

Project phase	**Construction**			
Impact	**Changing the Characteristics of a Watercourse - Pipeline**			
Description of impact	**Changing the characteristics of a watercourse such as removing vegetation, sand, changing the stream banks, etc.**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**Limit the removal of vegetation to the pipeline only. Limit construction on the streambanks. A rehabilitation plan is required which might include the need to rehabilitate and restabilise disturbed streambanks, including revegetating of streambanks.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge

Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-70: **Construction phase: Biodiversity - Changing the Characteristics of a Watercourse - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)**

Project phase	**Construction**			
Impact	**Changing the Characteristics of a Watercourse - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)**			
Description of impact	**Changing the characteristics of a watercourse such as removing vegetation, sand, changing the stream banks, etc.**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There are no watercourses therefore no characteristics of a watercourse will be changed. There is a stormwater drainage line just below the main road, but this can be rerouted and channelled as part of the stormwater management plan.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Immediate	Impact will self-remedy immediately	Immediate	Impact will self-remedy immediately
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Highly unlikely / none	Expected never to happen	Highly unlikely / none	Expected never to happen
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-71: **Construction phase: Biodiversity - Changing the Characteristics of a Watercourse - WTW & Sludge Lagoons**

Project phase	**Construction**
Impact	**Changing the Characteristics of a Watercourse - WTW & Sludge Lagoons**
Description of impact	**Changing the characteristics of a watercourse such as removing vegetation, sand, changing the stream banks, etc.**

Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There are watercourses on the north, east and west sides of the site. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of watercourses needs to be monitored during the construction phase.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Immediate	Impact will self-remedy immediately
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Highly unlikely / none	Expected never to happen
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-72: **Construction phase: Biodiversity - Changing the Characteristics of a Watercourse - Reservoir Site (1B) near Springfontein WTW & Sludge Lagoons**

Project phase	**Construction**			
Impact	**Changing the Characteristics of a Watercourse - Reservoir Site (1B) near Springfontein**			
Description of impact	**Changing the characteristics of a watercourse such as removing vegetation, sand, changing the stream banks, etc.**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There is a small ephemeral drainage line at the foot of the hill that needs to be protected. The watercourse has been delineated and buffered and no development is allowed to take place in it or the buffer zone. The main construction is not in or near a watercourse.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year

Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-73: **Construction phase: Biodiversity - Changing the Characteristics of a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. A)**

Project phase	**Construction**			
Impact	**Changing the Characteristics of a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. A)**			
Description of impact	**Changing the characteristics of a watercourse such as removing vegetation, sand, changing the stream banks, etc.**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There are no watercourses on the site. No specific mitigating measures are required.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Immediate	Impact will self-remedy immediately	Immediate	Impact will self-remedy immediately
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Highly unlikely / none	Expected never to happen	Highly unlikely / none	Expected never to happen
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce

Significance	**Negligible - negative**	**Negligible - negative**
Comment on significance	None	
Cumulative impacts	None	

Table 7-74: **Construction phase: Biodiversity - Changing the Characteristics of a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. B)**

Project phase	**Construction**			
Impact	**Changing the Characteristics of a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. B)**			
Description of impact	**Changing the characteristics of a watercourse such as removing vegetation, sand, changing the stream banks, etc.**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**There is a small stream and wetland area to the east of the site. This area has been buffered and no development must take place in the watercourse or buffer zone. There will therefore be no impact in terms of changing the characteristics of a watercourse**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Immediate	Impact will self-remedy immediately
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-75: **Construction phase: Biodiversity - Changing the Characteristics of a Watercourse – Command Reservoir 2**

Project phase	**Construction**	
Impact	**Changing the Characteristics of a Watercourse - Command Reservoir 2**	
Description of impact	**Changing the characteristics of a watercourse such as removing vegetation, sand, changing the stream banks, etc.**	
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts

Potential mitigation	**There are no watercourses on the site or the reservoir, but there are small streams at the foot of the hills and over which access roads will need to cross. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of stormwater needs to be monitored during the construction phase as the reservoir is on top of a high peak with steep contours and slopes.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None			
Cumulative impacts	None			

7.8.3 Operational Phase

Table 7-76: **Operational phase: Biodiversity – General - Pipeline**

Project phase	**Operation**	
Impact	**General - Pipeline**	
Description of impact	**Weed infestation, erosion, water leaks**	
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts
Potential mitigation	**A weed control plan is required for routine control along the pipeline servitude. Routine maintenance inspections are required for general maintenance, clean-up of litter, detection and fixing of any leaks as well as erosion caused by leaks.**	

Assessment	Without mitigation		With mitigation	
Nature	Negative		Positive	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - positive**	
Comment on significance	None			
Cumulative impacts	None			

Table 7-77: **Operational phase: Biodiversity – General - Pumpstations & Reservoir Sites**

Project phase	Operation			
Impact	**General - Pumpstations & Reservoir Sites**			
Description of impact	**General maintenance, weed control, corrective work on erosion, stormwater run-off, general clean-up and repairs**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**A weed control plan is required for routine control within and along the fencing and perimeters of the sites. Routine maintenance inspections are required for general maintenance, clean-up of litter, detection and fixing of any leaks as well as erosion caused by leaks. Stormwater systems need to be inspected and any inadequacies rectified. Perimeter fencing must be inspected to ensure it is still secure and keeping wild roaming animals at bay. Also to inspect whether there are any fringe impacts arising during the operational phase that need to be addressed and rectified. This includes oil run-off into neighbouring veld, watercourses, siltation of soils from operation sites into neighbouring environment, etc. Routine maintenance, weed control on the sites (pumpstations, reservoirs) will have a positive impact on the environment in general.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered

Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - positive**	
Comment on significance	None			
Cumulative impacts	None			

7.8.4 No-go alternative

The no-go alternative will result in the current *status quo* being maintained as far as the biodiversity potential is concerned. The biodiversity specialist is confident that the project footprint can be rehabilitated and that the overall impact can be mitigated should construction go-ahead.

7.8.5 Mitigation measures

7.8.5.1 Construction phase

7.8.5.1.1 Loss of vegetation

i. Pipeline servitude

- Top 30cm - 50cm of soil (topsoil) must be kept separate when excavation pipeline trench. This top layer of soil (topsoil) contains seeds, bulbs, rhizomes of locally indigenous flora.
- When closing up the trench this topsoil must be the final layer of soil thereby returning the seedbank to the area and resulting in better uptake and emergence of local indigenous vegetation species.
- Level soils, return topsoil to area removed, only remove vegetation in servitude and keep clearance of vegetation to a minimum. A site and project specific rehabilitation plan are required.
- An alien weed control plan is required and must be implemented during the construction phase as well.

ii. Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)

- Keep the project footprint as small as possible. Only remove necessary trees. There are no protected trees in this site. Trees where no development is taking place should be left.
- No trees should be unnecessary cleared for a temporary laydown area, as there are sufficient open spaces in the site area. Existing access roads to the site must be used.

- Before any tree is cut down / removed it must be inspected to ensure that there are no active bird nests present.
- If active nests are present, then the tree must be marked and an Ecological / Biodiversity Specialist consulted as how best to proceed.
- No poisons may be used to kill the trees or other vegetation on the site, as the site is too close to the important Orange River.
- The slope / gradient of the ground at the site is fairly steep which increases the erosion potential, especially after a rain downpour.
- Therefore, erosion must be continually monitored and corrective steps taken if any erosion is noticed. The steps may initially be temporary during the construction phase but final stormwater control and erosion prevention are important in the design and layout of the site.

iii. WTW & Sludge Lagoons

- Keep the project footprint as small as possible. Only remove necessary shrubs and herbaceous vegetation. There are no protected trees and only a few small common trees on the site.
- Natural vegetation where no development is taking place should be left. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas. Final access roads for the WTW site to be used as access roads during the construction phase as well.
- No new temporary access roads to be built. There are protected / flora SCC on the site - a plant permit will be required to relocate the plants prior to site establishment and construction.
- A rehabilitation plan is required and must form part of the final phase of the construction phase.

iv. Reservoir Site (1B) near Springfontein

- Keep the project footprint as small as possible. Only remove vegetation that is directly within the project footprint. There are no protected trees or flora SCC on the site. Natural vegetation where no development is taking place should be left undisturbed.
- Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients. Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built.
- The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes. A rehabilitation plan is required and must form part of the final phase of the construction phase.

v. Booster Pumpstation & Suction Reservoir (Alt. A)

- Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint.
- There are a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and, in that case, only those directly in the footprint may be removed.
- A tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / koppie.
- These trees need to be looked after and watered for the first two years until established and survival is guaranteed. Natural vegetation where no development is taking place should be left undisturbed.
- Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients. Final access roads for the site to be used as access roads during the construction phase as well.

- No new temporary access roads to be built. The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes. A rehabilitation plan is required and must form part of the final phase of the construction phase.

vi. Booster Pumpstation & Suction Reservoir (Alt. B)

- Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. Natural vegetation where no development is taking place should be left undisturbed.
- Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas. The site is within a CBA and therefore even more care to avoid loss of vegetation and negative impacts is necessary.
- Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. A rehabilitation plan for the site is required. During the construction phase all farm roads used need to be maintained and rehabilitated, with a final rehabilitation at the end of construction.
- All excess materials brought on to site need to be removed, unless some is required for maintenance / spare parts and then these need to be properly and neatly stored. No excessive pipe joints to be left lying around. All disturbed areas to be levelled, soils recontoured to surrounding contours, rubble removed, etc.

vii. Command Reservoir 2

- Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. There are (most likely) a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and in that case only those directly in the footprint may be removed.
- A final walk-down will be required and (most likely) a tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / ridge.
- These trees need to be looked after and watered for teh first two years until established and survival is guaranteed. Natural vegetation where no development is taking place should be left undisturbed Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas below the hill / ridge and not on steep gradients nor ontop of the hill / ridge.
- Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. The site has some very steep areas that need to be monitored for erosion, gully formation from rainfall and movement of loose soils down slopes.
- A site-specific rehabilitation plan is required and must form part of the final phase of the construction phase. An independent ECO is required for the construction of the reservoir. The site is very sensitive and is within a CBA. Note: The specific site was not able to be accessed during field investigations. However, the site was viewed from a distance and furthermore, the Specialist has a good understanding and knowledge of the general environment and aspects of these inselbergs / hills / ridges in the Free State Province.

7.8.5.1.2 Loss of Faunal Habitat

i. Pipeline Servitude

- Keep construction footprint as small as possible. Within a 100m wide servitude / work area along pipeline. Only remove vegetation (habitat) where absolutely necessary. That is, exactly on the pipeline servitude which is only a few metres wide.
- Do not clear any vegetation for temporary laydown areas, site offices, etc.
- During construction any active nests, burrows, etc. found directly within the pipeline footprint / construction footprint must first be cordoned off (danger netting, pole marker, etc) and then a Specialist / ECO contacted on how best to proceed. No wild animals or active nests / burrows may be interfered with.

ii. Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)

- Keep construction footprint as small as possible.
- Only remove vegetation (habitat) where absolutely necessary. Do not clear any vegetation for temporary laydown areas, site offices, etc.
- In particular do not remove any trees unnecessarily.
- During construction any active nests, burrows, etc. found directly within the project footprint / construction footprint must first be cordoned off (danger netting, pole marker, etc) and then a Specialist / ECO contacted on how best to proceed. No wild animals or active nests / burrows may be interfered with. It is recommended to plant some locally indigenous trees such as sweet thorn and karee along the boundaries of the site and/or within parking lot areas as offset.

iii. WYW & Sludge Lagoons

- Keep the project footprint as small as possible. Only remove necessary shrubs and herbaceous vegetation. There are no protected trees and only a few small common trees and shrubs on the site. Natural vegetation where no development is taking place should be left.
- Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and also where no trees need to first be removed. Final access roads for the WTW site to be used as access roads during the construction phase as well.
- No new temporary access roads to be built. There are protected / flora SCC on the site - a plant permit will be required to life and relocate the plants prior to site establishment and construction. It is recommended to plant a few locally indigenous trees (e.g., sweet thorn, karee) as part of the general landscaping of the site, including in carparks.
- No alien species allowed to be used in landscaping. During construction any active nests, burrows, etc. found directly within the project footprint / construction footprint must first be cordoned off (danger netting, pole marker, etc) and then a Specialist / ECO contacted on how best to proceed. No wild animals or active nests / burrows may be interfered with.
- A rehabilitation plan is required and must form part of the final phase of the construction phase.

iv. Reservoir Site (1B) near Springfontein

- Keep the project footprint as small as possible. Only remove vegetation that is directly within the project footprint. Natural vegetation where no development is taking place should be left undisturbed.
- Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients.
- Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built.
- The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes.

- A rehabilitation plan is required and must form part of the final phase of the construction phase. Breeding wild animals encountered on site must be cordoned off (if possible) and a Specialist or ECO contacted on how best to proceed**.**

v. Booster Pumpstation & Suction Reservoir (Alt. A)

- Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. There are a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and in that case only those directly in the footprint may be removed.
- A tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / koppie.
- These trees need to be looked after and watered for the first two years until established and survival is guaranteed.
- Natural vegetation where no development is taking place should be left undisturbed. Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas, not on steep gradients.
- Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built.
- The site has some steep areas that need to be monitored for erosion and movement of loose soils down slopes. A rehabilitation plan is required and must form part of the final phase of the construction phase.

vi. Booster Pumpstation & Suction Reservoir (Alt. B)

- Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. Natural vegetation where no development is taking place should be left undisturbed.
- Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas. The site is within a CBA and therefore even more care to avoid loss of vegetation and negative impacts is necessary.
- Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. A rehabilitation plan for the site is required. During the construction phase all farm roads used need to be maintained and rehabilitated, with a final rehabilitation at the end of construction.
- All excess materials brought on to site need to be removed, unless some is required for maintenance / spare parts and then these need to be properly and neatly stored.
- No excessive pipe joints to be left lying around. All disturbed areas to be levelled, soils recontoured to surrounding contours, rubble removed, etc. There is a watercourse on the east of the site that needs to be buffered and protected. Denuded open areas during construction phase need to be rehabilitated and re-grassed with locally indigenous species only.

vii. Command Reservoir 2

- Keep the project footprint as small as possible. Only remove vegetation directly within the construction footprint. There are (most likely) a number of protected trees (Wild olive trees) on the site. Preferably none of the wild olive trees to be removed. However, this might be impossible and in that case only those directly in the footprint may be removed.
- A final walk-down will be required and (most likely) a tree permit will be required prior to the removal of any olive trees. For every tree removed 5 new trees must be planted on the same hill / ridge. These trees need to be looked after and watered for the first two years until

established and survival is guaranteed. Natural vegetation where no development is taking place should be left undisturbed Temporary laydown and site office areas to be established in disturbed or low sensitivity areas and on flat areas below the hill / ridge and not on steep gradients nor on top of the hill / ridge.

- Final access roads for the site to be used as access roads during the construction phase as well. No new temporary access roads to be built. The site has some very steep areas that need to be monitored for erosion, gully formation from rainfall and movement of loose soils down slopes.
- A site-specific rehabilitation plan is required and must form part of the final phase of the construction phase. An independent ECO is required for the construction of the reservoir.
- The site is very sensitive and is within a CBA. Note: The specific site was not able to be accessed during field investigations. However, the site was viewed from a distance and furthermore, the Specialist has a good understanding and knowledge of the general environment and aspects of these inselbergs / hills / ridges in the Free State Province.

7.8.5.2 Impeding and Impounding a Watercourse

i. **Pipeline Servitude**

- Construction across all watercourses should preferably take place in the dry season when water flow is at its' lowest, especially across the few semi-perennial and perennial watercourses such as Van Zylspruit.
- During construction the upstream and downstream connectivity must be maintained. The main channel may not be rerouted or redirected even temporarily**.**

ii. Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)

- There are no watercourses on site. However, surface stormwater run-off needs to be properly managed. A detailed stormwater plan is required. This plan normally forms part of the engineering designs and layouts for the entire site.

iii. WTW & Sludge Lagoons

- There are watercourses on the north, east and west sides of the site. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed.
- A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of watercourses needs to be monitored during the construction phase.

iv. Reservoir Site (1B) near Springfontein

- There is a small ephemeral drainage line at the foot of the hill that needs to be protected.
- The watercourse has been delineated and buffered and no development is allowed to take place in it or the buffer zone. Surface stormwater run-off needs to be properly managed.
- A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of watercourses needs to be monitored during the construction phase.

v. Booster Pumpstation & Suction Reservoir (Alt. A)

- There are no watercourses on site. However, surface stormwater run-off needs to be properly managed.

- A detailed stormwater plan is required. This plan normally forms part of the engineering designs and layouts for the entire site.

vi. Booster Pumpstation & Suction Reservoir (Alt. B)

- There are watercourses on the east of the site. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones.
- Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site.
- Erosion and siltation of watercourses needs to be monitored during the construction phase even though erosion potential is low in this area**.**

vii. Command Reservoir 2

- There are no watercourses on the site or the reservoir, but there are small streams at the foot of the hills and over which access roads will need to cross.
- These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones.
- Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site.
- Erosion and siltation of stormwater needs to be monitored during the construction phase as the reservoir is on top of a high peak with steep contours and slopes.

7.8.5.3 Changing the Characteristics of a Watercourse

i. **Pipeline**

- Limit the removal of vegetation to the pipeline only.
- Limit construction on the streambanks.
- A rehabilitation plan is required which might include the need to rehabilitate and restabilise disturbed streambanks, including revegetating of streambanks.

ii. Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)

- There are no watercourses therefore no characteristics of a watercourse will be changed.
- There is a stormwater drainage line just below the main road, but this can be rerouted and channelled as part of the stormwater management plan.

iii. WTW & Sludge Lagoons

- There are watercourses on the north, east and west sides of the site. These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed.
- A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site. Erosion and siltation of watercourses needs to be monitored during the construction phase**.**

iv. Reservoir Site (1B) near Springfontein

- There is a small ephemeral drainage line at the foot of the hill that needs to be protected.
- The watercourse has been delineated and buffered and no development is allowed to take place in it or the buffer zone. The main construction is not in or near a watercourse.

v. Booster Pumpstation & Suction Reservoir (Alt. A)

- There are no watercourses on the site. No specific mitigating measures are required.

vi. Booster Pumpstation & Suction Reservoir (Alt. B)

- There is a small stream and wetland area to the east of the site. This area has been buffered and no development must take place in the watercourse or buffer zone.
- There will therefore be no impact in terms of changing the characteristics of a watercourse.

vii. Command Reservoir 2

- There are no watercourses on the site or the reservoir, but there are small streams at the foot of the hills and over which access roads will need to cross.
- These watercourses have been delineated and buffered and no development is allowed to take place in them or the buffer zones. Surface stormwater run-off needs to be properly managed. A detailed stormwater management plan is required. This plan normally forms part of the engineering designs and layouts for the entire site.
- Erosion and siltation of stormwater needs to be monitored during the construction phase as the reservoir is on top of a high peak with steep contours and slopes**.**

7.8.6 Operational Phase

7.8.6.1 Biodiversity (general)

i. Pipeline

- A weed control plan is required for routine control along the pipeline servitude. Routine maintenance inspections are required for general maintenance, clean-up of litter, detection and fixing of any leaks as well as erosion caused by leaks**.**

ii. Pumpstations & Reservoir Sites

- A weed control plan is required for routine control within and along the fencing and perimeters of the sites. Routine maintenance inspections are required for general maintenance, clean-up of litter, detection and fixing of any leaks as well as erosion caused by leaks.
- Stormwater systems need to be inspected and any inadequacies rectified. Perimeter fencing must be inspected to ensure it is still secure and keeping wild roaming animals at bay.
- Also to inspect whether there are any fringe impacts arising during the operational phase that need to be addressed and rectified. This includes oil run-off into neighbouring veld, watercourses, siltation of soils from operation sites into neighbouring environment, etc. Routine maintenance, weed control on the sites (pumpstations, reservoirs) will have a positive impact on the environment in general**.**

8 ENVIRONMENTAL IMPACT STATEMENT

The potential impacts associated with the proposed Scheme 1B have been assessed and considered in this report. With mitigation measures in place as set out in Section 6 and detailed in the EMPr (Annexure G), post mitigation impacts are anticipated to be negligible to moderate negative significance. The proposed project therefore does not result in unacceptable impacts to the environment.

8.1 Specialist statements

The following statements and impact summaries have been summarised from the specialist reports (Annexure D).

8.1.1 Agricultural statement

The proposed activities were evaluated against the current situation, i.e., a 'no-go' scenario. According to the screening tool, the site is classified as having high agricultural sensitivity due to cultivation, which occurs on land with low to moderate capability. The primary component of the project is a linear subsurface pipeline. We are confident that the project footprint can be rehabilitated to such an extent that the site can be grazed once again and returned to its current capacity. The impact of the pipeline on agricultural production was calculated in the economic analysis (refer to Appendix 1 of the Agricultural Assessment Annexure D to this report), using a buffer around the planned activity, resulting in an estimated loss of 1026 ha. However, the actual impact is unlikely to be as substantial, especially if the area undergoes rehabilitation.

Booster Pump Station 1B2, Option 1B1 Reservoirs and roads, as well as WTW1A & 1B, constitute non-linear infrastructure with high agricultural sensitivity due to crops being cultivated on land with low to moderate capability. Currently, cultivation is not practiced on these portions of land, based on recent Google satellite images and site visits. Therefore, the SANLC 2014 classification is outdated. More importantly, the actual footprint of the above infrastructure does not extend into high-sensitivity land. Other infrastructures are situated on land with medium to low sensitivity and have a relatively small footprint.

According to the screening tool, the site is classified as having high agricultural sensitivity due to cultivation, which occurs on land with low to moderate capability. The primary component of the project is a linear subsurface pipeline. We are confident that the project footprint can be rehabilitated to such an extent that the site can be grazed once again and returned to its current capacity. The impact of the pipeline on agricultural production was calculated in the economic analysis, using a buffer around the planned activity, resulting in an estimated loss of 1026 ha. However, the actual impact is unlikely to be as substantial, especially if the area undergoes rehabilitation.

- Since the land capability of the area under the low lift pump station is low, the loss of 3.75 ha will not have a significant impact on agricultural resources.
- Since the land capability of the area under the Water Treatment Works are low and mainly used for extensive livestock grazing the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Water Treatment Works does not overlie this high sensitivity area.
- Since the land capability of the area under the Booster Pump station 1B2 is low and mainly used for extensive livestock grazing the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Booster Pump station 1B2 does not overlie this high sensitivity area.

- Since the land capability of the area under the Reservoir 1A and 1B are low and mainly used for extensive livestock grazing the developments will not have a significant impact on agricultural resources.
- Since the land capability of the area under the Reservoir Option 1B1 is low and mainly used for extensive livestock grazing the development will not have a significant impact on agricultural resources. Part of the surveyed site has a high agricultural screening value due to the presence of cultivated land. Cultivation was not observed during site visit, is uneconomical and the actual footprint of the Reservoir 1B1 does not overlie this high sensitivity area.

The activities carried out during the project will not significantly increase the footprint of any current development around these sites and, therefore, will not have any further impact on agriculture. The specialist's opinion is that the development should proceed, as it will not have a significant impact on agricultural activities in the area and poses no threat to food security when compared to the current status quo.

- In terms of agricultural sensitivity, the development should be allowed to proceed.
- After mitigation significance ratings are between minor (negative) and negligible (negative) (Refer Table 8-1.

Table 8-1: Summary table of agricultural impacts and their significance pre- and post-mitigation

Ref:	Project phase	Impact	Significance Without mitigation	Significance With mitigation
1	Construction	Pipeline from Gariepdam to connection points	Minor - negative	Negligible - negative
2	Construction	Low lift pump station	Negligible - negative	Negligible - negative
3	Operation	Low lift pump station	Minor - negative	Minor - negative
4	Construction	Water Treatment Works with high lifting pump	Minor - negative	Negligible - negative
5	Operation	Water Treatment Works with high lifting pump	Minor - negative	Minor - negative
6	Construction	Booster pump station 1B2	Negligible - negative	Negligible - negative
7	Operation	Booster pump station 1B2	Minor - negative	Minor - negative
8	Construction	Booster pump option 1B1	Negligible - negative	Negligible - negative
9	Operation	Booster pump option 1B1	Minor - negative	Minor - negative
10	Construction	Reservoir sites 1A and 1B	Negligible - negative	Negligible - negative
11	Operation	Reservoir sites 1A and 1B	Minor - negative	Minor - negative
12	Construction	Reservoir option 1B1	Negligible - negative	Negligible - negative
13	Operation	Reservoir site 1B1	Minor - negative	Minor - negative

8.1.2 Heritage and cultural statement

The proposed activities were evaluated against the current situation, i.e., a 'no-go' alternative. This assessment has found that the area identified for the proposed Xhariep pipeline is a heritage environment of variable sensitivity but that significant impacts on palaeontological, archaeological and colonial period heritage resources arising from the project are unlikely.

Impacts to the cultural landscape are expected to be the most significant impacts, but these can be reduced through the implementation of suitable mitigatory measures.

There are currently no heritage-derived recommendations for changes in the proposed route.

If any changes are required in future, these are likely to be very minor.

If the project were not implemented, the site would stay as it currently is with a neutral impact

significance. It is our reasoned opinion, therefore, that the proposed Xhariep pipeline project may be authorised, but subject to the recommendations contained within the specialist report (Annexure D).

- In terms of heritage and cultural sensitivity, the development should be allowed to proceed.
- After mitigation significance ratings are rated as minor (positive) (Refer Table 8-2).

Table 8-2: Summary table of heritage and cultural impacts and their significance pre- and post-mitigation

Ref:	Project phase	Impact	Significance	Significance
1	Construction	Palaeontology	Moderate - negative	Minor - positive
2	Construction	Archaeology	Moderate - negative	Minor - positive
3	Construction	Colonial Period Heritage	Minor - negative	Minor - positive

8.1.3 Aquatic statement

From the general description of the region, and study area, it would seem to still be largely natural which also translates to a largely unmodified catchment. Watercourses and wetlands along the pipeline route would therefore seem to still be natural to a large extent. This is also a consequence of the absence of large towns or cities within these catchments, the exception being the Modder River which is heavily modified by the MMM but which only covers a small portion of the pipeline route in the most north eastern section of the route. The topography as discussed also promotes the formation of numerous small watercourses and wetlands which the survey has shown to contain quite prominent wetland conditions. Due to the large extent of the pipeline route, the wetlands and watercourses along it also differ to a significant degree. However, overall, the majority of these watercourses drain from the higher lying areas to the east toward the lower lying areas in the west and south. Almost all these watercourses are seasonal or ephemeral, functioning as rapidly flushing systems, containing main channel flow only for short periods after rainfall events occurring. The section of the pipeline route situated along the N1 National Road affects the watercourses and wetlands to a more significant extent than those situated along the Tierpoort Dam – Rustfontein Dam section where the pipeline will be situated to a large degree within natural areas. This is mostly as a result of the impact the road has on the geomorphology and hydrology of these watercourses and wetlands. The impact is therefore anticipated to be lower where the pipeline is situated within the road reserve of the N1 and R702 tarred roads while being higher where the pipeline is situated within natural areas. Due to the large extent of the pipeline and the large

number of watercourses and wetlands that will be affected, delineation may not be accurate in all cases and where small drainage lines or wetlands occur some may also have been overlooked. The watercourses and wetland along the pipeline route are however fairly prominent with almost all containing clear wetland conditions.

The proposed activities were evaluated against the current situation, i.e., a 'no-go' alternative. Activities associated with the proposed pipeline have been considered to be most relevant to the impact on watercourses and wetlands and have been assessed via the risk assessment matrix:

Construction phase

- The excavation of trenches will impede the flow while trenches are open. Disturbance of the bed and banks will promote sedimentation and will destabilise the system until adequate rehabilitation has been completed. Use of concrete casings may also affect the affected system.
- The removal of riparian and wetland vegetation will promote erosion and sedimentation of the affected system. Disturbance and removal of vegetation will also create conditions susceptible to the establishment of exotic weeds.

Operational phase

- Aging pipelines often start leaking or spills may also occur from overflows, valves and similar structures. The material being potable water, will result in any pollution but can alter the flow regime of watercourses and wetland where it is allowed to occur for long periods. This has also been shown to occur in similar developments.
- During the operational phase, periodic maintenance, fixing and replacing of sections of the pipeline will be required from time to time. As a result, event though adequate rehabilitation may previously have been done this may again destabilise the system and result in new impacts and may also have long-term impacts should poor rehabilitation be done after maintenance operations.

Taking all of the above into account, the risk for the watercourses and wetlands along the pipeline route varies from a Low to Moderate Risk and also depends on the condition of the system, its conservation value, size and flow regime, amongst others. However, given the temporary nature of the impact (as long as adequate and successful rehabilitation is undertaken), none of the affected watercourses and wetlands are anticipated to entail a High Risk.

- In terms of aquatic sensitivity, the development should be allowed to proceed.
- After mitigation significance ratings are rated as minor (negative) (Refer Table 8-3).

Table 8-3: Summary table of aquatic impacts and their significance pre- and post-mitigation

Ref:	Project phase	Impact	Significance Without mitigation	Significance With mitigation
1	Construction	Loss of riparian and wetland vegetation, including protected and rare species	Moderate - negative	Minor - negative
2	Construction	Disturbing the bed and banks of watercourses and the associated erosion and sedimentation	Moderate - negative	Minor - negative
3	Construction	Establishment of exotic weeds and invaders	Moderate - negative	Minor - negative
4	Construction	Altering the flow and flooding regime of watercourses	Moderate - negative	Minor - negative
5	Operation	Maintenance and repair of pipeline and associated infrastructure	Moderate - negative	Minor - negative

8.1.4 Civil aviation statement

The Gariep Dam Airspace is located approximately 1.3km south-east of the proposed water treatment works at the southern end of the development. The northern runway is aligned with the sludge lagoons of the proposed water treatment works. The risk of this would need to be confirmed by the SACAA, however it must be noted that a high-voltage power line runs through the potential site for the sludge dams. A reasonable assumption can therefore be made that if the risk associated with the existing powerline is being managed, the new infrastructure will not pose a risk that can't be managed to acceptable limits.

- In terms of civil aviation sensitivity, the development should be allowed to proceed.

8.1.5 Defence statement

The proposed Scheme 1B will be located in proximity to the Bram Fischer International Airport air traffic control zone and Tempe Military Base at Bloemfontein.

- In terms of civil aviation sensitivity, the development should be allowed to proceed.

8.1.6 Palaeontological statement

The general Palaeontological Sensitivity of the area is Very High. The National Palaeontological Database also indicates that fossils were collected from the proposed Xhariep Pipeline development area (white triangles with red outlines). However, the site visit did not detect any fossiliferous outcrop in the pipeline development area. This could be attributed to the general flat topography where the proposed pipeline is planned. However, the National Palaeontological database indicates that the general area is fossiliferous. Furthermore, the National Environmental Web-based Screening Tool indicates that the Palaeontological Sensitivity of the development is Very High. Although the general area has a Very High Palaeontological Sensitivity (according to the National Palaeontological database), NO fossils were detected in the Xhariep Pipeline footprint during the site investigation during March 2024.

The proposed activities were evaluated against the current situation, i.e., a 'no-go' alternative. The quality of preservation of different areas varies and it is thus difficult to allocate a Cumulative Sensitivity to the project. If all the mitigation measures are carried out, a conservative estimate of the Cumulative impacts on fossil Heritage will be high pre-mitigation and low post mitigation.

- In terms of aquatic sensitivity, the development should be allowed to proceed.
- After mitigation significance ratings are rated as minor (positive) (Refer Table 8-4Table 8-3).

Table 8-4: Summary table of palaeontological impacts and their significance pre- and post-mitigation

Ref:	Project phase	Impact	Significance Without mitigation	Significance With Mitigation

1	Construction	Loss of fossil heritage	Moderate - negative	Minor - positive

8.1.7 Socio-economic statement

The proposed activities were evaluated against the current situation, i.e., a 'no-go' alternative. In terms of the negative social impacts, the following should be noted:

The negative social impacts associated with the Xhariep Pipeline Project: Scheme 1B are largely low to moderate in significance and will respond to mitigation.

The majority of the negative social impacts identified in the SIA are anticipated to materialise during the construction phase. These potential impacts include:

- Intrusion impacts associated with the inflow of workers and jobseekers, which could result in negative impacts on the social dynamics and networks in the area. Conflict between local community members and the outside workforce could thus materialise. The use of local labour would mitigate this impact.
- Alignment of the pipeline through the southern section of JB Mafora and Bloemanda in Bloemfontein can result in resettlement of households with significant negative impacts. Re-alignment of the pipeline along the road reserves and to the south of the M30 can prevent this impact and successfully mitigate any possible negative impacts.
- Impacts on the resource use in areas where crop production is undertaken could result in negative financial impacts for the landowners;
- Negative impacts on the daily living and movement patterns of landowners as a result of dust and noise nuisances, movement of workers, construction vehicles and equipment;
- Increased risks in terms of safety and security. The presence of construction workers in the area would remain a source of concern, particularly with regards to the impact on safety;
- Health risks to the construction workers and the local communities. The key concern relate to the spread of HIV/Aids during the construction phase and the increased possibility of construction related accidents;
- The increased risk of fires remains a concern. This can be mitigated through proper site management and worker conduct. Precautionary measures, should however be implemented as recommended in the report;
- Negative intrusion impact on homestead and dwellings where the pipeline is proposed in close proximity to such infrastructure;
- Infrastructure and services that would be temporarily affected during the construction phase, but which can be mitigated in consultation with the relevant governing bodies.
- Construction impacts which are likely to occur are expected to be short-term and can, in most cases, be successfully mitigated. To accomplish this, the mitigation and monitoring plans and procedures would have to be undertaken during project implementation, especially those focused on mitigation of impacts on the landowners and residents of the affected towns.
- Site rehabilitation on completion of the construction period and management during the operational phase are critical to avoid any negative long-term impacts on the resource use of the landowners.
- The proposed project is not expected to have severe negative impacts on the agricultural activities of the landowners, once operational. This impact, however, remains important and

should be mitigated as far as possible during the construction phase through proper site rehabilitation. Therefore, areas where crop production is undertaken should be avoided as far as possible.

- In terms of the positive social impacts, the following should be noted:
- The proposed Xhariep Pipeline Project: Scheme 1B will provide a number of benefits that should be seen in balance to the associated negative impacts. As a direct and significant positive benefit, the infrastructure will assist in providing potable water to a number of local communities.
- During the construction phase, the proposed project would create various employment opportunities with some local employment opportunities, provide a platform for increased spending and possible increased investment in the local area.

The main positive impacts during the operational phase refer to the improved and reliable water supply and availability of water.

- The provision of a sustainable water supply and system can result in a number of indirect positive benefits. The existing status quo with regards to water supply is currently identified as a constraint to local economic development, but the proposed scheme should provide the capacity to supply current and future demands for water in the Bloemfontein area, which would create indirect benefits supporting e.g. housing development, the industrial sector and tourism.
- The proposed Xhariep Pipeline Project: Scheme 1B would not create large numbers of job opportunities, but the limited job creation (especially in the lower skilled levels) must still be viewed as a positive aspect. It is imperative that local labour be sourced otherwise no direct benefits would accrue to the locals during the construction phase. Apart from job creation during the construction phase, locals should also be allowed an opportunity to be included in a list of possible local suppliers and service providers. Social benefits in terms of training, skills development and the use of local labour should further be aspired to.
- Such an approach would also limit some negative impacts associated with the influx of large construction teams and the negative impacts associated with the inflow on the social dynamics in the area.
- The proposed project would not have a marked influence on the daily living and movement patterns of residents during the operational phase, although it would definitely assist in improving the overall community health and well-being through the provision of sustainable potable water to the end-users.
- The Xhariep Pipeline Project: Scheme 1B will enable government to avoid future water shortages in the area, resulting in Bloemfontein and possibly the smaller towns not experiencing long-term water security. Government must take adequate actions to ensure that all citizens have access to basic services, of which water is a crucial element. If other measures are not put in place to ensure an adequate continuous supply of potable water to the municipal area, government would not be fulfilling its duty in terms of water service provision to the end-users.
- The proposed project would thus, through the upgrading of the capacity of the bulk infrastructure networks and associated infrastructure assist to handle the current rate of development in the area. The proposed Xhariep Pipeline Project: Scheme 1B is therefore critical for the socio-economic well-being of the residents of Mangaung and surrounds.

Although the direct positive impacts are limited in extent, the impact of the overall project benefits should be considered in view of the socio-economic profile of the communities of the area and the indirect benefits that would accrue to the local communities due to the improved water services delivery.

- In terms of social sensitivity, the development should be allowed to proceed.

After mitigation significance ratings are rated between minor (negative) to moderate (positive). (Refer Table 8-5).

Table 8-5: Summary table of social impacts and their significance pre- and post-mitigation

Ref:	Project phase	Impact	Significance Without mitigation	Significance With mitigation
1	Construction	Employment Creation	Minor - positive	Moderate - positive
2	Construction	Inflow of workers and jobseekers	Minor - negative	Minor - negative
3	Construction	Accommodation of workforce	Minor - negative	Minor - positive
4	Construction	Local Economic Contribution	Minor - positive	Minor - positive
5	Construction	Impact on Metropolitan and Local Municipality	Minor - positive	Moderate - positive
6	Construction	Community Health Risks	Minor - negative	Minor - negative
7	Construction	Community Safety Risks	Minor - negative	Minor - negative
8	Construction	Impact on Infrastructure and Services	Minor - negative	Negligible - negative
9	Construction	Impact on agricultural practices	Minor - negative	Minor - negative
10	Construction	Daily Living and Movement Patterns and Possible Relocation	Moderate - negative	Minor - negative
11	Construction	Noise Impacts	Minor - negative	Negligible - negative
12	Construction	Dust Impacts	Minor - negative	Negligible - negative
13	Construction	Visual Impact and Sense of Place	Minor - negative	Negligible - negative
14	Operation	Employment Opportunities	Minor - positive	Minor - positive
15	Operation	Inflow of Workers	Minor - negative	Minor - negative
16	Operation	Local Economic Contribution	Moderate - positive	Moderate - positive
17	Operation	Daily living and movement patterns	Minor - negative	Minor - negative
18	Operation	Impact on agricultural activities	Minor - negative	Minor - negative
19	Operation	Community Health Risks	Minor - negative	Minor - negative
20	Operation	Community Safety Risks	Minor - negative	Minor - negative

21	Operation	Visual Impact and Sense of Place	Minor - negative	Minor - negative
22	Operation	Noise Impact	Negligible - negative	Negligible - negative

8.1.8 Terrestrial Biodiversity

The study site is within the original extent / historical distribution of five veldtypes / ecosystems, two of which are threatened with a status of 'Vulnerable'.

- Xhariep Karroid Grassland – Least Concern;
- Bloemfontein Dry Grassland – Vulnerable;
- Besemkaree Koppies Shrubland – Least Concern;
- Winburg Grassy Shrubland – Least Concern;
- Central Free State Grassland – Vulnerable.

The vegetation and ecosystems in which the project footprint is situated are mostly in fair condition to moderately degraded with few significant negative impacts. There are a number of mostly small seasonal or ephemeral streams and drainage lines that the proposed pipeline crosses, with only 2 – 3 semi-perennial and perennial large streams / small rivers, such as the Van Zylspruit. The impact on these watercourses will be limited and very localised. There are no large 'no-go' areas that the proposed project components such as pump stations are located that will need to be completely moved or trigger a 'fatal flaw'. The most sensitive and complex site area is for the proposed Command Reservoir No. 2. This is within a fairly pristine rocky mountain ridge (Leeuwkop) with numerous small watercourses present, including wetlands. The site will need to be very carefully planned. Much of the pipeline servitude is within ecological support areas (ESAs). These ESAs are linked to grassland NPAES focus areas and vulnerable grasslands. The pipeline will have very low levels of impact on the grasslands and ESAs. There are a few critical biodiversity areas (CBAs) that the pipeline passes through and in which pump station and reservoirs are planned for. The CBAs affected are in the north / northeast of the project site. Mitigating measures have been recommended that will reduce the impact on these areas.

There are protected wild olive trees on the site earmarked for the booster pump station with suction reservoir. It is likely that a few of these trees will need to be removed. A tree permit will be needed. It is also likely that there are protected wild olive trees on the site of Command Reservoir No. 2.

There are a few protected provincial orange data listed (ODL) plants of *Ledebouria* growing in the proposed footprint of the WTW and Sludge Lagoons. A provincial permit will be required to life and relocate these plants prior to any site establishment or construction.

A General Authorisation (GA) process or water use licence application (WULA) process will be required for the project.

The proposed activities were evaluated against the current situation, i.e., a 'no-go' alternative. Taking all findings and recommendations into account it is the reasonable opinion of the author / specialist that the proposed project and project related activities should be authorised. The project and related activities should be allowed to proceed, but with all proposed mitigating measures put in place. These measures must form part of the conditions of the EA, EMPr and other relevant licences.

- In terms of biodiversity sensitivity, the development should be allowed to proceed.
- After mitigation significance ratings are rated between moderate (negative) to negligible (negative) (Refer Table 8-6).

Table 8-6: Summary table of biodiversity impacts and their significance pre- and post-mitigation

Ref:	Project phase	Impact	Significance Without mitigation	Significance With mitigation
1	Construction	Loss of vegetation - Pipeline Servitude	Negligible - negative	Negligible - negative
2	Construction	Loss of Vegetation - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)	Moderate - negative	Minor - negative
3	Construction	Loss of Vegetation - WTW & Sludge Lagoons	Moderate - negative	Minor - negative
4	Construction	Loss of Vegetation - Reservoir Site (1B) near Springfontein	Moderate - negative	Minor - negative
5	Construction	Loss of Vegetation - Booster Pumpstation & Suction Reservoir (Alt. A)	Moderate - negative	Minor - negative
6	Construction	Loss of Vegetation - Booster Pumpstation & Suction Reservoir (Alt. B)	Moderate - negative	Minor - negative
7	Construction	Loss of Vegetation - Command Reservoir 2	Major - negative	Moderate - negative
8	Construction	Loss of Faunal Habitat - Pipeline Servitude	Negligible - negative	Negligible - negative
9	Construction	Loss of Faunal Habitat - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)	Moderate - negative	Minor - negative
10	Construction	Loss of Faunal Habitat - WYW & Sludge Lagoons	Moderate - negative	Minor - negative
11	Construction	Loss of Faunal Habitat - Reservoir Site (1B) near Springfontein	Moderate - negative	Minor - negative
12	Construction	Loss of Faunal Habitat - Booster Pumpstation & Suction Reservoir (Alt. A)	Moderate - negative	Minor - negative
13	Construction	Loss of Faunal Habitat - Booster Pumpstation & Suction Reservoir (Alt. B)	Moderate - negative	Minor - negative
14	Construction	Loss of Faunal Habitat - Command Reservoir 2	Major - negative	Moderate - negative
15	Construction	Impeding and Impounding a Watercourse - Pipeline Servitude	Minor - negative	Negligible - negative
16	Construction	Impeding and Impounding a Watercourse - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)	Negligible - negative	Negligible - negative
17	Construction	Impeding and Impounding a Watercourse -WTW & Sludge Lagoons	Negligible - negative	Negligible - negative
18	Construction	Impeding and Impounding a Watercourse - Reservoir Site (1B) near Springfontein	Negligible - negative	Negligible - negative
19	Construction	Impeding and Impounding a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. A)	Negligible - negative	Negligible - negative

20	Construction	Impeding and Impounding a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. B)	Minor - negative	Negligible - negative
21	Construction	Impeding and Impounding a Watercourse - Command Reservoir 2	Negligible - negative	Negligible - negative
22	Construction	Changing the Characteristics of a Watercourse - Pipeline	Minor - negative	Negligible - negative
23	Construction	Changing the Characteristics of a Watercourse - Low Lift Pump Station 1B (At existing Gariep Dam Pumpstation)	Negligible - negative	Negligible - negative
24	Construction	Changing the Characteristics of a Watercourse - WTW & Sludge Lagoons	Negligible - negative	Negligible - negative
25	Construction	Changing the Characteristics of a Watercourse - Reservoir Site (1B) near Springfontein	Negligible - negative	Negligible - negative
26	Construction	Changing the Characteristics of a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. A)	Negligible - negative	Negligible - negative
27	Construction	Changing the Characteristics of a Watercourse - Booster Pumpstation & Suction Reservoir (Alt. B)	Negligible - negative	Negligible - negative
28	Construction	Changing the Characteristics of a Watercourse - Command Reservoir 2	Negligible - negative	Negligible - negative
29	Operation	General - Pipeline	Negligible - negative	Negligible - positive
30	Operation	General - Pumpstations & Reservoir Sites	Negligible - negative	Negligible - positive

8.1.9 No-go option

The assessment of alternatives must always include the “no-go” option as a baseline against which all other alternatives must be measured. The option of not implementing the activity must always be assessed and to the same level of detail as the other feasible and reasonable alternatives. The “no-go” option is taken to be the existing rights on the property, and this includes all the duty of care and other legal responsibilities that apply to the owner of the property(ies) and other rights holders.

The no-go option / status quo has been assessed by all the specialists. All specialist are confident that potential impacts can be mitigated should the application receive a positive environmental authorisation.

The no-go option will result in not reaching the objectives of the SIP 18 and 19 project outcomes namely: to meet (i) water requirements as well as (ii) to meet the desired assurance of supply for both urban and agricultural water requirements.

8.2 Site sensitivity maps

A summary of the sensitivities of the proposed Scheme 1 B is as follows:

- The project footprint runs across a vast area of the Free State Province, but the footprint is very narrow and linear and therefore has a very low negative impact on the natural environment. The biggest negative impacts are very localised and within the modular footprint areas of the project that are for the WTW, Sludge Lagoons, Pump Stations and Reservoirs.
- According to the Screening Tool assessment, the overall sensitivities are a mix between 'Very High' and 'Low'. The screening tool assessments were verified during site investigations and found to be largely accurate and therefore confirmed and accepted. The sensitivity features or triggers in the 'very high' biodiversity areas are CBAs, ESAs, NPAES focus areas. All of these features have been addressed and noted in the study.
- The sensitive habitats or areas in the study area are watercourses and rocky hills / ridges. Although most of the project site is grassland and some of these grasslands are threatened, the actual 'sensitiivty' of them is 'Low'. Furthermore, due to the nature of the project – very narrow linear in footprint, potable water line, etc. the negative impacts over the entire area of eth study site is negligible to non-measurable. Furthermore, due to the fact that the pipeline is going to be buried and with proper mitigating measures the natural environment will very quickly recover to pre-construction levels. Within 6 months to a couple of years.
- The screening tool assessment highlights a limited number of faunal SCC that potentially occur in the study area. The study shows that probably all of them do occur in the study area, but some to a limited degree. However, once again the nature of the project is such that the pipeline will have absolutely no lasting negative impact on wild fauna after construction including loss of habitat. In the modular footprint areas of the study site (i.e. WTW, sludge lagoons, pump stations, reservoirs) the negative impact will be greater, but fortunately in all cases the limited loss of vegetation will not have a significant impact of habitat loss of fauna as there is enough similar habitat in the immediate surrounds. Even the modular footprint areas of the project will have negligible lasting negative impact on a regional scale as they are either in degraded areas and not in areas of irreplaceable biodiversity value.
- Sensitivity maps have been compiled by Zutari with the input from all the specialists for the following sensitivities: (i) CBA's (ii) Protected Olive Trees (iii) Freshwater (iv) Heritage and (v) Overlay of all sensitivities. Sensitivity maps are available in Annexure I.

8.3 Buffer Zones & Regulated Zones

- Standard 32 m wide buffers (regulated zones) are recommended around the edge of all wetlands and along the edges of all streams and rivers. The distance should be measured from the edge of the watercourse. That is, from the edge of the top of the stream bank or the outer edge of the temporary zone of the wetland.
- No buffers for any terrestrial environments, habitats or features are required.
- There are no 'no-go zones' that need to be buffered. However, all watercourses and rocky hills (koppies, hills, inselbergs) are considered sensitive and should be avoided unless directly within the footprint of the proposed project, such as in the case of proposed reservoirs and pump stations. In these cases all recommended mitigating and management measures must be implemented to reduce impacts.

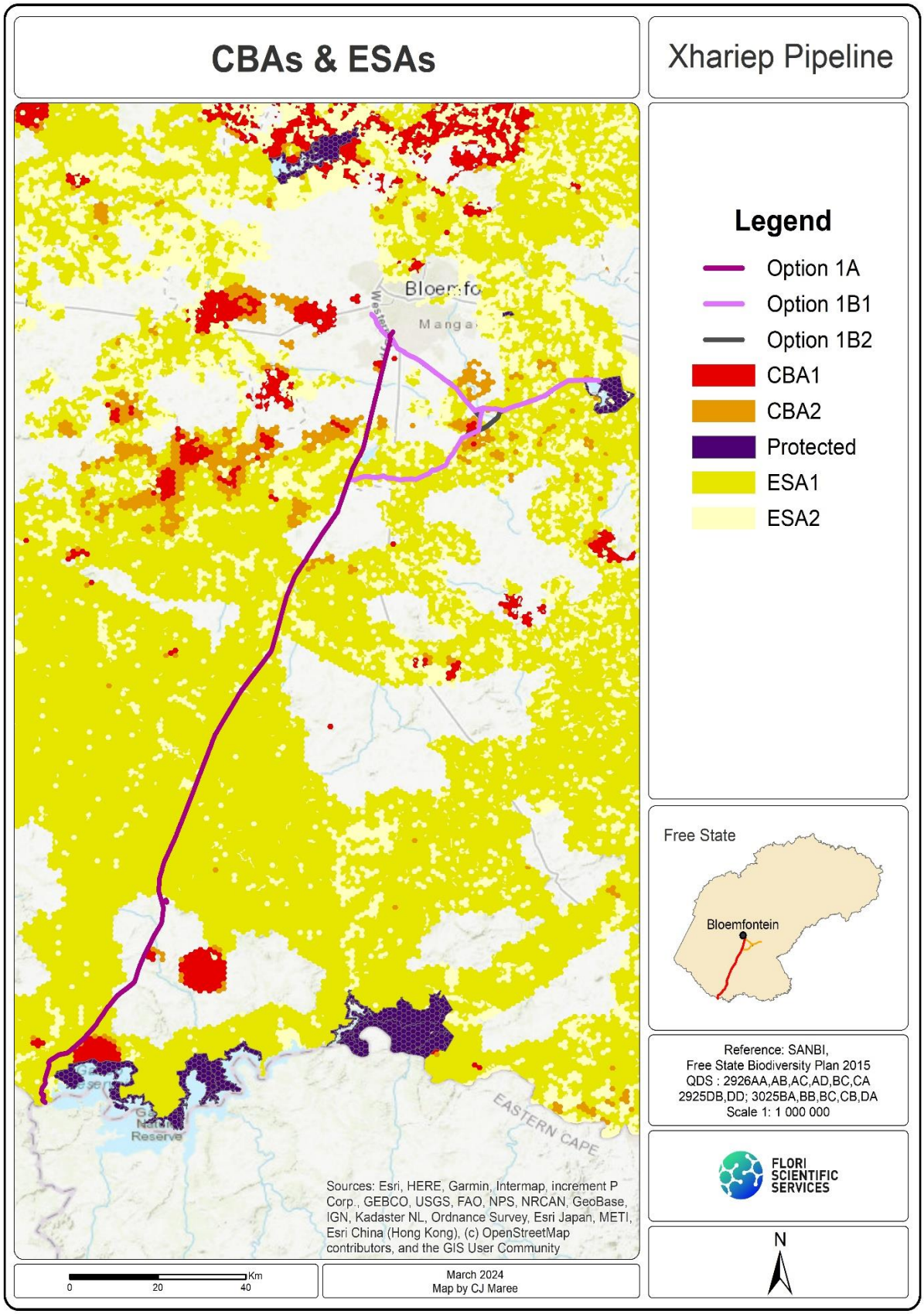


Figure 8-1: CBA's and ESA's (Courtesy of Setlala)

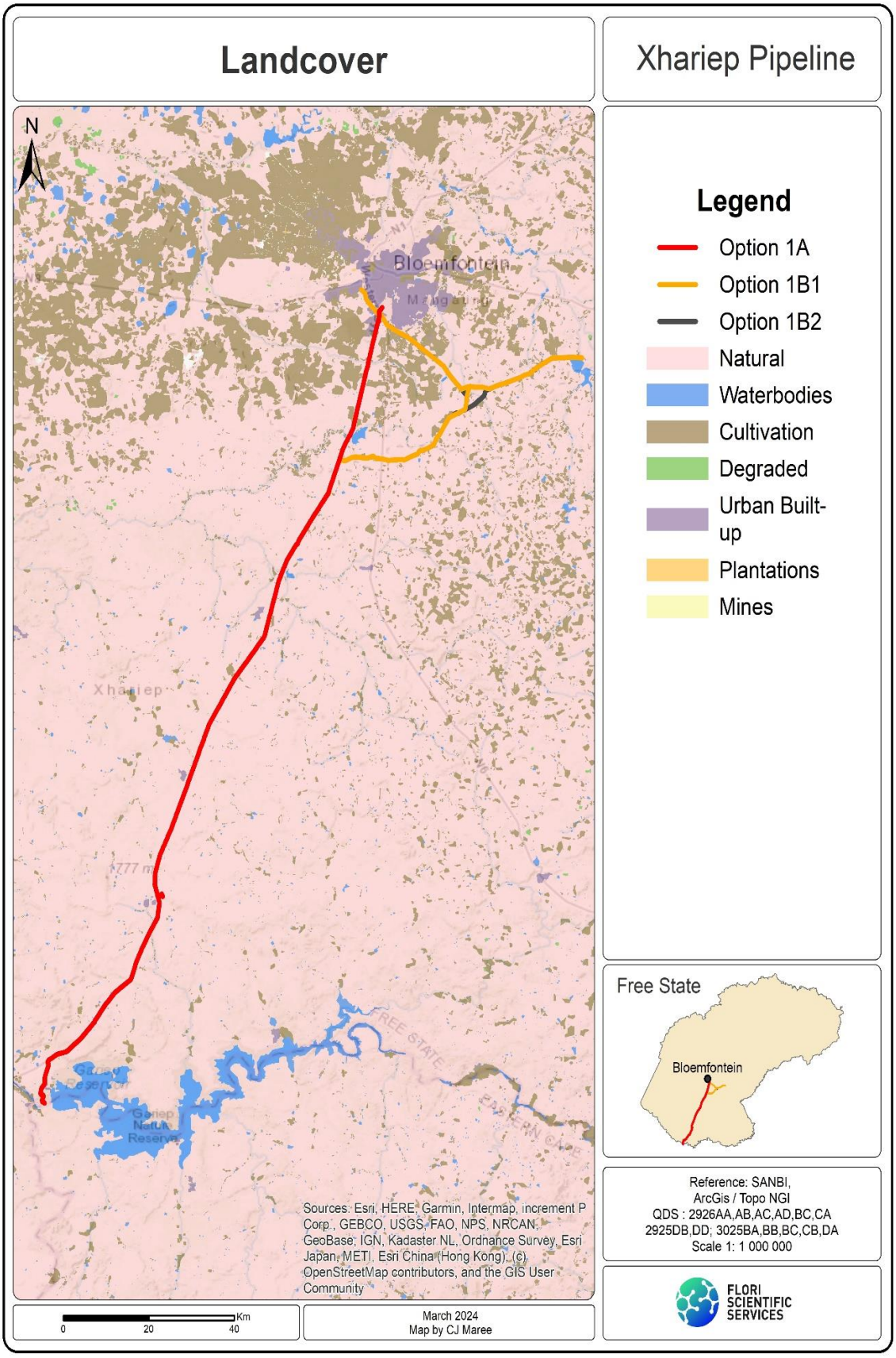


Figure 8-2: Landcover (Courtesy of Setlala)

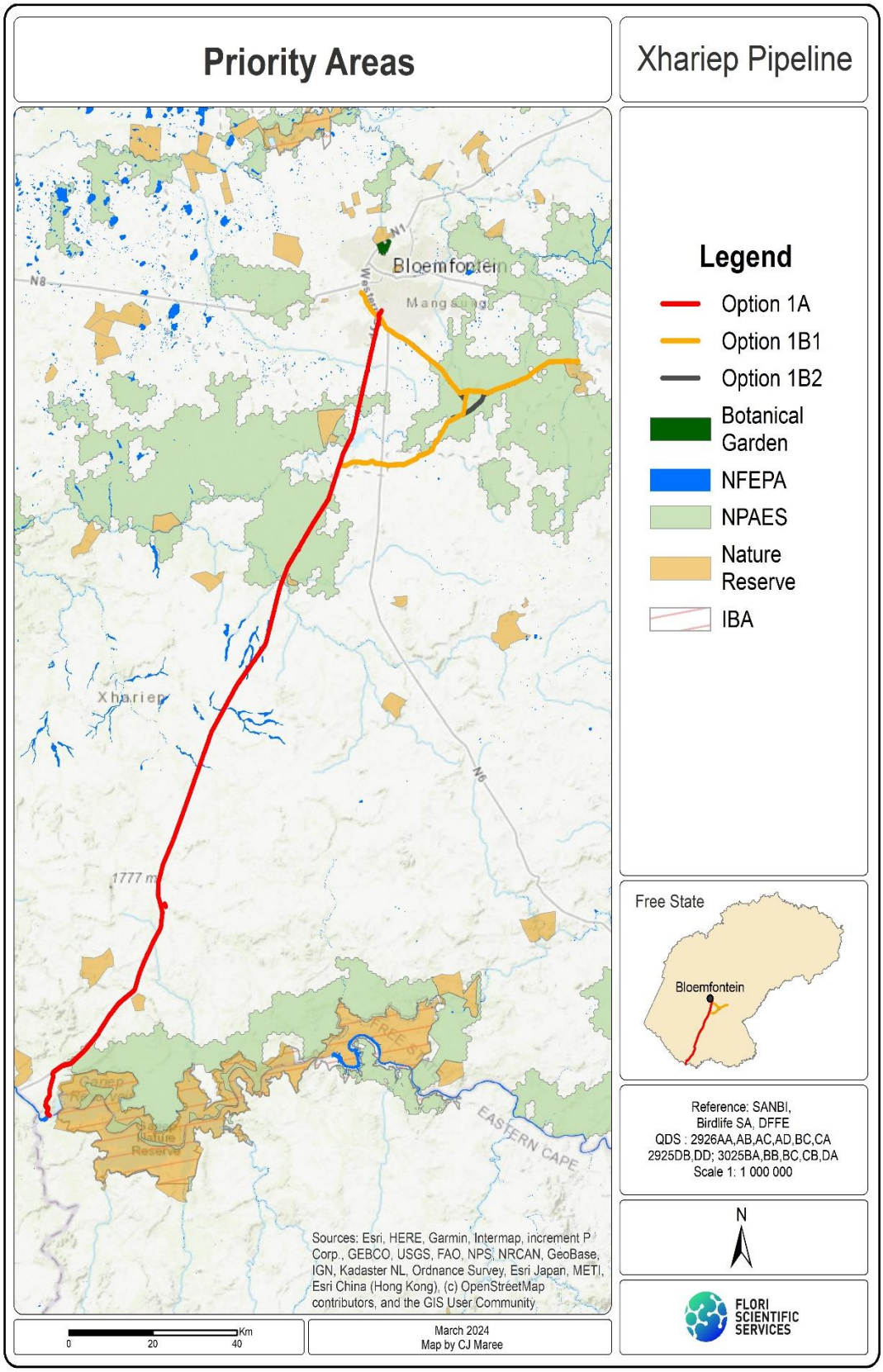


Figure 8-3: Priority Areas (Courtesy of Setlala)

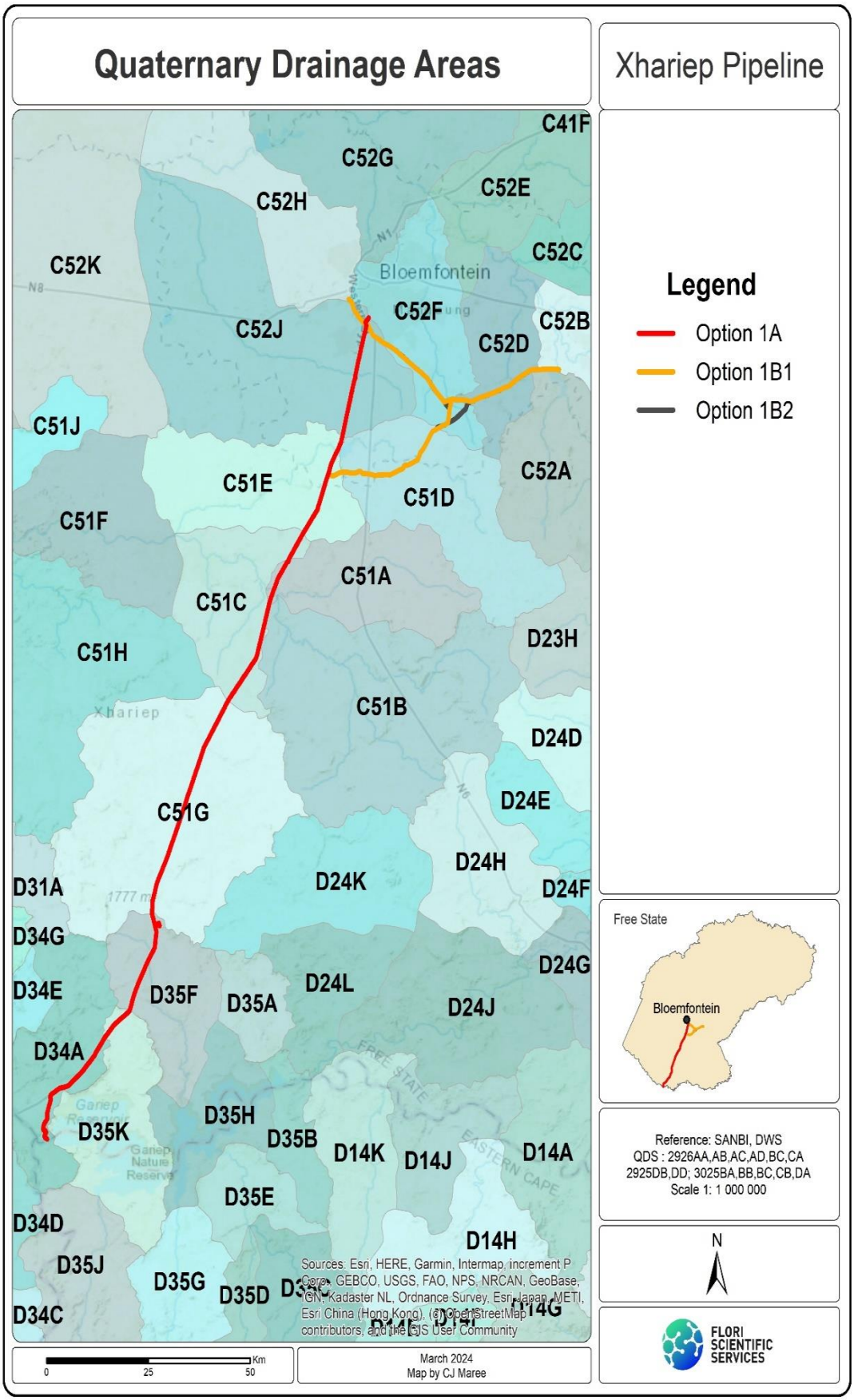


Figure 8-4: Quaternary drainage areas (Courtesy of Setlala)

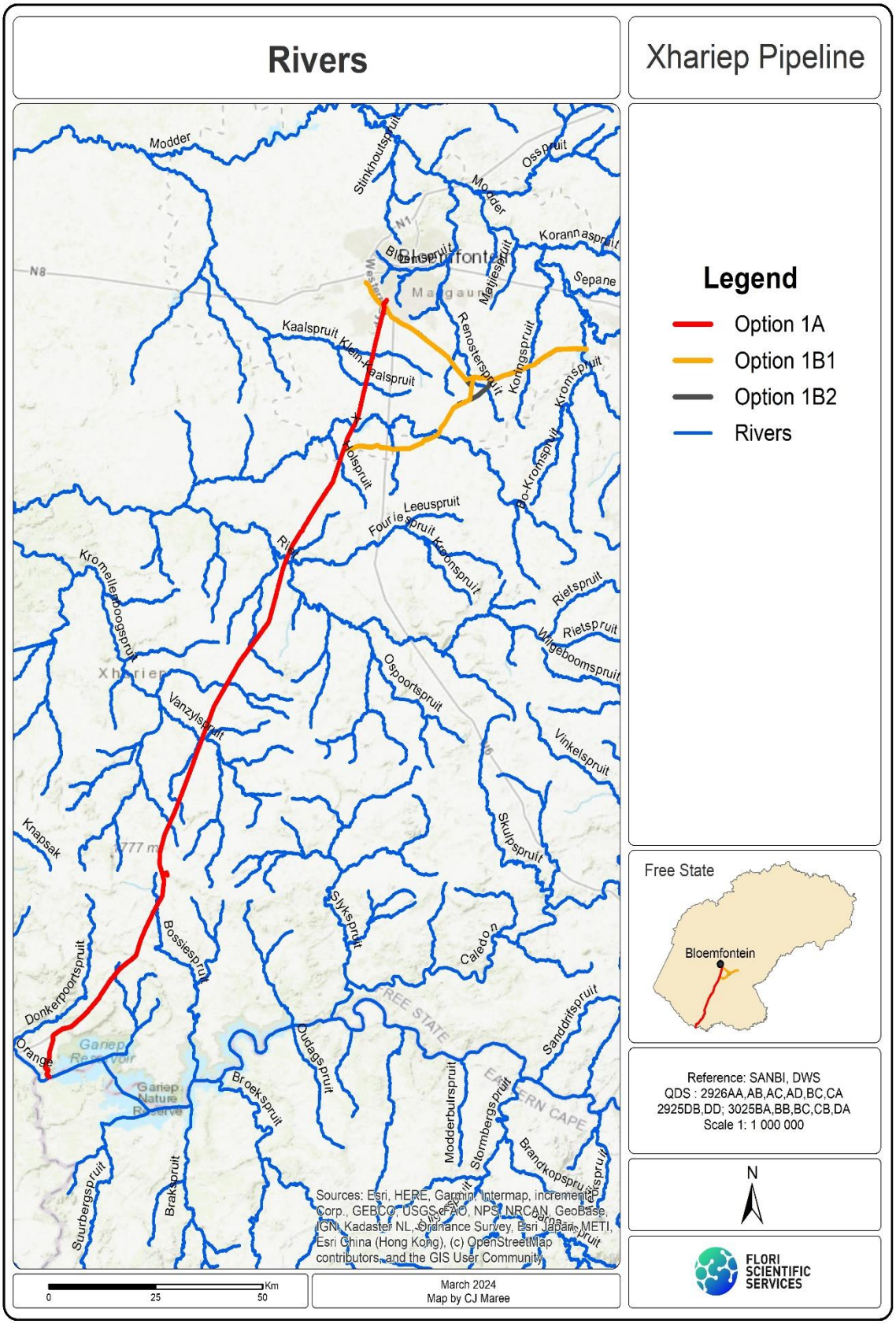


Figure 8-5: Rivers (Courtesy of Setlala)

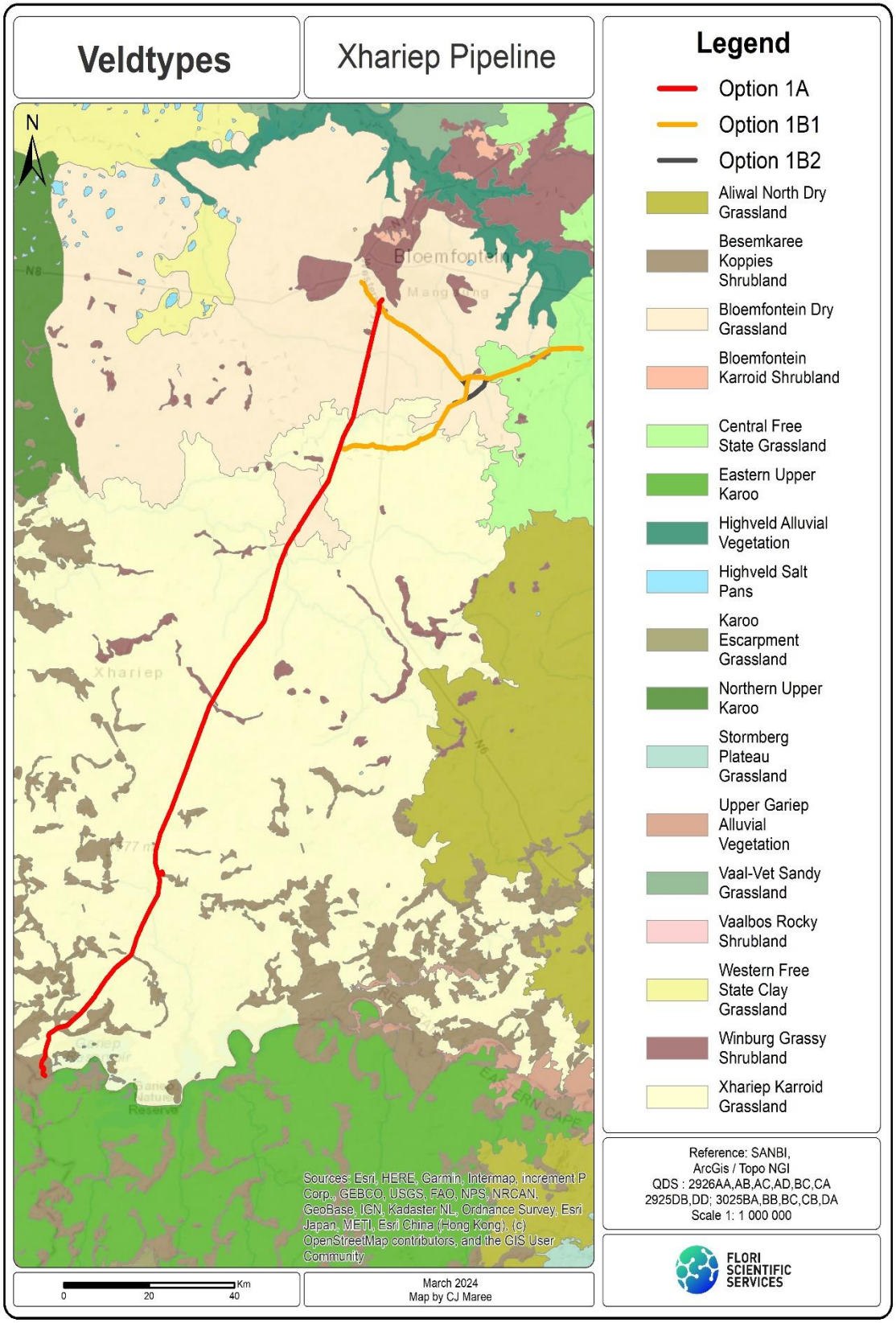


Figure 8-6: Veldtypes (Courtesy of Setlala)

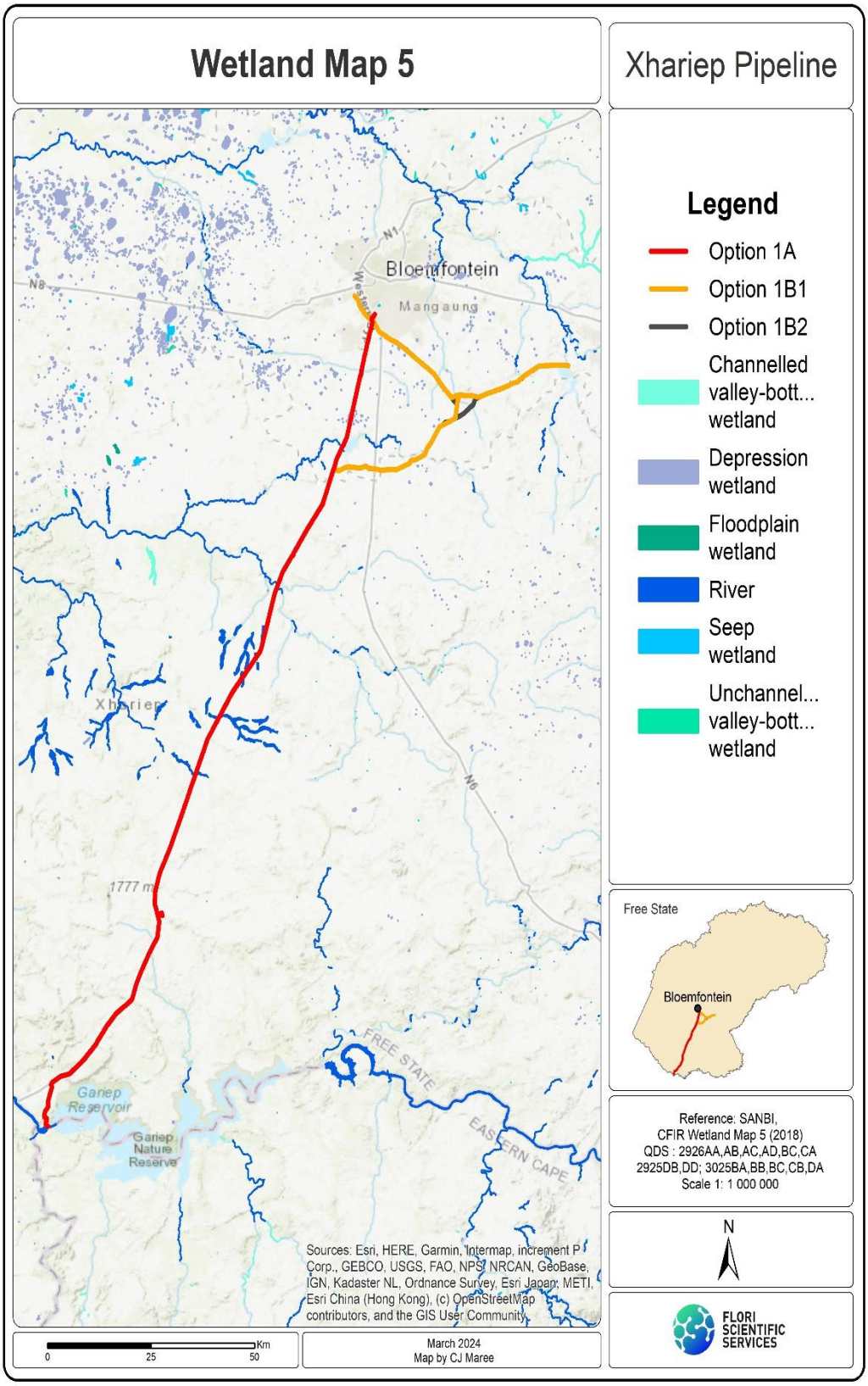


Figure 8-7: Wetlands

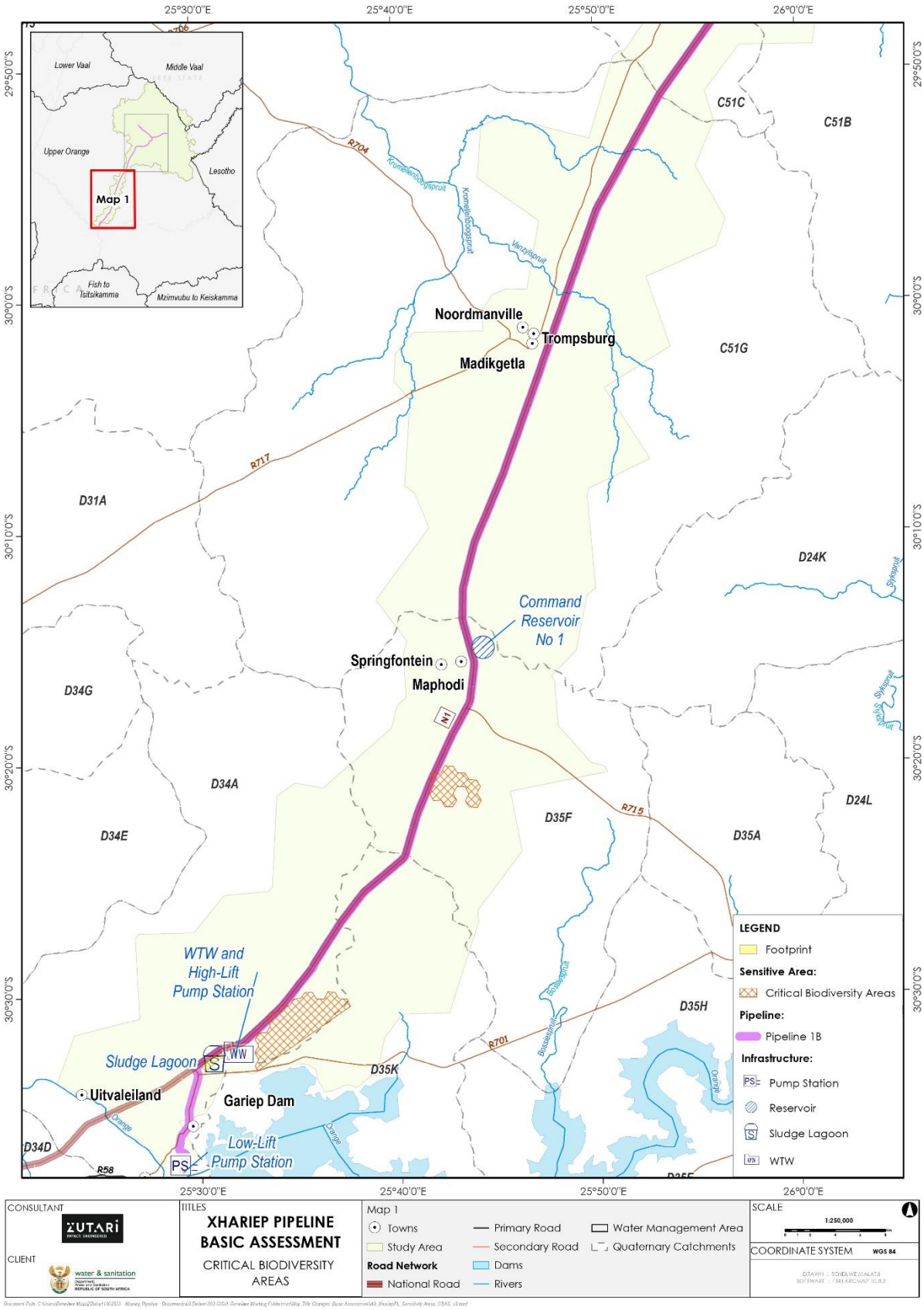


Figure 8-8: Environmental sensitivity map 1: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and CBAs

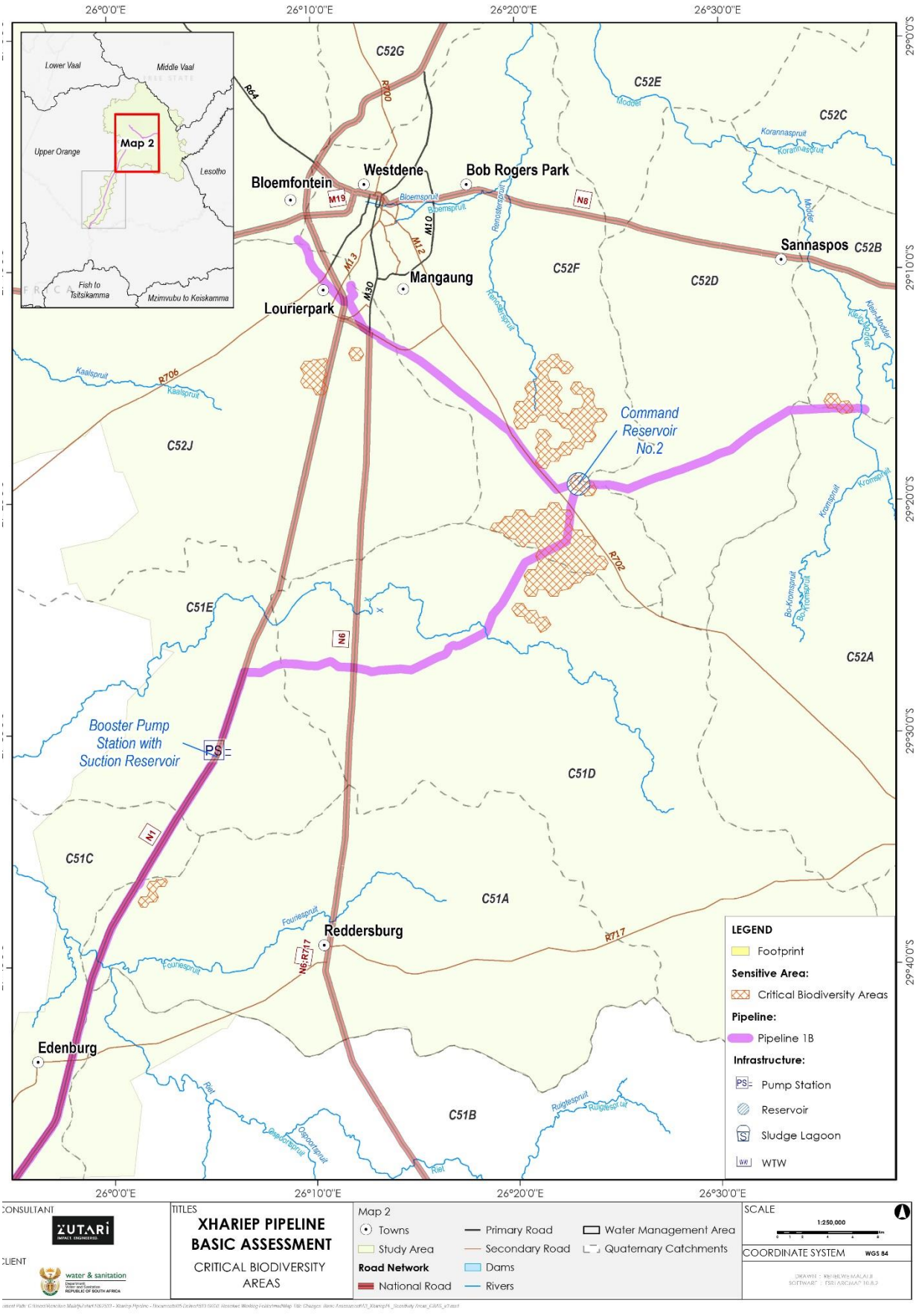


Figure 8-9: Environmental sensitivity map 2: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and CBAs

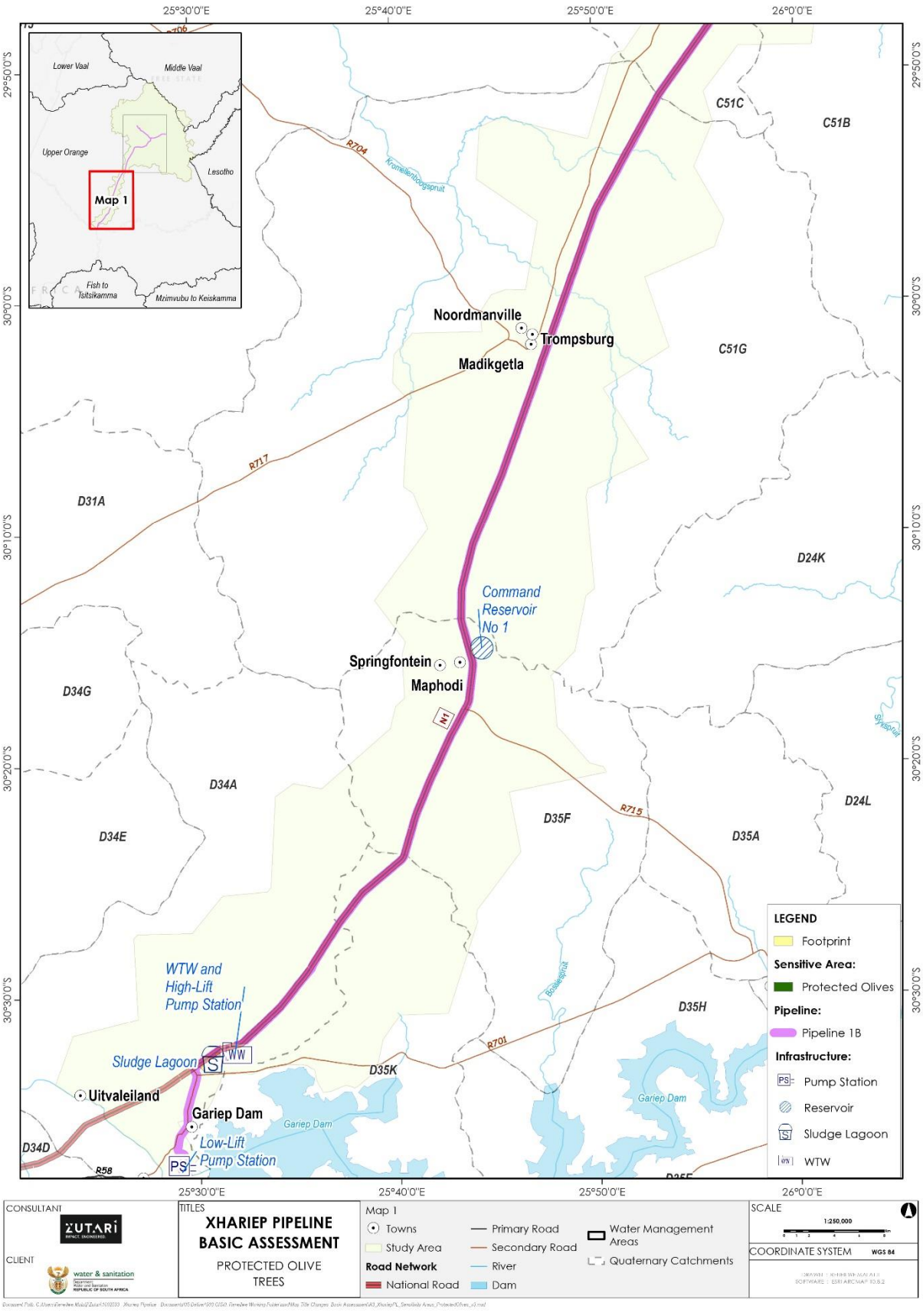


Figure 8-10: Environmental sensitivity map 1: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and Protected Olive Trees

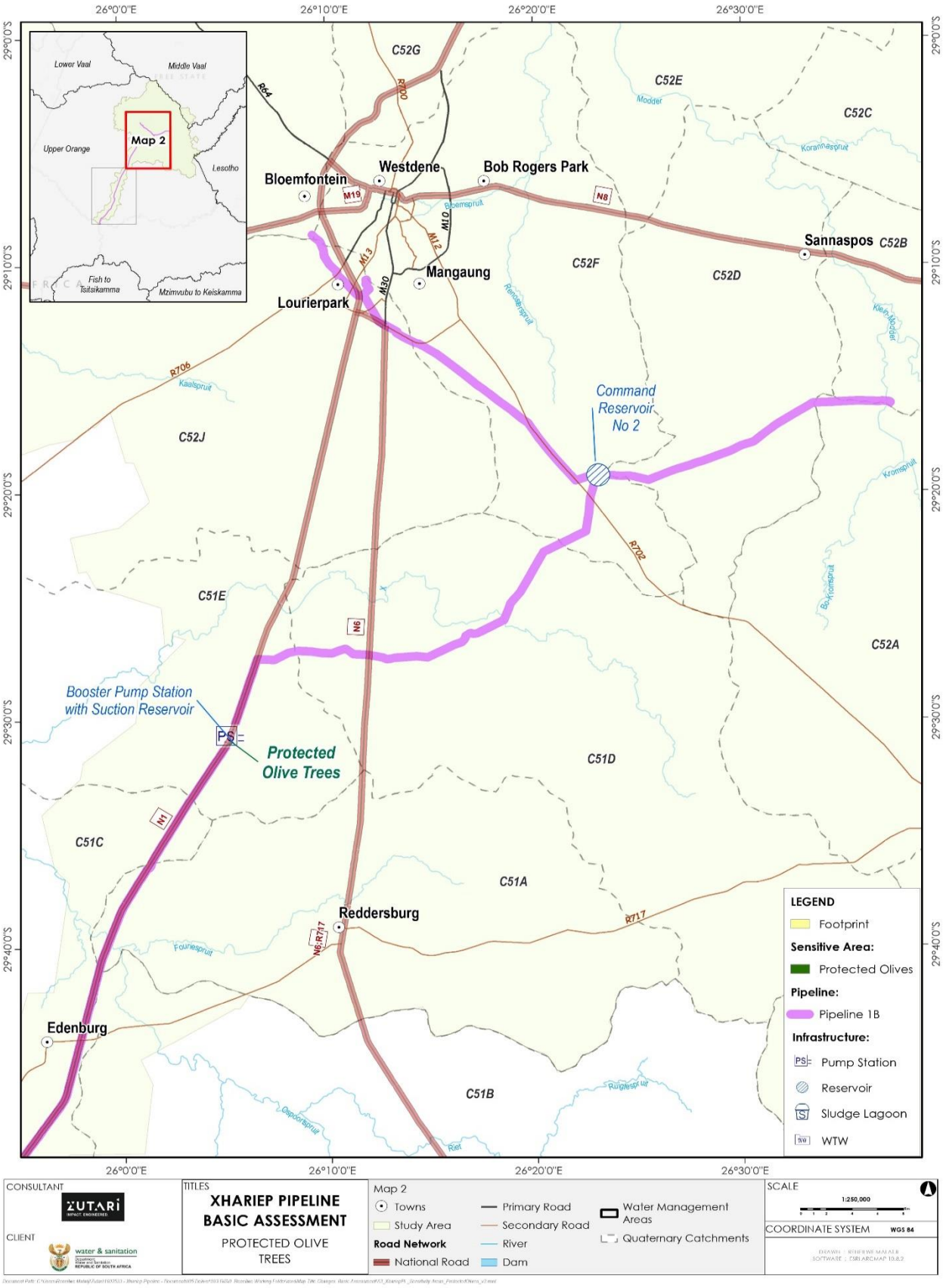


Figure 8-11: Environmental sensitivity map 2: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and Protected Olive Trees

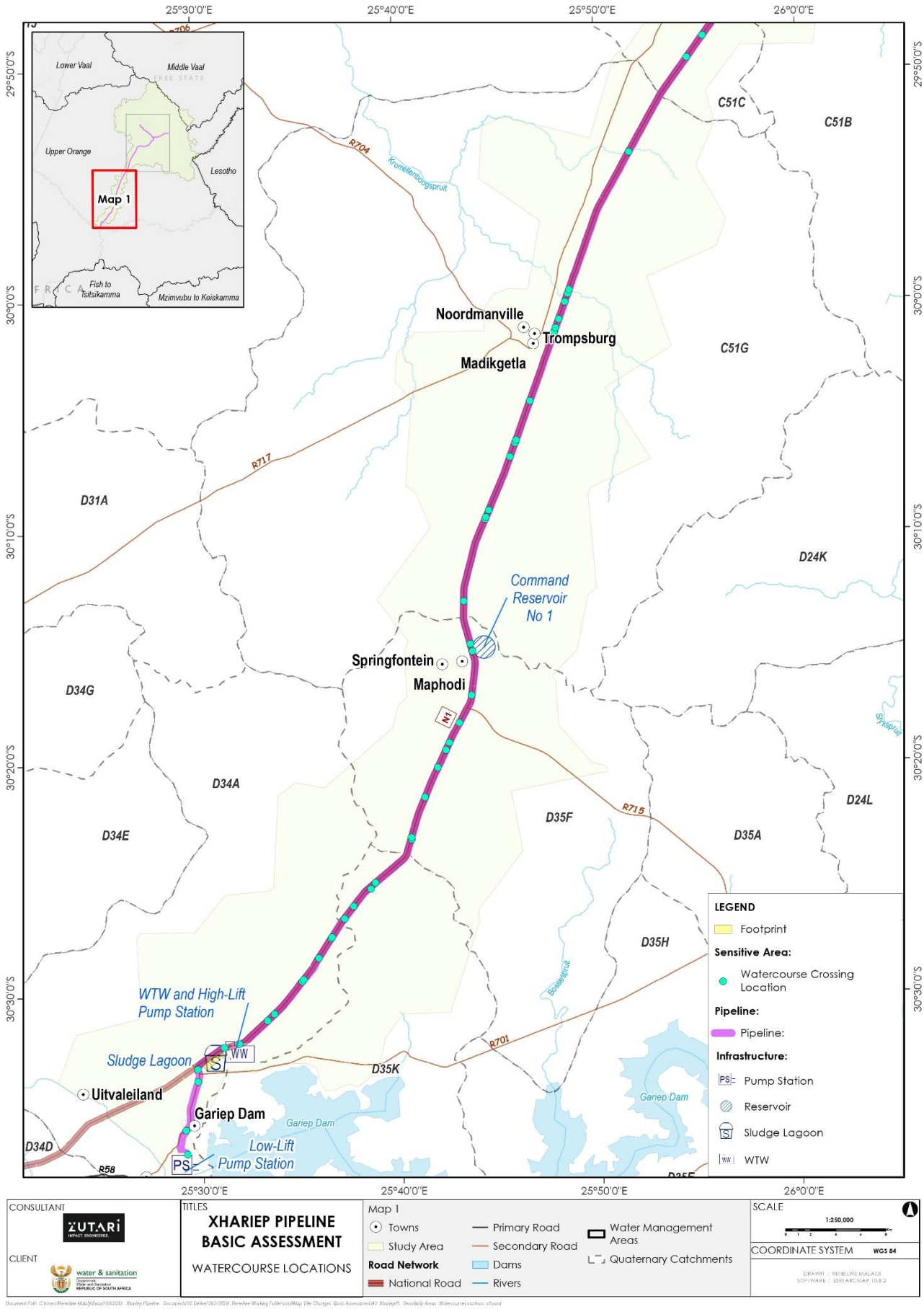


Figure 8-12: Environmental sensitivity map 1: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and Freshwater

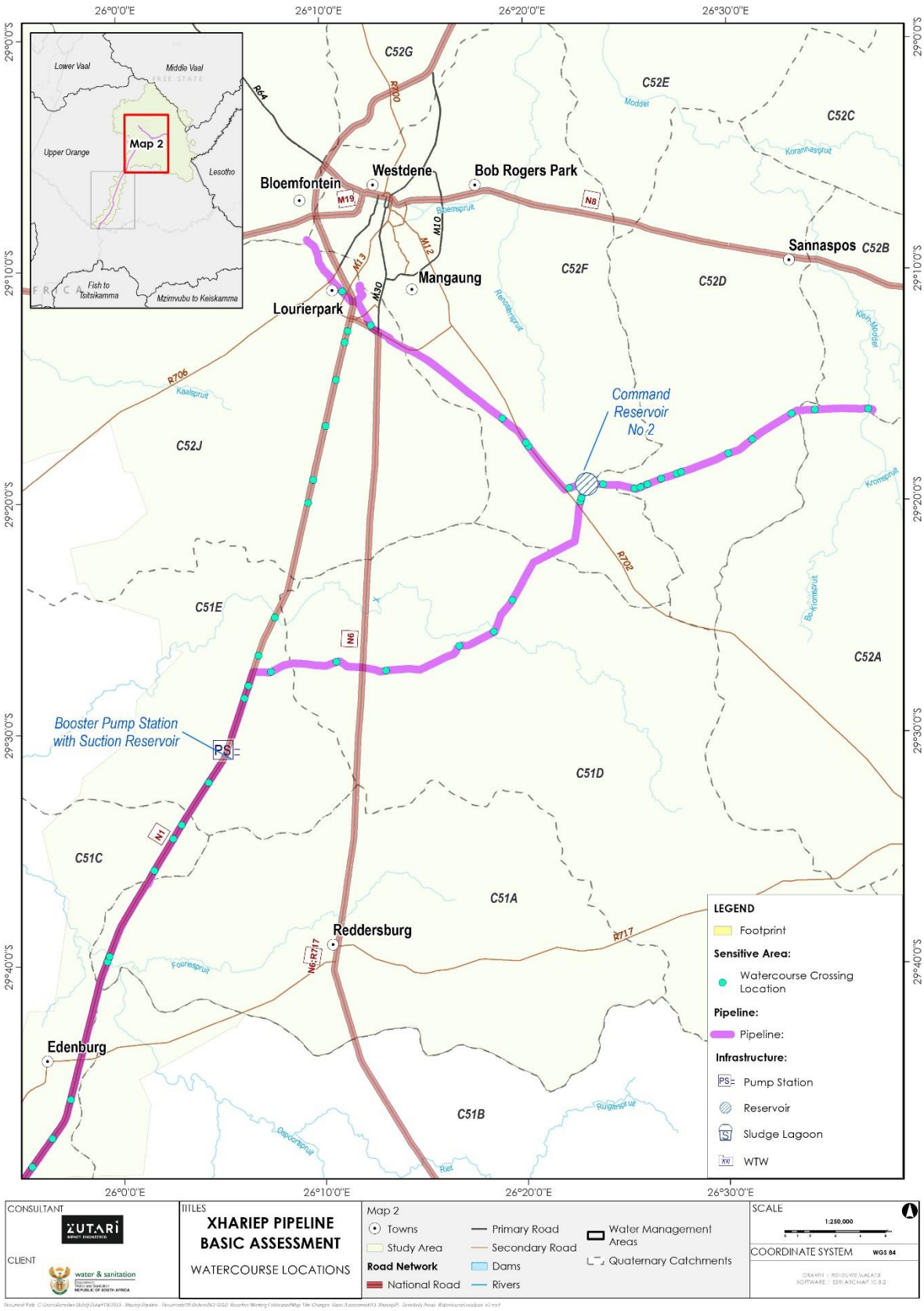


Figure 8-13: Environmental sensitivity map 2: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and Freshwater

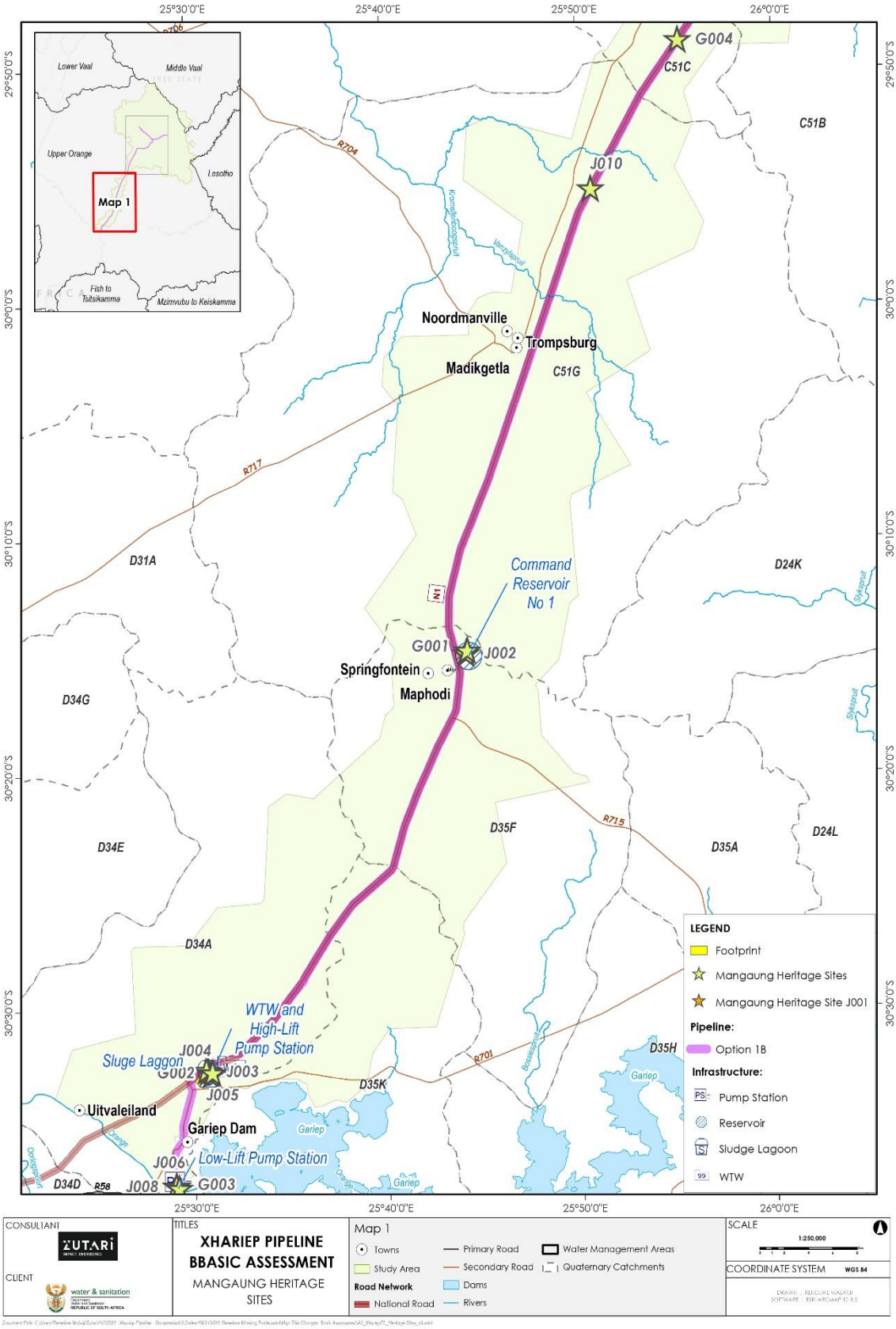


Figure 8-14: Environmental sensitivity map 1: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and Heritage

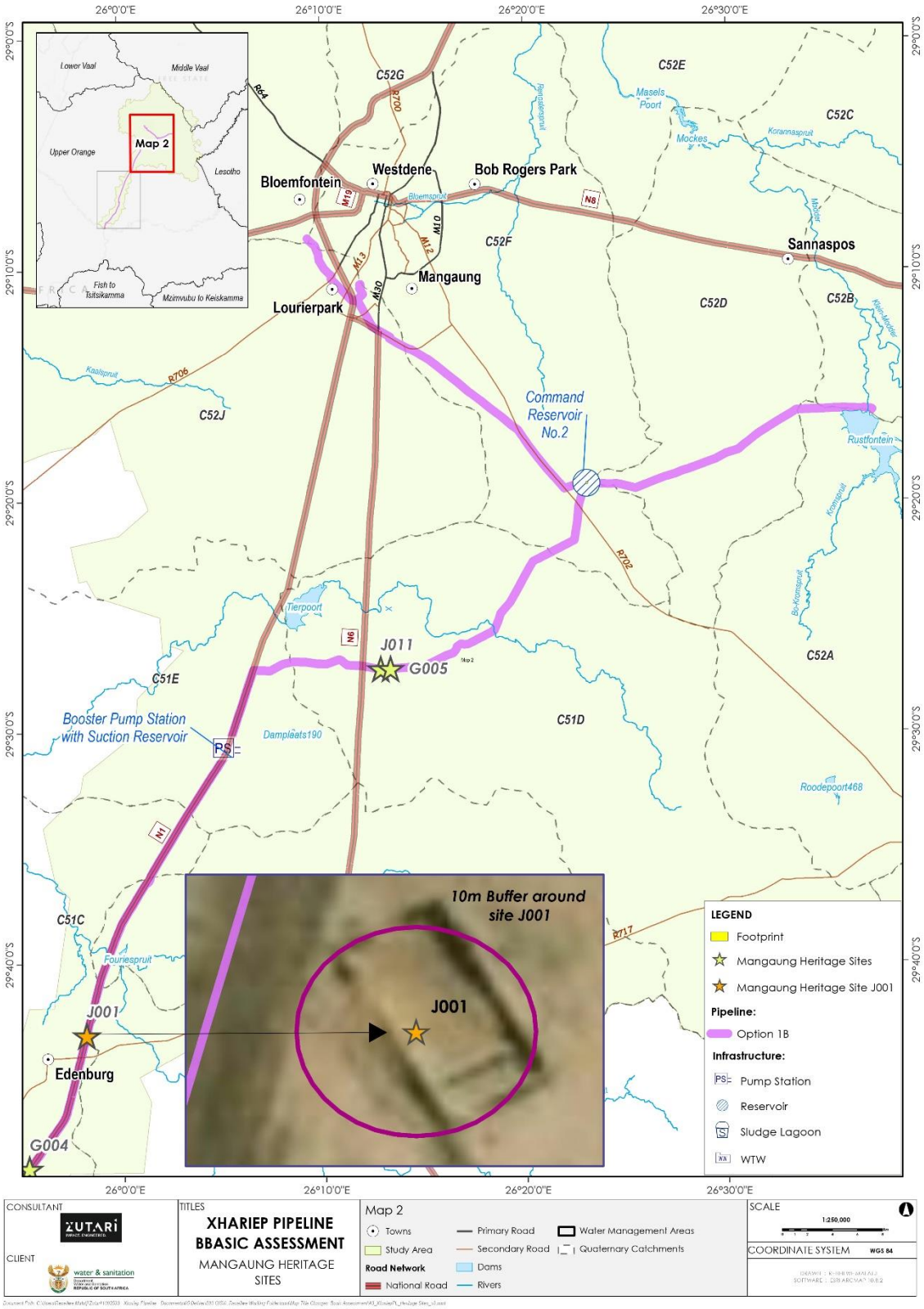


Figure 8-15: Environmental sensitivity map 2: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and Heritage

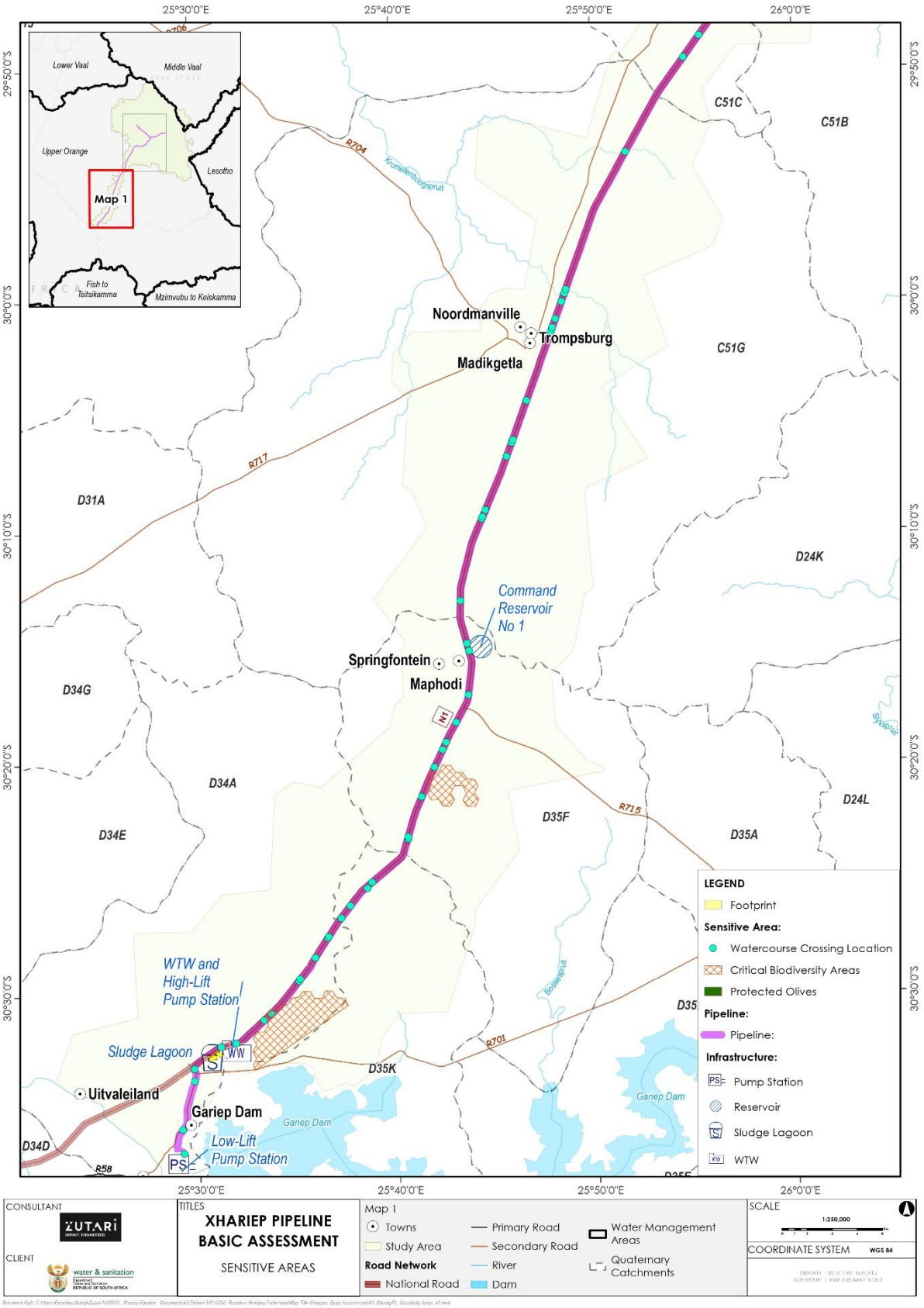


Figure 8-16: Environmental sensitivity map 1: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and all sensitivities (overlay)

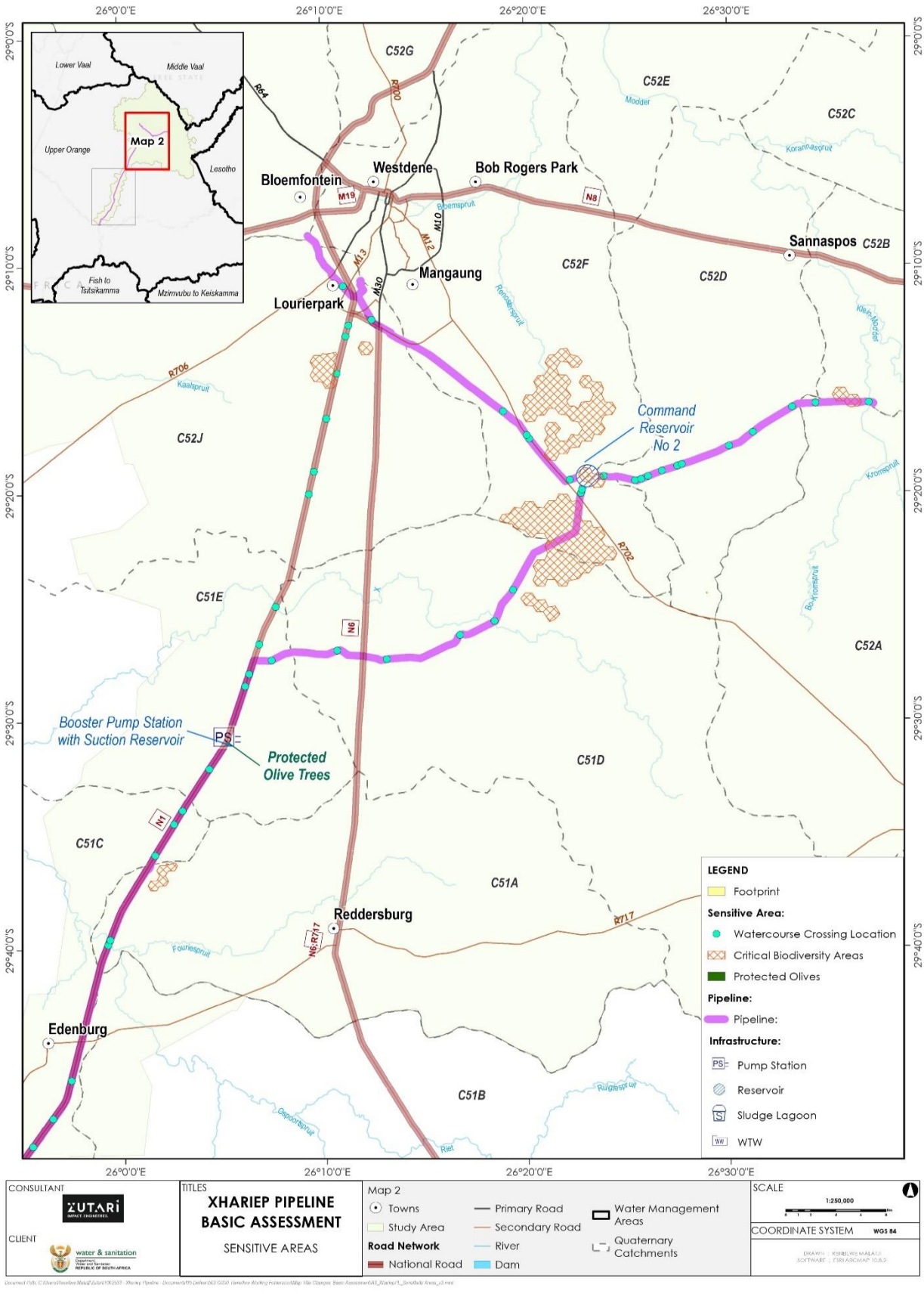


Figure 8-17: Environmental sensitivity map 2: Proposed infrastructure Xhariep Pipeline Project Scheme 1B and all sensitivities(overlay)

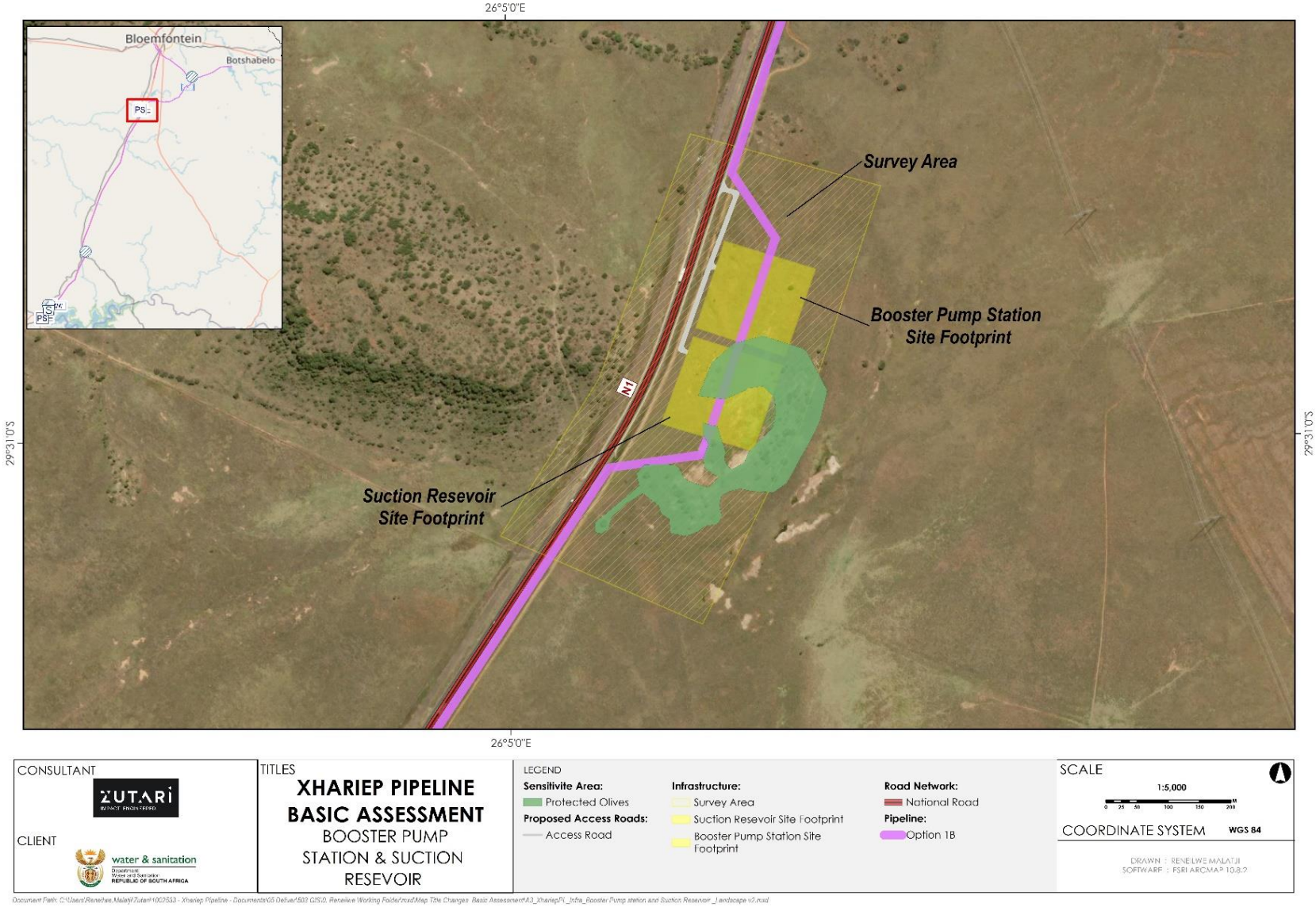


Figure 8-18: Environmental sensitivity map: Booster pumpstation and suction reservoir

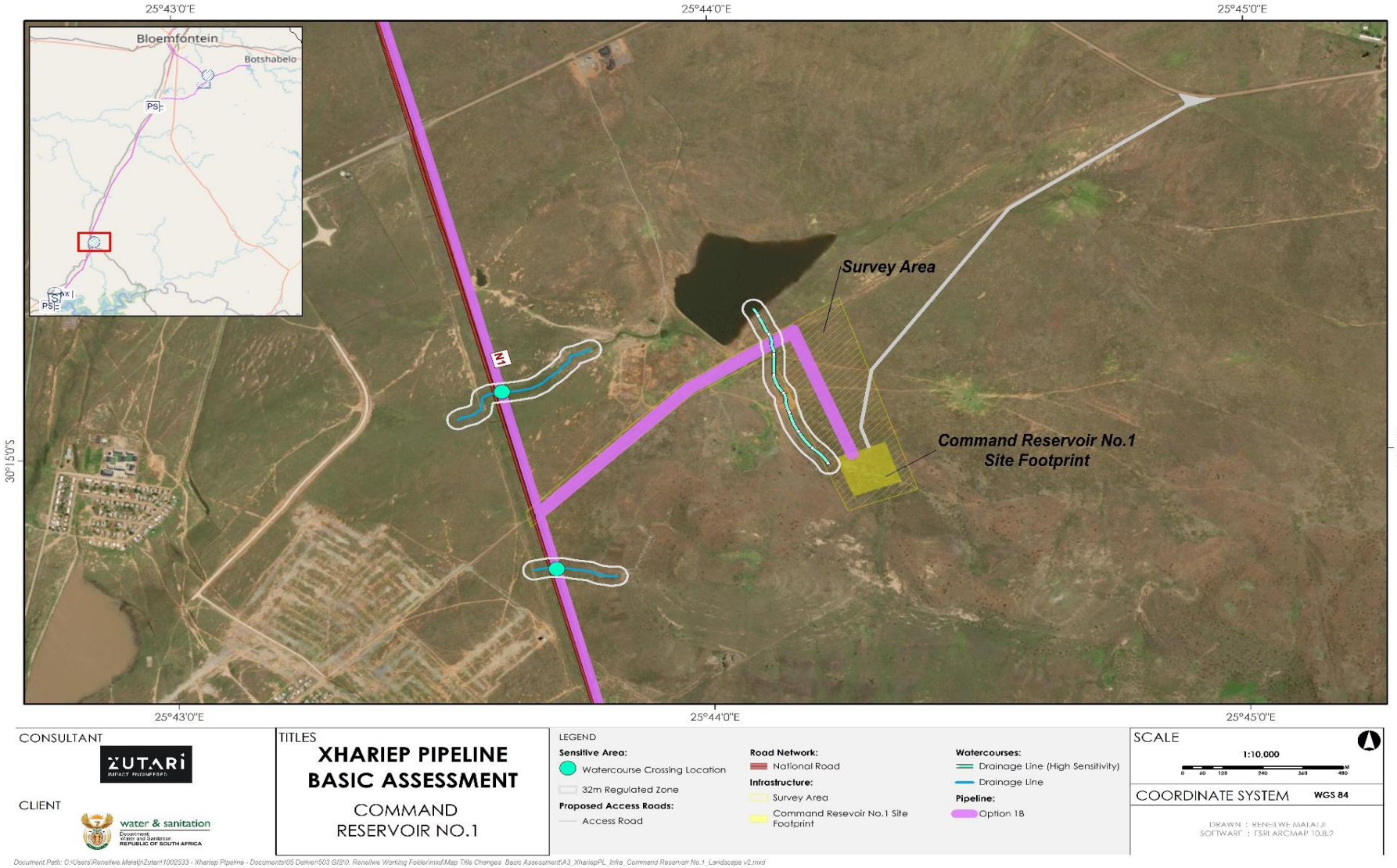


Figure 8-19: Environmental sensitivity map: Command reservoir 1

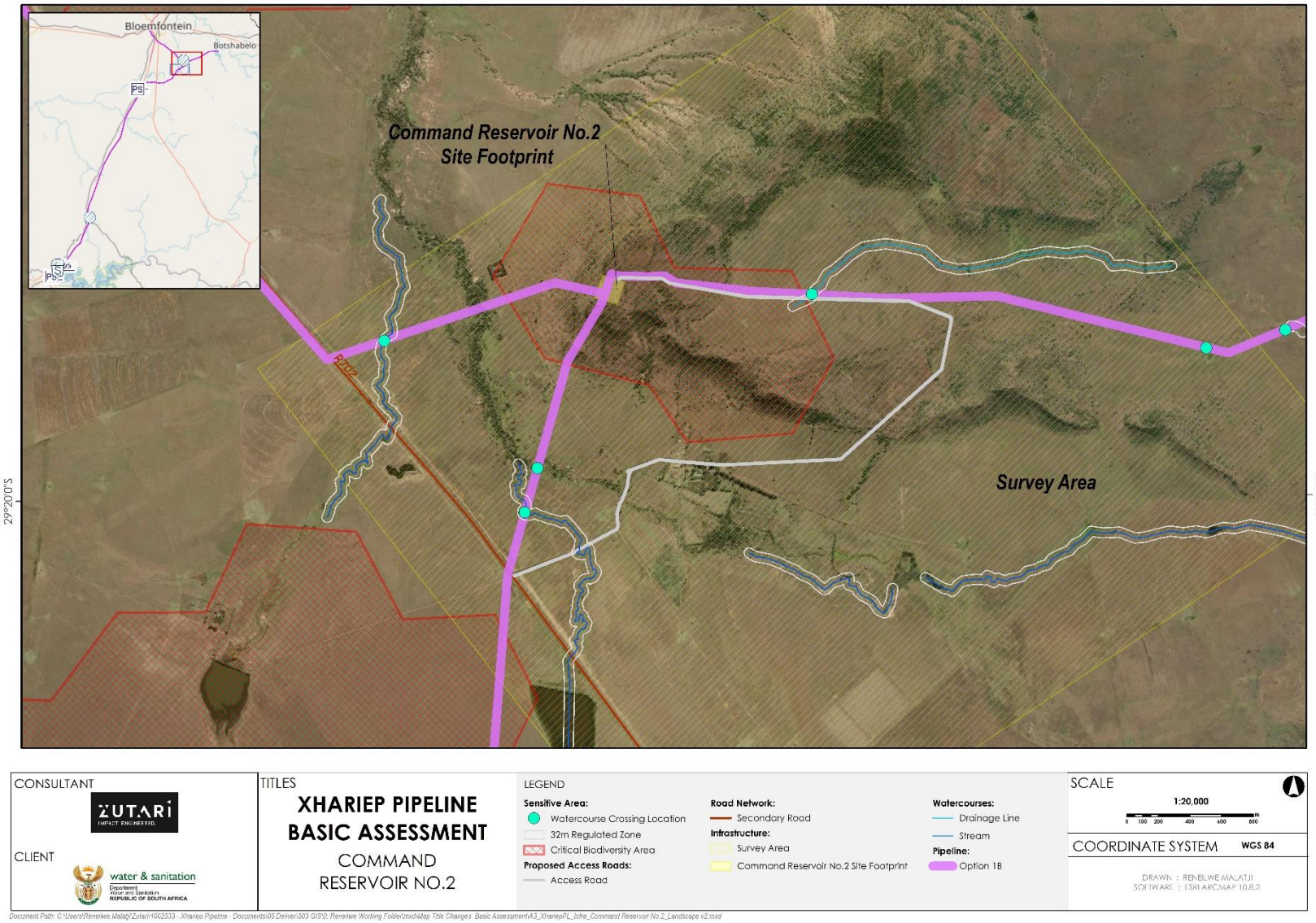


Figure 8-20: Environmental sensitivity map: Command reservoir 2

Figure 8-21: Environmental sensitivity map: Low lift pumpstation

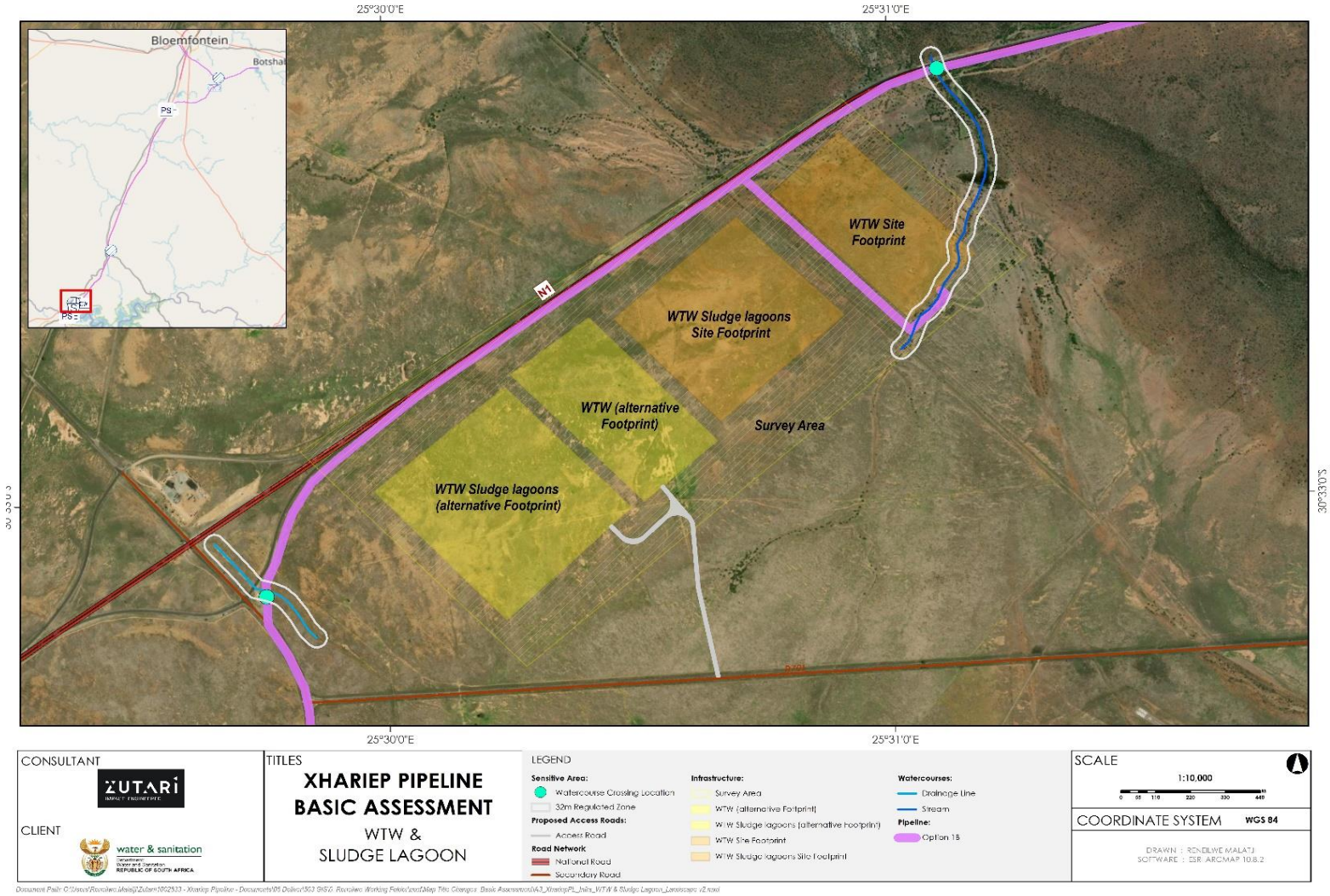


Figure 8-22: Environmental sensitivity map: WWT and sludge lagoon

8.4 Proposed Specific Conditions of Authorisation

- The packed stone kraal (J001) which is on the alignment of the pipeline must be avoided and not subject to impacts arising from the project. A buffer of 10m is recommended around this site.
- A pre-construction archaeological walkover survey of those portions of the pipeline route which cross dolerite ridges and river valleys, and those infrastructure areas that could not be accessed during the TerraMare Archaeology survey must take place.
- Any archaeological or palaeontolgical sites or material encountered during construction activities must be reported to the ECO by contractors, and SAHRA must be notified of any such discovery by the ECO so that the find can be assessed and arrangements made to mitigate it, if necessary. Such finds may require inspection or collection/excavation by an archaeologist. Such heritage is the property of the state.
- No identifiable graves have been recorded in the development area, but it is possible that human remains will be encountered during construction work. Should human remains be encountered, activities work in the vicinity of the find must cease, the remains must be left in situ but made secure and SAHRA must be notified immediately so that mitigatory action can be determined and be implemented.
- The following plans are required and must be submitted to DFFE before construction commence:
    - A comprehensive rehabilitation and monitoring plan. This plan must be compiled by an Ecologist.
    - A comprehensive maintenance management plan. This plan must be compiled by a Freshwater Specialist.
    - An alien weed control plan.This plan must be compiled by an Ecologist.
- A detailed stormwater management plan is required.
- A walkthrough of the final layout must be undertaken by an Ecologist before construction commence.
- The following conditions should be followed for protected species:
    - Where protected tree species (*Olea europaea subsp. africana* – Wild Olive) occur in the construction footprint they should be avoided as far as possible.
    - Where this is not possible, permits should be obtained from the relevant authority to remove them.
    - Where protected succulent/geophytic species will be affected by construction, permits should be obtained and these transplanted to adjacent or rehabilitated areas where they will remain unaffected. The transplanting of these species should be overseen by an ecologist, botanist or other suitably qualified person. For every olive tree removed 5 new olive trees must be planted on the same hill / koppie.
- Installation of the pipeline through wetlands and watercourses should preferably be undertaken during the winter months (July to September) when baseflow will be at its lowest level.
- The project must aim to maximise the use of suitably skilled local labour where applicable and where available, through the development of a Procurement Policy and Procurement Plan. This plan must be transparently and consistently applied.

8.5 Validity of the Environmental Authorisation

It is proposed that the Environmental Authorisation be valid for a period of 10 years from the date of the decision. This is to allow sufficient time for the applicant and developers to gain the necessary approvals required before construction can commence.

8.6 EAP Statement

It is the EAPs opinion that the recommended mitigation measures proposed by the specialists and contained in the EMPr, together with the Applicant's consideration of the sensitivities and no-go areas in the current design, will sufficiently reduce the negative impacts to an acceptable level.

In addition, the Applicant has shown willingness to consider further suggestions from specialists on ways to effectively reduce the remaining negative impacts as detailed in the attached specialist reports (Annexure D) and summarised in Section 7.

9 CONCLUSIONS AND WAY FORWARD

Since a thorough Feasibility Study of the Greater Mangaung Water Supply Augmentation Project – Xhariep Pipeline was conducted prior to the commencement of the BA process, during which alternative options and infrastructure locations (e.g. reservoir positions, pump station positions, etc.) were evaluated the Applicant and EAP are confident that the proposed route and infrastructure which has been assessed in this report is the preferred option. Further consideration of alternatives for the BA process only included the no-go alternative.

The project description (Section 5) informed the legal and planning context of the project (Section 2) as well as the methodology required for this BA process (Section 3). This in turn informed the requisite PPP (Section 4) which will ensure that the relevant and required stakeholders are invited to participate in the BA process.

Finally, the wide range of specialist assessments determined the baseline environment and the potential impacts that the project is expected to have on the affected environment (Section 7). These assessment reports also include recommended mitigation measures which have been included in the EMPr (Annexure G).

Based on the above information, the specialists and the EAP were able to conclude statements on whether to recommend the project for authorisation or not (Section 8).

All specialists and the EAP have recommended that the project be granted EA, with the proposed inclusion of specific conditions (Section 8.4).

10 BIBLIOGRAPHY

BANZAI. (2024). *Palaeontological Impact Assessment for the Xahriep Pipeline, Free State Province* Bloenfontein

Batho Earth (2024). *Social Impact Assessment for the Xhariep project*. Pretoria

DEA&DP. (2019). *Western Cape Land Use Planning Guidelines.*

DFFE. (2017). *Public Particpation guideline in Terms of NEMA EIA Regulations.* Pretoria.

DPR (2024). *Wetland Assessment for the proposed Xhariep bulk water supply pipeline form Garipe Dan to Bloemfontein and the Rustfontein Dam*, Free State, Brandhof

DSA. (2024). *Compliance Statements for the Xhariep Pipeline and Associated Infrastructure*, Bloemfontein

TerraMare (2024). *Heritage Impact Assessment Report for the Greater Manguang Augmentation Project Xhariep Pipeline, Free State Province,* Cape Town

Setlala. (2024). *Terrestrial Ecological Impact Assessment for the Proposed Xhariep Pipeline Project, which forms part of the Greater Mangaung Augmentation Project, and is Located in the Free State Province with the Pipeline Route from the Gariep Dam, mostly along the N1 National Route, and into the Bloemfontein area*. Pretoria

11 ANNEXURES

Annexure A: Details of the EAP

ANNEXURE B: Correspondence with DFFE

ANNEXURE C: Public Participation

ANNEXURE C1. I&AP register

ANNEXURE C2. Pre-app meeting minutes

ANNEXURE C3. Background information document

ANNEXURE C4. Adverts and site notices (Afrikaans and English)

ANNEXURE D: Specialist Reports

ANNEXURE D1. Agricultural Assessment

ANNEXURE D2. Archaeology and Heritage Assessment

ANNEXURE D3. Aquatic Assessment

ANNEXURE D4. Civil Aviation Compliance Statement

ANNEXURE D5. Defence Compliance Statement

ANNEXURE D6. Palaeontology Assessment

ANNEXURE D7. Social Assessment

ANNEXURE D8. Biodiversity Assessment

ANNEXURE D9. Geo-tech Assessment

ANNEXURE E: Screening Tool Report

ANNEXURE F: Coordinates and locality

ANNEXURE G: EMPr

ANNEXURE H: Site Photographs

ANNEXURE I: Maps

ANNEXURE I1. Locality

ANNEXURE I2. CBA’S

ANNEXURE I3. Protected Olive trees

ANNEXURE I4. Aquatic impacts

ANNEXURE I5. Heritage impacts

ANNEXURE I6. Environmental Sensitivities (overlay)

ANNEXURE I7. Booster pumpstation and reservoir and sensitivities

ANNEXURE I8. Command reservoir 1 and sensitivities

ANNEXURE I9. Command reservoir 2 and sensitivities

ANNEXURE I10. Low lift pumpstation and sensitivities

ANNEXURE I11. WTW and Sludge lagoons and sensitivities

ANNEXURE J: Declaration

In diversity there is beauty and there is strength.

MAYA ANGELOU

Document prepared by:
Zutari (Pty) Ltd
Reg No 1977/003711/07
1 Century City Drive
Waterford Precinct
Century City
Cape Town
South Africa
PO Box 494
Cape Town
8000
Docex: DX 204

T +27 21 526 9400

E capetown@zutari.com

ZUTARI
IMPACT. ENGINEERED.